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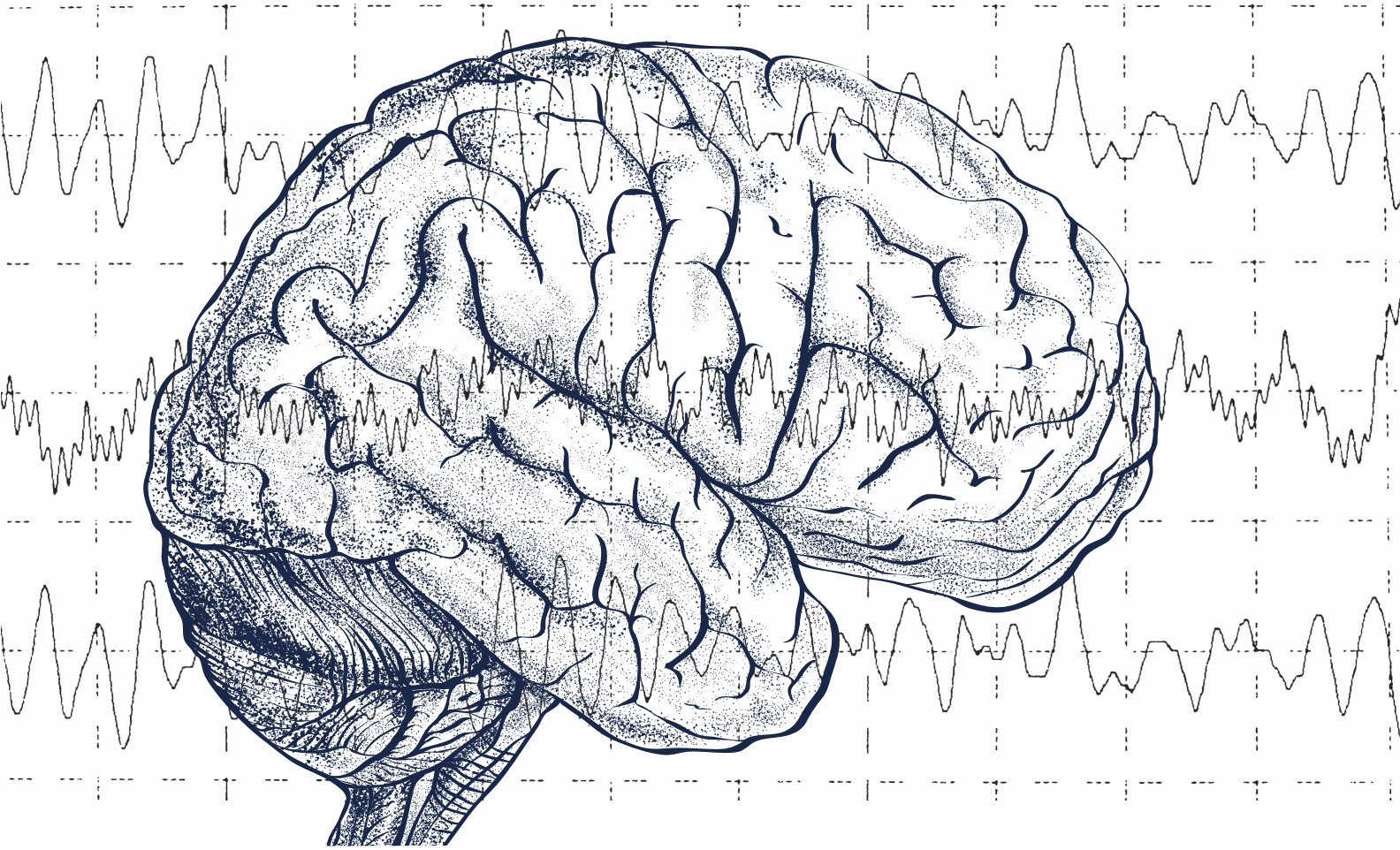

36th Annual
Meeting of the
Associated
Professional Sleep
Societies

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Abstracts by Category

Welcome to your preview of SLEEP 2022, the 36th Annual Meeting of the Associated Professional Sleep Societies, which is scheduled to be held in Charlotte, North Carolina on June 4-8, 2022.

This abstract supplement unites the journal *SLEEP*, and the science of SLEEP 2022. All abstracts presented at SLEEP 2022 are included in this special issue. This year 864 abstracts will be presented at the meeting. 196 will be presented in an oral presentation format, and the remainder will be presented in a poster format. Many authors of oral presentations will also be presenting their science in the virtual poster hall, providing additional time to network with the authors of these important studies. In addition, this abstract supplement contains case reports submitted by individuals in Sleep Medicine Fellowship and other training programs.

Abstracts in this supplement are divided between Basic and Translational Sleep Science, and Clinical Sleep Science and Practice and then assigned to one of 30 subcategories. Each abstract has a unique four-digit number to facilitate identification and location both within this issue and at SLEEP 2022. The four-digit number in the abstract supplement matches the four-digit code published in the SLEEP 2022 Mobile App.

The SLEEP meeting fosters an environment in which members and attendees learn about the latest basic, translational, and clinical science and technologies, promoting the continued growth of the field through the dissemination of new knowledge. This will be our first time that SLEEP is held in person since the beginning of the pandemic. We look forward to seeing everyone and sharing in the success of this pivotal event and hope you consider joining the American Academy of Sleep Medicine and Sleep Research Society in Charlotte, North Carolina in June.

Allan I. Pack. MBChB, PhD
Editor-in-Chief

0001

ASSOCIATIONS BETWEEN CIRCADIAN FACTORS AND TRAVEL DISTANCE WITH PERFORMANCE: A RETROSPECTIVE ANALYSIS OF 2014-2018 NATIONAL BASKETBALL ASSOCIATION DATA

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Introduction: Frequent travel across time zones and travelling long distances interferes with healthy sleep and disrupts the circadian system, often degrading athletic performance. National Basketball Association (NBA) players face a demanding travel schedule often requiring multiple games per week, with games spanning the continental United States. This investigation aimed to clarify the influence of circadian factors and travel distance on NBA performance using a dataset from the 2014-2018 seasons.
Methods: NBA (2014-2018) game data were acquired from an open-access source: (https://www.kaggle.com/ionaskel/nba-games-stats-from-2014-to-2018). Circadian variables of time zone change (TZΔ) and adjusted jet lag (AJL) were formulated, with quadratic versions utilized across analyses. TZΔ captured circadian delay/advance based on travel for a game, with each TZ going eastward and westward reflected by -1 and +1, respectively. AJL advances TZΔ by allowing acclimation to a novel TZ, with each day resulting in a 1-unit change towards circadian neutral. AJL is a season-long rolling summation, which was computed using two different travel approaches: Approach1 (AJL1) assumes travel the day before each game, whereas Approach2 (AJL2) was designed to prioritize being home. A standardized flight tracker determined travel distance for each game (GameDistance). Team ability differences, characterized as difference in season win percentages (SeasonWinPerDiff), served as an analytic covariate. Game point differential (PointDiff), defined as a team's score minus their opponent's score, and a team's free throw percentage (FreeThrowPer) served as outcome variables. Linear mixed-effects modeling assessed univariate and multivariate associations, with games nested within both team and year.
Results: AJL2 (β = -0.63; p = .01) and GameDistance (β = -0.73; p<0.0001) significantly associated with PointDiff. TZΔ (β = -0.002; p = .03), AJL1 (β = -0.002; p =.04) and GameDistance (β = -0.003; p = 0.007) significantly associated with FreeThrowPer. AJL2 and GameDistance maintained significant relationship with PointDiff in fully adjusted model that included AJL2, GameDistance, and SeasonWinPerDiff.
Conclusion: Results suggest that both circadian delay/advance and greater distance traveled for games negatively influence NBA performance, even when controlling for differences in team ability. Season travel and flight plans could be constructed to reduce the effects of circadian misalignment and travel distance.
Support (If Any): None

0002

GO TO BED! A SYSTEMATIC REVIEW AND META-ANALYSIS OF BEDTIME PROCRASTINATION DETERMINANTS AND SLEEP OUTCOMES.

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Central Queensland University [1]

Introduction: Bedtime procrastination, the volitional delay of going to bed without any external circumstances causing the delay, is associated with poor sleep outcomes. Alleviating bedtime procrastination is an important target for interventions to promote adequate sleep, yet the social cognitive, biological, and behavioural determinants of bedtime procrastination are poorly understood. The present study aimed to conduct a systematic review, narrative synthesis, and meta-analysis of (1) the underlying determinants of bedtime procrastination, and (2) the strength and direction of the relationship between bedtime procrastination and sleep outcomes.
Methods: A database search was conducted through CINAHL, EMBASE, PsychINFO, PubMed, Scopus and Web of Science, using keywords related to procrastination, delay, bedtime and sleep.
Results: A total of 2087 records were identified, and 38 publications met the inclusion criteria. Random-effects meta-analysis for bedtime procrastination and sleep outcomes is ongoing. Preliminary findings suggest self-regulation, self-control and chronotype are the most prominent determinants.
Conclusion: Future research should expand focus to identify a broader range of determinants. Given that there are multiple benefits to a theory-based approach to behaviour change interventions, further research exploring determinants will be able to guide the development of interventions targeting bedtime procrastination.
Support (If Any):

0003

ON THE SAME WAVELENGTH? QUANTIFYING THE ASSOCIATIONS BETWEEN EATING TIMING AND REST-ACTIVITY RHYTHMS IN FREE-LIVING ADULTS

Elissa Hoopes[1], Michele D'Agata[1], Talia Brookstein-Burke[1], Shannon Robson[1], Melissa Witman[1], Susan Malone[2], Freda Patterson[1]
University of Delaware [1] New York University [2]

Introduction: Misalignment between the central circadian clock and daily behaviors increases cardiometabolic morbidity and mortality risk, likely due to internal misalignment between central and peripheral circadian rhythms. Experimental studies suggest food intake may act as a time cue ('zeitgeber') for resetting circadian rhythms, representing a potential behavioral target to ameliorate circadian misalignment and associated health consequences. However, the extent to which eating timing relates to circadian rhythms in free-living adults is unclear. Therefore, we tested the associations between eating timing with 24-h rest-activity-rhythms (RAR), a free-living proxy for endogenous circadian rhythms, in non-shift-working adults.
Methods: Adults without chronic health conditions or sleep disorders completed 14 days of 24/7 wrist accelerometry to evaluate RAR variables of interdaily stability (IS; day-to-day stability in RAR), intradaily variability (IV; within-day fragmentation of RAR), relative amplitude (RA; difference between peak vs. trough activity), L5 onset time (5-h period with lowest activity), and M10 onset time (10-h period with highest activity). Concurrently, time-stamped image-assisted diet records were obtained to generate average eating timing variables, including daily eating onset (time of first caloric intake after awakening), offset (last caloric intake time), duration (time elapsed between eating onset and offset), and caloric midpoint (time at which 50% of daily kcals were consumed), and variables illustrating irregularity in eating timing (standard deviation of eating timing variables). Pearson's correlations quantified the associations between RAR and eating timing variables.
Results: Participants (N=30) were 28.0±6.6 years, 57% female, with a BMI of 23.8±2.5 kg/m2. Higher IS was correlated with lower irregularity in both eating onset (r=-0.55, p<0.01) and duration (r=-0.51, p<0.01). Higher RA correlated with earlier eating onset (r=-0.47, p<0.01), longer eating duration (r=0.53, p<0.01), and lower eating onset irregularity (r=-0.37, p<0.05). Later L5

correlated with later eating onset (r=0.67, p<0.001), offset (r=0.58, p<0.001), caloric midpoint (r=0.56, p<0.01), and greater eating offset irregularity (r=0.53, p<0.01). Later M10 correlated with later eating offset (r=0.40, p<0.05).
Conclusion: Preliminary findings indicate that eating timing and RAR are moderately correlated in free-living adults. Earlier eating timing, increased eating regularity, and longer daily eating duration may represent behavioral targets for improving circadian rhythms and subsequent cardiometabolic outcomes.
Support (If Any): Support provided by the American Heart Association (#831488) and a University of Delaware Research Fund-Strategic Initiative Award.

0004

SLEEP, TEAM AND SOCIAL PROCESSES, AND HEALTH, PERFORMANCE, AND SAFETY IN NAVAL OPERATIONAL ENVIRONMENTS

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Naval Health Research Center | Leidos Inc. [1] Naval Health Research Center [2] Commander, Naval Surface Force, US Pacific Fleet [3]

Introduction: Sleep disruption and teamwork are inherent features of 24/7 operational environments, yet little is known about how sleep and team/social processes interact to affect crew readiness and endurance.
Methods: We analyzed data of 3,434 active duty US sailors (80% male) from the Afloat Safety Climate Assessment Survey. Using structural equation modeling, we specified latent factors of Sleep Health (typical hours of sleep per day and sleep disturbances in shipboard environment); crew team and social factors of Team Transition Processes, Team Action Processes, Team Interpersonal Processes, Unit Cohesion, Psychological Safety, and Social Support; and operational outcome risks of Physical Health (no. days in previous 30 with physical illness or injury), Mental Health (no. days with stress, depression, or emotional problems), Performance (frequency of fatigue-induced functional impairments on duty), and Safety (individual and crew noncompliance, and rate of observed near misses).
Results: Higher Sleep Health reduced impairments in Physical Health, Mental Health, Performance, and Safety (standardized βs = −0.096 to −0.542, ps < 0.0001, CFI/TLI > 0.980, RMSEA = 0.033). Higher Sleep Health improved Team Transition, Action, and Interpersonal Processes, Unit Cohesion, Psychological Safety, and Social Support (βs = 0.178 to 0.380, ps < 0.0001, CFI/TLI > 0.982, RMSEA = 0.029). Social Support reduced risks to Physical Health, Mental Health, and Performance; Team Interpersonal Processes reduced Metal Health risk; Psychological Safety reduced Performance and Safety risks; Unit Cohesion reduced Safety risk (βs = −0.053 to −0.709, ps < 0.05, CFI/TLI > 0.979, RMSEA = 0.027). Mediation models indicated good Sleep Health enhances Social Support's beneficial impact on Physical Health, Mental Health, and Performance; Psychological Safety's impact on Performance and Safety; Team Interpersonal Processes' impact on Physical Health; and Unit Cohesion's impact on Safety (indirect effect βs = −0.032 to −0.127, ps < 0.0001, CFI/TLI > 0.967, RMSEAs < 0.051).
Conclusion: Sleep health improves team/social functioning, which serves an additive protective function and enhancement to crew operational health, performance, and safety. Future work should closely examine these interrelationships to identify mechanisms as targets for policy and procedures to help optimize crew readiness and endurance.
Support (If Any): Military Operational Medicine Research Program under work unit N2010.

0005

BIDIRECTIONAL ASSOCIATIONS OF SLEEP AND ALCOHOL USE WITHIN AND BETWEEN REGULARLY DRINKING YOUNG ADULTS

David Reichenberger[1], Anne-Marie Chang[1], Michael Russell[1]
The Pennsylvania State University [1]

Introduction: Young adults can be resistant to drinking interventions, but improving other health behaviors, such as sleep, may indirectly reduce hazardous drinking. Evidence linking sleep to next-day drinking among regular drinkers could support sleep interventions as an indirect pathway to alcohol misuse reduction. We investigate this connection in the natural environments of 222 regularly drinking young adults.
Methods: Regularly drinking young adults (21-29 years; 63% women) wore an alcohol monitor across six days that continuously measured transdermal alcohol concentration (TAC). Participants completed daily smartphone-based surveys reporting the previous night number of drinks and sleep. Predictors were disaggregated into within- and between-person variables. Sleep variables were used to predict next-day alcohol use, and alcohol use variables were used to predict subsequent sleep. Multilevel Poisson and linear models with random intercepts for each outcome were adjusted for weekends, sex, weight, and prior night sleep/drinking.
Results: Between-person results showed that participants who tended to go to bed later had on average 24% more drinks (p<0.01) and achieved 26% higher peak TAC (p<0.02) the next day. Every hour of sleep duration the prior night was associated with a 14% decrease in the number of next-day drinks (p<0.03). Conversely, participants who drank more went to bed on average 12-19 minutes later (p<0.01) and slept 5 fewer minutes (p<0.01). Within-person results showed that on nights when participants drank more than usual they went to bed 8-13 minutes later (p<0.01), slept 2-4 fewer minutes (p<0.03), and had worse sleep quality (p<0.01).
Conclusion: Young adults who went to bed earlier and slept longer on average tended to use alcohol less the next day, and using less alcohol tended to improve subsequent sleep within young adults. Taken together, these results suggest that better sleep health may improve drinking behaviors and intoxication dynamics, which may have implications for interventions targeting sleep as a mechanism to reduce heavy drinking.
Support (If Any): David Reichenberger was supported by the Prevention and Methodology Training Program (T32 DA017629) with funding from the National Institute on Drug Abuse (NIDA). This research was funded by departmental funds and a pilot mentoring and professional development award through P50DA039838 (NIDA), both awarded to Michael Russell.

0006

AN AT-HOME EVALUATION OF A LIGHT INTERVENTION TO MITIGATE SLEEP INERTIA SYMPTOMS

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San Jose State University [1] Menlo College [2] NASA [3] Naval Postgraduate School [4] NASA Ames Research Center [5]

Introduction: Sleep inertia symptoms typically occur after waking from nocturnal sleep. Under laboratory settings, light exposure upon waking has been shown to improve alertness, mood, and

vigilant attention. We investigated whether a field-deployable light-emitting device would help to improve alertness and working memory in a real-world setting.
Methods: Thirty-five participants (18 female; 26.4 ± 6.0 y) completed an at-home, within-subject, randomized crossover study. Participants wore actiwatches during their normal sleep-wake schedule for five nights ahead of the adaptation and experimental nights. On the experimental night, participants performed baseline testing before their self-selected bedtime. Forty-five minutes after bedtime, participants received a phone call and were instructed to perform test bouts while wearing light-emitting glasses with the light either on (light condition) or off (control). A 3-minute descending subtraction task (DST) and the Karolinska Sleepiness Scale (KSS) were performed at +7, +17, +27, and +37 minutes after the call. Participants were then instructed to go back to sleep and were called 45 minutes after lights out to repeat the test bouts in the opposite condition. A series of mixed-effects models were performed with fixed effects of condition, test bout, and their interaction, and a random effect of participant. Condition order, sex, and baseline were included as covariates.
Results: There was a significant effect of test bout for DST total responses ($\chi2$ [3] = 17.42; p < .001) and total correct ($\chi2$ [3] = 21.29; p < .001) with improved performance at +27 and +37 minutes compared to +7 minutes. Sex was a significant predictor for KSS (F1,30 = 10.26; p = .003), with females (8.20 ± 0.23) rating higher sleepiness than males (7.10 ± 0.25). There were no other significant effects for DST or KSS outcomes (p > .05).
Conclusion: These results suggest that the intervention was not able to improve working memory or alertness under naturalistic at-home settings. Further analysis is needed to determine whether these results are applicable to other cognitive performance domains.
Support (If Any): Funded by the Naval Postgraduate School, via the Naval Medical Research Center's Naval Advanced Medical Development Department (MIPR N3239820WXHN007), with support from the NASA Airspace Operations and Safety Program, System-Wide Safety.

0007

TEMPORAL ASSOCIATIONS BETWEEN ACTIGRAPHY-MEASURED DAYTIME MOVEMENT BEHAVIORS AND DAYTIME SLEEP IN EARLY CHILDHOOD

Christine St Laurent[1], Jennifer Holmes[1], Rebecca Spencer[1]
University of Massachusetts Amherst [1]

Introduction: Although napping in early childhood is associated with some cognitive and behavioral outcomes, less is known about relations with physical health measures. Lower levels of sedentary behavior and higher levels of physical activity have been beneficially associated with sleep measures in adults. Studies exploring sleep and daytime movement behaviors (sedentary time and physical activity) in young children have had inconsistent results and primarily focused on overnight sleep. The purpose of this micro-longitudinal analysis was to determine if: 1) daytime movement behaviors predicted the likelihood of napping the next day, 2) daytime movement behaviors predicted next-day nap duration, and 3) the occurrence of a nap predicted next-day movement behaviors.
Methods: In 240 children (age=50.8±9.8 months, 49.2% female) sedentary time (% of wake time), total physical activity (counts/min), and nap duration (min) were derived from wrist-based actigraphy (mean = 9.7 days), and occurrence of a nap was recorded daily. Multilevel logistic and linear models with lagged effects were used to examine temporal within-person relations between wake behaviors and nap sleep, and adjusted for night's sleep duration of nights between days of interest (min), age (months), sex (male or female), and socioeconomic status (index). Preliminary models included interactions with nap habituality (rarely, sometimes, or frequent).
Results: Occurrence of a nap was not associated with next-day wake behaviors and previous-day wake behaviors did not predict nap duration. However, on days children napped, they were less sedentary (B=-2.09, p<0.001) and more active (B=25.8, p<0.001) the following day. Nap habituality did not moderate these associations.
Conclusion: Bidirectional associations between nap sleep and daytime wake behaviors were not evident. While daytime movement behaviors were not predictive of nap sleep, napping was beneficially associated with subsequent-day movement behaviors in preschool children. Further studies could explore specific nap sleep metrics in samples with more diverse sleep health, as well as consider the reason for daytime napping.
Support (If Any): NIH R01 HL111695

0008

UNIVERSITY-WIDE CHRONOTYPING SHOWS LATE-TYPE STUDENTS HAVE LOWER GRADES, SHORTER SLEEP, AND MORE ABSENTEEISM

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Duke-NUS Medical School [1] National University of Singapore [2]

Introduction: A person's preferred timing of nocturnal sleep (chronotype) has important implications for cognitive performance. Students who prefer to sleep late may have a selective learning disadvantage for morning classes due to inadequate sleep and circadian desynchrony. We tested whether late-type students perform worse only for morning classes, and we investigated factors that may contribute to their poorer academic achievement.
Methods: Chronotype was determined objectively in 33,645 university students (early, n = 3,965; intermediate, n = 23,787; late, n = 5,893) by analysing the diurnal distribution of their logins on the university's Learning Management System (LMS). Linear mixed models were used to test for differences between chronotype groups in grade point average (n = 33,645), actigraphy-estimated sleep behaviour (n = 261), and class attendance estimated using Wi-Fi connection data (n = 17,356).
Results: Late-type students had lower grades than their peers for courses held at all different times of day, and during semesters when they had no morning classes. Actigraphy studies confirmed LMS-derived chronotype was associated with students' sleep patterns. Nocturnal sleep on school days was shortest in late-type students because they went to bed later than the other chronotype groups and woke up earlier compared with non-school days. Wi-Fi connection logs for classrooms revealed that late-type students had lower lecture attendance than their peers for both morning and afternoon classes.
Conclusion: Large university-archived datasets can be used to assess relationships between chronotype and academic performance. Late-type students had lower grades, shorter sleep, and were more likely to miss classes. Shifting classes later may improve sleep and circadian synchrony in late-type students. However, this probably will not eliminate the performance gap because they still had lower grades when they only had afternoon classes. Interventions that focus on improving students' well-being and learning strategies may be important for addressing the late-type academic disadvantage.
Support (If Any): Data storage and management were supported by the NUS Office of the Senior Deputy President & Provost and

ALSET. The work was funded by the Ministry of Education, Singapore (MOE2019-T2-2-074) and the National Research Foundation, Singapore (NRF2016-SOL002-001).

0009

INTERINDIVIDUAL VARIATION AND EXTENDED WAKEFULNESS IN SLEEPINESS AFTER ACUTE AND CHRONIC SLEEP DEPRIVATION

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Universidade Federal de Sao Paulo [1] Universidade Federal da Bahia [2]

Introduction: Sleepiness is a behavioural consequence of sleep pressure and is associated with negative outcomes with interindividual variation, possibly related to central sleep mechanisms. However, there is a lack of evidence linking progressive sleep need and sleepiness with factors of individual variability, which could be tested by total acute and chronic sleep deprivation. Thus, the objective of the study was to investigate the development of sleepiness in sleep deprived mice.
Methods: Male C57BL/6J mice were distributed in sleep deprivation, sleep rebound and control groups. Animals underwent acute sleep deprivation for 3, 6, 9 or 12 hours or chronic sleep deprivation for 6 hours for 5 consecutive days. Sleep rebound groups had a sleep opportunity for 1, 2, 3, or 4 hours after acute sleep deprivation or 24 hours after chronic sleep deprivation. During the protocols, sleep attempts were counted to calculate a sleepiness index. After euthanasia, blood was collected for corticosterone assessment.
Results: Using the average of group sleep attempts, it was possible to differentiate between sleepy (mean>group average) and resistant animals (mean<group average). Resistant mice were more frequent in all settings. Individual variation accounted for 52% of sleepiness variance during chronic sleep deprivation and extended wakefulness explained 68% of sleepiness variance during acute sleep deprivation. A normal corticosterone peak was observed at the start of the dark phase, independent of sleep deprivation.
Conclusion: Different profiles of sleepiness emerged in sleep deprived mice. Sleep deprivation was the main factor for sleepiness during acute sleep deprivation whereas in chronic deprivation individual variation was more relevant.
Support (If Any): Our studies are supported by the following funding agencies: AFIP (Associação Fundo de Incentivo à Pesquisa), São Paulo Research Foundation (FAPESP #2017/18455-5 to GLF), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES - Finance Code 001 to GLF), and CNPq (fellowships to MLA and ST; #169040/2017-8, and #141445/2021-1 to GLF). This study received indirect funding from AFIP and CNPq, which support the department in which the project was conducted.

0010

BED SHARING VERSUS SLEEPING ALONE ASSOCIATED WITH SLEEP HEALTH AND MENTAL HEALTH

Brandon Fuentes[1], Kathryn Kennedy[1], William Killgore[1], Chloe Wills[1], Michael Grandner[1]
University of Arizona [1]

Introduction: Although many adults do not sleep alone, associations between bed-sharing and sleep parameters in community samples are not well-known. The present study explored whether sharing a bed was associated with sleep duration and quality and mental health factors.
Methods: Data was obtained as part of the Sleep and Health Activity, Diet, Environment, and Socialization (SHADES) study of N=1,007 working-age adults from southeastern Pennsylvania. Bed Sharing was assessed with survey items assessing frequency in the past month of sharing a bed with a partner/spouse, child/children, pet(s), other family member(s), or nobody (sleeping alone). Other sleep health factors assessed included Insomnia Severity Index, Brief Index of Sleep Control, Epworth Sleepiness Scale, Fatigue Severity Scale, STOP-BANG apnea score, sleep duration, sleep latency, and wake after sleep onset. Mental health factors included PHQ9 depression score, GAD7 anxiety score, Multidimensional Scale of Perceived Social Support, Perceived Stress Scale, and global ratings for overall life satisfaction and relationship satisfaction. Covariates included age, sex, race/ethnicity, income, and education.
Results: Compared to those who reported "Never," those who shared a bed with a partner "Most nights" reported less insomnia severity (B=-1.60; 95%CI[-2.55,-0.66]; p=0.001), more sleep (B=0.25; 95%CI[0.02,0.48]; p=0.035), less fatigue (B=-2.24; 95%CI[-4.10,-0.39]; p=0.018), less sleep apnea risk (B=-0.25; 95%CI[-0.42,-0.09]; p=0.003), shorter sleep latency (B=-6.32; 95%CI[-11.15,-1.50]; p=0.010) and less WASO (B=-8.69; 95%CI[-15.85,-1.52]; p=0.018). Those who slept with their child "Most nights" reported greater insomnia severity (B=2.14; 95%CI[0.65,3.62; p=0.005), less control over sleep (B=-0.37; 95%CI[-0.59,-0.15]; p=0.001), and greater sleep apnea risk (B=0.33; 95%CI[0.07,0.59]; p=0.012). Those who slept with other family members reported more apnea risk (B=0.44; 95%CI[0.07,0.82]; p=0.021). Those who slept alone reported greater insomnia severity (B=2.28; 95%CI[1.28,3.28]; p<0.0001), more sleepiness (B=0.98; 95%CI[0.22,1.74]; p=0.011), more fatigue (B=2.87; 95%CI[0.89,4.84]; p=0.005), and greater apnea risk (B=0.24; 95%CI[0.06,0.41]; p=0.007). In addition, sleeping with a partner was associated with lower depression, anxiety, and stress scores, and greater social support and satisfaction with life and relationships. Sleeping with children was associated with more stress. Sleeping alone was associated with higher depression scores, and lower social support and life and relationship satisfaction.
Conclusion: Sleeping with a partner/spouse is associated with better sleep quality and mental health overall. Sleeping with a child, on the other hand, was associated with worse sleep in general.
Support (If Any):

0011

WORK HARD, SLEEP HARD: VIGOROUS WORKDAYS AND SLEEP DIFFICULTIES

Jake Jeppson[1], Brooke Mason[1], Chloe Wills[1], Andrew Tubbs[1], William Killgore[1], Michael Grandner[1]
University of Arizona [1]

Introduction: It is common in America to work 5 or 6 days as a full work week. This is exhausting, especially for those with a vocation that requires vigorous physical activity during the work day. Sleep is an important factor when assessing workplace efficiency, as those able to obtain regular healthy sleep will perform better.
Methods: A multinomial logistical regression analysis was conducted on the 2017 - March 2020 data collected from the National Health and Nutrition Examination Survey (NHANES) to explore a relationship between those with self-assessed sleep difficulties and the number of days of vigorous physical activity during work. The specific question used for analysis was, "Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like carrying or lifting heavy loads, digging or construction work for at least 10 minutes continuously?" If yes, the number of days during a typical week was recorded. Sleep difficulties were self-reported as difficulties "falling asleep, staying asleep,

or sleeping too much" within the previous two weeks, categorized as "never," "less than half the days," "more than half the days," and "nearly every day." Reported results were unweighted; weighted results are forthcoming. Results were adjusted for sex, age, race/ethnicity, education level, and relationship status.
Results: Compared to those with no days of vigorous physical activity at work, those with 2 days were more likely to report having sleep difficulties several days in the past 2 weeks (OR: 1.13, [1.00,1.73], p=0.049). those reporting 6 days per week of vigorous work-related activity were less likely to report sleep difficulties several days (OR: 0.73, [0.59,0.91], p=0.004), more than half the days (OR: 0.67, [0.48,0.93], p=0.016), or nearly every day (OR: 0.68, [0.50,0.94], p=0.018). Those who reported 6 days per week of vigorous work-related activity were less likely to report sleep difficulties several days (OR: 0.75, [0.51,0.98], p=0.038) or more than half the days (OR: 0.57, [0.34,0.96], p=0.035).
Conclusion: It is possible that a physically demanding job has protective effects on sleep quality when compared to those that did not have any vigorous physical activity related to their profession.
Support (If Any):

0012

DISORDERED SLEEP AND EMOTIONAL SELF-REGULATION IN A PROSPECTIVE COHORT OF PRESCHOOL-AGE CHILDREN.

Jennifer Emond[1], Grace Ballarino[1], Delaina Carlson[1], Reina Lansigan[1], Cassandra Godzik[2], Diane Gilbert-Diamond[1]
Dartmouth College [1] Dartmouth-Hitchcock Medical Center [2]

Introduction: Disrupted sleep has been associated with poor emotional self-regulation among preschool-age children cross-sectionally, with few studies examining change over time. Our goal was to examine the prospective association between disrupted sleep and emotional self-regulation over six months among preschool-age children.
Methods: Analyses included 54 children, age 3-5 years old, who completed their participation in a currently ongoing, 6-month prospective study conducted in a rural area of New England to examine early-life predictors of obesity. Parents completed the 35-item Children's Sleep Habits Questionnaire (CSHQ), a validated scale to measure problematic sleep, reflecting both reduced sleep quantity and quality. Total scores greater than 41 reflect a clinically-meaningful sleep disorder. Parents also completed the 5-item emotional self-regulation subscale of the validated Child Social Behavior questionnaire. A final score was computed as the average across the 5 items (range 1-7), with higher scores indicating poorer emotional self-regulation. A series of linear regression models were used to examine associations between sleep and emotional self-regulation at baseline, as well as change in self-regulation over six months. Each model was adjusted for child age, sex, and parental education level.
Results: The sample was largely white, non-Hispanic (87.0%), with 61.1% of male children, 90.7% of accompanying parents as mothers, and 79.6% of parents with a Bachelor's degree or greater. One-fourth (n=14, 25.9%) of children met the criteria for disordered sleep at baseline. In an adjusted linear regression model, children with disordered sleep at baseline, on average, had worse self-regulation at baseline (beta coefficient=0.90, SE=0.33; p<0.01) and, separately, a greater decrease in self-regulation over six months (beta=0.78, SE=0.30; p=0.01). When further adjusting for disordered sleep at month 6, disordered sleep at baseline remained predictive of a greater decrease in self-regulation over time (beta=1.12; SE=0.41; p<0.01).
Conclusion: In this preliminary analysis, disordered sleep was associated with poor emotional self-regulation cross-sectionally and a decline in emotional self-regulation over six months. Generalizability is limited because of the high socioeconomic status of the sample. Yet findings suggest that the effects of disordered sleep on emotional self-regulation may manifest within in the preschool-years.
Support (If Any): This study was supported by the National Institute of Diabetes and Digestive and Kidney Diseases, grant number K01DK117971.

0013

PSYCHOMOTOR VIGILANCE TEST PERFORMANCE DECLINES RELATED TO ILLNESS SEVERITY, NOT SLEEP

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Introduction: While the Psychomotor Vigilance Test (PVT) has been used extensively to track vigilance degradation following sleep loss, there is evidence that it may also track vigilance degradation related to illness. However, it is unclear how much performance decline is driven by sleep loss related to an illness or the illness itself independent of sleep loss. Here we assessed how sleep and acute infectious diarrhea impact vigilance performance in a controlled human infection model (CHIM) with enterotoxigenic Escherichia coli (ETEC).
Methods: During a CHIM assessing the efficacy of an immunoprophylactic targeting ETEC, we measured sleep via actigraphy over an 8-day inpatient period. A 10-minute PVT was also administered up to three times each day in the morning, afternoon, and evening. Participants ingested an oral immunoprophylaxis 3 times/day on days -2 and -1, and ingested ETEC on day 0. Participants were categorized as to whether or not they experienced the primary endpoint of moderate-severe diarrhea (MSD).
Results: Among 56 participants (aged 34.7±8.5 years, 64% male), 54% reached the primary endpoint of moderate-severe diarrhea following ETEC infection. Total sleep times across the study did not differ between those with and without MSD. While PVT minor lapses (i.e., not responding within 500 milliseconds) did increase following ETEC infection for all subjects as revealed by a mixed linear model [effect of day: f(7,657)=3.35, p=0.002], there was also a significant main effect of group [f(1,657)=5.85, p=0.016], where those participants who experienced MSD following ETEC infection had more minor lapses across the study than those who did not experience MSD (6.28±0.43 vs 4.88±0.38).
Conclusion: While the negative impact of sleep loss on performance has been well demonstrated, these are the first data to suggest that illness severity[KT1] , independent of sleep loss, also negatively impacts performance. In operational populations such as the military, special care should be taken to prevent illness and remove ill operators from the field, just as this care should be taken to prevent sleep loss and remove sleepy operators. By preventing and monitoring sleep loss and illness, these operations can avoid potentially costly performance errors.
Support (If Any): The clinical trial from which these data were obtained was funded by the Congressionally Directed Medical Research Program through the Joint Warfighter Medical Research Program under Award No. W81XWH-15-C-0083 to the Henry M. Jackson Foundation for the Advancement of Military Medicine,

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0014

INSUFFICIENT SLEEP IS RELATED TO POOR INFANTRY BATTLE DRILL PERFORMANCE IN SPECIAL OPERATIONS SOLDIERS

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Introduction: Although multiple studies have documented the impact of insufficient sleep on Soldier performance, most studies have done so using artificial measures of performance (e.g., tablet or simulator tests). The current study sought to test the relationship between sleep and Soldier performance during infantry battle drill training, a more naturalistic measure of performance.
Methods: Fifteen junior special operations infantry Soldiers participated in the study. Soldiers wore Phillips Actiwatch Spectrum and reported their subjective sleep duration and quality during the week prior to Close Quarters Battle (CQB) drills. CQB training emphasizes close quarter combat tactics and requires a diverse range of cognitive skills (e.g., memory, decision-making, scanning). Each team of Soldiers performed six iterations of CQB – three using Ultimate Training Munitions (UTM; non-lethal rounds of munition) and three with live ammunition. Experienced leaders monitored each iteration and recorded errors on scorecards that are regularly used by the unit during CQB trainings.
Results: Participating Soldiers were all male and were 24.3 ± 3.82 years old. Soldiers slept an average of 6.6 hours per night leading up to the exercise and had an average sleep efficiency of 82/100%. The average number of errors committed during the UTM trials was 2.5 ± 1.9, and the average number of errors during the live ammunition trials was 1.1 ± 1.1. The number of errors committed during the live ammunition iterations was negatively correlated with subjective number of hours slept ($r = -.67$, $p = .006$) and subjective sleep efficiency/quality ($r = -.55$, $p = .03$). A t-test showed those with subjective sleep duration ≥ 7 hours had a significantly lower number of errors than Soldiers with subjective sleep duration < 7 hours ($t(14) = 2.26$, $p = .04$).
Conclusion: Enhancing infantry battle drill performance during training may directly translate to greater success in combat scenarios. These data preliminarily suggest that sleep quality and duration may influence subsequent performance on infantry battle drill training, particularly for Soldiers with limited experience in battle drill conduction who have not yet perfected battle drill techniques. Future studies should enact sleep augmentation to determine the causal influence of sleep on performance in this setting.
Support (If Any): Support for this study came from the Military Operational Medicine Research Program (MOMRP) of the United States Army Medical Research and Development Command (USAMRDC). Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the authors, and are not to be construed as official, or as reflecting true views of the Department of the Army or the Department of Defense. The investigators have adhered to the policies for protection of human subjects as prescribed in AR 70–25. The authors have no conflicts of interest to disclose.

0015

EFFECTIVENESS-IMPLEMENTATION STUDY OF TWO NOVEL LIGHTING INTERVENTIONS FOR SHIFTWORKERS ON A SUBMARINE WATCHFLOOR

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Introduction: Shiftwork is common in the military, where around-the-clock readiness is necessary. Yet, non-standard schedules can negatively impact sleep, circadian health, and performance. Light is a leading countermeasure due to its phase shifting and alerting properties, with higher intensities and shorter wavelengths eliciting relatively greater effects. New technologies allow for deliberate spectral engineering that targets specific photobiological responses. This study examined the efficacy and implementation of two spectrally-distinct lights for improving sleep, alertness, and performance in active duty service members working nightshift schedules.
Methods: Participants were service members working 12-h shifts (0530-1730) on a high-security, submarine watchfloor (N=56, 9 females; mean+SE age=28.95 + 0.76). Lighting interventions included LED panels (3,721 cm2) that were either enhanced (SW+) or depleted (SW-) in short wavelength energy, while maintaining a comparable color temperature (~3000 K) and photopic illumination (~300 lux at 46 cm from eyes). For both SW+ and SW-, a bank of light panels were arranged across the front of the watchfloor and illuminated for the full duration of the nightshift. In addition, participants wore blueblocker glasses after nightshifts up until bedtime, when eye masks were worn during sleep. There were two data collection periods that coincided with existing 16-day schedule cycles: the first contained an 8-day baseline (BL1) and 8-day SW+ condition, and the second contained an 8-day baseline (BL2) and 8-day SW- condition (order within those 16-day periods was pseudo-randomized). Sleep and alertness were assessed via actigraphy, sleep diary, psychomotor vigilance test (PVT), and Karolinska Sleepiness Scale (KSS). Implementation metrics were obtained with questionnaires.
Results: All analyses are still ongoing. Preliminary examinations show higher satisfaction with the SW+ than BL1, and greater comfort and fewer symptoms under both SW+ and SW- as compared to BL1. Most felt the SW+ and SW- improved alertness on shift and expressed an interest in keeping the lights on the watchfloor.
Conclusion: Findings thus far indicate the interventions were well-received by participants. Subsequent analyses will further examine barriers to intervention use and the efficacy of the lights for improving sleep, alertness, and performance in service members working nightshifts.
Support (If Any): ONR TS-788

0016

CHANGES IN ALERTNESS OVER CONSECUTIVE WORKDAYS FOR INTERNAL MEDICINE INTERNS: A SECONDARY ANALYSIS OF THE ICOMPARE TRIAL

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Introduction: Little is known about the impact of cumulative workdays on medical residents' alertness. The purpose of this study was to examine changes in alertness over consecutive workdays following a day off for internal medicine interns.

Methods: This is a secondary report of a randomized non-inferiority trial of 12 internal-medicine residency programs assigned to either standard duty-hour (80h workweek/16h shifts) or flexible (80h workweek/no shift-length limit) policies. Interns were followed for 2 weeks during inpatient rotations. Each morning, alertness (number of Brief Psychomotor Vigilance Test [PVT-B] lapses) was assessed, and interns selected the type of shift worked (day-off, days, nights, beginning/ending extended overnights, or other). Sleep duration (actigraphy) was averaged each 24h day. For this analysis, interns were included if they had ≥1 day-off followed by at least 3 workdays, and had no flagged PVT-B results for non-adherence. To examine the longitudinal effect of consecutive workdays on alertness, a generalized linear mixed model with random intercept and slope, and Poisson distribution was used to determine the rate of PVT-B lapses for up to 4 work days following a day off, controlling work shift type, sleep duration, and policy, with sleep and shift type interaction, and linear spline to account for the change in slope after the 2nd workday.
Results: N=328 interns were included (mean age 27.8±2.2y, 49% males). Mean±SD number of PVT-B lapses were 3.4±4.5, 4.2±5.6, 5.3±6.6, 4.8±5.8, and 4.7±6.0, and mean±SD sleep duration was 9.0±1.9, 6.9±1.3, 6.5±2.1, 6.6±1.8, and 6.9±1.7 hours for a day off and workdays 1-4 respectively. Rate of lapses increased by 1.1 lapse/day from a day off to the 2nd workday (p=0.004; 95%CI: 1.03-1.18), and then significantly decreased from days 2-4 at a rate of 0.89 lapses/day (p<0.0001; 95%CI: 0.85-0.92). Patterns of change in the rate of lapses were similar to changes in sleep duration, where, from baseline, every 1h longer sleep duration was associated with 0.91 fewer PVT-B lapses (p<0.0001; 95%CI: 0.93-0.97).
Conclusion: Both sleep and subsequent alertness were negatively impacted when returning to work following a day off for interns in this study. After two workdays, sleep duration appeared to increase again, with observed improvements in alertness.
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0017

MURDER ON THE MIDNIGHT EXPRESS: NOCTURNAL WAKEFULNESS AND HOMICIDE RISK

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Introduction: There is a nocturnal peak in incident suicide risk after adjusting for population wakefulness (Perlis et al., 2016; Tubbs et al., 2020). This peak in risk is hypothesized to result from a series of negative changes in mood, reward processing, and executive function that occur at night and increase the propensity for dysregulated and violent behaviors. Although the unadjusted incidence of dying by homicide is elevated at night, no existing studies of time-of-day and death by violent crime have adjusted for population wakefulness.
Methods: Data from 48,486 homicide victims with a known time of fatal injury were collected from the National Violent Death Reporting System (NVDRS) for 2003-2017, tabulated by clock hour, age, sex, race, and ethnicity, and combined with population wakefulness data from the American Time Use Survey (ATUS) for the same years. Homicide counts were additionally characterized by the proportion of cases with blood alcohol level (BAL) of 0, <80mg/dl, or ≥80mg/dl at autopsy and modeled using robust Poisson regression with population wakefulness entered as an offset term, thus producing hourly incident risk ratios (IRR).
Results: Homicide counts were lowest in the morning (6AM-7AM) and highest at night (10PM-11PM). After adjusting for population wakefulness, the incident risk for death by homicide was elevated between 10PM and 5AM compared to the 24-hour average, with the highest risk between 2AM (IRR: 8.25 [6.62-10.3]) and 3AM (IRR: 7.22 [6.04-8.64]). Moreover, the adjusted risk of dying by homicide was significantly greater at night for those with a BAL≥80mg/dl, such that the risk at 2AM was 13.8-fold greater than the 24-hour average (IRR: 13.8 [10.6-18.1]).
Conclusion: The risk of homicide death is higher at night after adjusting for population wakefulness and especially among those with alcohol intoxication. Although homicide victims do not choose when to die (unlike suicide victims), neurophysiological changes at night may promote risky behaviors or put victims in more dangerous circumstances than they would be otherwise. Future research should examine sociodemographic, clinical, and circadian risk factors for death by homicide, as well as examine time-of-day patterns in other violent crimes.
Support (If Any):

0018

SLEEP DIFFICULTY AND WEEKLY SEDENTARY MINUTES

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University of Arizona [1]

Introduction: Decreased energy and activity may be a mechanism linking poor sleep health and cardiometabolic risk. This study aimed to examine, at the national level, whether poor sleep quality was associated with more sedentary time (as opposed to less exercise, which has been difficult to establish).
Methods: Data from the 2017 - March 2020 National Health and Nutrition Examination Survey was used. A linear regression analysis was completed to assess the relationship between sedentary minutes and self-reported sleep difficulties. These were assessed by self-report of difficulty "falling asleep, staying asleep, or sleeping too much" over the past 2 weeks, with options for "never," "less than half the days," "more than half the days" and "almost always." Covariates included sex, age, race/ethnicity, education level, and relationship status. Results are unweighted; weighted results are forthcoming.
Results: All groups experiencing self-reported sleep difficulties demonstrated increased sedentary minutes when compared to those that do not experience sleep difficulties. More specifically, unadjusted results show 21.5 more sedentary minutes (B: 21.5, [95%CI:10.8,32.2], p<0.001) for those that have sleep problems several days a week, 21.8 more sedentary minutes (B:21.8, [95%CI:4.90,38.7], p<0.001) for those that have sleep difficulties more than half the days in a week, and 42.3 minutes (B: 42.3, [95%CI:26.8,57.8], p<0.001) for those that have sleep difficulties nearly every day during the week. Once adjusted for covariates, results showed 17.6 more sedentary minutes (B:17.6, [95%CI:6.76,28.3], p<0.001) for those that have

sleep difficulties several days a week, 18.3 more minutes (B:18.3, [95%CI:1.45,35.1], p<0.001) for those that have sleep difficulties more than half the days in a week, and 48.4 more sedentary minutes (B:48.4, [95%CI:32.8,63.9], p<0.001) for those that have sleep difficulties nearly every day during the week.
Conclusion: Those with general sleep difficulties were more likely to report more sedentary minutes per day. Although previous efforts have focused on improving physical activity directly, perhaps future efforts could target sleep health as a way to reduce sedentary behavior.
Support (If Any):

0019

DROWSY DRIVING IN A COMMUNITY SAMPLE: ASSOCIATIONS WITH SLEEP DURATION, INSOMNIA SEVERITY, DAYTIME SLEEPINESS, AND FATIGUE

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Introduction: Drowsy driving is an important public health concern. Yet, real-world data on drowsy driving patterns remains relatively scarce. The present study aimed to investigate reports of drowsy driving in a general community sample and whether these are associated with daytime and nighttime sleep health risk factors.
Methods: Data were obtained through the Sleep and Health Activity, Diet, Environment, and Socialization (SHADES) study, which recruited N=1,007 working-age adults from the Philadelphia area. Drowsy driving was assessed with the item from the CDC BRFSS, "During the past 30 days, have you ever nodded off or fallen asleep, even just for a brief moment, while driving?" Responses were coded as "yes" or "no" (or "don't drive," which was excluded). Sleep-related factors included sleep duration (NHANES item, assessed in hours), insomnia (Insomnia Severity Index [ISI]), sleepiness (Epworth Sleepiness Scale [ESS]), fatigue (Fatigue Severity Scale [FSS]), and sleep medication use (PSQI item). Covariates included age, sex, education, income, race/ethnicity, employment, body mass index, and stress (Perceived Stress Scale).
Results: The sample consisted of N=738 adults, excluding those who did not drive in the past 30 days. After adjustment for covariates, each hour of sleep duration was associated with a 23% reduction in likelihood of drowsy driving (OR=0.77; 95%CI[0.66,0.89]; p<0.0005). Likelihood of drowsy driving increased with each point on the ISI by 8% (OR=1.08; 95%CI[1.04,1.13]; p<0.0005), with each point on the ESS by 19% (OR=1.19; 95%CI[1.13,1.26]; p<0.0005), and with each point on the FSS by 4% (OR=1.04; 95%CI[1.02,1.06]; p<0.0005). Sleep medication use was not associated with drowsy driving. In a post-hoc model that combined duration, insomnia, sleepiness, and fatigue, unique effects were seen for sleepiness (OR=1.17; 95%CI[1.10.1.23]; p<0.0005) and sleep duration (OR=0.82; 95%CI[0.70,0.98]; p=0.026).
Conclusion: Drowsy driving in a community sample is associated with less sleep duration and more insomnia, sleepiness, and fatigue. These effects may overlap, though daytime sleepiness emerged as the most robust risk factor. The combined model showed that sleep duration also contributed variance that was otherwise unexplained by the other factors. Drowsy driving prevention efforts should focus on sufficient sleep and daytime sleepiness as screening and prevention targets.
Support (If Any):

0020

INVESTIGATION OF SEASONAL CHANGES IN SELF-REPORTED SLEEP QUALITY AND PSYCHOMOTOR VIGILANCE TASK OUTCOMES: RESULTS FROM THE ULTRA LONG-TERM SLEEP (ULTS) STUDY

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Introduction: Although sleep is fundamental for human well-being, factors that contribute to an individual's experience and report of sleep quality remain poorly understood. Utilizing that sleepiness is known to impact vigilance performance, this study sets out to explore how self-reported sleep quality changes with behavioral performance and how this variation is affected by seasonal changes.
Methods: This work is an interim analysis of self-reported sleep quality and behavioral performance data collected in the Ultra Long-term Sleep (ULTS) study (ClinicalTrials.gov Identifier: NCT04513743). In the study 20 healthy participants (average 33±13 years of age) were enrolled for 365 continuous days to observe the seasonal variation in sleep and cognitive performance. The outcome from the daily psychomotor vigilance task (PVT) and sleep questionnaire is analyzed and reported. The sleep questionnaire is a composite of questions from the Sleep Satisfaction Tool, the Karolinska Sleep Diary, questions regarding feelings of pain and outside disturbances, easiness of waking up, and the Karolinska Sleepiness Scale (KSS). The PVT was designed for self-administered high-frequency testing and has a short 3-minute test period. Monthly changes were examined from June to November. This period was chosen since all subjects were active.
Results: The first eight participants have now completed the study. Repeated measures correlations between KSS and mean PVT reaction time showed moderate but highly robust associations between the two measures over time (r=0.2; 95% CI 0.18-0.23). From the data collected thus far from the entire population, fastest PVT mean reaction times were found on Saturdays and slowest on Tuesdays. Similarly, KSS had best scores in weekends. There was an overall increase in mean PVT reaction time during the investigated period from June to November. This was also observed in KSS.
Conclusion: Our findings show a moderate correlation between the mean PVT reaction time and Karolinska Sleepiness Scale with up to 365 datapoints per subject with weekly and seasonal trends observed.
Support (If Any): This research is supported by Innovation Fund Denmark.

0021

THE EFFECT OF VIDEO GAMING ON THE SLEEP PATTERNS AND WELL-BEING OF U.S. MARINES

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Introduction: Video gaming (VGs) is a popular activity among active-duty service members (ADSMs) and can have both positive and negative impacts on ADSM well-being and behavior. The overall aim of the project was to assess attributes and aspects

of video gaming in the United States Navy and Marine Corps (USMC). Our current results specifically address the effects of video gaming on the sleep patterns of Marines.
Methods: Data were collected from 927 Marines from three USMC commands. Volunteers completed a survey and participated in semi-structured focus groups. The survey items focused on demographic and occupational characteristics, behavioral habits, video gaming habits, why ADSMs play video games, and functional effects. Validated tools were used to assess depression (Patient Health Questionnaire-8), generalized anxiety (GAD-7), excessive daytime sleepiness (Epworth Sleepiness Scale), and drinking habits (Alcohol Use Disorders Identification Test for Consumption-AUDIT-C).
Results: The study sample included predominantly males (854, 92.3%) and enlisted personnel (771, 83.3%). Also, 850 (91.7%) Marines reported playing video games (799 [94.0%] males). Gamers reported playing VGs predominantly later in the day (i.e., after work and before bedtime). Approximately 16% of gamers reported sleeping later because of playing VGs when at home/off duty, ~14% when on duty/in port, and ~5% when deployed/underway. When deployed/underway, most gamers reported playing video games in their racks (93.2%). Gamers reported symptoms of depression (~23% of ADSMs), generalized anxiety (~19%), excessive daytime sleepiness (~33%), and AUDIT-C scores suggestive of heavy drinking (39%). Excessive gamers tended to be younger, used dysfunctional coping styles more frequently, and played VGs more frequently and for more hours. Excessive gamers were more likely to report sleeping later because of playing VGs and to be identified with symptoms of depression, anxiety, and excessive daytime sleepiness.
Conclusion: This study provided valuable insight into how video gaming habits affect ADSM sleep patterns. Further research is needed to objectively assess the relationship between video gaming and sleep in operational conditions.
Support (If Any): Supported by the Manpower and Reserve Affairs (M&RA), Headquarters Marine Corps (HQMC), and the Office of the Chief of Naval Operations/21st Century Sailor Office (OPNAV/N17).

0022

IMPROVING PREDICTED EFFECTIVENESS OF SHIFTWORKERS IN WATCHFLOORS

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Introduction: In support of 24/7 hour operations around the globe, Navy and Marine Corps shore-based watchfloors provide information, intelligence, and technical support to the warfighter. Personnel working on these watchfloors are challenged to obtain consistent sleep due to shift working. The study objectives were to model the predicted effectiveness (PE) of the current watch schedule and recommend a new schedule to improve sleep, safety, and performance.
Methods: In a 3-week longitudinal, naturalistic study, we assessed the work/rest patterns and well-being of watchstanders while on their typical watch schedule. Participants (N=11, age:19-33yrs) completed an online sleep/activity log for the study period. Standardized tools (Pittsburgh Sleep Quality Index--PSQI, Epworth Sleepiness Scale--ESS, Insomnia Severity Index--ISI, Profile of Mood States--POMS) were completed pre/post-study. Based on study findings combined with information gathered from the command leadership, we designed an improved watch schedule. The Fatigue Avoidance Scheduling Tool (version 3.3.01T) employing the Sleep, Activity, Fatigue, and Task Effectiveness model (SAFTE/FAST) was used to model PE in the legacy and newly improved watch schedules.
Results: The median daily reported sleep duration was 6hrs (range: 5-8.5hrs). Nine participants (82%) were classified as poor sleepers and six (55%) had elevated daytime sleepiness. Four (36%) participants had moderately severe/severe insomnia symptoms. In terms of mood, 10 (91%) participants had a lower vigor-activity score than the adult norms, whereas eight (73%) scored higher than the adult norms for fatigue. The mid-shift watches had low PE that dropped steeply throughout the shift. The timing of low PE coincided with the period in which personnel was briefing leadership and/or commuting from work.
Conclusion: Based on our findings, we recommended a schedule that enables more regular sleep patterns. Compared to the legacy schedule, the new schedule increased both the number of week days and weekend days off, with 2-3 full weekends off per month. Also, PE was improved and the trough in PE did not occur during the commute. Lastly, we recommended that the new watch schedule should rotate less frequently with longer times on an assigned shift.
Support (If Any): This work was supported in part by the Naval Medical Research Center's Naval Advanced Medical Development Program.

0023

SCREEN TIME AND INSOMNIA SYMPTOMS IN UNIVERSITY STUDENTS

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Introduction: Prior research has demonstrated a relationship between screen time and sleep health, but more work is needed to understand the potential impact of reason for screen time and timing (i.e., weekend vs. weekday). This study aimed to determine whether screen time, and reason for use, was associated with insomnia symptoms in a sample of university students during the school term. Further, we sought to determine whether effects differed by weekend/weekday.
Methods: Participants were 767 enrolled students from two universities (age $\bar{x}$=20.94 [SD=5.25]; 74% women). Insomnia symptoms were assessed with the Insomnia Severity Index (ISI); screen time was a self-report of average daily screen time for a variety of purposes (productivity, social media, streaming media, browsing the internet, or video games) on weekdays/workdays and weekends/off days.
Results: A total of 16.4% of the sample had insomnia symptoms in the clinical range (ISI $\bar{x}$=9.1 [SD=5.3]). Participants reported 10.0 hours (SD=4.5) of screen time per day on weekdays and 10.8 hours (SD=5.2) per day on weekends. During the week, the most screen time (44%; $\bar{x}$=4.4 [SD=2.6] hours/day) was spent on productivity (work or school). On weekends, the most screen time (30%; $\bar{x}$=3.3 [SD=2.1] hours/day) was spent on streaming media. More screen time on the weekends was associated with greater insomnia symptoms (r=.10, p=.004), but not during the week (r=.05, p=.185). Regression analyses indicated weekend screen time accounted for 2% of the variance in insomnia symptoms, and this relationship was driven by screen time for productivity (beta=.09, p=.017) and video games (beta=.09, p=.019).
Conclusion: Among university students, self-reported screen time during the week was not associated with elevated insomnia

symptoms. Weekend screen time, particularly for the purpose of productivity and video games, was associated with elevated insomnia symptoms though the effect was small. Although screen time is often highlighted as a key contributor to poor sleep health, this impact was minimal in the current study. Future work should continue to examine whether different motivations for screen time is associated with various facets of sleep health, and delineate these associations by weekend vs. weekday.

Support (If Any): None

0024

ARC GENOTYPE MODULATES EEG SPECTRAL POWER FOLLOWING TOTAL SLEEP DEPRIVATION

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Introduction: Sleep homeostasis is manifested by a robust increase in slow wave sleep (SWS) following acute total sleep deprivation (TSD), with concomitant changes in spectral power of the non-REM (NREM) sleep EEG marked by substantial interindividual differences. We previously found that a single nucleotide polymorphism of the activity-regulated cytoskeleton associated protein (ARC) gene modulates SWS rebound following TSD. Here we sought to determine whether ARC genotype is also associated with interindividual differences in spectral power of the NREM sleep EEG.

Methods: 50 healthy adults (27.3±4.9 years; 28 females) participated in one of two in-laboratory studies. Each participant had a 10h baseline sleep opportunity (22:00–08:00), 38h TSD, and a 10h recovery sleep opportunity (22:00–08:00). Sleep periods were recorded polysomnographically and visually scored according to AASM criteria. Genomic DNA was assayed for the ARC c.*742 + 58C>T non-coding SNP, rs35900184. Log-transformed NREM sleep EEG spectral power (C3-M3 derivation) over 0.2 Hz frequency bins in each of four frequency bands – delta (0.8–4.0 Hz), theta (4.2–8.0 Hz), alpha (8.2–12.0 Hz), and beta (12.2–16.0 Hz) – was analyzed by band using mixed-effects ANOVA with fixed effects for ARC genotype, night (baseline, recovery), frequency bin, and their interactions. Analyses included study and age as covariates and a random effect over subjects on the intercept.

Results: The genotype distribution in this sample was 33 C/C homozygotes, 11 C/T heterozygotes, and 6 T/T homozygotes. There was a significant ARC by night interaction in the theta ($F_{2,1833}=5.94$, $p=0.003$) and alpha ($F_{2,1833}=8.58$, $p<0.001$) bands. Compared to baseline sleep, during recovery sleep C/C homozygotes had 18.9% more theta power and 8.7% more alpha power, C/T heterozygotes had 17.9% more theta power and 7.6% more alpha power, and T/T homozygotes had 20.0% more theta power and 15.1% more alpha power.

Conclusion: Our results show that ARC genotype mediates the NREM sleep EEG response to TSD; compared to C allele carriers, homozygosity for the T allele is associated with a much more pronounced increase in alpha power, as well as a larger increase in theta power. The functional implications of this ARC effect remain to be determined.

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0025

CIRCADIAN DYSREGULATION OF HUMAN DNA REPAIR GENES AND ELEVATED DNA DAMAGE IN SIMULATED NIGHT SHIFT SCHEDULE

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Introduction: Circadian misalignment from night shift (NS) work is associated with increased risk of cancer. In a simulated NS study, we sought to investigate the potential role of circadian disruption of cancer hallmark pathway genes.

Methods: N=14 healthy adults (aged 22-34) participated in a laboratory study. Seven were assigned to a simulated day shift (DS) schedule involving 3 days of daytime wakefulness (06:00-22:00); the other seven were assigned to a simulated NS schedule involving 3 days of nighttime wakefulness (18:00-10:00). Subjects then underwent a 24-hour constant routine protocol, during which blood was collected at 3-hour intervals. Leukocytes extracted from blood were subjected to transcriptomics using the NanoString nCounter PanCancer Pathways panel augmented with canonical clock genes. Statistical analysis involved mixed-effects cosinor analysis followed by functional enrichment analysis of rhythmic genes. Leukocytes were also subjected to endogenous DNA damage assessment through alkaline comet and immunofluorescence assays. Furthermore, exogenous DNA damage from exposure to ionizing radiation was investigated for blood collected at opposite times of day (07:30 and 19:30) based on DNA damage biomarkers assessed with immunofluorescence and immunoblot assays.

Results: Transcriptomics data showed that the simulated NS schedule, as compared to the simulated DS schedule, significantly altered the endogenous circadian rhythmicity of genes involved in cancer hallmark pathways, as measured under constant routine. A DNA repair pathway showed enrichment of rhythmic genes following the DS schedule ($P<0.05$), but not following the NS schedule. Functional assessments revealed that the NS schedule was associated with increased endogenous DNA damage, as evidenced by alkaline comet assay ($P<0.001$) and increased BRCA1 foci ($P<0.01$) and γH2AX foci by immunofluorescence assay ($P<0.001$). After exposure to ionizing radiation, there were increased BRCA1 foci ($P<0.01$) and γH2AX foci by immunofluorescence assay ($P<0.005$) and elevated DNA damage response signaling biomarkers by immunoblot assay, especially in the samples collected at 19:30.

Conclusion: These results suggest that a NS schedule causes circadian dysregulation of DNA repair genes and increases DNA damage – a primary hallmark of carcinogenesis – which may underlie the elevated cancer risk in NS workers.
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0026

TARGETED GENOME SEQUENCING IDENTIFIES MULTIPLE RARE VARIANTS IN CAVEOLIN-1 ASSOCIATED WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is a common disorder associated with increased risk for cardiovascular disease, diabetes, and premature mortality. There is strong clinical and epidemiologic evidence supporting the importance of genetic factors influencing OSA, but limited data implicating specific genes.
Methods: Leveraging high depth genomic sequencing data from the NHLBI Trans-Omics for Precision Medicine (TOPMed) program and imputed genotype data from multiple population-based studies, we performed linkage analysis in the Cleveland Family Study followed by multi-stage gene-based association analyses in independent cohorts to search for rare variants contributing to OSA severity as assessed by the apnea-hypopnea index (AHI) in a total of 7,708 European-Americans.
Results: We identified 21 non-coding rare variants in Caveolin-1 (CAV1) associated with lower AHI after accounting for multiple comparisons (P = 7.4×10-8). These non-coding variants together significantly contributed to the linkage evidence. Follow-up analysis revealed significant associations between increased CAV1 expression with lower AHI (P=0.024) and higher minimum overnight oxygen saturation (P=0.007).
Conclusion: Caveolin-1 is a membrane scaffolding protein that is essential in the formation of plasma membrane lipid rafts and mediates cholesterol trafficking; regulates several signaling molecules including transforming growth factor β (TGF-beta), Toll Like Receptor 4 (TLR4) and endothelial nitric oxide synthase (eNOS); with mutations implicated in disorders associated with OSA: pulmonary hypertension, diabetes, atherosclerosis, endothelial and cardiac dysfunction, and inflammation. Our results indicate that caveolin-1 also plays a significant role in OSA, with rare variants and higher CAV1 expression associated with lower AHI.
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0027

RECIPROCAL MODULATION OF CORTICAL EXCITATORY AND INHIBITORY SYNAPSES BY WAKE-SLEEP HOMEOSTATIC STATE

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Introduction: A widely debated function of sleep involves a homeostatic program of down-regulation of excitatory synaptic strength following an overall increase during the preceding waking period, preserving however the previously existing synaptic weights associated with newly acquired memories. We tested this hypothesis by applying thorough statistical analysis of parameters of excitatory and inhibitory miniature postsynaptic currents (mEPSC/mIPSC) recorded ex vivo in mouse cortical pyramidal neurons at three characteristic wake/sleep stages.
Methods: Cingulate cortex coronal slices were obtained at fixed Zeitgeber time (ZT6, to control for circadian clock) from control C57BL6 (MEF2C f/f) mice subjected to 6h acute sleep deprivation (SD), recovery sleep =4hSD+2h(RS), or 6h control sleep (CS). mEPSCs and mIPSCs were recorded from functionally identified whole-cell patch-clamped pyramidal neurons in cortical layer 2/3 (L2/3). Statistical analysis of frequencies, amplitudes, and charge transfer rates of mEPSCs and mIPSCs was done using non-parametric Kruskal-Wallis multiple comparison test and K-means clustering test.
Results: mEPSC frequency (F) and charge transfer (CT) were significantly reduced for RS and CS compared to SD (F: -57%, -47%; CT: -64%, -55%). mEPSC amplitude (A) was significantly reduced for CS compared to SD (-15%). Two-centroid clustering test revealed that analyzed parameters of F, A and CT for SD condition were approximately evenly split between upper and lower range clusters, while the same parameters for RS and CS conditions revealed a pronounced redistribution (>75% lower-, <25% upper ranges). Wake/sleep state related changes of mIPSC parameters showed opposite pattern compared to excitatory synapses. All three parameters were increased in RS vs. SD (F: +63%, A: +7%, CT: +42%) and this difference reached significance levels in CS vs. SD (F: +88%, A: +24%, CT: +109%). Clustering analysis of mIPSC parameters revealed mostly stable distribution pattern between upper and lower ranges for all wake/sleep states.
Conclusion: Significant changes in excitatory/inhibitory balance in the frontal cortex is part of the homeostatic response upon transition from wakefulness to various phases of sleep. The excitatory component prevails during wakefulness, while the inhibitory component peaks during sleep.
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0028

NETWORK ANALYSIS OF ADIPOKINES IN SLEEP DISORDERS AND METABOLIC DYSREGULATION

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Introduction: Adipokines are a growing group of secreted proteins that play important roles in metabolism. Accumulating evidence suggests that adipokines may mediate the close association between sleep disturbance and metabolic derangements. Due to the extensive crosstalk between adipokines and metabolic pathways, an integrated approach is required to better understand the significance of adipokines in sleep disorders and associated metabolic dysregulation. In the current study, we employed network analysis, a set of concepts and methods derived from graph theory, to obtain novel insights into the roles of adipokines in sleep disorders and associated metabolic dysregulation.
Methods: A network of six adipokines and their molecular targets is constructed based on current understanding of their roles in sleep and metabolic disorders using an adjacency matrix. The network is then visualized and analyzed using an open source platform Gephi to derive network-level metrics, including degree and centrality measures. These metrics are used to explore the relationship between sleep disturbance and associated metabolic dysregulation in several disease processes.

Results: 94 nodes and 264 edges were identified in the network, representing regulatory factors, adipokines, molecular pathways, and disease processes. Two adipokines, leptin and adiponectin, were found to have higher degrees than other adipokines, indicating their central roles in connecting sleep disturbance to metabolic dysregulations. Among the regulatory factors, obesity and obstructive sleep apnea were found to be major drivers for the sleep associated metabolic dysregulation based on their higher degrees. The important pathways adipokines act on in the network included insulin signaling, inflammation, food intake, and energy expenditure. The main disease processes adipokines act on included cardiovascular, reproductive, and autoimmune diseases. Leptin, AMPK, and fatty acid oxidation were found to have global influence in the network based on their high betweenness.
Conclusion: Adipokines are important players in the metabolic dysregulations associated with sleep disturbance. Adipokines such as leptin and adiponectin act on diverse metabolic pathways in response to sleep disturbance, obesity, insulin resistance, and inflammation.They play important roles in cardiovascular, reproductive, and autoimmune diseases. Adipokines and their targets, such as leptin, AMPK, and fatty acid oxidation are likely important interventional/pharmaceutical targets for these disease processes.
Support (If Any): none

0029

DEVELOPING A PIPELINE FOR TRANSLATING GENOME-WIDE ASSOCIATION SIGNALS TO BEHAVIORAL CORRELATES OF SLEEP DYSFUNCTION

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Introduction: Insomnia is a pervasive sleep disorder affecting up to one-third of the adult U.S. population. An extensive amount of genetic association data from genome wide association studies (GWAS) has uncovered hundreds of loci associated with insomnia and other sleep traits, yet few of these targets have undergone full characterization and their contribution to sleep traits remain poorly understood. Additionally, GWAS does not necessarily determine the true effector gene(s) at a given locus, leading to frequent mischaracterization and misinterpretation of genotype-phenotype interactions.
Methods: Our group has developed a variant-to-gene mapping approach that integrates existing insomnia GWAS loci with a combination of ATAC-seq and promoter-focused Capture C-derived data in human induced pluripotent stem cell-derived neural progenitor cells. We identified candidate genes with accessible promoter regions that were contacted at high resolution by insomnia-associated SNPs residing in open chromatin. Target genes with known orthologs and available Drosophila RNAi lines were then subjected to deep phenotyping of sleep traits. Candidate genes producing greater than 20 percent change in sleep duration in Drosophila were then screened in a vertebrate zebrafish model using CRISPR/Cas9 mutagenesis in F0 larvae.
Results: This pipeline revealed fifteen genes producing robust sleep phenotypes with more than a 20 percent change in sleep duration in Drosophila. Of the candidate genes screened thus far in zebrafish, we found that disruption of pigq expression significantly ($p<0.05$) increased sleep duration in both zebrafish and Drosophila through regulation of sleep bout length and frequency, revealing a conserved, yet novel regulator of sleep duration. Additionally, CRISPR mutations in cbx1b and meis1b in zebrafish resulted in reduced sleep duration similar to results in Drosophila.
Conclusion: This pipeline uses cutting-edge genomic and behavioral approaches to perform high-throughput screening of existing GWAS-identified insomnia loci. This genotype-to-phenotype approach emphasizes the importance of behavioral validation following large cohort studies and narrowed the candidate gene list from more than 200 to fewer than 20 providing a more tractable set of gene targets for further molecular characterization. Cross-species validation also improves our understanding of the conservation of sleep characteristics throughout evolution.
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0030

DEVELOPMENT AND VALIDATION OF A METABOLOMIC RISK SCORE FOR OBSTRUCTIVE SLEEP APNEA ACROSS RACE/ETHNICITIES

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Introduction: Obstructive sleep apnea (OSA) is a common disorder characterized by recurrent episodes of upper airway obstruction during sleep resulting in oxygen desaturation and sleep fragmentation, and associated with increased risk of adverse health outcomes. Metabolites are being increasingly used for biomarker discovery and evaluation of disease processes and progression. We aimed to develop a metabolomic risk score (MRS) for OSA and identify individual metabolites associated with OSA to provide insights into the pathogenesis of OSA.
Methods: We studied 219 metabolites and their associations the apnea hypopnea index (AHI) and with OSA, defined as AHI , in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) (n=3507) using two methods: (1) association analysis of individual metabolites, and (2) least absolute shrinkage and selection operator (LASSO) regression to identify a subset of metabolites that are jointly associated with OSA, and develop an MRS. We then validated the results in Multi-Ethnic Study of Atherosclerosis (MESA) (n=475), an independent dataset.
Results: HCHS/SOL participants were 41.72 years old on average, 50.7% female, and 10.2% had OSA. MESA individuals were 68.45 years old on average, 56.2% females, and 46.7% had OSA.

When assessing the associations between OSA/AHI and individual metabolites, we identified seven metabolites significantly and positively associated with OSA in HCHS/SOL (FDR p<0.05), of which four associations - glutamate, oleoyl-linoleoyl-glycerol (18:1/18:2) (DAG(36:3)), linoleoyl-linoleoyl-glycerol (18:2/18:2) (DAG(36:4)) and phenylalanine, replicated in MESA (one sided-p value<0.05). The OSA-MRS, composed of 14 metabolites, was associated with 52% increase of risk for moderate to severe OSA (OR=1.52 [95% CI: 1.23-1.87] per 1 SD of OSA-MRS, p<.001) in the discovery dataset of HCHS/SOL and 44% increased risk (OR=1.44 [95% CI: 1.03-2.03] per 1 SD of OSA-MRS, p=0.034) in the validation dataset of MESA, both adjusted for demographic, lifestyle, and comorbidities. Similar albeit less significant associations were observed for AHI modeled continuously.

Conclusion: We developed an MRS that replicated in an independent multi-ethnic dataset, demonstrating the robustness of metabolomic-based OSA risk score to population heterogeneity. Replicated metabolite associations may provide insights into OSA-related molecular and metabolic mechanisms.

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0031

SLEEP REGULARITY IS ASSOCIATED WITH DNA METHYLATION IN COGNITIVE, CARDIOVASCULAR AND MOOD-RELATED GENES: A GWAS-INFORMED STUDY IN ADOLESCENTS

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Introduction: Adolescence is associated with a delay in the circadian timing of sleep. However, social factors prevent adolescents from adapting to a later sleep-wake pattern, leading to different forms of circadian misalignment that may increase the risk of cardiovascular and mental health disorders. Several GWAS have identified genes associated with sleep and circadian phenotypes, however, little is known regarding the epigenetic basis and significance of sleep timing and its regularity in adolescence.

Methods: We analyzed data from 230 adolescents from the Penn State Child Cohort follow-up study who provided a blood sample for DNA extraction and had complete at-home 7-night (at least 3) actigraphy (ACT) data. ACT-measured sleep midpoint was calculated as the intra-individual mean of the 7-night midpoint (zeroed to midnight) of the sleep period. ACT-measured sleep regularity was calculated as the intra-individual standard deviation of the 7-night sleep midpoint. Epigenome-wide single nucleotide resolution of DNA methylation in cytosine-phosphate-guanine (CpG) sites and surrounding regions were obtained from peripheral leukocytes. This study focuses on methylation sites in GWAS-informed genes previously associated with sleep and circadian phenotypes. Linear regression assessed the association between sleep midpoint and sleep regularity with site-specific methylation levels, adjusting for sex, age, race/ethnicity, body mass index, and psychotropic medication use. Using the Benjamini & Hochberg method to adjust for a false discovery rate. Adjusted p-values are reported as q-values.

Results: Sleep midpoint was not associated with a significant change in methylation at any of the measured intragenic sites. Sleep regularity was significantly associated with differential methylation at 238 intragenic sites in 147 genes with an adjusted p<0.05, of which, three sites were within GWAS-informed sleep/circadian-related genes. Higher sleep irregularity was associated with hypermethylation in MAD1L1 (q=2.4x10-2) and with hypomethylation in CALN1 (q=3.8 x 10-4) and ZNF618 (q=3.8 x 10-2).

Conclusion: Sleep irregularity is associated with altered DNA methylation in genes previously identified in GWAS of sleep/circadian phenotypes. Our data provides evidence for a potential epigenetic link between sleep irregularity and genes

involved in neurocognitive functioning (CALN1), internalizing disorders (MAD1L1) and blood pressure (ZNF618).
Support (If Any): National Institutes of Health (R01HL136587, R01MH118308, UL1TR000127)

0032

OBJECTIVE AND SUBJECTIVE MEASURES OF SLEEP INITIATION ARE DIFFERENTIALLY ASSOCIATED WITH DNA METHYLATION IN ADOLESCENTS

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Introduction: The onset of puberty is associated with a shift in the circadian timing of sleep leading to delayed sleep initiation [i.e., later sleep onset time (SOT)] driven by later bedtimes and/or longer sleep onset latency (SOL). Subjective sleep initiation, as per self-reports, and objective sleep initiation, as per actigraphy (ACT) or polysomnography (PSG), assess equally relevant but different domains of the same physiological process. Several GWAS have identified genes associated with sleep and circadian phenotypes; however, little is known regarding the epigenetic basis and significance of delayed sleep initiation in adolescence, a critical developmental period.
Methods: We analyzed data from 263 adolescents from the Penn State Child Cohort follow-up study who had complete subjective (self-reported questionnaires), at-home 7-night ACT, and in-lab 9-hour PSG data for bedtime, SOL and SOT. Epigenome-wide single-nucleotide resolution of DNA methylation in cytosine-phosphate-guanine (CpG) sites and surrounding regions were obtained from peripheral leukocytes. Linear regression assessed the association between bedtime, SOL and SOT with site-specific methylation levels, adjusting for sex, age, race/ethnicity, body mass index, and psychotropic medication use. P-values were adjusted using the Benjamini & Hochberg method to correct for false discovery rate and, thus, q-values are reported.
Results: Exome-wide analysis showed differential methylation in 1450 unique genes across the 9 sleep measurements, while GWAS-informed analysis yielded 57 genes. Gene hits were identified for bedtime (PSG), SOL (subjective, ACT and PSG) and SOT (subjective and PSG): 14 genes were associated with both subjective and PSG-measured SOL, 34 with both ACT- and PSG-measured SOL, and one (TBC1D22A) with subjective, ACT- and PSG-measured SOL. One gene (ABTB2) was associated with subjective and PSG-measured SOT.
Conclusion: Objective and subjective sleep initiation in adolescents is associated with altered DNA methylation in genes previously identified in adult GWAS of sleep and circadian phenotypes. Our data provides evidence for a potential epigenetic link between habitual (subjective and ACT) SOL and in-lab SOT and DNAm in genes involved in circadian regulation (i.e., RASD1, RAI1), metabolism (i.e., FADS1, WNK1, SLC5A6), and neuropsychiatric disorders (i.e., PRR7, SDK1, FAM172A).
Support (If Any): National Institutes of Health (R01HL136587, R01MH118308, UL1TR000127)

0033

DYSREGULATED SLEEP AND NREM SLEEP ELECTROENCEPHALOGRAM DELTA POWER INDUCED BY INTERMITTENT HYPOXIA EXPOSURE ARE ATTENUATED IN NLRP3 KNOCKOUT MICE

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Introduction: The nucleotide-binding domain leucine rich family pyrin containing 3 (NLRP3) inflammasome protein complex activates caspase-1 to convert the pro-forms of IL-18 and IL-1 beta (IL-1β) into their active forms and is involved in homeostatic sleep and sleep responses to pathogenic stimuli. Intermittent hypoxia (IH) is a hallmark of sleep disordered breathing (SDB) and both IL-18 receptors are associated with SDB in humans. Thus, we hypothesized that NLRP3 inflammasomes are involved in SDB-related sleep disturbances.
Methods: Sleep architecture was assessed by polysomnography in NLRP3 knockout (KO) and wild-type (WT) mice (N = 8 per group). A gas exchange mixer delivered house air serving as a control or chronic IH that involved 90 second episodic oxygen reductions that consisted of ambient oxygen (21%) with brief hypoxic conditions (~10%) that lasted for 3 seconds for the first 10 h of the light period for 5 consecutive days. Gene expression and protein levels in the brain and lungs were assayed using real-time polymerase chain reaction and enzyme-linked immunosorbent assays, respectively.
Results: In WT mice, significant increased non-rapid-eye movement (NREM) sleep amounts and NREM sleep electroencephalogram delta power (0.5-4 Hz) were found after 1 day of IH compared to control conditions ($p < 0.001$). After 5 days of IH, WT mice showed a significant attenuation in NREM sleep amounts and NREM sleep delta power ($p < 0.001$) and increased wake bout frequency ($p = 0.006$) when compared to control conditions. However, the IH-induced NREM sleep and NREM sleep delta power enhancements and reductions were attenuated (21-35%) in NLRP3 KO mice compared to WT mice. In WT mice, NLRP3, IL-1β, IL-18 and caspase-1 gene expression, IL-1β and IL-18 protein levels, and caspase-1 activity were significantly increased in the somatosensory cortices, NTS, and lungs after both 1 and 5 days of IH when compared to control conditions ($p < 0.05$ for all), although NLRP3 KO mice did not exhibit significant differences in molecules downstream of NLRP3 inflammasome activation.
Conclusion: Our findings indicate that altered NLRP3 inflammasome activation contributes to dysregulated sleep occurring from IH and likely is involved in sleep disturbances in SDB.
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0034

GENETIC DETERMINANTS OF CARDIOMETABOLIC AND PULMONARY TRAITS AND OBSTRUCTIVE SLEEP APNEA IN THE HISPANIC COMMUNITY HEALTH STUDY/STUDY OF LATINOS

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Introduction: Obstructive sleep apnea (OSA) often co-occurs with other health outcomes. The respiratory event index (REI), often used to define OSA, is similarly correlated with several health phenotypes. Genetic data provide an opportunity to explain the nature of these associations.

Methods: We used data from the Hispanic Community Healthy Study/Study of Latinos (HCHS/SOL) to estimate genetic correlations (i.e., the correlation between phenotypes that is due to genetic effects) between OSA severity as measured by the REI and 56 anthropometric, glycemic, cardiometabolic, and pulmonary traits. Genetically-correlated traits (>0.2 and p-value<0.05) were carried forward for additional analysis. Using summary statistics from published genome-wide association studies (GWAS), we constructed Polygenic Risk Scores (PRSs) representing the genetic basis of each correlated trait and OSA, and studied their associations with the genetically-correlated traits, REI and OSA. OSA was defined as REI5. When a PRS for a correlated-trait was associated (p-value<0.05) with REI/OSA or vice versa, we used GWAS summary statistics to test causal relationships using Mendelian Randomization (MR) analysis. We further estimated correlated-trait PRS associations with REI and OSA in subgroups of individuals with and without obesity (BMI>30).

Results: The dataset included 11,155 participants (mean age: 46.2 (SD =13.8) years; 41.1% males) from the baseline HCHS/SOL exam who underwent home sleep apnea testing. 30.65% had OSA. 22 traits were genetically correlated with REI. Without BMI adjustment, the PRSs of BMI, waist-to-hip ratio (WHR), diastolic blood pressure (DBP), pulse pressure (PP), HbA1c, triglycerides (TG), FEV1/FVC and insomnia were significantly associated with REI/OSA. The associations of WHR, DBP, PP, HbA1c and insomnia PRSs and REI/OSA remained in BMI adjusted analysis. In obesity-stratified analysis, PRS of BMI, WHR and DBP were associated with REI/OSA in individuals with obesity, while PRSs of FEV1/FVC, HbA1c, insomnia, PP, TG, and WHR were associated with REI/OSA in individuals without obesity. MR analysis identified robust causal effect of increased BMI on OSA, and suggestive causal effects of WHR, DBP, and PP on OSA.

Conclusion: Our results support shared genetic basis of anthropometric traits, blood pressure traits, and insomnia with OSA, with potential differences in disease mechanisms in individuals with and without obesity.

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0035

ENRICHMENT OF RAI1 GENETIC ABERRATIONS ASSOCIATED WITH SLEEP DISTURBANCES IN SMS, IN AUTISM SPECTRUM DISORDER

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Introduction: Autism Spectrum Disorder (ASD) comprises a complex of neurodevelopmental disorders primarily characterized by deficits in verbal communication, impaired social interactions and repetitive behaviors. The profound clinical heterogeneity of ASD poses challenges in diagnosis and treatment. Genetic studies have pointed to hundreds of presumptive causative or susceptibility variants in ASD, making it difficult to find common underlying pathogenic mechanisms and suggesting that multiple different genetic etiologies for ASDs influence a continuum of traits. Smith–Magenis syndrome is a rare genetic disorder that results from an interstitial deletion of 17p11.2 and, in rare cases, from a retinoic acid induced 1 (RAI1) gene variant. The prevalence is estimated to be 1/15,000–25,000. Haploinsufficiency of RAI1 is the primary cause of the neurobehavioral and metabolic phenotype in SMS. Individuals with SMS present with a distinct pattern of mild to moderate intellectual disability, delayed speech and language skills, distinctive craniofacial and skeletal abnormalities, behavioral disturbances, and, almost uniformly, significant sleep disturbances. Alterations in RAI1 copy number has been also linked to a number of neurodevelopmental disorders including ASD.

Methods: We conducted a large-scale association analysis of the ASD MSSNG whole genome sequencing data to elucidate the prevalence of RAI1 SNVs and CNVs in the ASD population. We accessed the MSSNG database hosting over 11,000 genomes (6080 probands) and queried both SNVs and CNVs.

Results: Specifically, we focused on the prevalence of the classic deletions, microdeletions of (exon 3) and of the causative variants. We report a single case of a classic deletion (17p11.2 critical region), and an additional 3 cases of microdeletions in exon 3. Moreover, we report 2 frameshift mutations and one splicing variant. Given that the frequency of SMS is 1 in 15000 in the general population, we observe a 2.5x enrichment of the major deletion (1 in 6080 samples) and a >5x enrichment of the frameshift variants (2 in 6080 samples). In a set of 6080 probands we also observed 54 unique missense variants in 84 individuals within exon 3 of RAI1 gene.

Conclusion: Both ASD patients and SMS patients suffer from sleep disturbances. In this population of individuals with ASD, we report here an enrichment of variants known to cause SMS. We estimate the enrichment to be at least 2.5-fold and potentially higher than 10-fold enrichment, considering the types of variants observed in the population. Currently, the prevailing theory is that there is an underlying circadian pathophysiology causing sleep disturbances in SMS associated with RAI1 haploinsufficiency, as these patients exhibit low overall melatonin concentrations and abnormal timing of peak plasma melatonin concentrations. This abnormal inverted circadian rhythm is estimated to occur in 95% of individuals with SMS. The sleep disturbance seen in individuals with SMS may be also the underlying mechanism in at least a subset of individuals with ASD, especially in those individuals with consequential variants in the RAI1 gene Further studies will help delineate the role of RAI1 variants in sleep physiology.

Support (If Any):

0036

POPULATION WAKEFULNESS AND NOCTURNAL SUICIDE RISK

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Introduction: Nocturnal wakefulness may mediate the relationship between disrupted sleep and suicide risk since nighttime is associated with a peak in negative mood and altered reward processing and executive function. One example is a wakefulness-adjusted nocturnal peak in population suicide risk measured from 2003-2010 (Perlis et al, 2016), but these results have not been replicated with more recent data.
Methods: A total of 77,784 suicides with known time of fatal injury were extracted from the National Violent Death Reporting System (NVDRS) for 2003-2010 and 2011-2017. These data were then weighted by the estimated proportion of the population that was awake at each hour as derived from the American Time Use Survey (ATUS) for the same years. Suicides were tabulated by clock hours, age, sex, race, and ethnicity, and suicide counts were modeled using robust Poisson regression with hourly population wakefulness entered as an offset term, thus producing hourly incident risk ratios.
Results: A comparison of analyses between previously reported data (2003 to 2010) and new data (2011 to 2017) showed a consistently elevated risk of suicide at night (midnight to 6AM) that did not differ between time periods. After combining all fifteen years, the maximum number of suicides occurred at noon. Adjusting for population wakefulness, however, revealed a significant increased risk for suicide between 11PM and 5AM, with a 4.61-fold increase at 3AM (IRR: 4.61 [4.11-5.16]). Adjusting for age, sex, race, and ethnicity attenuated, but did not alter these results. In subgroup analyses, the nocturnal risk for suicide was elevated among those with bipolar disorder (5.2% of cases), those with a blood alcohol level greater than 80 mg/dl (14.9% of cases), and those who tested positive for a Z-drug (i.e., zolpidem, zaleplon, and eszopiclone) at autopsy (0.7% of cases).
Conclusion: Fifteen years of data from suicides across the United States show a significantly increased risk for suicide during the circadian night that peaks at 3AM. Nocturnal wakefulness remains a significant risk factor for suicide, and suicide prevention efforts may benefit from interventions to reduce nocturnal wakefulness and/or an increase in prevention resources at this time.
Support (If Any):

0037

BLUE LIGHT EXPOSURE FACILITATES CORTICAL NEURAL EFFICIENCY EXCLUSIVE OF MELATONIN EFFECTS

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Introduction: Sleep and circadian rhythms are influenced by exposure to light at specific times of day. In particular, blue light exposure can suppress melatonin production, shift circadian timing of sleep and wake, and acutely enhance alertness. Despite the consistency of these effects, little is known about their underlying mechanisms. We propose that in addition to the melatonin and phase shifting effects of blue light, that it also produces acute changes in brain activation that lead to greater neural efficiency.
Methods: Twenty-six individuals (11 male; 15 female, Mean age=24.27, SD=6.27) completed a counterbalanced cross-over design study while undergoing two separate neuroimaging scans in a 3T MRI scanner separated by one week. During scanning, each participant was exposed to either BLUE light (470 nm; active condition) or AMBER (580 nm; placebo condition) light conditions on alternate weeks. All scans occurred between 11:00 a.m. and 1:30 p.m., a time that has been described as the "dead zone" when melatonin levels are generally unaffected by light exposure. Participants completed a well-established working memory task (i.e., N-back task) in the scanner while undergoing continuous exposure to the specific light wavelength for the duration of the task. We contrasted the simple 1-back memory condition versus the 0-back memory condition using SPM12. Contrast maps were then compared using a paired-samples t-test.
Results: Compared to AMBER light, the BLUE light was associated with significantly less deactivation within two large clusters comprising the default mode network (DMN). These included a large cluster (k=1343 voxels) in the medial prefrontal cortex and a large cluster (k=5075 voxels) encompassing the posterior cingulate, precuneus, and parietal cortex regions ($p<.05$ FDR cluster corrected). Melatonin levels did not differ from pre-to-post light exposure for either condition.
Conclusion: Despite no effect on salivary melatonin, BLUE light exposure was associated with significantly less deactivation of brain regions that are usually suppressed to engage in cognitively demanding tasks. This suggests that blue light appears to enhance cognitive efficiency, potentially leading to similar performance while taxing fewer brain resources. Such findings suggest a potential role for blue light in sustaining performance during periods of sleep loss.
Support (If Any):

0038

ACUTE BLUE LIGHT EXPOSURE INCREASES ACTIVATION IN THE PULVINAR NUCLEUS

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Introduction: Blue-wavelength light can produce phase-shifts in the circadian rhythm. We have previously shown that morning blue light exposure was associated with advanced onset of sleep time and diminished daytime sleepiness. These changes were associated with increased gray matter volume in the left pulvinar nucleus of the thalamus, a key hub of the visual attention network. However, very little is known about the underlying mechanisms of these light activations. We hypothesized that the pulvinar may be affected more by the acute activating effects of light rather than its effects on melatonin. Therefore, we exposed individuals to blue or amber light while undergoing functional neuroimaging at a time of day when melatonin levels are almost non-existent.
Methods: Twenty-six healthy individuals (15 male; 11 female; age=24.27, SD=6.27) completed a counterbalanced cross-over study involving two 3T functional MRI sessions separated by one

week. During scanning, participants were acutely exposed to either continuous blue light (470 nm; active condition) or amber light (580 nm; placebo) while completing an N-Back working memory task. We contrasted the 2-back versus the 0-back condition and compared the blue and amber sessions using a paired t-test in SPM12.

Results: Acute blue light (versus amber placebo) during a working memory task was associated with significantly greater activation ($p<.05$) within the left pulvinar nucleus ($k=47$ voxels; MNI: $x=-14$, $y=-34$, $z=8$), a region nearly identical to that found in our previous work where we found increased volume with six-weeks of daily blue light exposure. Salivary melatonin levels were unchanged by either light condition.

Conclusion: Acute exposure to blue-wavelength light (versus amber placebo light) activated a key region of the visual attention network that was previously demonstrated to be enlarged by 6-weeks of daily morning blue light exposure. As melatonin levels remained unchanged by the light in this study, the findings point to an underlying neural mechanism that may lead specifically to activation of the pulvinar, which over time may enhance gray matter volume of that structure. These findings suggest a concordance of functional and structural changes induced by blue light exposure, which have been associated with shifts in sleep and circadian rhythms.

Support (If Any):

0039
WITHDRAWN

0040
SLEEPING DURING THE PANDEMIC: COVID-19-RELATED STRESSORS AND THEIR INFLUENCE ON PARENTAL SLEEP, PARENTING, AND CHILDREN'S PSYCHOSOCIAL HEALTH

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Introduction: The COVID-19 pandemic has affected millions of parent in the United States by creating physical health-related stress, changes to work and parenting demands, and the possibility of losing a job or not being able to pay bills (Brooks et al., 2020). Such stressors have the potential to disrupt parents' basic, essential needs, such as sleep (e.g., Sadeh et al., 2004). Although ample research suggests that disturbances to parents' sleep can have diverse, negative repercussions on their own behavior and functioning (e.g., Grandner et al., 2020), there remains relatively little evidence linking parents' sleep problems to potentially disrupt parenting processes and children's behaviors. Given the emerging and established links between these diverse constructs, the proposed study will examine the potential for COVID-19-related stressors to prospectively influence children's behavior via parents' sleep quality and subsequent parenting practices.
Methods: The sample is comprised of 1003 parents of school-aged (5-18 years old) children who completed an initial online survey (from March 27th to April 30th of 2020) followed by up to 8 weekly online diary assessments. During the initial survey, parents reported on three forms of COVID-related stress: health-related stress, stress associated with work/parenting demands, and finance-related stress. In the follow-ups, parents completed measures of sleep (i.e., PROMIS sleep disturbance questionnaire), parenting (e.g., Alabama Parenting Questionnaire), and child behavioral problems (i.e., CBCL).
Results: Multi-level modeling results, at the between-person level, suggested that the influence of COVID-related financial stress on children's behavioral problems was mediated by parental sleep disturbance and angry/hostile parenting behaviors. At the within-person level, weekly spikes in parental sleep disturbance were associated with corresponding spikes in angry/hostile parenting, which, in turn, were associated with subsequent spikes in children's behavior problems.
Conclusion: Our results highlight the longitudinal impact of parental sleep disturbance as a mechanism linking COVID-19-related stressors, parenting, and child functioning.
Support (If Any):

0041
CHRONOTYPE PREDICTS HEALTH OUTCOMES BUT NOT SLEEP DURATION IN EARLY PANDEMIC SLEEP SCHEDULES

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Introduction: Lockdowns associated with the COVID-19 pandemic allowed for individuals to change their schedules. Chronicity is a trait-like preference for individuals' times of the day for activity and feeling best. As a result of the lockdowns, some individuals were able to adjust their schedule to reflect personal chronotype needs. This study examined whether chronotype predicted sleep duration and health outcomes.
Methods: A sample of 304 participants were recruited through Amazon's Mechanical Turk service to fill out surveys relating to personality and health. Individuals responded with their normal bedtime and waketime for weeknights and weekends and filled out the Morningness-Eveningness Questionnaire (MEQ; Horne & Östberg, 1976). Self-reported health outcomes were measured via 9 items on the Patient Reported Outcomes Measurement Information System (PROMIS; Cella et al., 2010). Data were cleaned and analyzed via linear regressions in SPSS with age, sex, race, ethnicity and education as covariates.
Results: Participants reported an average of 8.52 hours of sleep (SD = 1.97 hours). 35.3% of the sample scored strong- or moderately morning-type, 54.7% were neither morning-nor evening-type and 10% scored as evening- or strong-evening types (M = 54.95; SD = 9.42). Results from the PROMIS ranged from 18 to 45 (M = 32.24, SD = 5.49). The model predicting sleep duration ($R2 = .06$, $p = .03$) produced a significant effect of ethnicity but not chronicity. Hispanic or Latino ethnicity reported shorter sleep durations relative to those who self-identified as non-Hispanic or Latino. The model predicting PROMIS (general health) scores ($R2 = .14$, $p < .001$) produced effects of education ($b = .46$, $p = .04$) and Morningness ($b = .21$, $p < .001$). People with higher educational levels and those with morning preferences reported better health.
Conclusion: Morningness is often associated with better self-regulation, lower risky behaviors, better physical and mental health and better sleep. During the early stages of the COVID-19 pandemic, lockdowns allowed many individuals more scheduling flexibility. As a result, sleep duration differences across chronotypes were absent, though health differences remained. Future research should continue to explore differences in sleep schedules in predicting health outcomes.
Support (If Any): Charlie Reeve and the Misfits lab at UNCC.

0042
COVID-19 RELATED DISTRESS AND SLEEP AMONG TRAUMA-EXPOSED SOUTH ASIANS: DOES GENERATIONAL STATUS MATTER?

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Introduction: The COVID-19 pandemic has resulted in substantial changes in social interactions, work schedules, and socioeconomic factors that may negatively impact sleep onset, maintenance, and quality. The ongoing stress of the pandemic also may exacerbate existing racial/ethnic disparities in sleep health. In this study, we examined the effects of COVID-19 related distress on sleep-related impairment and sleep disturbances among trauma-exposed South Asian adults. Since a health advantage among foreign-born individuals has been previously noted in the literature (the "immigrant paradox"), we also assessed whether generational status (i.e., being born in the U.S. or not) moderated associations between COVID-19 related distress and sleep outcomes.
Methods: Participants were recruited through Amazon's Mechanical Turk and completed online surveys on demographic information, the COVID-19 Stress Scale, The Life Events Checklist for DSM-5 (LEC-5), and PROMIS™ Sleep-Related Impairment and Sleep Disturbances Scale. The final sample included 316 South Asian adults residing in the U.S, who had been exposed to a traumatic event at some point in their lifetime. Most participants were male (55%) and U.S.-born citizens (64%), with an average age of 35.32 (SD = 9.52) years.

Results: Examination of t-scores for PROMIS™ sleep-related and sleep disturbances revealed that our sample endorsed slightly higher values than the general U.S. population. Greater COVID-19 distress was associated with more sleep disturbances (b = 0.09, p < .001, sr2 = .04) and sleep-related impairment (b = 0.20, p < .001, sr2 = .12). Generational status was not associated with sleep, nor did it modify associations between COVID-19 distress and sleep.
Conclusion: In our sample, we found that psychological distress triggered by the pandemic (e.g., fear of contamination, fear of the dangerousness of the virus, socioeconomic worries) was associated with greater sleep difficulties. Our findings highlight the importance of developing targeted interventions to cope with stress and sleep disturbances during the pandemic, particularly among vulnerable populations, such as those exposed to trauma. Our results did not support the immigration paradox: stress and sleep associations were similar regardless of generational status. Future studies are needed to better understand the role of generational status on sleep across different immigrant subgroups.
Support (If Any):

0043

JOB LOSS, FINANCIAL HARDSHIP, AND SLEEP DURING THE COVID-19 PANDEMIC: DIFFERENCES BY SEX/GENDER AND RACE/ETHNICITY

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Introduction: In the United States (US), health and financial consequences of COVID-19 have disproportionately impacted minoritized groups. Yet, few US studies have investigated COVID-related financial loss/consequences and sleep health disparities.
Methods: To investigate differences by sex/gender and race/ethnicity in cross-sectional associations between both job/business loss and substantial financial hardship (SFH) with sleep health, we used data collected from 12/2020 to 2/2021 among 4,726 men and women in the nationally representative COVID-19 Unequal Racial Burden (CURB) Study (N=5,500 American Indian/Alaska Native (AI/AN), Asian, Black, Hispanic/Latino, Multiracial, Native Hawaiian/Pacific Islander (NH/PI), and non-Hispanic (NH)-White adults). Participants reported job/business loss since the start of the pandemic (yes, no) and SFH (e.g., unable to pay for housing costs). Poor sleep health was defined as concurrence of self-reported fair/poor sleep quality, non-restorative sleep, sleep problems, and difficulty falling asleep in the past week. Adjusting for sociodemographic and health characteristics and receipt of financial assistance, weighted Poisson regression with robust variance estimated prevalence ratios (PRs) for poor sleep overall, by sex/gender, and by race/ethnicity.
Results: Men and women equally reported both job/business loss (20%) and SFH (11% men and 12% women). Minoritized racial/ethnic groups except Asians most frequently reported job/business loss (20%-25% vs. 16% Asian, 13% NH-White) and SFH (11%-15% vs. 9% NH-White, 5% Asian). Poor sleep health was more prevalent among women (21%) than men (14%) and among AI/AN, NH/PI, and Multiracial adults (each 22% vs. 11%-19% remaining racial/ethnic groups). Both job/business loss and SFH were associated with a higher prevalence of poor sleep health, overall. Compared to women, men had stronger associations for both job/business loss (PRmen=1.80 [95% CI:1.39,2.33], PRwomen=1.23 [1.01,1.50]; pinteraction=0.01) and SFH (PRmen=4.46 [3.18,6.26]), PRwomen= 1.82 [1.45,2.30]; pinteraction=0.01). For job/business loss, associations were strongest among Asians (PR=2.07 [1.32,3.23] vs. PR range=0.88-1.89; pinteraction=0.09).
Conclusion: COVID-19 related job/business loss and financial hardship were both associated with poorer sleep health, and associations for job/business loss were strongest among men and Asian adults.
Support (If Any): Divisions of Intramural Research: National Institute of Environmental Health Sciences (Z1AES103325[CLJ]) and National Institute on Minority Health and Health Disparities, National Institutes of Health (NIH); National Institute on Aging, NIH (P30 AG015272[ALS])

0044

PRE-PANDEMIC CIRCADIAN PHASE PREDICTS PANDEMIC SLEEP, DEPRESSION, AND ALCOHOL USE AMONG ADOLESCENTS

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Introduction: Growing evidence links later circadian timing during adolescence to worse sleep, more severe depression, and greater alcohol involvement, perhaps due to circadian misalignment and sleep restriction imposed by early school start times. School schedules initially shifted later during the COVID-19 pandemic, which hypothetically should reduce circadian misalignment and sleep restriction for adolescents with later circadian timing, and thus may mitigate any problems with sleep, depression, and alcohol. Here we used the pandemic as a natural experiment to test whether adolescent drinkers with later circadian timing, relative to those with earlier circadian timing, showed improved sleep, depressive symptoms, and alcohol involvement.
Methods: We studied 42 high school students reporting alcohol use (aged 16-18; 27 female participants), assessing circadian phase via the dim light melatonin onset (DLMO) during pre-pandemic conditions, and then following them over four remote assessments every 3 months during the pandemic. Sleep characteristics were assessed via the Munich Chronotype Questionnaire, depressive symptoms were assessed via the Quick Inventory of Depressive Symptomatology, and alcohol use was assessed via a 90-day Timeline Followback. Mixed-effect models focused on the pre-pandemic baseline, COVID baseline (Apr/May 2020), and COVID-9-mo (Jan/Feb 2021) timepoints, and covaried for age, time between pre-pandemic and COVID baselines, and current school/work status.
Results: In the pre-pandemic period, compared to those with earlier circadian timing, individuals with later circadian timing (later DLMO) got relatively less sleep (shorter total sleep time) on school nights. During the pandemic, earlier and later groups no longer differed on school night sleep. Over the course of the pandemic, compared to the earlier group, individuals with later circadian timing also reported larger increases in alcohol use (number of drinks, drinking days, and maximum drinks). Individuals with later circadian timing reported relatively greater depressive symptoms both pre-pandemic and 9-months into the pandemic.
Conclusion: While individuals with later circadian timing benefitted in terms of more school night sleep during the pandemic, this did not translate to mitigating depression or alcohol use. These findings suggest that later circadian timing may contribute to risk for depression and alcohol use over and above effects due to insufficient sleep.

Support (If Any): Supported by grants from NIH (R01AA025626; P50DA046346).

0045

EXAMINING THE ASSOCIATION OF TRAIT SLEEP REACTIVITY WITH CHANGES IN SLEEP, DEPRESSION, AND ANXIETY IN THE COVID-19 PANDEMIC

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Introduction: Sleep Reactivity (SR), a trait-like tendency for stressful events to trigger sleep disturbances, is an established diathesis for insomnia and depression. However, no studies to date have examined SR in the context of the COVID-19 pandemic and it's related restrictions. Thus, the goal of this analysis is to test whether SR confers a vulnerability for greater sleep and mood symptoms due to the stress of COVID-19 and it's related restrictions. We hypothesized that (1) The onset of the pandemic will trigger greater increases in insomnia symptoms in highly sleep reactive individuals. 2) Sleep-reactive individuals would experience reduced recovery of insomnia, anxiety, and depression symptoms over the course of the pandemic.
Methods: SR, insomnia, anxiety, and depressive symptoms were assessed by the Ford Insomnia Response to Stress Test (FIRST), Insomnia Severity Index (ISI), Beck Anxiety Inventory (BAI), and Beck Depression Inventory (BDI II), respectively, at two time points (early-pandemic, 6-month follow-up). Additionally, participants retrospectively reported ISI prior to the pandemic. N = 253 adults from Stanford's COVID-19 Pandemic Sleep Study (April-November 2020) provided baseline insomnia measures, and were excluded if they reported pre-pandemic clinical insomnia (ISI >10). Ranked-correlation tests were used to test the current hypotheses. Paired t-tests were used to evaluate changes in mean insomnia, depression, and anxiety scores. Covariates included essential worker status, sex, and age.
Results: ISI after COVID-19 was significantly higher than retrospective, pre-pandemic ISI ($t = 8.2$, $d = 0.55$, $p < 0.0001$). However, SR was not significantly correlated with the pandemic-related increase in ISI ($\rho = 0.07$, $p = 0.34$). Depression significantly increased after 6-months ($t = 2.0$, $d = 0.27$, $p = 0.047$), whereas anxiety did not ($t = 1.7$, $d = 0.26$, $p = 0.10$). Neither changes in depression nor anxiety were predicted by SR (Depression: $\rho = 0.15$, $p = 0.32$; Anxiety: $\rho = -0.13$, $p = 0.40$).
Conclusion: Insomnia and depression, but not anxiety, increased with the onset of the pandemic. However, trait SR was not a predisposing factor for pandemic-related sleep and mood changes. This is the first analysis examining SR as a risk factor for insomnia and mood symptoms in the pandemic.
Support (If Any):

0046

CIRCADIAN MISALIGNMENT IS ASSOCIATED WITH COVID-19 INFECTION

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Introduction: Sleep disturbances are frequently reported in patients infected by Covid-19, but the role of sleep-wake behaviors as a risk factor to contract Covid-19 has up to now poorly been studied. The aim of this study was to explore the relationship between usual sleep-wake behaviors and the risk of Covid-19 infection in a population of subjects suspect of contact or infection with SARS-CoV-2.
Methods: Cross-sectionnal monocentric study set during a non-confined period in winter 2021. Recruitment took place in a Covid-19 ambulatory screening platform. Subjects between 18 and 45 years old were included whether they were symptomatic or not, healthcare workers or not, in contact with a Covid-19 case or not. They were asked about their usual sleep-wake behaviors. Usual sleep duration and sleep timing were explored during workdays and free days. Circadian misalignment was defined as at least 2 hours shift of circadian alignment (defined as the difference between mid-sleep during workdays and mid-sleep during free days, mid sleep as the middle between bedtime and getting up time).
Results: One thousand eighteen subjects were included in our study (acceptance rate: 10.8%, 39% of men, mean age of 28± 8). Habitual mean sleep duration was equivalent in both groups (7h47 vs 7h49, p=0.733). Circadian misalignment greater than 2 hours concerned 33% of subjects in the Covid-19 group versus 20% of the control group (p=0.026). After adjustment on age, gender, BMI and work schedules, subjects presenting a circadian misalignment superior to 2 hours had 2.07 more chances to be tested positive than subjects which respected on identical sleep-wake timing between workdays and free days (OR=2.07, 95%CI= [1.12-3.80], p=0.024).
Conclusion: Altered sleep not only is present in subjects infected by Covid-19 but could be responsible of a higher change to be infected. Chronobiological impact on immune system and higher chances to be exposed to social contacts could explain our findings which deserve to be confirmed through a future large cohort study. Ultimately regular sleep-wake pattern could constitute a privileged prevention target to fight Covid-19 infection.
Support (If Any):

0047

RELATIONSHIP OF EMOTIONS, SOCIAL ISOLATION, AND COVID-RELATED MEDIA TO SUBJECTIVE SLEEP QUALITY DURING THE COVID-19 PANDEMIC

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Introduction: The COVID-19 pandemic safety restrictions led to changes in social interactions and information seeking about the virus. For some, these led to increased negative emotions, feelings of social isolation, and increased COVID-related media consumption. We examined the relationship of these variables to subjective sleep quality from participant daily diaries kept early in the pandemic.
Methods: From April 20th-May 12th, 2020, college (students, faculty/staff, alumni, parents) and local (churches, community centers, libraries) community members (N=94, 72 women, ages 18-77) completed a 30-minute survey for before and during social distancing (measuring: mental health, personality, social distancing, and demographics) for possible prizes. Participants then completed daily evening and morning diaries for 5-14 days describing daily affect, social isolation, emotion regulation, COVID media consumption, and subjective sleep quality.
Results: Emotions: During the pandemic, poor sleep quality was predicted by less positive mood ($r(91)=.486$, $p<.001$) and more negative mood ($r(91)=-.433$, $p<.001$). Participants with poorer sleep quality reported less success regulating their emotions that

day (r(90)=.292, p=.005) and greater suppression of emotions (rather than cognitive reappraisals to regulate them) (r(91)=-.260, p=.012). Social Isolation: Subjective sleep quality was not predicted by social distancing behaviors (r(88)=.069, p>.05); however, poorer sleep quality was significantly predicted by greater daily feelings of social isolation (r(91)=-.264, p=.005) and lower feelings of social life satisfaction (r(91)=.338, p<.001). COVID-related media: Sleep quality was not significantly related to COVID-media consumption for all participants; however, moderation analyses showed that participants with low avoidance coping, low neuroticism, and high emotional well-being did experience poorer sleep quality associated with greater COVID media consumption (all p's<.05).

Conclusion: That mood and social isolation are associated with sleep quality replicates previous findings. The pandemic, however, provided a unique opportunity to observe these relationships in individuals not normally socially isolated because of confounding variables (e.g., health issues, depression, anxiety) with known relationships to sleep quality. That COVID-related media was only related to sleep quality for more well-adjusted participants (low avoidance coping, low neuroticism, high emotional well-being) was surprising, suggesting some may find COVID-19 information anxiety-relieving rather than anxiety-provoking.

Support (If Any): Nancy and Craig Wood Odyssey Professorship and Charles L. Brewer Endowed Fund

0048

THE ASSOCIATION BETWEEN SLEEP HEALTH AND WORK- AND HEALTH-RELATED QUALITY OF LIFE IN DESK WORKERS AND DIFFERENCES IN ASSOCIATIONS PRE- AND POST-COVID-19 EMERGENCE

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Introduction: COVID-19 resulted in many office workers switching to remote work. Emerging studies report working from home has negatively affected sleep health (SH) and psychological well-being. Our aim was to evaluate the relationship between SH and health- and work-related quality of life and explore whether these associations differed pre- and post-COVID-19 emergence.

Methods: Baseline data from 125 adults enrolled pre- (n=59) and post-COVID-19 emergence (n=66) in a clinical trial with desk jobs were included in this analysis (86.4% White; 49.6% female; 43.9±10.7 y). Health-related quality of life (HRQoL) was assessed using the SF-36 questionnaire, which addresses eight health concepts (physical, social, and role functioning; mental health; health perceptions; energy or fatigue; pain; general health) and yields 2 summary scales (mental component summary, physical component summary). Workplace productivity and worker health was measured using the Health and Work Questionnaire (HWQ). Six SH dimensions were assessed using questionnaires (satisfaction, alertness) and 7 nights of actigraphy (regularity, timing, efficiency, duration). Each dimension was categorized as "good" or "poor"; a composite score was created based on the sum of good SH dimensions. Multiple linear regression models were adjusted for gender and age and stratified by enrollment pre- or post-COVID-19 emergence. Data are presented as standardized coefficients (β) and p-values (p).

Results: Compared to participants enrolled prior to COVID-19, those enrolled post-COVID-19 had worse SF-36 emotional, social, and general health and greater HWQ-assessed impatience (all p<0.05); however, SH did not differ between those enrolled pre- and post-COVID. Prior to COVID-19, greater SH was associated with higher SF-36 physical component scores (β=.389, p=.003); however, no association was observed post-COVID (β=.137, p=.271). In contrast, no association was observed pre-COVID between SH and SF-36 mental component scores (β=.181, p=.160), but greater SH was associated with greater mental component scores post-COVID (β =.308, p=.004). Furthermore, better SH was associated with lower stress post-COVID (β =-.423, p<.001).

Conclusion: SH was associated with HRQoL and workplace and worker health, though these associations sometimes differed between pre- and post-COVID emergence. Research should explore whether promoting SH in employees impacts their personal and workplace-related quality of life.

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0049

SCREEN TIME AND SLEEP IN YOUNG ADOLESCENTS BEFORE AND ACROSS THE FIRST YEAR OF THE COVID-19 PANDEMIC.

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Introduction: The COVID-19 pandemic has been associated with profound biopsychosocial changes for children, potentially affecting their health and wellbeing. Among these changes are altered sleep patterns and screen time use, however, no work has examined interactions between these two behaviors in the context of the pandemic. Here, we used longitudinal data from the Adolescent Brain Cognitive Development (ABCD) Study® to investigate changes in both sleep and screen time, and their relationship, from before and across the first year of the COVID-19 pandemic in young adolescents.

Methods: More than 5000 adolescents (11-14 years; 48% girls) completed digital surveys about their sleep and daily screen time use before the pandemic and across six timepoints during 2020-2021, as part of the ongoing ABCD Study®. Random intercept linear mixed effect models (LMMs) were used to examine longitudinal associations between bedtime, wake-up time, and daily screen time use (social media, gaming), considering age, sex, and school effects.

Results: Adolescents' wake up time was delayed (R2 = 0.51; ~1.5 hour) during May-August 2020 relative to the pre-pandemic assessment (p<0.01), which was partially related to the summer break (p<0.01), before advancing to earlier times in October 2020. Bedtimes also delayed at all pandemic assessments (R2=0.62; ~1 hour), even after starting the new school year (p<0.01), particularly in older adolescents (p<0.01) and girls (p<0.01). Recreational screen time was dramatically higher across the first year of the pandemic, relative to pre-pandemic (p<0.01; ~45min social media, ~20min video gaming). More time spent with screen related activities was associated with later bedtimes and wake up times (p<0.01), across the pandemic, with effects being evident in male and female adolescents.

Conclusion: Our findings show profound changes in sleep timing and screen time use across the pandemic in young adolescents, and critically, that excessive screen time negatively impacts sleep. As adolescents increasingly turn to more screen usage, these data highlight the need to promote their balanced and informed use of social media platforms, video games, and other digital technology to ensure adequate opportunity to sleep and maintain other healthy behaviors during this critical period of developmental change.
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0050

THE ROLE OF POVERTY AND PERCEIVED STRESS ON INSOMNIA SYMPTOM SEVERITY DURING THE COVID-19 PANDEMIC

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Introduction: In 2020, poverty in the United States increased as the COVID-19 pandemic led to the loss of work and/or income. Recent research has also shown that stress caused by the pandemic has led to increased rates of poor sleep. While insomnia rates have increased nationwide, it is not yet known if those living in poverty experienced insomnia symptoms at disproportionate rates. This study examined the effect poverty has had on insomnia symptom severity, as well as whether perceived stress mediated this association.
Methods: Survey data was collected from 3,775 U.S. adults (83.1% White, 78.6% female, age = 18 – 86 years old) during the initial months of the COVID-19 pandemic (April-June 2020). These data were used for a secondary analysis. Participants completed an online survey aimed to assess basic demographics, sleep, physical activity, social engagement, and overall stress levels. Poverty was defined using the poverty guidelines provided by the Department of Health and Human Services (i.e., based on self-reported income and family/household size). The Insomnia Severity Index (ISI) was used to assess insomnia symptoms. Perceived stress was assessed using the Perceived Stress Scale (PSS).
Results: 316 participants (8.4%) met criteria to be considered living below the poverty threshold. Those below the poverty threshold had a mean ISI of 10.20 (95% CI: 9.54, 10.86), while those above the poverty threshold had a mean ISI of 8.33 (95% CI: 8.13, 8.53). Put differently, 26.6% of those below the poverty threshold met criteria for clinical insomnia (i.e., ISI > 14), whereas 15.9% of those above the poverty threshold met criteria for clinical insomnia. Finally, a mediation test (with bootstrapping) confirmed that the association between poverty and insomnia was partially mediated by perceived stress (indirect effect = 1.15, 95% CI: 0.76, 1.55).
Conclusion: While poverty guidelines vary by state, these data generally support that there are notable disparities in sleep and insomnia based on family/household income, and that these differences are, in part, due to greater perceived stress. This may be due to increased stress related to loss of work or income. Future studies examining the impact of pandemic stress on insomnia should consider the role of socio-economic status.
Support (If Any): K23HL141581 (PI: Vargas); R25HL10544 (PI: Jean-Louis); K24AG055602 (PI: Perlis)

0051

THE ROLE OF PERCEIVED CONTROL IN BUFFERING AGAINST POOR SLEEP IN ESSENTIAL WORKERS DURING COVID-19

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Introduction: The COVID-19 pandemic has impacted sleep, with some populations such as essential workers reporting insomnia and poor sleep health. Prior research has suggested (but not tested) that this worsening of sleep may be tied to a lack of control over one's health or safety during the pandemic. This study tests this prediction and examines the role of perceived control as a protective factor against poor sleep in essential workers.
Methods: This study uses data from the NDSU National COVID Study, which has followed 301 nationally-representative American adults across four waves of data collection since April 2020. The current analysis includes data from wave 1 (April 2020) in 279 participants who had complete demographic, essential worker, perceived control (including domain general perceived control as well as health, COVID, work-specific control), and sleep health (RU SATED) data. Using t-tests and correlations, we hypothesized: (1) sleep health would be worse in essential workers compared with others; (2) perceived control would relate to better sleep health; and (3) perceived control would be a stronger predictor of sleep health in essential workers relative to others.
Results: There were no significant differences in sleep health between essential workers (N=44, M=8.27, SD=2.72) and others (N=235, M=8.46, SD=2.54; t=-0.44, p=.66). In the full sample, all indices of perceived control were significantly related to better sleep health (rs=.17-.31, ps<.004). Associations were stronger in essential workers (N=44, rs=.30-.56, ps<.05) than in others (N=235, rs=.13-.31, ps<.04). In sensitivity analyses that excluded participants not working for pay (e.g., people who were unemployed, retired, or receiving disability) from the other category, moderation effects were stronger; only COVID-related perceived control was significantly related to sleep health (N=110; r=.24, p=.01) in non-essential workers.
Conclusion: This is the first study to demonstrate links between perceived control and sleep. Although sleep health was not significantly different between essential and non-essential workers, we found that perceived control was especially beneficial for essential workers' sleep. Our results suggest interventions to improve perceived control, a modifiable psychosocial resource, might improve sleep health for essential workers.
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0052

A MIXED-METHODS EXAMINATION OF PERCEIVED CHALLENGES DURING THE COVID-19 PANDEMIC: ASSOCIATIONS WITH SLEEP HEALTH AND NIGHTMARES AMONG HEALTHCARE WORKERS

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Introduction: The emergence of CoVID-19 has created an immense burden on healthcare systems across the world, placing healthcare workers (HCWs) under significant, additional stress while they also confront multiple personal, family and sociopolitical challenges

during the pandemic. Many studies have reported the negative impact of pandemic-related stress on sleep of HCWs. Our mixed-methods investigation sought to extend existing research by characterizing the themes of HCWs' primary concerns during the early pandemic and identifying the most salient concerns which might be impacting sleep.

Methods: North American HCWs (n = 1331) were surveyed during the "second wave" of CoVID-19 case increases (6/9/2020 – 8/17/2020), which included a questionnaire with measures of sleep health (RU-SATED) and nightmare frequency (PSQI). Additionally, each HCW was asked to openly-describe their most salient concern with regard to the pandemic. Each response was categorized by topic. T-tests were conducted to compare frequencies of each response category with sleep health and nightmare frequency.

Results: The study sample comprised 1331 HCWs (91.7% female; 74.5% non-Hispanic white; 64.31% with exposure to CoVID-19 patients; 85.1% working in-person). Primary concerns were grouped into 8 categories including combinations of personal/familial-level concerns (e.g. concern about CoVID-19 infection/spread), and work-related stressors (e.g. increased workload). Concerns about lack of PPE/equipment was significantly associated with lower scores on RU-SATED (t = -2.69; p = .007) and increased nightmare frequency (t = 2.70; p = .007). Additionally, concerns about increased workload were significantly associated with lower scores on both RU-SATED (t = -2.79; p = .005) and increased nightmare frequency (t = 5.24; p = .000). Individually, primary concerns for CoVID-19 infection/spread was significantly associated with more-frequent nightmares (t = 2.01; p = .045). Neither sleep measure was associated with categories involving societal-level concerns (e.g. sociopolitical concerns) among the sample.

Conclusion: Our results indicate that the HCWs most concerned about workplace stressors during the pandemic indicated poorer sleep health and more frequent nightmares. Further analyses could help guide proper stratification of therapeutic approaches to improve sleep health and related distress for HCWs.

Support (If Any):

0053

THE ROLE OF SOCIAL ISOLATION ON SLEEP PROBLEMS INTERFERING WITH DAILY FUNCTIONING

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Introduction: Amidst the COVID-19 pandemic, widespread feelings of social isolation have become more prevalent than ever before as lockdowns and social distancing measures led people to remain in their homes. The constructs of social isolation and loneliness are similar but reflect slightly different aspects of social experience. Social isolation reflects the amount of social contact a person experiences, whereas loneliness reflects the subjective experience of an emotional yearning for such contact. While is known that sleep problems have increased during the pandemic, there has been little research into the potential effects of social isolation on sleep problems. Here, we examined the influence of social isolation on the extent to which insomnia has interfered with daily life activities. We hypothesized that social isolation would contribute to greater disruption in daily functioning from insomnia, exclusive of the effects of loneliness.

Methods: 13,298 English-speaking adults from across the U.S. (18-92 years old; 57.5% female) completed an online battery of assessments that included demographic questions, the Insomnia Severity Index (ISI), and the UCLA Loneliness Scale – Version 3 between April 2020 and April 2021. Participants were grouped based on whether they felt "socially isolated" or not at the time of assessment. Social isolation groups were compared for the extent that insomnia interfered with daily functioning, while statistically controlling for loneliness.

Results: After controlling for loneliness, socially isolated individuals reported much greater daily interference from sleep problems, M=1.58, SD=1.19, compared to those who denied feeling socially isolated, M=0.96, SD=1.04, F(1,13295)=287.67, p=7.5x10-64.

Conclusion: Social isolation during the pandemic was associated with significantly greater disruption of daily functioning due to sleep-related issues, even after adjusting for self-reported loneliness. Thus, feeling isolated and lacking social contact was related to functional degradation due to sleep problems. Prior evidence suggests that social isolation can have a dramatic negative impact on mental health and can lead to increased all-cause mortality, but these results suggest social isolation may also impact sleep health and functional outcomes (whether that be physical, cognitive, or psychological). Thus, being isolated during the pandemic was associated with greater degradation of functional outcomes of sleep, regardless of subjective loneliness.

Support (If Any):

0054

A FEAR OF DYING: HOW AN OBSESSION WITH DEATH DURING THE PANDEMIC CONTRIBUTES TO MORE SEVERE INSOMNIA

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Introduction: The prevalence of insomnia and other sleep disorders increased during the COVID-19 pandemic. While general anxiety, which increased during the pandemic, may account for some of the rise in sleep complaints, other factors may also contribute to insomnia. Here, we examined the potential contribution of fear of dying from the novel coronavirus on the severity of insomnia. We hypothesized that those endorsing a high fear of dying specifically from COVID-19 within 12 months of their assessment would demonstrate more severe insomnia.

Methods: From April 2020 through October 2021, 13,298 U.S. participants (18-92 years old; 57.5% female) completed a online survey (~1,000 participants per month) that included an assessment of their perceived likelihood of dying from COVID in the next year, the Generalized Anxiety Disorder scale-7 (GAD-7), and the Insomnia Severity Index (ISI). We examined insomnia over the course of the first year of the pandemic and divided the sample into those who endorsed at least a 50% or greater perceived likelihood that they would die from COVID-19 in the next year versus those who endorsed a less than 50% perceived likelihood of dying from the illness.

Results: Fear of dying (50% chance or higher) was associated with higher ISI scores (p<.00001) and tended to decline over the course of the year (p<.00001). A significant month x fear interaction (p=.021) suggested that individuals who believed they would die within the year showed significantly fluctuations in insomnia over the course of 13 months with peaks around June and October 2020. Even accounting for

situational anxiety (GAD-7), those with a fear of dying still demonstrated higher insomnia levels than their counterparts ($p<.00001$).

Conclusion: Self-perceived likelihood of dying from COVID-19 in the near future was associated with significantly elevated severity of insomnia, and this remained true even when controlling for a clinical assessment of generalized anxiety levels. These findings suggest that fear of succumbing to the novel coronavirus contributed significantly to the severity of sleep problems during the first year of the pandemic.

Support (If Any):

0055

BIDIRECTIONAL ASSOCIATIONS BETWEEN SLEEP AND DAILY BEHAVIORS IN URBAN AMERICAN INDIAN/ ALASKA NATIVE (AI/AN) YOUTH

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Introduction: American Indian/Alaska Native (AI/AN) individuals experience health disparities that emerge early in life. This is the first study to prospectively examine associations between sleep and daily behaviors in urban AI/AN adolescents.

Methods: Participants were 142 urban AI/AN adolescents (mean age = 14 years, 58% female). Sleep health characteristics were measured with actigraphy (total sleep time [TST], sleep efficiency [SE]) and daily diary (bedtime, wakeup time, sleep quality, alertness) over 7 days. Daily behaviors (caffeine consumption, physical activities, participation in traditional cultural activities, electronic use after 8PM, and mood) were measured via daily diary. Multilevel models examined the degree to which nightly sleep predicted next day's behaviors and, reversely, daily behaviors predicted nightly sleep, controlling for age, gender, and weekday/weekends. Weekday/weekend was tested as a moderator.

Results: Earlier bedtime (b = -0.11, p = 0.03) and wakeup time (b = -0.18, p < 0.001) were associated with more physical activity the following day. Earlier wakeup time (b = -0.17, p = 0.048) and shorter TST (b = -0.004, p = 0.03) were associated with greater participation in cultural activities. Later wakeup time (b = 0.96, p = 0.004), better sleep quality (b = 0.38, p < 0.001), longer TST (b = 0.02, p = 0.001), and higher alertness (b = 0.28, p < 0.001) were associated with higher mood rating.When examining the reverse direction, greater daytime caffeine consumption was associated with later wakeup time (b = 0.17, p = 0.01). More physical activity was associated with earlier bedtime (b = -0.12, p = 0.002) and wakeup time (b = -0.12, p = 0.01), but only during weekdays. Participation in cultural activities was associated with later bedtimes (b = 0.14, p = 0.02). More electronic use after 8 PM was associated with later bedtime (b = 0.38, p < 0.001) and wakeup time (b = 0.32, p < 0.001), shorter TST (b = -8.24, p = 0.001) and lower SE (b = -0.94, p = 0.002), with stronger effects on the weekdays than weekends.

Conclusion: Findings highlight dynamic associations between sleep and daily behaviors in AI/AN adolescents and may elucidate novel pathways for intervention and future research.

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0056

REST-ACTIVITY RHYTHMS (RARS) AND COGNITIVE FUNCTIONS IN EARLY POST-MENOPAUSAL WOMEN

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Introduction: RAR disruptions are more common among individuals with dementia than healthy individuals. In healthy older women, RAR disruption predicted future diagnosis of Mild Cognitive Impairment (MCI). With no cure for Alzheimer's Disease, it is crucial to identify modifiable risk-factors for early prevention of cognitive decline. Here we aim to determine whether RAR disruption was associated with cognitive status and cognitive performance in early post-menopausal women, thereby representing a modifiable risk factor for dementia.

Methods: The sample drawn from MsBrain study, included 229 cognitively unimpaired women and 42 women with MCI/ dementia, based on score on Montreal Cognitive Assessment (MOCA) adjusted for age and race. Participants completed a 72-hour wrist actigraphy monitoring and neuropsychological assessment including: California Verbal Learning Test (CVLT), Letter Number Sequencing (LNS), Card Rotation Test, Symbol Digit Modalities Test (SDMT). Latent profile analysis (LPA) was performed using five nonparametric RAR variables (intra-daily variability (IV), inter-daily stability (IS), relative amplitude (RA), alpha and F-statistic). The association between RAR clusters and cognitive performance and the relationship between RAR clusters, cognitive status and race/ethnicity were assessed using linear regression models, controlling for age, race/ethnicity, education and body mass index (BMI); and using chi-square test respectively.

Results: LPA revealed three clusters: Robust with high F-Stat, RA and IS and low IV; Normal;Weak with low RA and high alpha. The proportion of subjects with MCI/dementia did not differ between clusters however there was a significant association between race and RAR clusters, X2 (2, N = 271)=14.18, p<0[P1] .001, with non-white women more likely than white women to belong in the Weak group (p < .01). In an adjusted analysis of healthy women, the Weak group performed worse than the Robust group in LNS control (p<.050). In the unadjusted model, the Weak group performed worse than Robust group in CVLT Total Learning and Long Delay Recall and SDMT (p=.0074, p=.011and p= .0041, respectively).

Conclusion: Non-white women had weaker RAR than their white counterparts. Weaker RARs related to poorer working memory as measured by LNS; and poorer verbal memory and processing speed, measured by CVLT and SDMT however these effects were largely influenced by covariates, particularly race/ethnicity and education.

Support (If Any):

0057

AGE AT MENOPAUSE AND INSOMNIA IN A RACIALLY DIVERSE COHORT

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Introduction: Menopause is related to major hormonal, physical, and psychological changes for women, each of which could influence their sleep. However, sleep in women post-menopause may differ by race and ethnicity. We aimed to examine associations between age at menopause and insomnia symptoms among US women by race and ethnicity.

Methods: We utilized 2008-2012 data from the Health and Retirement Study, a nationally representative cohort of US adults age 50+, restricted to women with natural transition to menopause. Age at menopause was retrieved from baseline information (2008) and was used to categorized women into premature menopause (age≤40y), early menopause (age 41-45y), and normal menopause (age>45y). An insomnia composite score was constructed from 2010 and 2012 survey items that assessed insomnia symptoms (i.e., trouble falling asleep, nighttime awakenings, early morning

awakenings, and feelings of nonrestorative sleep). Insomnia items that were reported as "most of the time" were considered positive and contributed to the composite score (range: 0-4). We estimated associations between age at menopause and insomnia symptoms using linear regression models and logistic regression models for continuous and binary outcomes, respectively. Models were stratified by White/non-White race and were adjusted for age, education, physical activity, parity, marital status, and survey year.
Results: Among 4,435 women, 338, 701, and 3,396 reported premature, early, and normal menopause, respectively. In White women, premature menopause was associated with a higher mean composite insomnia score than those who had normal menopause (b=0.20, p=0.03). However, this association was not seen in non-Whites. For individual insomnia survey items, premature menopause in White women was associated with greater odds of nonrestorative sleep (OR=1.98, 1.30-3.03) compared with normal menopause. In contrast, a premature menopause was not associated with nonrestorative sleep in non-Whites. Premature menopause was not associated with other individual insomnia symptoms for both groups.
Conclusion: Premature transition to menopause is associated with increased insomnia symptoms in White women. Among individual insomnia features, premature menopause had the greatest impact on nonrestorative sleep. Given the importance of sleep quality for various health outcomes, our findings highlight a need for more dedicated sleep assessments in women who experience premature menopause.
Support (If Any):

0058

CONSUMER DIGITAL HEALTH AND PERSON GENERATED HEALTH DATA – OPPORTUNITIES AND CHALLENGES FOR SLEEP DISPARITIES RESEARCH AND CLINICAL PRACTICE

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Introduction: Social and structural determinants of health—including economic/educational inequalities, healthcare access, systemic racism, and lifetime stress—account for 60-80% of modifiable risk factors that contribute to sleep health disparities. Many sleep interventions use population averages to create "one-size-fits-all" approaches, but are limited by individual heterogeneity in number, magnitude, interplay, and amplification of social determinants. Person-generated health data (PGHD) from widely available consumer wearable and mobile technologies are emerging tools for developing personalized digital interventions targeting unique, multi-level needs of individuals or populations. PGHD can objectively measure individual lived experiences and biobehavioral health including sleep in an objective, low-cost, accessible, and continuous manner outside of intermittent clinical care. However, PGHD are a form of real-world data and are not captured in controlled research settings, impeding their acceptance and use across the healthcare ecosystem. Most studies involving PGHD use "bring-your-own-device" designs which have systematically underrepresented populations experiencing health disparities, including Black or American Indian/ Alaska Native individuals, and low-income populations, limiting their potential to address health inequities. Further, systemic barriers in the healthcare enterprise, including logistical, implementation, validation, interpretation, reimbursement, privacy, and data security challenges could handicap the entire field. To address these gaps, the American Life in Realtime (ALiR) was developed as a generalizable research infrastructure involving a holistic and sociodemographically representative registry of continuously-collected Fitbit and health data. The current study reviews the current challenges associated with the use of consumer PGHD to measure and improve population-specific sleep health and describes how the ALiR advances a critical community resource to mitigate methodological gaps and fully realize the immense potential of consumer PGHD in an equitable manner.
Methods: Leveraging a multidisciplinary perspective, including biomedical engineering, behavioral psychology, clinical medicine, and health policy and economics, we discuss the state-of-the-science regarding sleep PGHD producing technologies, from basic science to clinical application. We explore the strengths and weaknesses of current and emerging initiatives such as All of Us at the National Institutes of Health. Finally, we introduce ALiR and describe how it's sample, recruitment methods, and data elements can be used to mitigate field-wide methodological gaps to improve health equity in sleep research.
Results: To date, 1007 individuals consented to participate in ALiR. Racial/ethnic distributions include 65% White, 13% Black, 4% American Indian / Alaska Native, 9% Asian, 1% Hawaiian / Pacific Islander, 8% Mixed, and 26% Hispanic/Latino, with relatively even gender and age distributions. Seventy percent of individuals are without a bachelor's degree, and 20% have at least one chronic condition (e.g., obesity, cardiovascular disease). Overall response rates exceed 87%, averaging 90% for surveys and 82% for Fitbits. Planned analyses will include a framework for leveraging ALiR to mitigate methodological gaps associated with use of PGHD for sleep health from basic science to clinical application.
Conclusion: ALiR establishes a generalizable research infrastructure to use PGHD to explore the influence of population-specific lived-experiences on sleep and other health outcomes in virtually any population. This novel and ongoing research infrastructure which will ultimately be publically available, providing an invaluable resource to better understand and intervene on sleep health disparities.
Support (If Any): R01LM013237

0059

DOES DISCRIMINATION MODERATE THE RELATIONSHIP BETWEEN INSOMNIA AND TELOMERE LENGTH IN OLDER ADULTS FROM THREE RACIAL/ETHNIC GROUPS?

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Introduction: Both insomnia and discrimination have been associated with adverse physical and mental health outcomes. Evidence suggests that discrimination may moderate the effects of sleep on telomeres, DNA sequences at the end of chromosomes that protect them from degradation. The purpose of this study was to determine the relationship between insomnia and telomere length among older non-latinx white, black, and latinx individuals and whether discrimination moderated this relationship differently based on race or ethnicity.
Methods: This study is a secondary analysis from the Health and Retirement Study, a longitudinal project sponsored by the National Institute on Aging. Our analysis consisted of 3,205 US participants who provided information on sleep problems as well as salivary samples from which telomere data were assayed. We computed a linear regression to examine the relationship between insomnia symptoms and telomere length in each racial/ethnic

group, including interaction terms to assess moderating effects of discrimination.
Results: Insomnia symptoms were associated with shortened telomere length among non-latinx white participants (β -0.046, p=0.015, [-0.06, -0.01]). Discrimination had a moderating effect between insomnia symptoms and telomere length among black participants (β -0.28, p=0.045, [-0.33, -0.00]). Analyses remained significant after adjusting for age, medical co-morbidities, smoking status, and a history of depression.
Conclusion: Our results suggest that symptoms of insomnia may contribute to telomere erosion, with potentially adverse effects on genomic integrity. For black individuals, those who experienced discrimination were at greater risk of telomere damage associated with insomnia.
Support (If Any): Funding has been made available by the NIH, granted to UCSF School of Nursing Biobehavioral Research Training Program in Symptom Science (NIH: T32 NRO16920).

0060

SLEEP DISPARITIES BY RACE/ETHNICITY DURING PREGNANCY: AN ENVIRONMENTAL INFLUENCES ON CHILD HEALTH OUTCOMES (ECHO) STUDY

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Introduction: Poor sleep during pregnancy is common and associated with increased risk of adverse perinatal outcomes. Racial/ethnic minoritized groups in the United States experience worse sleep than non-Hispanic Whites (nHW), likely due to downstream effects of systemic and structural discrimination. Nonetheless, the extent of sleep disparities in the perinatal period remains understudied. In this analysis we estimated the prevalence of subjective measures of sleep in a multi-racial/ethnic pregnant population from the Environmental influences on Child Health Outcomes (ECHO) program.
Methods: Participants self-reported their race and ethnicity and were grouped into four categories: 1)nHW, 2)non-Hispanic Black/African American (nHB/AA), 3)Hispanic, 4)non-Hispanic Asian (nHA). Our analysis examined trimester-specific nocturnal sleep duration, sleep quality, and sleep disturbances (derived from the Pittsburgh Sleep Quality Index and the ECHO maternal sleep health questionnaire) by race/ethnicity. A total of 1119,2409 and 1284 participants in the first (T1), second (T2) and third trimesters (T3) reported on sleep duration. 1107,1742 and 783 participants in T1,T2 and T3 reported on sleep quality. 1112,1758, and 787 participants in T1,T2 and T3 reported on sleep disturbances Linear or multinomial regression were used to estimate associations between race/ethnicity and each sleep domain by trimester, controlling for body mass index (BMI) and age. We repeated analyses within education strata (high school degree, GED/equivalent; some college and above)
Results: nHB/AA participants reported shorter sleep duration (T2: β=-0.55 [-0.80,-0.31]: T3: β=-0.65 [-0.99,-0.31]), and more sleep disturbances (T2:β=1.92 [1.09,2.75]; T3:β=1.41 [0.09,2.74]) compared to nHW. Hispanic participants reported longer duration compared to nHW (T1: β=0.22 [0.00004, 0.44];T2: β=0.61 [0.47,0.76];T3: β=0.46 [0.22,0.70]), better sleep quality (Compare to Very good quality OR for Fairly good T1: OR=0.48 [0.32,0.73], T2: OR=0.36 [0.26,0.48], T3: OR=0.31 [0.18,0.52]; Fairly bad T1:OR=0.27 [0.16,0.44], T2:OR=0.46 [0.31,0.67], T3: OR=0.31[0.17,0.55]), and fewer sleep disturbances (T2 β=-0.5 [-1.0,-0.12]; T3 β=-1.21 [-2.07,-0.35]). Differences persisted within the subsample of high SES women.
Conclusion: These findings highlight racial/ethnic disparities across multiple domains of sleep health during pregnancy. Given the stark racial/ethnic disparities in perinatal outcomes and their associations with sleep health, further research is warranted to investigate the determinants of these disparities, such as downstream effects of systemic and structural discrimination
Support (If Any):

0061

ASSOCIATIONS BETWEEN SLEEP, ADVERSE CHILDHOOD EXPERIENCES AND HIGH BODY MASS INDEX IN A NATIONAL SAMPLE OF ADOLESCENTS

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Introduction: Adverse childhood experiences (ACEs) are independently associated with short sleep duration (SD) and an increased obesity risk that tracks into adulthood. Similarly, substantial research has demonstrated an association between deficient sleep and overweight/obesity in adolescents. Not known is how sleep duration and ACEs may interact in association with obesity risk in adolescents. This study explored ACEs as a moderator between sleep duration and obesity risk in a national sample of adolescents.
Methods: Using the National Survey of Children's Health 2017-2018 dataset, we included adolescents (10-17 yrs) with available SD and Body Mass Index (BMI) data. Parents reported adolescent's SD, and number of ACEs. We classified adolescents as overweight/obese if they had a BMI ≥85th percentile. Using a stepwise approach and accounting for complex survey design, logistic regression (STATA 16.0) estimated the interaction between SD and the number of ACEs in adolescents, controlling for selected covariates (i.e., demographics, social determinants, sleep regularity, exercise, and mental/physical health outcomes).
Results: In a sample of 26,013 adolescents (mean age=13.81, SD=2.29; 52% male, 70% White, Non-Hispanic), 27% were classified as overweight/obese, 47% had >1 ACE, and 34% had SD <8-10 hours/night. Accounting for covariates and ACEs, every hour increase in SD was associated with 6% decrease in the odds of overweight/obesity (OR=0.94, p=0.04). There was a significant interaction between SD and ACEs. Compared with having no ACEs, the association between longer sleep and lower odds of high BMI was weakened or even reversed if an adolescent experienced one ACE (OR=1.18, p=0.02) or two or more ACEs (OR=1.13, p=0.04).
Conclusion: Adolescence may be a critical period in the life course for the interaction between SD and ACEs on obesity risk. Increasing SD is a known intervention target to decrease obesity risk, yet in children experiencing one or more ACE, this protective role may be dampened. Our results suggest that sleep and

cardiometabolic intervention efforts should target adolescents who may be living within risky childhood environments.
Support (If Any): None.

0062

RACE/ETHNICITY, SLEEP DURATION, AND ALL-CAUSE MORTALITY RISK IN THE UNITED STATES

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Introduction: Health experts recommend that adults should sleep between 7 to 9 hours in a 24-hour period, with data indicating higher mortality risks both above and below these thresholds. However, no study to date has examined the association between sleep duration and mortality risk across racial/ethnic groups.
Methods: Data from the linked mortality files of the 2004-2015 National Health Interview Survey (NHIS) were used to examine the association between sleep duration and all-cause mortality among U.S. adults. Of 278,103 adults aged 25+, 22,347 individuals died over the follow-up period. Sleep duration was coded as: <7 hours, 7 to 9 hours, and >9 hours. Race/ethnicity was categorized as: non-Hispanic (NH) White, NH Black, NH American Indian/Alaska Native, NH Asian, NH multiple races, and Hispanic. Cox Proportional Hazard models were used to estimate associations between sleep duration, race/ethnicity, and mortality. All results are reported as relative risk ratios (RRR).
Results: Across the sample, we replicated previous research, finding increased mortality risk for those sleeping <7 hours or >9 hours in a 24-hour period. Relative to NH Whites, after adjustments for sociodemographic and socioeconomic variables, mortality risk for NH Blacks and NH multiracial individuals was statistically indistinguishable while NH Asians (RRR= 0.79; p <0.001) and Hispanics (RRR= 0.80; p<0.001) had lower risk. Interactions between sleep duration and race/ethnicity showed that NH White adults sleeping >9 hours experienced 1.82 times higher (p<0.001) risk than those sleeping 7 to 9 hours. This risk was greater than NH Blacks (RRR= 1.42; p<0.001), NH Asians (RRR= 1.00; p< .05), and Hispanics (RRR= 1.15; p <0.01). Further, stratified regression analyses showed heightened mortality risks only for NH Whites sleeping <7 hours (RRR= 1.06; p <0.05).
Conclusion: The association between sleep duration and all-cause mortality risk varies by race/ethnicity. While sleeping <7 hours in a 24-hour period is thought to increase mortality risk, we found this is specific to NH Whites. Sleeping >9 hours is associated with a higher mortality risk, but more so for NH Whites than other groups. More research on sleep duration and mortality that takes race/ethnic specific risk factors into account is needed to identify causal mechanisms.
Support (If Any): Health Equity Research Center (HERC) at Washington State University

0063

BIOPSYCHOSOCIAL PREDICTORS OF SLEEP HEALTH IN BLACK, ASIAN, AND HISPANIC/LATINX SAMPLES

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Introduction: Sleep health is an important aspect of sleep and is associated with biopsychosocial factors such as physical health, mental health, and social functioning. Disparities in sleep health are widely prevalent in individuals who identify as Black, Asian, and Hispanic/Latinx. Investigating unique associations between general sleep health and biopsychosocial factors may elucidate underlying associations and lead to innovative approaches to promote sleep health in these historically marginalized populations.
Methods: 3,284 adults participated in an online study investigating sleep longitudinally across normal development (ISLAND). These analyses were conducted in the samples of individuals who self-identified as Black (n = 263, Mage = 40.6 years, 52.1% female), Asian (n = 208, Mage = 34.8 years, 39.9% female), and Hispanic/Latinx (n = 216, Mage = 35.8 years, 44.4% female). Participants were stratified across the lifespan, with equal numbers of men and women recruited. Participants completed several questionnaires including demographics, the RU-SATED, Patient Health Questionnaire-15 (PHQ-15), Patient Health Questionnaire-2 (PHQ-2), Generalized Anxiety Disorder-2 (GAD-2), and the De Jong Gierveld Loneliness Scale. Multiple regression analyses were conducted within each group to determine whether biological (PHQ-15 without the sleep item), psychological (composite score of PHQ-2 and GAD-2), and social (social loneliness factor of the De Jon Gierveld Loneliness Scale) predictors of sleep health while controlling for demographic variables (i.e., age, sex, education).
Results: Within the Black sample, lower mental health functioning was associated with poorer sleep health (p=0.008). Within the Asian sample lower physical functioning and lower mental health functioning were significantly associated with poorer sleep health (p's<.001). Within the Hispanic/Latinx sample, lower physical functioning was significantly associated with poorer sleep health (p<.001).
Conclusion: Sleep health was observed to be associated with biopsychosocial factors within Black, Asian, and Hispanic/Latinx samples. Unique patterns of associations were observed within each sample. Future research would benefit from employing longitudinal designs or using more objective measurements to further elucidate these associations.
Support (If Any): National Institute on Aging of the National Institutes of Health under Award Number K23AG049955 (PI: Dzierzewski).

0064

YOUTH SLEEP-WAKE EXPERIENCE IN JUVENILE JUSTICE FACILITIES: A DESCRIPTIVE ANALYSIS

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Introduction: Adolescents are susceptible to sleep loss due to biological and environmental factors such as delayed circadian timing and schedule demands. Few studies have examined sleep-wake patterns for adolescents residing in juvenile justice facilities. The current study assessed youth's self-reported sleep-wake schedules, sleep environment perceptions, and sleep quality.
Methods: Participants were recruited from 11 juvenile services detention and treatment facilities in Maryland. For seven consecutive mornings, youth completed a sleep-wake diary reporting their bed/wake times, sleep onset, and type of (nocturnal) light exposure. Youth wore digital wristwatches to accurately depict their sleep-wake schedules. Sleep quality and wake difficulty were rated on a scale from 1-10 (1=very poor/easy to 10=very good/hard, respectively).

Results: Participants (N= 64) were 13-19 years old (M= 16.7, SD= 1.3 years) and 85.9% male. Racial backgrounds: 61% Black, 18% White, 8% Multiracial, and 13% Other. Youth-reported bedtimes (M= 21:04, SD= :50) were about 50 minutes earlier than their sleep onset times (M= 21:52, SD= 1:02) while wake times (M= 6:41, SD= :46) were about 20 minutes earlier than the time youth reported leaving their bed (M= 7:00, SD= :44). Youth disclosed waking up throughout the night (M= 1.7, SD= 9) for an average 16.8 minutes (SD= 14.9). Multiple diary-responses (58%) noted "partial or overhead" lights were on in youth's sleeping areas; 23.4% wrote in "other" types of light sources, most of which were blue lights (63%). Average sleep quality (M= 5.7, SD= 2.1) and difficulty waking up ratings (M= 5.4, SD= 2.2) indicate mediocre sleep.
Conclusion: Findings summarize youth's sleep-wake experience while residing in a juvenile justice facility. Reported bedtimes are earlier than sleep onset times which increases the likelihood for conditioned insomnia. Circadian dysregulation of sleep behavior can develop from frequent night awakenings and light exposure, particularly, blue light. Ultimately, these findings will help develop facility-wide interventions, improving the youth's sleep-wake schedules and other environmental influences.
Support (If Any): This research is made possible by the American Academy of Sleep Medicine (AASM) Foundation Award #22-CS-19 and Department of Juvenile Services' supportive collaboration.

0065

GEOGRAPHIC ASSOCIATION BETWEEN NEIGHBORHOOD SLEEP HEALTH AND CHILD OPPORTUNITY INDEX: DATA AT THE CENSUS TRACT LEVEL

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Introduction: Sleep health impacts the community in many ways. Regional sleep health may reflect other important indicators of health and well-being. Few studies have examined sleep health at the regional level, though.
Methods: Data on neighborhood sleep health values were obtained from the "500 Cities" data collected by the CDC that includes census tract and proportion of the population in that region that report values associated with health, as assessed with the Behavioral Risk Factor Surveillance System. Data include the population of each census tract as well as census-estimated proportion of the population in each census tract that report obtaining at least 7 hours of sleep. Additional variables included as covariates in analyses included the proportion with healthcare access, that were obese, had high blood pressure, had diabetes, and were smokers. The Child Opportunity Index (COI) is a publicly-available index (DiversityDataKids.org) reported at the census tract level. It provides indices for "Education," "Health & Environment," and "Social & Economic" domains, as well as a global score. The present analysis merged the 500 Cities data with the COI data, using census tract as the matching variable. Linear regression analyses examined COI global and subscale scores as outcome variable and proportion of the population obtaining 7 hours of sleep as the independent variable, unadjusted and adjusted for covariates. When data were merged, 27,130 census tracts were included.
Results: Sleep sufficiency was associated with global COI, such that for each additional percent of the population that obtains >=7 hours of sleep, COI increases by 3.6 points (95%CI[3.57,3.64]; p<0.0001); this was attenuated in adjusted analyses (B=1.58; 95%CI[1.53,1.63]; p<0.0001). Each component of COI was related to sleep sufficiency, including education (B=3.06; 95%CI[1.19,1.33]; <0.0001), health & environment (B=3.61; 95%CI[3.57,3.64]; p<0.0001), and social & economic (B=2.23; 95%CI[2.19,2.28]; p<0.0001). All associations were attenuated but significant in adjusted analyses.
Conclusion: Regional prevalence of insufficient sleep was linearly associated with Child Opportunity Index, which itself is an important predictor of a wide range of health and economic outcomes. Community sleep health interventions may have wide-ranging benefits.
Support (If Any):

0066

A MEXICAN SPANISH VERSION OF THE ASSESSMENT OF SLEEP ENVIRONMENT

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Introduction: Sleep research that has been previously completed with individuals of Mexican descent generally do not use instruments that have been translated in accordance with the language norms of the target community. In this study, the Assessment of Sleep Environment (ASE) was translated by a bilingual research study team. The ASE was then completed by English and Spanish speaking participants, in their preferred language.
Methods: Data were collected from a sample of N=100 individuals of Mexican descent in Nogales, Arizona, located at the US-Mexico border. The ASE is a 13-item scale that quantifies the degree to which an individual perceives that their physical environment interferes with their sleep quality. It includes items about heat, cold, noise, quiet, light, dark, smell, humidity, comfort of sleeping surface and bedding, and safety. To translate the measure into Spanish, the following procedure was followed: (1) a bilingual study team member performed an initial translation; (2) a bilingual community member edited the translation; (3) a certified medical translator edited the revision; (4) a focus group of N=5 bilingual community members made contextual edits; (5) a back-translation was performed; (6) an additional bilingual focus group examined the final version for compatibility; and (7) the medical translator certified the accuracy of the final version. T-tests examined differences between those who completed the measure in Spanish vs English.
Results: Of the N=100 survey respondents, N=42 completed the ASE in Spanish. No significant differences were seen in overall scores between those who completed the measure in English or Spanish (p=0.17). In addition, no differences were seen for individual items assessing light (p=0.19), dark (p=0.21), noise (p=0.73), quiet (p=0.15), heat (p=0.08), cold (p=0.96), pillows (p=0.93), firmness (p=0.98), other sleeping surface issues (p=0.08), or safety (p=0.28), but mean differences were seen for humid (0.04), smell (0.04), and softness (p=0.02), with respondents to the Spanish version reporting a lower degree of disturbance due to these factors.

Conclusion: There were no significant differences seen in overall scores between those that completed the English and Spanish versions. Future studies can use the Spanish version of the ASE when assessing this population.
Support (If Any):

0067

SLEEP DISPARITIES AND THE ACADEMIC ACHIEVEMENT GAP IN 1.9 MILLION COLLEGE STUDENTS

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Introduction: Adults from under-represented minority groups (URM) disproportionately experience sleep disturbances. Sleep disparities can be prevalent in academic settings, however, it is still unknown whether sleep disparities directly contribute to other disadvantages in URM students, such as the academic achievement gap. Using a national database of college students collected over 20 years, we investigated whether poor sleep quality mediated the relationship between race/ethnicity and grade point average (GPA).
Methods: We conducted secondary analyses on American College Health Association – National College Health Assessment survey data (ACHA-NCHA). The ACHA-NCHA I, II, IIb, IIc, and III surveys were conducted between 2000 and 2020, and included approximately 1,900,000 participants. We analyzed responses to questions regarding race/ethnicity, socioeconomic status, academic achievement (GPA), daytime sleepiness, and sleep health. Non-URM students were those identifying as non-Hispanic White or Asian whereas URM students included all other racial/ethnic identifications. We calculated a sleep-problems composite score by transforming each sleep item response into a z-score and averaging across all items.
Results: Sleep disparities were evident amongst the college students; relative to non-URM students, URM students reported fewer days per week that they felt rested (95% CIs: 3.884–3.895 vs. 4.155–4.161) and worse sleep-problem composite scores (95% CIs: .0453–.0496 vs. -.0226 – -.0199). In addition, there was significant evidence for an academic achievement gap, such that URM students reported significantly lower GPAs than non-URM students (95% CIs: 3.162–3.166 vs. 3.344–3.346). Feeling rested and sleep problem composite scores partially mediated the relationship between race/ethnicity and academic achievement (ps < .001), explaining 4.1% and 5.1% of the variance, respectively. These results were lower in magnitude than the contribution of socioeconomic status (25.3% of the mediation variance); however, sleep problems and feeling rested continued to explain significant variance even when controlling for socioeconomic status.
Conclusion: Sleep disparities contribute to academic achievement gaps experienced by URM students. The current findings indicate that university-wide sleep health programs may help to remove an unnecessary barrier to academic achievement, particularly if such programs incorporate behavioral change theory and address system-level financial, sociocultural, and environmental barriers to sleep quality.
Support (If Any): National Science Foundation (1920730 and 1943323)

0068

IMPACT OF OSA THERAPY ON HEALTHCARE ECONOMICS: ACTUARIAL ANALYSIS OF OSA PREVALENCE, THERAPY ADHERENCE, CO-MORBIDITY, AND COSTS IN A LARGE CMS POPULATION COHORT

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Introduction: Research studying the economics of OSA therapy faces confounds including the prevalence of undiagnosed OSA, rate of diagnosed patients declining therapy, spectrum of treatment adherence, and effects of concurrent co-morbidity. We provide an actuarial analysis to study the economic impact of OSA therapy, accounting for these confounds, using the 2016-2018 Medicare 5% LDS Analytical File, a random sample of Medicare Claims containing approximately 2.9 million patients/year, resulting in N=2,001,538 eligible Fee-For-Service patients excluding managed care patients and incomplete data.
Methods: We segmented the study population into three cohorts and three 12-month time-periods. The cohorts analyzed were A) patients with OSA diagnosis and >12 months treatment, B) patients with OSA and <12 months treatment, and C) patients with OSA diagnosis who never received treatment, resulting in 1,351,838 patient-months. We analyzed the healthcare costs in each cohort in the year before treatment, the first year of treatment, and following treatment year. We applied actuarial risk adjustment within each cohort and time-period to provide a risk-adjusted cost comparison. Results were analyzed cross-sectionally given zero-to-seven co-morbidities among obesity, hypertension, type-II diabetes, depression, COPD, CHF, and/or prior stroke, facility-vs-home testing, and with-or-without surgical procedures.
Results: The average per-patient-per-month (PPPM) total medical spending was highest in the diagnosed-but-never-treated cohort-C ($1,375), second highest in <12-months treatment cohort-B ($1,005), and lowest in >12-months treatment cohort-A ($983). In both cohorts that started therapy, average/quantile costs decreased from pre-treatment year to post-treatment year, and from the first-to-second year on therapy. Compared to no-therapy cohort-C, costs were 29% lower in cohort-A and 27% lower in cohort-B. Among co-morbid, 75th quartile of cost members, we observed similar differences (18% and 16%) but larger absolute dollars. Patients undergoing surgical procedures had higher costs but lower spend reduction in initial and following year of therapy (22% and 5%).
Conclusion: We observed significant differences in cost between OSA patients that started treatment versus those that did not, and those differences further increased the year following therapy onset. These findings imply that receiving treatment for OSA reduces a patients overall medical spend. In terms of mean cost, the >12-month and <12-month cohorts costs fell in both follow-up treatment years.
Support (If Any):

0069

TRAJECTORIES OF SLEEP CHARACTERISTICS IN BLACK AND WHITE WOMEN DURING THE FIRST YEAR POSTPARTUM

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Introduction: In the postpartum period, many women experience sleep deficiency due to caring for their infant. Racial disparities exist in sleep characteristics in the adult population, with Black adults having shorter total sleep time (TST) and worse sleep efficiency (SE) than White adults. However, few studies have investigated sleep changes in postpartum Black and White women. The purpose of this study was to examine trajectories of sleep characteristics from 6-8 weeks to 12 months postpartum in Black and White women.
Methods: Black (n=48) and White (n=86) women who gave birth to a singleton infant at ≥37 weeks gestation, wore an Actiwatch Spectrum Plus (Phillips Respironics, Inc) at 6-8 weeks, 4, 6, 9, and 12 months postpartum. Participants were instructed to wear the monitor, complete a sleep diary, and to maintain their normal daily activities over 7 days. Daily time in bed (TIB), TST, SE, and wake after sleep onset (WASO) were determined.
Results: Trajectories of TIB, TST, SE and WASO were not different between Black and White women from 6-8 weeks to 12 months postpartum. However, Black women had shorter TIB and TST, and lower sleep efficiency ($p<0.001$ for all). WASO was similar between Black and White women. For the entire sample, TIB significantly decreased from 470±74 (mean±SD) minutes at 6-8 weeks to 459±54 minutes at 12 months ($p=0.0038$). TST significantly increased from 347±86 minutes at 6-8 weeks to 369±70 minutes at 4 months ($p=0.0085$) but did not change at the later timepoints. SE increased from 80±8% at 6-8 weeks to 83±7% at 6 months ($p=0.0034$) but did not change at the later timepoints. WASO decreased from 54±24 minutes at 6-8 weeks to 46±21 minutes at 4 months ($p<0.0001$) but did not change at later timepoints.
Conclusion: In the first year postpartum, Black and White women had similar trajectories for sleep characteristics, but Black women had shorter TIB and TST and lower SE than White women. TIB and WASO decreased while TST and SE increased over time. The first 4 to 6 months show the greatest changes.
Support (If Any): NIH Grant R21MD012740

0070

A MEXICAN SPANISH VERSION OF THE BRIEF INDEX OF SLEEP CONTROL

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Introduction: The Brief Index of Sleep Control (BRISC) is a 4-item assessment of the degree to which an individual perceives that they are in control of their sleep. Previous work shows that this measure may be useful for sleep health promotion efforts. The present study describes an attempt to develop a version of this measure in Spanish, particularly for individuals of Mexican descent.
Methods: Data were collected from a sample of N=100 individuals of Mexican Descent in Nogales, Arizona, located at the US-Mexico border. The BRISC is a 4-item scale that quantifies the degree to which an individual perceives that their sleep is under their control, assessing perceived control over time to bed, time out of bed, total sleep time, and sleep quality. To translate the measure into Spanish, the following procedure was followed: (1) a bilingual study team member performed an initial translation; (2) a bilingual community member edited the translation; (3) a certified medical translator edited the revision; (4) a focus group of N=5 bilingual community members made contextual edits; (5) a back-translation was performed; (6) an additional bilingual focus group examined the final version for compatibility; and (7) the medical translator certified the accuracy of the final version. T-tests examined differences between those who completed the measure in Mexican Spanish vs English.
Results: Of the N=100 survey respondents, N=42 completed the BRISC in Spanish. No significant differences were seen in overall scores between those who completed the measure in English or Spanish ($p=0.69$). In addition, no differences were seen for individual items regarding time to bed ($p=0.30$), wake time ($p=0.77$), total sleep time ($p=0.58$), or sleep quality ($p=0.98$).
Conclusion: Data collection instruments be linguistically and culturally appropriate to the study population. This version of the BRISC was adapted to Mexican Spanish for use in future studies.
Support (If Any):

0071

A MEXICAN SPANISH VERSION OF THE CIRCADIAN ENERGY SCALE

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Introduction: Circadian health is increasingly recognized for the contributions it makes to general health. Few instruments assessing circadian rhythms have been translated into Spanish, however. The present study describes a Spanish translation of the Circadian Energy Scale (CIRENS). The instrument was designed according to the language norms of those living along the US-Mexico border by a bilingual research team. The CIRENS was completed by both English and Spanish speaking border residents, in their preferred language.
Methods: Data were collected from a sample of N=100 individuals of Mexican descent living in Nogales, Arizona. CIRENS is a 2-item scale that assesses chronotype by examining overall energy level in the morning and evening. Translation of the instrument into Spanish was done according to the following process: (1) a bilingual study team member attempted an initial translation; (2) a bilingual community member edited the translation; (3) a certified medical translator edited the revision; (4) a focus group of N=5 bilingual community members made further contextual edits; (5) a back-translation was performed; (6) an additional bilingual focus group examined the final version for compatibility; and (7) the medical translator certified the accuracy of the final version. T-tests examined differences between those who completed the measure in Spanish vs English.
Results: Of the N=100 survey respondents, N=42 completed the CIRENS in Spanish. No significant differences were observed in overall chronotype determination between those who took the Spanish versus English version ($p=0.22$) of the instrument. As a continuous score, the respondents in Spanish demonstrated slightly

more morningness (p=0.01). Per the individual items, no differences were seen for evening energy levels (p=0.22), but Spanish respondents reported slightly higher morning energy scores (2.76 vs 2.17, p=0.008).
Conclusion: The individuals that completed the CIRENS in Spanish reported higher morning energy scores but no significant differences in chronotype. Future studies can use the Spanish CIRENS to evaluate circadian factors across cultural/linguistic groups.
Support (If Any):

0072

A MEXICAN SPANISH VERSION OF THE INSOMNIA SEVERITY INDEX

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Introduction: Data were collected for the Insomnia Severity Index (ISI). To ensure the validity of study subject responses, the ISI was translated into Mexican Spanish by a bilingual research study team, based on a previous Spanish translation. It was then administered to study subjects in their preferred language.
Methods: Data were collected from a sample of N=100 individuals of Mexican Descent in Nogales, Arizona, at the US-Mexico border. The Insomnia Severity Index (ISI) is a 7-item scale that quantifies the degree to which an individual experiences insomnia symptoms. A Spanish translation already exists, but this had not been previously localized to Mexican Spanish. To localize the measure, the following procedure was followed: (1) a bilingual community member edited the translation; (2) a certified medical translator edited the revised items; (3) a focus group of N=5 bilingual community members made contextual edits to the new measure; (4) a back-translation was performed; (5) an additional bilingual focus group examined the final version for compatibility; and (6) the medical translator certified the accuracy of the final version. As a result of this process, text edits to items 4 and 6 were made to accomplish the localization (the other items remained unchanged). T-tests examined differences between those who completed the measure in Mexican Spanish vs English.
Results: Of the N=100 survey respondents, N=42 completed the ISI in Spanish. Those who completed the ISI in Spanish reported significantly lower overall scores (8.2 vs 9.8, p=0.048). No significant differences were seen for individual items regarding early morning awakenings (p=0.13), satisfaction (p=0.71), interference with daily functioning (p=0.29), whether sleep problems are noticeable (p=0.06), and worry/distress about sleep (p=0.14). However, those completing the measure in Spanish reported lower scores on items regarding difficulty falling asleep (p=0.03) and staying asleep (p=0.001).
Conclusion: When adapting the ISI to a Spanish-speaking population at the US-Mexico border, modifications were made to the existing Spanish translation to improve linguistic and cultural appropriateness.
Support (If Any):

0073

A MEXICAN SPANISH VERSION OF THE SLEEP DISORDERS SYMPTOM CHECKLIST

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Introduction: The Sleep Disorders Symptom Checklist (SDSCL-25) is a brief assessment of patient-reported symptoms that suggest risk for a wide range of sleep disorders. To ensure the validity of study subject responses, the SDSCL-25 was translated into Spanish by a bilingual research study team. It was then administered to study subjects in their preferred language.
Methods: Data were collected from a sample of N=100 individuals of Mexican Descent in Nogales, Arizona, US-Mexico border. The SDSCL-25 is a screening tool that assesses the presence of a wide range of symptoms for sleep disorders. To translate the measure into Spanish, the following procedure was followed: (1) a bilingual study team member performed an initial translation; (2) a bilingual community member edited the translation; (3) a certified medical translator edited the revision; (4) a focus group of N=5 bilingual community members made contextual edits; (5) a back-translation was performed; (6) an additional bilingual focus group examined the final version for compatibility; and (7) the medical translator certified the accuracy of the final version. T-tests examined differences between those who completed the measure in Spanish vs English.
Results: Of the N=100 survey respondents, N=42 completed the SDSCL-25 in Spanish. Those who took the measure in Spanish showed no differences in frequency of reports of delayed sleep phase (p=0.28), snoring (p=0.85), morning dry mouth (p=0.87), choking/gasping (p=0.09), uncomfortable sensations in legs (p=0.25), urge to move legs (p=0.09), cataplexy (p=0.09), sleep paralysis (p=0.12), sleepwalking (p=0.08), or bruxism (p=0.13). Respondents in Spanish reported lower frequency of insufficient sleep (p=0.01), variability in bedtime (p=0.02), difficulty falling asleep (p=0.002), difficulty staying asleep (p=0.01), early morning awakenings (p=0.02), daytime tiredness/fatigue (p=0.006), phase advance (p=0.0003), daytime sleepiness (p=0.03), loud snoring (0.002), breathing pauses (p=0.049), frequent awakenings (p=0.0007), hypnogogic/pompic hallucinations (p=0.003), nightmares (p=0.047), panic awakenings (p=0.01), and overall sleep disturbance (p=0.043).
Conclusion: The present study describes a Spanish translation of the SDSCL-25. For those that took the Spanish version, there were lower reported frequencies of insufficient sleep, variability in bedtime, insomnia symptoms, daytime sleepiness and tiredness/fatigue, phase advance, sleep apnea symptoms, frequent awakenings, hypnogogic/pompic hallucinations, nightmares, panic awakenings, and overall sleep disturbance.
Support (If Any):

0074

NEIGHBORHOOD-LEVEL SLEEP HEALTH AND CHILDHOOD OPPORTUNITY INDEX AT THE CENSUS TRACT LEVEL: COMPARISON TO OTHER HEALTH INDICATORS

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University of Arizona [1] Stony Brook University [2]

Introduction: Promoting sleep health at the neighborhood level may be an efficient way to promote overall health and well-being. This study examined the relative contribution of sleep health, versus other regional health metrics.
Methods: Neighborhood sleep health values were obtained from the "500 Cities" data collected by the CDC, which includes census tract and proportion that report values associated with health. Data include the population of each census tract as well as census-estimated proportion of the population in each census tract that report obtaining at least 7 hours of sleep. Other health indicators evaluated included access to health insurance, past-year routine medical or dental checkup, older adult preventive care, leisure-time activity, mammography, pap testing, and prevalence of arthritis, binge drinking, hypertension, antihypertensive use, cancer, asthma, coronary disease, cholesterol screening, colon screening, COPD, smoking, diabetes, hypercholesterolemia, kidney disease, poor mental and physical health, obesity, stroke, and teeth lost. The Child Opportunity Index (COI) is a publicly-available index (DiversityDataKids.org) reported at the census tract level. It provides indices for "Education," "Health and Environment," and "Social and Economic" domains, as well as a global score. The present analysis merged the 500 Cities data with the COI data, using census tract as the matching variable. When data were merged, 27,130 census tracts were included.
Results: In stepwise analyses adjusted for population size, with global COI as the dependent variable, sleep health emerged as the strongest predictor, accounting for 57.2% of the variance of global COI ($p<0.0001$). When all other health predictors were included in the model, the next largest contributors were teeth lost (additional 15.5%), health insurance (additional 3.0%), and asthma (additional 1.4%). Similarly, when stepwise analyses examined each component of COI as dependent variable, sleep health consistently emerged as the most substantial predictor, accounting for 41.2%, 24.3%, and 56.4% of the variance of "Education," "Health and Environment," and "Social and Economic" scores, respectively (all $p<0.0001$).
Conclusion: Sleep health is more strongly associated with overall COI (and all its components) than any other regional health metric. Public health efforts targeting sleep health may have disproportionately beneficial impact on factors that support family health and well-being.
Support (If Any):

0075

FOOD INSECURITY IS ASSOCIATED WITH SLEEP DURATION AND SLEEP DISORDERS SYMPTOMS IN A COMMUNITY ADULT SAMPLE

Chloe Craig[1], Suzanna Martinez[2], Lauren Hale[3], Charles Branas[4], William Killgore[1], Chloe Wills[1], Michael Grandner[1]
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Introduction: Food insecurity is an issue of socioeconomic disadvantage and is increasingly recognized as a key risk factor psychosocial stress and metabolic health. This study examined relationships with aspects of sleep health including sleep duration, quality, continuity, and control, and sleep disorders symptoms.
Methods: This cross-sectional study used data from the Sleep and Healthy Activity, Diet, Environment, and Socialization (SHADES) study of working-age adults ages 22-60 (N=1003). Food insecurity was assessed using items regarding: worry that food would run out, food would not last, and inability to afford healthy meals. Each item was scored 0-2 and total scores ranged from 0-6. Sleep-related variables included habitual sleep duration, Insomnia Severity Index, Brief Index of Sleep Control, Epworth Sleepiness Scale, self-reported habitual sleep latency and wake after sleep onset (WASO), nightmares, restless legs symptoms, STOP-BANG, and statements indicating that medical health and/or stress interfere with sleep. Covariates included age, sex, race/ethnicity, education, insomnia, and shiftwork.
Results: Greater food insecurity was associated with an increased likelihood of being a very short (<5h) sleeper (RRR=1.23, 95%CI[1.08,1.04) or short (5-6h) sleeper (RRR=1.15, 95%CI[1.05.1.25]), as well as having mild (RRR=1.28, 95%CI[1.16,1.41]) or moderate/severe insomnia (RRR=1.38, 95%CI[1.24,1.54]). Those with higher food insecurity perceived less control over sleep (B=-0.11, 95%CI[-0.14,-0.07]), more sleepiness (B=0.40, 95%CI[0.23,0.57]), longer sleep latency (B=2.24, 95%CI[1.09,3.38]), more WASO (B=1.80, 95%CI[0.09,3.51]), and more nightmares sometimes (RRR=1.13, 95%CI[1.04,1.23]) or often (RRR=1.23, 95%CI[1.07,1.40]). Participants were more likely to report uncomfortable sensations in their legs at night and needing to move legs to alleviate discomfort >3 times/week (RRR=1.33, 95%CI[1.17,1.51] and RRR=1.27, 95%CI[1.11,1.45], respectively). They also experienced a higher STOP-BANG score (B=0.09, 95%CI[0.05,0.13]) and were more likely to either agree or strongly agree that medical symptoms (RRR=1.30, 95%CI[1.15,2.47]l and RRR=1.34, 95%CI[1.15,1.57], respectively) and stress (RRR=1.88, 95%CI[1.31,2.69]l and RRR=2.16, 95%CI[1.51,3.10], respectively). Post-hoc analyses showed that most of these relationships were consistent across all 3 components of food insecurity.
Conclusion: Food insecurity was associated with worse sleep health, including risk for insufficient sleep, insomnia, sleep apnea, restless legs, and nightmares. Future research should investigate if efforts to reduce food insecurity can help improve sleep health and other associated outcomes.
Support (If Any):

0076

DIFFERENCES IN PAIN CATASTROPHIZING AND INSOMNIA AMONG RACIALLY DIVERSE VETERANS WITH CHRONIC PAIN

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James A. Haley Veterans' Hospital [1]

Introduction: Racially diverse Veterans may be particularly susceptible to insomnia in the context of chronic pain. Pain catastrophizing (PC) involves a negative response to pain including rumination, magnification, and helplessness, and is positively associated with deleterious pain outcomes, including insomnia severity. As little work has examined racial differences among Veterans, this poster will explore differences in insomnia severity and PC between Black/African American, Hispanic/Latino, and White Veterans.
Methods: 271 Veterans with moderate to severe chronic pain seeking treatment to address insomnia completed PC (Pain Catastrophizing Scale; PCS) and insomnia (Insomnia Severity Index; ISI) measures. The sample consisted of 100 Black/African American, 48 Hispanic/Latino, and 123 White Veterans. A one-way analysis of covariance (ANCOVA) investigated whether ISI varied significantly across racial groups. Similarly, ANCOVAs were conducted to test whether PC differed by race. Numerical pain rating was included as a covariate in the models.
Results: There was a significant difference in insomnia severity [$F(2 , 263) = 4.03$; $p = .02$; partial $n2 = .03$] by race. Post-hoc analyses demonstrated a significant difference in insomnia severity between Black/African Americans and White Veterans ($p = .02$). There was also a statistically significant difference in PC based on race, ($F(2 , 262) = 7.03$, $p = .001$; partial $n2 = .05$). Post-hoc analyses indicated a significant difference in PC between Black/African Americans and White Veterans ($p = .01$), as well as White and Hispanic/Latino Veterans ($p < .01$).In addition, there were significant differences in all three PCS subscales by race. Black/African Americans and White Veterans significantly differed on rumination ($p < .01$), and magnification ($p < .001$). White and Hispanic Veterans significantly differed on rumination ($p = .02$), magnification ($p = .001$) and helplessness ($p < .05$).
Conclusion: This is the first study to explore insomnia and PC differences by race in Veterans. Black/African American and Hispanic Veterans demonstrated higher insomnia severity and PC than White Veterans. No significant differences emerged between Black/African American and Hispanic Veterans. Interventions that reduce PC may be particularly important for improving sleep for racial minority Veterans. Future studies should explore the relationship between sleep and PC for racial minority Veterans.
Support (If Any):

0077

EXPLORING PSYCHOLOGICAL AND BEHAVIORAL FACTORS WITH SLEEP HEALTH IN LATINX CHILDREN

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California State University, Long Beach [1] University of South Florida[2] Pennsylvania State University [3]

Introduction: While sleep health is comprised of multiple dimensions, extant research tends to investigate single elements of sleep, such as sleep duration or sleep quality. The current study aimed to explore whether psychological and behavioral factors were associated with a multidimensional sleep health score as well as if sleep health was related to adiposity among Latinx children.
Methods: A community sample of 100 Latinx 10-to-12-year-olds were recruited from Los Angeles and Orange Counties (California, US). Psychological (perceived stress, anxiety and depressive symptoms), sleep hygiene and chronotype (lower scores indicate more adaptive sleep hygiene and eveningness, respectively) measures were collected with surveys. Diet data (sugar, fiber) was collected by two 24-hour recalls. Adiposity (BMI percentile, percent body fat) was assessed via bioimpedance scale. Sleep actigraphy (1 week) provided objective sleep dimension data. A composite score of sleep health across 6 dimensions (regularity, satisfaction, alertness, timing, efficiency, and duration) was constructed (0=better to 6=poorer). Hierarchical linear regressions, controlling for demographics (age, gender, monthly household income), assessed associations for each set of factors.
Results: The mean sleep health score was 2.08±1.41; 31.6% of Latinx children in our sample had poor sleep health (using median cut-point of 2). Poorer sleep hygiene (std. β=-.235, p=.037) and higher income (std. β=.244, p=.022) were significantly associated with poorer sleep health, while eveningness was marginally related (std. β=-.210, p=.068). Lower fiber intake (std. β=-.235, p=.037) and higher income (std. β=-.245, p=.038) were significantly associated with poorer sleep health. Psychological and adiposity variables were not associated with sleep health after controlling for demographics.
Conclusion: This study shows the prevalence and correlates of poor sleep health in Latinx children, an understudied group at risk for several health disparities. Better sleep hygiene was related to better sleep health. Several findings diverge from the literature based on single dimensions of sleep in general samples. Higher SES was related to poorer sleep health. Psychological factors and adiposity were not related to sleep health. A novel finding was that higher fiber intake was related to better sleep health. Additional research is needed to better understand factors related to multidimensional sleep health in Latinx children.
Support (If Any): This work was supported by the National Institute of General Medical Sciences under Award Numbers UL1GM118979, TL4GM118980, and RL5GM118978 as well as the National Heart, Lung and Blood Institute Award Number 1K01HL140283.

0078

ASSESSING SLEEP HEALTH IN CHILDREN RECENTLY ADOPTED FROM FOSTER CARE

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University of Houston [1]

Introduction: An estimated 450,000 children were in the U.S. foster care system in 2019. Early adversity including maltreatment and/or neglect renders this vulnerable population at high risk for negative outcomes, both physical and psychological. Burgeoning evidence suggests that children in foster care develop high rates of sleep disruption. Sleep disruption is associated with negative life outcomes including heart disease, diabetes, and psychiatric disorders. However, there is still a lack of knowledge examining sleep health in children adopted from foster care.
Methods: Sleep quality and problems were examined among a sample of children adopted from foster care ($n = 234$) within the past two years, ages 4 to 11 years ($M = 5.94$, $SD = 1.97$). Caregivers across the US were invited to complete an anonymous Qualtrics survey via private Facebook groups for foster families. The Child Sleep Habits Questionnaire (CSHQ) was completed by foster parents to assess child sleep problems (e.g., nightmares, bedwetting,

snoring, etc.) and overall sleep quality. Caregivers endorsed sleep problems and frequency using responses "Never," "Sometimes," and "Usually; sleep quality was rated using a Likert scale from 1 = Very Poor to 10 = Excellent.

Results: Paired-samples t-test compared first month (i.e., when first arrived in the home) and current child sleep quality based on caregiver-report. Sleep quality showed significant improvement since arrival in the foster home; $t(233) = 12.98$, $p < .001$, $d = 0.85$. However, on the CSHQ, 99% of the sample scored above the clinical cutoff for this measure indicating elevated sleep problems.

Conclusion: Children adopted from foster care show some improvement in sleep quality after achieving permanency. However, these data suggest this population continues to experience clinical levels of sleep problems even after being adopted. Our results suggest a need for specialized intervention services targeting sleep health among children recently adopted from foster care.

Support (If Any): None

0079

FEASIBILITY, APPROPRIATENESS, AND ACCEPTABILITY OF A MOBILE WELLNESS MEDITATION INTERVENTION TO IMPROVE SLEEP QUALITY AMONG A RACIALLY/ETHNICALLY DIVERSE POPULATION

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Emory University [1]

Introduction: Although sleep is fundamental to health and wellness, it is largely ignored from lifestyle modification recommendations to improve health. Stress and anxiety are associated with poor sleep quality, thus intervening on these factors is needed. This study evaluated the acceptability, appropriateness, and feasibility of using a mobile application-based wellness program to improve sleep quality among a diverse group of adults.

Methods: Individuals (n=18) enrolled in the Mindfulness Intervention to Improve Sleep and Reduce Diabetes Risk Among a Diverse Sample in Atlanta (MINDS) study completed modules focused on stress and anxiety reduction for 30-days via a mobile phone application. This explanatory qualitative study used online focus group discussions (N=4 with 17 individuals) to collect information about user experiences. A rapid analyses approach was used to descriptively compare motivators of app use, barriers and facilitators to app use, and perceived tailoring needs across participants.

Results: Participants on average were 30 years old, 88.2% female, and identified as Black/African American (52.9%), White (23.5%), Asian (11.8%), and Hispanic (11.8%). All participants felt the app was acceptable and appreciated the ability to customize meditation sessions in length. Individuals with 50 percent or greater app adherence (daily use for 30 days) reported being motivated to use the app as a stress relief tool throughout the day with barriers related to app functionality, versus the remainder of individuals who used the sessions when already relaxed and who faced external barriers to app use (e.g., lack of time). Only those participants who used the app exclusively in the evenings reported falling asleep faster and staying asleep. Suggestions for tailoring the app differed by race and age. Only Black or African American participants chose to try different instructors, preferring to use the Black instructor, and wanted to have additional sleep education components integrated into the app alongside further options to personalize app functions.

Conclusion: Using a mobile wellness meditation app to enhance sleep quality is acceptable and feasible. Timing of the app use in the evening had the greatest improvement on sleep. Culturally tailoring the app for Black and African American may improve uptake in this population.

Support (If Any): This work was supported in part by grant P30DK111024 from the Georgia Center for Diabetes Translation Research funded by the NIDDK.

0080

INFLUENCE OF NEIGHBORHOOD SAFETY ON STRESS AND SLEEP

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University of California Irvine [1]

Introduction: Our health is influenced by the environment in which we live. Due to socioeconomic differences, disparities exist across neighborhoods, with certain groups experiencing higher detriments to their health compared to others. Emotional distressing experiences due to the neighborhood in which we live cause stress levels to rise. Given the psychological and physiological impact of stress, high levels of stress can be a contributing factor for poor sleep. We investigated the influence of feelings of neighborhood safety on stress and sleep and the ethnic differences found in each of these outcomes. In addition, we ask whether feelings of neighborhood safety mediate the association between stress and sleep.

Methods: 1,606 participants were recruited online through Amazon Mechanical Turk to participate in a questionnaire. Components of this survey included demographic data, the Pittsburgh Sleep Quality Index (PSQI), Perceived Stress Scale (PSS), and the Neighborhood Questionnaire Neighborhood Safety Subscale.

Results: We found that as neighborhood safety levels rise, stress levels lower. Further, ethnic differences were found for feelings of neighborhood safety, stress, and sleep: Latino participants had the lowest feelings of neighborhood safety, highest stress levels, and worst sleep. We also found that stress mediates the association between neighborhood safety and sleep.

Conclusion: Our results highlight the contribution of feeling safe in one's own neighborhood on stress and sleep outcomes. Given the ethnic differences present in each of our outcomes, future work should investigate neighborhood characteristics influencing neighborhood safety as possible areas of intervention benefitting sleep.

Support (If Any):

0081

PHYSIOLOGIC ANATOMY, USE OF INFRA-RED THERMOGRAPHY IN HYPERSOMNIA.

Srini Govindan[1]
Wheeling Hospital, WVU Medicine [1]

Introduction: In the words of Michel Salmon, " Between anatomy and physiology there is room for a functional anatomy and for a physiologic anatomy ". This concept was applied to analyze our (1) Sleep Research 21, 1992,341 (2) Sleep Research 22, 1993, 363, and (3) SLEEP 31, 2008, A219 publications on patients with Hypersomnia who had intracranial and extracranial blood flow evaluations.
Methods: For "Functional Anatomy", Intracranial cerebral blood flow was done with Xenon 133 inhalation. For "Physiologic Anatomy", Extracranial facial blood flow Imaging, Infra-Red thermography was done. 1992,3 and 2008 data was classified: Groups I, II and III. Group I had Intracranial and Extracranial blood flow study, 5% CO2 inhalation. Groups II had Extracranial flow study with 5 % CO2 and 100 % Oxygen inhalation. Groups III had Extracranial flow study 100 % Oxygen inhalation. Response interpretation: Normal response to 5% CO2, vasodilation. For 100% Oxygen / hyperoxia, vasoconstriction. Response is considered as normal or abnormal, if response is absent or paradoxical.
Results: Group I: All three patients 5% CO2 inhalation, intracranial Functional anatomy vasomotor response normal. Physiological Anatomy response abnormal. Group II, Physiological Anatomy study. 8 patients. CO2 response, 7/8 vasoconstriction, abnormal response. 100% Oxygen challenge, 4/8 had no vasoconstriction, abnormal response. Group III: Physiological anatomy. 7 patients tested with 100% Oxygen challenge. 6/7 abnormal response, (1 vasoconstriction, 4 no response, 2 vasodilation). Total of 18 patients in all groups, physiological anatomy/ Extracranial flow vasomotor response was abnormal in 16/18, (Group I = 3, Group II = 7, and Group III = 6)
Conclusion: In hypersomnia patients vasomotor testing, Functional Anatomy, intracranial flow vasomotion normal in 3/3 for hypercarbia inhalation. For Physiologic Anatomy, using Infra-Red Thermography to image extracranial facial blood flow (not coupled with metabolism) vasomotion was abnormal in 16/18 patients. 5% CO2 and 100% Oxygen inhalation used as contrast agents is well tolerated and facilitates imaging vasomotor dysfunction in the facial blood flow, trigeminal angiosomes, which can be correlated with hypersomnia. Association between trigeminal system and the hypocretin receptor 1 gene HCRTR1 gene has been reported.
Support (If Any): None.

0082

EXTERNAL VALIDATION OF AN ENHANCED MACHINE LEARNING ALGORITHM: POLYSOMNOGRAPHY-BASED NARCOLEPSY-LIKE FEATURE ASSESSMENT AND CLINICIAN NOTIFICATION IN ROUTINE SLEEP MEDICINE CLINICS

Hyatt Moore[1], *Alex Zheng*[2], *Alyssa Cairns*[3], *Prasheel Lillaney*[4], *Jed Black*[5]
InformAton Inc. [1] Huneo [2] BioSerenity [3] Jazz Pharmaceuticals [4]
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Introduction: Polysomnography (PSG) contains quantitative information that, using machine learning (ML) algorithms, may aid the identification of type 1 narcolepsy. This study aimed to evaluate the utility of a previously developed quantitative tool (ML evaluation of PSG data) for detecting narcolepsy (types 1 and 2) in a "real-world" sleep clinic population.
Methods: Nocturnal PSG studies from a random sample of sleep clinic patients (narcolepsy, n=302; controls, n=21,535) were randomly split (1:1) into a training set and a validation set for algorithm testing. A separate, external PSG dataset was used for additional testing of the final model. Sleep stage probability graphs (hypnodensities) were estimated from PSGs on 15-second epochs using a previously developed convolutional neural network. Feature engineering was applied to hypnodensities to create a feature vector that was used to train a Gaussian process (GP) model to identify patients with a high probability of having narcolepsy. Features could be scaled to the 85th percentile, zero-mean and unit-variance, or unscaled. A recursive feature-elimination scheme was compared with training the GP kernel's length scale for determining the subset of features that best discriminate narcolepsy and controls. A synthetic minority oversampling technique was applied in combination with random undersampling to balance the distribution of cases and controls in the training set. Several kernels and relevant hyperparameters were evaluated. Model performance (specificity and sensitivity) was examined using receiver operating characteristics with the goal of achieving an area under the curve (AUC) ≥0.80.
Results: The final GP model used a Matérn 5/2 covariance kernel with the length scale hyperparameter trained to determine the feature subset selection. Input features were normalized to zero-mean and unit-variance. The model had AUC=0.9960 and AUC=0.8014 for classifying narcolepsy in the training and validation sets, respectively. Sensitivity ranged from 73% to 65% when specificity was between 75% and 80%. Final performance evaluation of the model for classifying narcolepsy in an external PSG dataset is ongoing; results will be presented at the congress.
Conclusion: An ML-based algorithm can offer an objective, sensitive, and specific tool for alerting sleep clinicians about patients at risk for narcolepsy, using nocturnal PSG in general sleep medicine clinics.
Support (If Any): Jazz Pharmaceuticals.

0083

A THERMOREGULATED PILLOW IMPROVES SLEEP: RESULTS FROM REAL-LIFE DATA

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MOONA [1]

Introduction: Sleep is regulated by homeostatic mechanisms and circadian rhythms.Thermal environment is one of the most important factors that can affect human sleep. This real-life study aims to evaluate the effects of temperature regulation on sleep quality using a thermoregulated pillow.
Methods: The Moona device has been used to control the temperature of a pillow pad from 64°F to 95°F. Users with more than 7 uses of the device and who completed the initial questionnaire (18 profile questions) participated in this study from October 2019 to July 2021. Participants rated their sleep quality on a scale of 1 to 5. Comparison between the sleep quality before the first use and the average of the last seven uses of the device has been done. A survey has been sent to all users from June to November 2021. To date, 206 answers have been collected including 32 users who reported having been diagnosed with insomnia. Improvement of their insomnia has been assessed by a

5-point scale (from 'much better' to 'much worse'). Statistical analyses have been performed on Python 3.7. Mean comparisons have been measured by student t-test.

Results: The sleep quality significantly increased with the use of the device from 2.6/5 to 3.7/5 ($p<0.001$) in the general population (N=620). This significant difference has been also measured in several subgroups who have temperature issues. That is the case for overweight/obese users (N=321, from 2.6/5 to 3.7/5, $p<0.001$), women over 45 (N=97, from 2.4/5 to 3.6/5, $p<0.001$) and users who feel hot during the night more than several times a week (N=523, from 2.5/5 to 3.8/5, $p<0.001$). Moreover, 30 out of 32 insomniacs have reported an improvement of their insomnia since using this active cooling pillow pad.

Conclusion: The present study findings showed that an active thermoregulated pillow could improve sleep of insomnia patients and several subgroups of patients with issues at controlling temperature at night.

Support (If Any):

0084

CONSUMER SLEEP TECHNOLOGIES (CSTS) FOR USE IN REAL-WORLD SLEEP RESEARCH ENVIRONMENTS: A SURVEY OF EXPERTS

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Institutes for Behavior Resources, Inc. [1]

Introduction: Consumer sleep technologies (CSTs) have been designed for the everyday consumer rather than as a reliable scientific tool, but are becoming sufficiently accurate for use in the research landscape. Despite the growing conversation about the viability of CSTs for research, manufacturers may not be interested in increasing scientific accuracy in their devices unless doing so is expected to result in greater consumer sales. To establish concensus opinion about important device features and economic demand for CSTs for sleep research, professional opinions from sleep medicine experts were elicited to identify what metrics and device features for measuring sleep outside the laboratory are most desirable to the scientific community. This is the first known attempt to establish consensus opinion or economic valuation for scientifically-desirable CST device features and metrics using expert elicitation within the sleep science community.

Methods: Sleep and/or circadian researchers with experience collecting data in real-world environments were recruited from international academic, government, clinical, and industry research backgrounds using social media and nonprobability sampling techniques. The anonymous survey was hosted through the online tool Qualtrics between April to July 2021. Exposure to survey recruitment techniques were tracked through Twitter Analytics and Qualtrics. Respondents were asked to rank sleep metrics and consumer sleep technology features to estimate their average level of importance (low, medium, or high). A hypothetical purchase task estimated economic valuation for devices with different features by price.

Results: Survey respondents were 46 real-world sleep research experts with, on average, 11 (range: 1-27; mode: 10) years of experience conducting human research related to sleep in real-world environments. Sixty-six percent (66%) preferred wrist-worn devices and 52% indicated that sleep onset/offset could be determined from a period of inactivity ≤20 minutes. Eighty-three percent (83%) collected data related to napping. Forty-four percent (44%) preferred a continuous observation window between 4-14 days long. Respondents ranked battery life as the most important factor limiting the observation window. Total sleep time was ranked as the most important measure of sleep followed by objective sleep quality while sleep architecture/depth and diagnostic information were ranked as least important. Economic value was greater for hypothetical devices with longer battery life.

Conclusion: Real-world sleep experts prefer wrist-worn devices that can reliably estimate sleep and short naps. Battery life is important. Based on responses to both rank order questions and the hypothetical purchase task, estimating sleep depth is less important to researchers than measures of sleep duration and quality. These data set a precedent for future studies to determine the scientific relevance of metrics or how scientific endorsement of a product impacts the potential market value of a CST device.

Support (If Any): NA

0085

SLEEPINCEPTIONNET: A DEEP LEARNING ALGORITHM FOR REAL-TIME SLEEP STAGES SCORING USING SINGLE-CHANNEL EEG

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Introduction: Most of the current automatic polysomnography sleep staging methods use multi-signal data and require a sequence of preceding and following epochs to score the stage of a specific epoch, which may not be desirable for analysis in real-time and/or in free-living conditions. We developed a deep learning-based sleep staging algorithm, namely SleepInceptionNet, that is designed to score each epoch using only single-channel electroencephalogram (EEG) data within that specific epoch.

Methods: Polysomnography data of 883 participants (937,975 thirty-second epochs) in the Multi-Ethnic Study of Atherosclerosis (MESA) obtained from the National Sleep Research Resource (NSRR) were randomly divided into a separate training/validation set of 194 participants and a test set of 689 participants. Each 30-second raw central EEG channel signal was transformed to time-frequency domain images using continuous wavelet transform method. Sleep stage in each epoch was obtained using SleepInceptionNet, in which the InceptionV3 convolutional neural network structure was trained and tuned on the time-frequency images of the training set to classify each epoch into one of the five stages of Wake, N1, N2, N3, or rapid eye movement (REM) sleep.

Results: Compared to the ground truth manually scored polysomnography sleep stages, SleepInceptionNet achieved an overall kappa agreement of 0.690 and overall weighted accuracy of 0.897. The model showed accuracy (mean±SD across the test set participants) of 0.940±0.067 in detecting Wake, 0.883±0.047 in detecting N1, 0.845±0.055 in detecting N2, 0.939±0.038 in detecting N3, and 0.930±0.038 in detecting REM epochs, in reference to manually scored polysomnography.

Conclusion: SleepInceptionNet showed a high agreement with manually scored polysomnography in epoch-by-epoch classification of sleep stages. This study demonstrates the viability of real-time, accurate sleep staging using a single-channel EEG, which could have a variety of applications such as delivery

of on-demand interventions during specific sleep stages in free-living conditions.

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0086

UNOBTRUSIVE SENSING OF SKIN TEMPERATURE DURING SLEEP USING A MATTRESS SENSOR

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Introduction: Sleep is associated with temperature changes in the human body. At sleep onset, distal (hands and feet) and proximal (abdomen) temperatures increase by ~1°C and ~0.5°C, respectively, forming a distal-to-proximal gradient that increases throughout the first half of a night's sleep. However, core temperature decreases during this period. Few devices can measure these temperatures unobtrusively. Our aim was to estimate distal skin temperature unobtrusively during sleep using a temperature sensor array on a mattress.

Methods: Three male volunteers participated in the study. Skin temperatures were measured using an array of 5 equally spaced thermistors distributed laterally across the mattress region aligning with the torso. Participants wore an Empatica smart watch to provide benchmark distal skin temperatures.Data from 249 sleep hours were used to build predictive models estimating distal skin temperature. The preprocessed data were grouped by participant and segmented into training and test sets (~60%/40%, respectively), with earlier sleep sessions selected for training and later sessions selected for testing. Using the Automated Machine Learning (AutoML) feature in Databricks, a model was developed that optimized R2. This model was applied to the test set and its performance evaluated by Bland-Altman analysis, using predicted and benchmark distal temperatures.

Results: The AutoML selected an XGBoost decision-tree model to predict distal skin temperature for each minute. The mean difference in temperature between predicted and benchmark readings was 0.13°C (R2=0.35), with lower and upper limits of agreement (LOA) of -1.59 and 1.84, respectively. Next, all minute-level data were averaged by sleep session, and model performance was re-evaluated across all sleep sessions. This approach resulted in smaller LOAs (-0.58, 0.91), with a mean difference in temperature of 0.16°C (R2=0.73).

Conclusion: Our results suggest that a temperature sensor array, coupled with an optimized decision-tree model, can predict mean distal skin temperature for each sleep session with reasonable accuracy. Our system enabled unobtrusive, ecologically valid collection of distal skin temperatures during sleep and may be useful for future studies of overnight temperature dynamics.

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0087

FEASIBILITY OF EXAMINING COMPONENT-SPECIFIC EFFECTS OF YOGIC BREATHING ON SELF-REPORT SLEEP METRICS: A THREE-ARM PILOT RCT

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Introduction: Mind-body interventions (MBIs) continue to receive widespread interest for improving sleep disturbances. This study investigated the feasibility of using an automated electronic survey system in REDCap in the context of a fully remote clinical trial study to produce detailed measures of participant adherence, daily sleep quality, and associations with physiological outcomes captured by wearable devices.

Methods: Eighteen healthy participants (age 18-30 yrs, 12 female) were randomized to one of three 8-week long interventions: slow-paced breathing (SPB, N=5, 24.6 ± 2.1 years, 4 female), mindfulness (M, N=6, 23.7 ± 3.7 years, 4 female), or yogic breathing (SPB+M, N=7, 24.3 ± 3.1 years). Participants completed two weeks of daily sleep logs along with the Pittsburgh Sleep Quality Index (PSQI) prior to a virtual laboratory visit, which consisted of a 60-min intervention-specific training, including a 20-min guided practice, and subsequent tasks including experimental stress induction. Participants were then instructed to repeat their assigned intervention practice daily, selecting either the same or a similar guided audio as their initial training. After an initial video check-in appointment, participants received regular visual feedback of their data and completed weekly check-ins with the study team to improve adherence. At the end of the intervention period, participants again completed daily sleep logs and the PSQI, in addition to other outcome measures and a virtual laboratory visit. Data were analyzed using linear mixed models.

Results: Sleep log adherence was over 90% in all three groups. The groups were successfully distinguishable based on HRV-derived breathing and mindfulness ratings. For the SBP+M group only, there was a trend of reduced sleep onset latency (SOL, p=.093) and a significant increase in sleep efficiency (SE, p=.025). There were no significant changes in PSQI or other sleep log measures. More detailed analysis of timecourse across these measures is ongoing.

Conclusion: These findings support feasibility for a fully remote, semi-automated clinical trial study assessing component-specific effects of these MBIs on sleep in generally healthy young adults. Research evaluating MBIs for sleep in both clinical and nonclinical populations would benefit from similar study designs to examine intervention-specific components while increasing both scalability and quality control.

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0088

REMOTE CLINICAL RESEARCH OPERATIONS DURING COVID-19: LESSONS LEARNED AND RECOMMENDATIONS

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Introduction: As a result of the global COVID-19 pandemic, there have been significant challenges conducting clinical sleep research. Participant recruitment has been a particular challenge due to federal safety guidelines and institutional directives. The purpose of this project is to describe the adaptation of an in-person study protocol (of sleep problems among military service members and their families) to an entirely remote approach.

Methods: Prior to COVID-19, planned research methods included in-person recruitment, enrollment, and study support; approved by the Institutional Review Board (IRB) of Walter Reed National Military Medical Center (WRNMMC), Fort Belvoir Community Hospital (FBCH), and the University of Maryland, Baltimore (UMB). As COVID-19 restrictions increased, the research team adapted to a fully remote approach (via phone/email) and developed a "research call center" to replace in-clinic recruitment/enrollment. Detailed operating procedures were standardized, including shipping study materials (wearable device) via FedEx. Following enrollment, participants completed multiple assessments, sleep diaries 2x/day over 10 days, and a post-monitoring satisfaction survey.

Results: Thirty-five participants between the ages of 18-75 years (M= 46 years, SD= 15.8) were successfully recruited from the Internal Medicine clinic and Sleep Disorders Center at WRNMMC. Following data collection, the research team debriefed and developed recommendations to execute a successful remote study protocol. Three key operational domains were identified: research team, remote procedures, and data management. Recommendations included 1) prioritizing consistent communication, mutual support, and personal wellbeing among the research team, 2) advancing recruitment by establishing and refining preferred recruitment pathways, and 3) providing critical attention to remote data management—allocating responsibilities to regulate the evolving changes of multiple data sources. In addition, partnering closely with IRB personnel was invaluable to refine procedures and maintain regulatory compliance.

Conclusion: Despite challenges associated with the on-going pandemic, researchers can conduct high-quality clinical research by transitioning to a fully remote study approach. These recommendations can help guide investigative teams to transition from in-person protocols to remote approaches, thus advancing the perpetuation of research activities through a pandemic.

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0089

FEASIBILITY OF RAPID MEASUREMENT OF BRAIN METABOLITES IN OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive Sleep Apnea (OSA) affects over 15% of the adult population and is associated with brain dysfunction. Although the dysfunction is well-identified and presents brain morphological changes as shown with structural imaging, it is unclear what pathology underlies these neural alterations. Magnetic resonance spectroscopic imaging (MRSI) can non-invasively measure several metabolites from multiple brain regions in vivo. However, the clinical practicality of the standard MRSI techniques (Cartesian phase-encoding or echo-planar [EP]) is hindered by long scan times. In order to assess clinical populations, our group developed an alternative MRSI technique, "radial" EP-MRSI. To assess the feasibility and calculate effect sizes we did a pilot study of brain metabolites in OSA using radial EP-MRSI.

Methods: Radial EP-MRSI data with a speed-up (undersampling) factor of 2.5 (compared to a fully-sampled Cartesian MRSI scan) were acquired in 5 OSA patients (3 males, 37±11 yrs., Apnea Hypopnea Index (AHI): 8.2±5.5) and 10 healthy controls (5 males, 28±7 yrs.). Spectra from twelve brain regions were selected from each subject and five metabolites–total choline, myo-inositol (mI), total N-acetylaspartate, glutamine+glutamate (Glx) and lactate (Lac)–were quantified as ratios with respect to creatine (Cr), using "LC Model" software. The brain regions include left/right of: basal ganglia, insula, and gray/white of the frontal and occipital regions. Mean group differences were calculated and compared with independent samples t-tests.

Results: Glx/Cr was significantly decreased (27%; $p<0.05$) in OSA vs. control in the left posterior insula. Other metabolites did not show significant differences. mI/Cr trends were consistent with previous findings (higher in OSA) and Lac/Cr trended higher OSA.

Conclusion: This feasibility study showed that it is possible to measure multiple metabolites in multiple regions and detect effects of OSA. The accelerated technique enabled measurements to be completed in under 4 minutes.

Support (If Any):

0090

PERFORMANCE OF A MULTISENSOR RING TO EVALUATE SLEEP: IN-LAB EVALUATION RELATIVE TO PSG AND ACTIGRAPHY: IMPORTANCE OF GENERALIZED VERSUS PERSONALIZED SCORING

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Introduction: Multisensor sleep wearable devices have demonstrated utility for research and relative accuracy for discerning

sleep-wake patterns at home and in the laboratory. Additional sensors and more complex scoring algorithms may improve the ability of wearables to assess sleep health.
Methods: Thirty-six healthy adults completed assessment while wearing the experimental device (Happy Ring), as well as Philips Actiwatch, Fitbit, Oura, and Whoop devices. Evaluations occurred in the laboratory (Alice 6 polysomnogram). The Happy Ring includes sensors for accelerometry, photoplethysmography, electrodermal activity, and skin temperature. Epoch-by-epoch analyses compared the Happy Ring to lab polysomnography, as well as other sleep-tracking devices. Scoring was accomplished using two machine-learning-derived algorithms: a "generalized" algorithm which was static and applied to all users (like those used for other devices) and a "personalized" algorithm where parameters are personalized, dynamic, and change based on data collected across different parts of the night of sleep.
Results: Compared to in-lab polysomnography, the generalized algorithm using data from the Happy Ring demonstrated good sensitivity (94%) and specificity (70%). The personalized algorithm also performed well with good sensitivity (93%) and specificity (83%). Other devices also demonstrated good sensitivity, ranging from 89% (Fitbit) to 94% (Actiwatch); specificity however, was more variable, ranging from 19% (Actiwatch) to 54% (Whoop). Overall accuracy was 91% for generalized and 92% for personalized, compared to 88% for Oura, 86% for Whoop, 84% for Fitbit, and 85% for Actiwatch. Measurement of sleep stage accuracy was 67%, 85%, and 85% for light, deep, and REM sleep, respectively, for the Happy generalized algorithm. For the Happy personalized algorithm, accuracy for sleep stages were 81%, 95%, and 92%, for light, deep and REM sleep, respectively. Post-hoc analyses showed that the Happy personalized algorithm demonstrated better specificity than all other modalities ($p<0.001$). Kappa scores were 0.45 for generalized and 0.68 for personalized, compared to 0.32 for the Oura Ring, 0.32 for Whoop Strap, and 0.37 for Fitbit wristband.
Conclusion: The multisensory Happy ring demonstrated good sensitivity and specificity for the detection of sleep in the laboratory. The personalized approach outperformed all others, representing a potential innovation for improving detection accuracy.
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0091

THE PRACTICALITY OF IMPLEMENTING NIGHTLY REMOTE PATIENT MONITORING (RPM) OF OSA PATIENTS IN CLINICAL PRACTICE

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Introduction: If Remote Patient Monitoring (RPM) is to become integrated into sleep medicine practices, patient compliance and reliability of data acquisition needs to be determined. We developed the REST Tracker platform to monitor OSA patients nightly, using an oximeter ring with data analyzed by a recognized method (1) to render a sAHI that has been FDA approved (FDA reference number K182618) providing an equivalent to the AHI. The REST Tracker tracks the sAHI along with multiple other parameters, providing the clinician nightly physiologic data to assist in OSA management decisions. Here we present patient compliance and system reliability data.
Methods: Data obtained from a ring pulse oximeter worn nightly is transmitted by Bluetooth to a cellular device at the bedside. Nightly data from bedtime to final morning awakening is transmitted to the cloud and retrieved by the REST Tracker system which tabulates and displays the data in a format that assists the clinician in OSA management decisions. Compliance and reliability performance criteria used to assess the REST Tracker system were as follows: Patient Retention Rate (patients were considered a Drop Out if there was no usage within 15 days prior study termination on Dec 15th), Data Acquisition Reliability = percentage of nights with > 3 hours of data on those nights the ring was used. Successful Monitoring Achieved if a patient had over 70% of nights containing > 3 hours of data. Data acquisition was initiated on 1/1/21 and ended 12/15/21 with a minimum of 6 weeks of monitoring.
Results: A total 38 patients (28 M / 10 F) Ave age 60 (SD +/-13) enrolled from 1/1/21 to 10/31/21, and acquisition ended 12/15/21. Monitoring ranged from 6 to 50 weeks. 10 patients dropped out, rendering a 74% Patient Retention Rate. Data was collected for a total 4072 nights from all patients, of which 3441 nights had > 3 hrs of data, rendering an overall Data Acquisition Reliability of 84.5%. There were 33 patients that achieved Successful Monitoring (87%) as defined above.
Conclusion: In our practice RPM has been well accepted with 74% Patient Retention Rate and 87% achieving Successful Monitoring. This study demonstrated the feasibility of this approach. We are currently implementing methods to achieve higher retention successful monitoring rates. The REST Tracker has been used in our practice for the management of OSA patients undergoing a variety of treatments approaches ranging from PAP, dental appliances and Inspire (HGNS). The REST Tracker has enhanced our ability to assess these patients on an ongoing basis, decreased the need for in lab sleep testing and expedited management decisions. Clinical cases are currently being accumulated and will be presented to demonstrate the utility of the REST Tracker RPM approach.
Support (If Any): Reference: (1) Al Ashry HS, Hilmisson H, Ni Y, Thoms RJ, Investigators A. Automated Apnea-Hypopnea Index from Oximetry and Spectral Analysis of Cardiopulmonary Coupling. Ann Am Thorac Soc. 2021;18(5):876-83.

0092

THE EFFECTS OF SLOW-OSCILLATORY GALVANIC VESTIBULAR STIMULATION ON SLEEP PHYSIOLOGY IN HEALTHY HUMANS

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Introduction: Recent studies have demonstrated that rocking promotes sleep in animals and humans. The application of an alternating current galvanic vestibular stimulation (GVS) can elicit body sway like rocking sensation. Here, we examined the effects of slow-oscillatory GVS, which can evoke the virtual rocking sensation in the brain, on objective and subjective sleep quality in healthy young adults.
Methods: We studied 14 healthy subjects (age: 22.7 p/m 1.4 years) who underwent 3 nap conditions (adaptation, sham [SHAM], and stimulation [STIM]), where SHAM and STIM were randomly allocated with a 1-week interval in general. The polysomnographic recordings were started at 2 pm and time in bed was restricted to 90 min for all subjects. In both conditions, electrodes were placed on both mastoids for GVS; in STIM condition, the slow-oscillatory (0.25 Hz sinusoidal) GVS was applied

throughout the nap period with a current intensity of approximately 80% of sensory thresholds of each subject. The pattern of center of pressure during quiet standing was also measured using a force plate, with or without the same slow-oscillatory GVS. We analyzed sleep variables and electroencephalographic (EEG) spectral power and compared them between STIM and SHAM. Subjective sleep quality was also measured and compared between STIM and SHAM.

Results: We confirmed that subsensory slow-oscillatory GVS induced body sway corresponding to the stimulation frequency for all subjects. We found that sleep latency was significantly shorter and total sleep time as well as N2 duration were significantly longer in STIM than in SHAM. N3 duration did not differ significantly between the conditions. EEG power spectrum densities in delta, theta, and sigma bands were significantly greater in STIM than in SHAM. Subjective sleep quality was significantly better in STIM than in SHAM.

Conclusion: We demonstrated that subsensory slow-oscillatory GVS facilitated wake-sleep transition and improved objective and subjective sleep quality. The results suggest that weak periodic inputs into vestibular systems promote sleep by modulating the thalamocortical mechanisms in humans. This finding may open a new avenue toward a development of novel techniques for human sleep augmentation.

Support (If Any): JST PRESTO (JPMJPR19J3) and JSPS KAKENHI (18K17891) to AK.

0093

EFFICACY OF A CHATBOT-BASED SLEEP INTERVENTION ON SLEEP QUALITY IMPROVEMENT AMONG YOUNG ADULTS

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Introduction: Insufficient sleep duration and poor sleep quality are prevalent in adolescents and young adults. Artificial-intelligent agents such as chatbots have been integrated into digital health interventions to support symptom management and promote health behaviors. This pilot study tested the efficacy of a sleep advice chatbot in young adults with self-reported sleep disturbances.

Methods: Young adults aged 18 to 28, who scored 55 and above (t-score) on the PROMIS Sleep Disturbance (Short Form) were enrolled into the study. Using a 2 x 2 research design, participants were randomly assigned into four groups: chatbot 1 (sleep advice), chatbot 2 (sleep advice & emotional support), human 1(sleep advice), human 2 (sleep advice & emotional support). Sleep advice chatbots were developed using Google's Dialogflow. After the conversation, participants rated the effectiveness of the sleep advice on a 5-point Likert scale. Participants completed the PROMIS Sleep Disturbance seven days after the study.

Results: Of 293 participants who were enrolled, mean age was 19.75 (SD = 1.57) and 85.1% were females. Average sleep disturbance scores measured before and after the study was 25.47 (SD = 4.91) and 20.97 (SD = 5.55), showing a significant decrease in sleep disturbance ($p < .001$). Mean advice effectiveness was 3.96 (SD = 1.10), with human advice provider receiving better scores ($p < 0.05$). Controlling for age and sex, two-way ANOVA analysis showed a significant interaction between advice giver type (chatbot vs. human) and advice type (sleep advice vs. sleep & emotional support) on alleviating sleep disturbances [$F(1, 262) = 4.07$, $p = .045$, partial $\eta 2 = .015$]. Specifically, participants who received sleep advice from a chatbot had greater decreases in sleep disturbances (Mdiff = -4.69, SD = 3.65) than from a human (Mdiff = -3.78, SD = 5.92). On the other hand, with emotional support, advice given by humans was more effective (Mdiff = -5.56, SD = 5.86) than chatbots (Meandiff = -3.44, SD = 6.31).

Conclusion: The results of this study suggest the potential efficacy of a chatbot-based sleep advice intervention among young adults. Future research can consider using a combination of chatbot and human expert-based sleep interventions.

Support (If Any):

0094

OSCILLATORY THETA-BAND ACTIVITY AS A SLEEP STAGE INDEPENDENT MEASURE OF REM-LIKE ACTIVITY THROUGHOUT SLEEP

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Introduction: The importance of human cortical theta-band power during REM is suggested by its association with aspects of emotional processing. Currently, this is measured first by visual-inspection of polysomnography to define REM-sleep (scored-REM) and then summing the total theta power within. However, activity attributed to scored-REM has been hypothesized to occur during some scored-NREM ("covert REM") and total theta conflates different theta-band sources. Oscillatory theta-band activity (OTA) in the hippocampus and associated regions is the hallmark of REM-like sleep in invasive animal studies. We posit that an EEG assessment specifically targeting all-night OTA is a more accurate biomarker of theta-dependent REM functions than current methods. As a first step towards testing this hypothesis, we developed a sleep stage independent approach to isolate REM-like OTA from scalp-EEG. For validation, we compared this measure to conventional-staging and high-frequency activity.

Methods: Our method uses Irregular-Resampling Auto-Spectral Analysis to remove the aperiodic spectrum (a major source of theta-band power), followed by low-band power normalization to derive the relative oscillatory-theta activity (OTA). Covert REM-containing epochs were calculated based on OTA exceeding a threshold. We combined data from two in-laboratory studies resulting in a sample size of 42 healthy young adult subjects. Analyses used non-sleep restricted overnight EEG recordings from a frontal channel.

Results: A clear oscillatory-theta peak was observed after processing. Using all sleep stages, we found separation of OTA from total theta-band power evidenced by conventional staging (OTA: scored-REM>scored-NREM, $p=0.003$ vs total theta: scored-REM<scored-NREM, $p<0.001$) and correlation with beta-band activity (OTA: $r=0.2$, $p<0.001$ vs total theta: $p=0.4$). Supporting "covert REM", OTA was present during scored-NREM ($p<0.001$). On average during a single sleep episode, covert REM was found in 28% of scored- NREM epochs (range=2-85%).

Conclusion: We developed a novel automated method for measuring REM-like oscillatory-theta activity, independent of conventional sleep staging methods. This method was used to measure REM-like activity across all sleep stages and, as reported in a companion abstract, test the hypothesis that this constitutes a better predictor of REM-dependent behavioral effects than current conventions.

Support (If Any): This effort was fully supported by the Department of Defense Military Operational Medicine Research Program (MOMRP).

0095

SLEEP ENHANCEMENT TECHNOLOGY IN 2021: AN UPDATED SURVEY OF APPS

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Introduction: Commercially available smartphone apps that claim to improve sleep quantity and/or quality represent an ever-evolving and fast-growing market. Although a large body of work has validated the performance of sleep tracking technologies, there is little information regarding potential sleep enhancement technologies. Our study systematically surveyed currently available commercial sleep enhancement smartphone apps to provide details to inform both providers and patients alike, in addition to the healthy consumer market.
Methods: We systematically searched the Google Play Store (Android) on 30 JUN 2021 and the App Store (Apple) on 30 JUN 2021 and 26 JUL 2021 in the US using the keyword "sleep." The Android search was conducted via the Google Play Store website. The Apple search was conducted via third-party websites linked to the App Store due to restrictions on searching the App Store online. This survey was conducted using Google Chrome web browsers and is inclusive of all smartphone applications found.
Results: We identified 550 apps: 59.5% on Android (N=327) and 40.5% on Apple (N=223). Ninety-four percent of apps offered a free version. The majority of sleep apps were intended for use during wake (72.7% exclusively during wake; 25.1% during both wake and sleep), with only 2.2% intended to be used during sleep alone. Most apps purport to enhance rather than measure sleep (87.8% versus 0.5%). The vast majority of apps claim to enhance sleep via reductions in sleep latency (92.9%). Reduced sleep latency is primarily achieved using auditory stimuli (74.5%).
Conclusion: Most current sleep apps are designed to be used while awake, prior to sleep, and focus on the enhancement of sleep, rather than measurement, by targeting sleep latency. Given the evidence that supports sleep latency as an important target for sleep promoting interventions and the multitude of available sleep enhancement apps across both Android and Apple platforms, sleep apps could be considered a possible strategy for patients and consumers to improve their sleep, although validation of these apps is required.
Support (If Any): Department of Defense Military Operational Medicine Research Program (MOMRP)

0096

SLEEP APNEA DIAGNOSIS USING TRACHEAL SIGNALS AND OXIMETRY

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Introduction: Diagnosing sleep apnea requires detection of apneas and hypopneas during sleep either via in-laboratory overnight polysomnography (PSG) or portable in-home sleep apnea testing (HSAT). While PSG is the optimal method, it is expensive, inconvenient and often inaccessible for patients. Although HSATs are more convenient and less expensive than PSG, they are not as accurate and have relatively high failure rates because of the nature of the sensors used to measure respiratory variables. We have developed a HSAT, the Patch, that is unique in that it is very simple and reliable because it measures respiratory variables using tracheal motion and sound combined with oximetry to detect respiratory events. In this study we tested the ability of the Patch to detect respiratory events versus simultaneous PSG.
Methods: Participants were adults with a suspected sleep disorder referred to the sleep laboratory at Toronto Rehabilitation Institute for PSG. Simultaneous to the PSG, the Patch, consisting of a module containing a microphone and a 3-D accelerometer that was affixed to participants' suprasternal notch, and a finger oximeter. After filtering the tracheal signals, the envelope of the tracheal motions in the cranial and postero-anterior directions and tracheal sound envelope were extracted. Along with tracheal features, the amplitude and slopes of oxygen desaturations were also extracted and, were fed into a supervised deep neural network model to detect apneas and hypopneas. The total number of detected events was divided by total estimated sleep time to estimate the apnea-hypopnea index (AHI). The performance of the model in diagnosing sleep apnea was evaluated by sensitivity (AHI≥15) and specificity (AHI<15). The relationship between the estimated AHI and PSG-based AHI was quantified using Pearson correlation.
Results: Ninety-nine participants (42 females, age: 48±16 years, body mass index: 29.2±5.2 kg/m2, and AHI: 15.8±19.4 events/hour) completed the study. We found that the Patch had 88.6% sensitivity and 89.1% specificity for diagnosing sleep apnea. Strong agreement was observed between the estimated and reference AHI values ($r = 0.92$, $p < 0.001$).
Conclusion: The Patch is a novel, robust and convenient portable device that provides an accurate means of detecting and quantifying sleep apnea. It has the potential to provide reliable home-based sleep apnea monitoring.
Support (If Any): Funded by Bresotec Inc.

0097

REM-LIKE NEURAL ACTIVITY IS SUPERIOR TO NREM PARAMETERS FOR PREDICTING NON-SLEEP RESTRICTED VIGILANCE

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Introduction: Currently unknown is whether REM-like neural activity reverses, incurs, or is neutral with respect to its effect on sleep pressure independent from NREM recovery. We investigated the relationship between a novel scalp-EEG measure of REM-like neural activity and next-day performance on the Psychomotor Vigilance Task (PVT) – a sensitive measure of sleep debt. Our EEG measure reflects the oscillatory-theta activity (OTA) that is the hallmark of REM sleep in animal studies. This method preserves amplitude information, isolates OTA from aperiodic theta-band power, and accounts for REM-like activity thought to occur outside of conventionally scored-REM epochs. We compared the PVT-association of OTA, traditionally measured EEG REM-theta, and traditional sleep parameters. To assess REM-like independent effects, we controlled for traditional parameters using a multivariate model.
Methods: Our method uses Irregular-Resampling Auto-Spectral Analysis to remove the aperiodic spectrum, followed by low-band

power normalization to derive the relative oscillatory-theta activity (OTA). The average OTA was then used to predict next-day performance on the PVT. Traditional sleep parameters (sleep efficiency, total sleep time, %NREM, %N3, and delta-band power) were also examined. We combined data from two previously reported in-laboratory studies resulting in a sample size of 42 healthy young adult subjects. Analyses used non-sleep restricted overnight EEG recordings from a frontal channel.

Results: There was a substantial PVT-OTA association (OTA positively correlated with response-time and thus with reduced vigilance) during scored-REM epochs (r=0.44, p=0.003). This was stable irrespective of conventional sleep staging when using all sleep epochs (r=0.48, p=0.001), and OTA during scored-NREM (r=0.35, p=0.02). The effect was also stable after controlling for total sleep time, %NREM, and N3 delta-band power in a multivariate model (all-sleep PVT-OTA: r=0.5, p=0.004). Traditional sleep parameters were not significantly correlated with PVT performance.

Conclusion: OTA was a superior quantitative predictor of reduced next-day vigilance than traditional sleep parameters, and this persisted after controlling for NREM parameters. These findings are consistent with the hypothesis that periods of high REM-like activity are less restorative than other periods and may actually increase homeostatic sleep pressure.

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0098

A MODEL FOR A CHRONIC NAPPING IN OLDER ADULTS AT RISK FOR ALZHEIMER'S DISEASE

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Introduction: Theoretically, napping could have positive effects on health (e.g., by reducing stress and compensating for short night time sleep) or negative effects (e.g., by disrupting nighttime sleep or impairing circadian synchronization). Epidemiologic studies have produced mixed results regarding associations of napping with health. Causality can be better addressed with a randomized controlled trial of daily napping, as described herein.

Methods: Participants were 12 older adults (70.8±4.4 years) with a first degree relative with Alzheimer's Disease. Inclusion criteria included normal cognitive function; stable sleep schedule; stable medication use; and self-reported ease of taking naps, but with napping frequency of ≤2 days per week. Exclusion criteria included having a sleep disorder or high risk of obstructive sleep apnea; hypertension; sleeping pill use > once per week; MI or stroke within the past 3 years. Following a one week baseline involving a stable sleep/nap schedule consistent with usual habits, participants were randomized to one of two 21-day treatments: (1) daily napping (1 h/day begun at 5-7 h after arising) while keeping a stable night sleep schedule consistent with baseline (n=6); (2) a no-napping control treatment in which participants read quietly for 1 h/day at the same time (n=6). Sleep for night sleep and napping (or non-napping) was assessed via self-report, actigraphy, and the Z-machine.

Results: ANOVA revealed a significant increase in napping minutes/day (p=0.01) in the napping treatment (baseline: 14.5±21.1; 21-day average: 42.1±19.1) compared with the control treatment (baseline: 2.2±5.5; treatment: 1.4±3.5). However, reported nighttime sleep duration did not change significantly between the napping (from 7.1±1.2 to 7.4±1.0 h) and the control treatment (7.8±0.7 to 7.8±0.6 h). Actigraphic night sleep changed from 7.3±0.8 to 7.1±0.9 and 7.8±5 to 7.6±0.7 after napping and control, respectively. There were not significant treatment differences (nor notable effect size differences) for depressed mood, sleepiness, PSQI, amyloid beta, nor cardiovascular measures (e.g., blood pressure, flow mediated dilation, pulse wave velocity).

Conclusion: The data indicate that older adults can undergo daily napping without significant impairment in nighttime sleep. Neither benefits nor detrimental effects on health-related variables were shown in this small sample. A more prolonged intervention is needed.

Support (If Any): Institute for Social Science Research (ASU)

0099

COMPARISON OF TWO ACTIGRAPHY-BASED ALGORITHMS FOR DETECTING DAYTIME AND NIGHTTIME SLEEP

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Introduction: The Actiware software that comes with Philips Respironics' actiwatches tends to overestimate sleep, due to its poor accuracy in distinguishing immobility from sleep. Re-scoring rules were introduced in the Cole-Webster algorithm to overcome this issue. Previous validation of the two algorithms was based on nighttime sleep, and their performance in daytime sleep detection is unknown. This study aims to test/compare the performance of the two algorithms in detecting daytime sleep and nighttime sleep.

Methods: We analyzed actigraphy and polysomnography data that were simultaneously collected from 25 participants (14 non-shift-workers and 11 shift-workers; age: 30.93±8.96 [mean±SD]; female: 14 [56%]) each in two in-lab visits with scheduled nighttime or daytime sleep. The sleep/wake epochs scored by the Cole-Webster algorithm and Actiware (using medium wake threshold) were compared to those obtained from polysomnography. We conducted linear mixed-effects regression models to compare the sensitivity, specificity, and F1-score (a measure of performance less affected by imbalanced datasets) in detecting daytime and nighttime sleep and between the two algorithms.

Results: The Cole-Webster algorithm (mean±SE: daytime=0.66±0.02, nighttime=0.60±0.02) yielded lower sensitivity than Actiware (daytime=0.96±0.02, nighttime=0.96±0.02; p<0.0001), which was consistent for both daytime and nighttime sleep (daytime/nighttime×algorithm interaction: p=0.2). The Cole-Webster algorithm (daytime=0.91±0.04, nighttime=0.94±0.05) yielded higher specificity than Actiware (daytime=0.45±0.04, nighttime=0.56±0.05; p<0.0001), which was consistent for both daytime and nighttime sleep (daytime/nighttime×algorithm interaction: p=0.2). Both sensitivity and specificity did not differ between daytime and nighttime sleep (p>0.05). F1 scores of the Cole-Webster algorithm were lower (daytime=0.77±0.02, nighttime=0.74±0.02) than those of Actiware (daytime=0.92±0.02, nighttime=0.97±0.02; p<0.0001) for both daytime and nighttime sleep. There was a significant daytime/nighttime×algorithm interaction on F1 score (p=0.02). Specifically, the Cole-Webster algorithm performed better in scoring daytime than nighttime sleep,

whereas Actiware performed better in scoring nighttime than daytime sleep.
Conclusion: For both algorithms, the performance was similar in detecting daytime and nighttime sleep. Compared to Actiware, the Cole-Webster algorithm was generally better at detecting wake (i.e., high specificity) but worse at detecting sleep epochs (i.e., low sensitivity) and yielded worse overall performance (i.e., low F1). Future studies should test/validate other Actigraphy-based algorithms' performance in scoring daytime sleep.
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0100

DAYTIME SLEEP-TRACKING PERFORMANCE OF FOUR WEARABLE DEVICES DURING UNRESTRICTED HOME SLEEP

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Introduction: Many previous studies, from our group and others, have tested the sleep-tracking performance of commercial wearable devices and generally found that many can track sleep-wake patterns on most nights in laboratory or home settings with equal or better performance as actigraphy. However, nearly all previous studies tested devices under fixed time in bed (TIB) and only during nighttime sleep. Despite the relevance for night shift workers, device algorithms are programmed/optimized for tracking nighttime sleep, and daytime sleep-tracking performance largely remains unexplored. We therefore tested the sleep-tracking performance of devices during unrestricted home daytime sleep.
Methods: Participants were 16 healthy young adults (6 men, 10 women; 26.6±4.6 years, mean±SD) with habitual daytime sleep schedules (i.e., slept between 06:00 and 22:00 for ≥1 hour at least twice weekly). Participants slept at home for 1 week under unrestricted conditions (i.e., self-selecting TIB) using a set of four commercial wearable sleep-tracking devices and completed sleep diaries. Wearables included the Fatigue Science Readiband, Fitbit Inspire HR, Oura Ring, and Polar Vantage V Titan. TIB biases and missed daytime sleep episodes were assessed against sleep diaries.
Results: In total, 86 episodes met criteria for "daytime sleep," ranging from 2-10 episodes per participant. Percentage of daytime sleep episodes with TIB biases ≤15 and ≤60 minutes, and percentage of missed episodes in total and for short TIB (i.e., <4 hours), respectively, were as follows: Readiband (33.8%, 90.8%, 11.0%, 85.7%), Inspire HR (60.4%, 87.7%, 2.4%, 6.3%), Ring (39.5%, 90.7%, 35.8%, 85.7%), and Vantage V Titan (49.0%, 92.2%, 38.6%, 100%).
Conclusion: The commercial wearable devices generally had similar performance for tracking daytime sleep episode TIB. Like our previous findings when the devices were tested during nighttime sleep, TIB biases were also low for most daytime sleep episodes. However, the devices missed detecting several daytime episodes, which occurred more often when TIB was <4 hours. Preliminary findings suggest that daytime sleep TIB tracking is largely achievable with different commercial wearable devices; however, device sleep algorithms are not as reliable as when tracking nighttime sleep. Daytime sleep-tracking performance should be explored further.
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0101

PERFORMANCE OF A MULTISENSOR RING TO EVALUATE SLEEP AT-HOME RELATIVE TO PSG AND ACTIGRAPHY: IMPORTANCE OF GENERALIZED VERSUS PERSONALIZED SCORING

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Introduction: Multisensor sleep wearable devices have demonstrated utility for research and relative accuracy for discerning sleep-wake patterns at home and in the laboratory. Additional sensors and more complex scoring algorithms may improve the ability of wearables to assess sleep health.
Methods: Thirty-six healthy adults completed assessment while wearing the experimental device (Happy Ring), as well as Philips Actiwatch, Fitbit, Oura, and Whoop devices. Evaluations at home were conducted using the Dreem headband as an at-home polysomnography reference. The experimental Happy Ring device includes accelerometry, photoplethysmography, electrodermal activity, and skin temperature. Epoch-by-epoch analyses compared the Happy Ring to home polysomnography, as well as other sleep-tracking wearable devices. Scoring was accomplished using two machine-learning-derived algorithms: a "generalized" algorithm, similar to that used in other devices, which was static and applied to all users, and a "personalized" algorithm where parameters are personalized, dynamic, and change based on data collected across different parts of the night of sleep.
Results: Compared to home polysomnography, the Happy generalized algorithm demonstrated good sensitivity (94%) and specificity (67%), and the Happy personalized algorithm also performed well (93% and 75%, respectively). Other devices demonstrated good sensitivity, ranging from 91% (Whoop) to 96% (Oura). However, specificity was more variable, ranging from 41% (Actiwatch) to 60% (Fitbit). Overall accuracy using the Happy Ring was 91% for generalized and 92% for personalized algorithms, compared to 92% for Oura, 89% for Whoop, 89% for Fitbit, and 89% for Actiwatch. Regarding sleep stages, accuracy for the Happy Ring was 66%, 83%, and 78% for light, deep, and REM sleep, respectively, for the generalized algorithm. For the personalized algorithm accuracy was 78%, 92%, and 95%, for light, deep and REM sleep, respectively. Post-hoc analyses showed that the Happy personalized algorithm demonstrated better specificity than all other modalities ($p<0.001$). Kappa scores were 0.42 for generalized and 0.60 for personalized, compared to 0.45 for Oura, 0.47 for Whoop, and 0.48 for Fitbit.
Conclusion: The multisensory Happy ring demonstrated good sensitivity and specificity for the detection of sleep at home. The personalized approach outperformed all others, representing a potential innovation for improving detection accuracy.
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0102

PERFORMANCE EVALUATION OF A 24-HOUR SLEEP-WAKE STATE CLASSIFIER DERIVED FROM RESEARCH-GRADE ACTIGRAPHY

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Introduction: Wrist-worn research-grade actigraphy devices are commonly used to identify sleep and wakefulness in freely-living people. However, common existing algorithms were developed primarily to classify sleep-wake within a defined in-bed period with PSG, and exhibit relatively high sensitivity (accuracy on sleep epochs) but relatively low specificity (accuracy on wake epochs). This classification imbalance results in the algorithms performing poorly when attempting to classify data that does not have a predefined sleep period, such as over a 24-hour interval. Here, we develop a 24-hour actigraphy classifier to overcome limitations in specificity (accuracy on wake epochs), which typically afflict in-bed focused algorithms.
Methods: Four datasets scored via either PSG or direct observation of daytime wakefulness were combined (n=52 participants of mean age 49.8yrs, age range 19 - 86; 52% male; 221 total days/nights). Actigraphy (counts) and PSG (RPSGT-staged epochs) were temporally aligned. A model was trained to transform a time-series actigraphy counts to a time series of sleep-wake classifications, using the TensorFlow library for Python. 5-fold cross-validation was used to train and evaluate the model. Classification performance was compared to the output of the Spectrum device (Philips-Respironics) using the Oakley algorithm with a wake threshold of 'medium'.
Results: The developed classifier was compared to the Spectrum classifications across the 24-hour intervals. The developed classifier had higher accuracy (95.4% vs. 76.8%), higher specificity (95.9% vs. 68.9%) and higher balanced-accuracy (95.2% vs. 81.6%) relative to the Spectrum classifications, each assessed via paired-sample t-test. Sensitivity did not statistically differ (94.5% vs. 94.4%).
Conclusion: The model trained and evaluated on 24-hour data outperformed the existing algorithm output in terms of overall accuracy, specificity, and balanced accuracy, while sensitivity did not significantly differ. A model trained on 24-hour data may be more appropriate for analyses of freely living people, or older populations where napping is more common. Developing an accurate 24-hour sleep/wake classifier fosters new opportunities to evaluate sleep patterns in the absence of self-reports or assumptions about time in bed.
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0103

FEASIBILITY OF EXAMINING COMPONENT-SPECIFIC EFFECTS OF YOGIC BREATHING ON HEART RATE VARIABILITY DURING SLEEP: A THREE-ARM PILOT RCT

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Introduction: Wearable devices and mind-body interventions (MBIs) continue to receive widespread interest as tools for improving sleep. This study investigated the feasibility of using an automated electronic survey system and wearable heart rate (HR) monitor in the context of a fully remote clinical trial study to produce detailed measures of participant adherence, daily sleep quality, and associations with physiological outcomes captured by wearable devices.
Methods: Eighteen healthy participants (age 18-30yrs, 12 female) were randomized to one of three 8-week long interventions: slow-paced breathing (SPB, N=5, 24.6 ± 2.1 years, 4 female), mindfulness (M, N=6, 23.7 ± 3.7 years, 4 female), or yogic breathing (SPB+M, N=7, 24.3 ± 3.1 years). Participants completed two weeks of daily sleep logs prior to a virtual laboratory visit, consisting of a 60-min intervention-specific training with 20-min guided practice, and subsequent tasks including experimental stress induction. Participants started a 24-hour HR recording using a Polar H10 chest strap on the night prior. Then, participants were instructed to repeat their assigned intervention practice daily, using a guided audio similar to their initial training, while concurrently recording HR data and completing a detailed practice log. HR interbeat interval data were examined with spectral analysis using full spectrograms for inspection of timecourse and frequency-specific patterns in both the nocturnal recordings and daily practice sessions.
Results: Participants completed an average of 75% of daily practice sessions across the 8-week intervention period (SPB: 77%, M: 65%, SPB+M: 77%). An automated procedure was developed to analyze and visualize the timecourse of HRV-derived breathing patterns in the 754 completed practice sessions and 36 nocturnal recordings. The three groups were then successfully distinguishable based on breathing rates and mindfulness questionnaires. Nocturnal HR recordings demonstrated visually identifiable patterns of interindividual variability and intraindividual consistency. Statistical analysis is ongoing to further characterize these patterns.
Conclusion: These findings support feasibility for a fully remote, semi-automated clinical trial study assessing component-specific effects of these MBIs on sleep, including detailed spectral analysis of high-quality HR data. Future studies would benefit from examining scalability of this type of study design with wearable physiology in both clinical and nonclinical populations.
Support (If Any): Pilot Research Grant, Osher Center for Integrative Medicine of Harvard Medical School and Brigham & Women's Hospital; National Institutes of Health (5T32HL007901-22)

0104

ACOUSTIC ENHANCEMENT OF SLOW-WAVE SLEEP IN HEALTHY ADOLESCENTS

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Introduction: Adolescents have a stable sleep-need of between 9-10 hours a night, yet a pattern of markedly restricted sleep duration, particularly on school nights, has given rise to an epidemic of sleep deprivation in this population. As demonstrated by large numbers of studies, insufficient, irregular, and/or poor-quality sleep is a risk factor for both mental health problems and learning difficulties. Enhancing slow-wave sleep through non-pharmacological means may be a mechanism for alleviating daytime functional deficits in youth. In this study, we tested the feasibility of enhancing slow-wave sleep in healthy adolescents using a closed-loop, sleep-wearable device (SmartSleep, Phillips-Respironics) which monitors the EEG signal to automatically detect sleep stages, slow-waves, and micro-arousals to deliver acoustic stimulation to enhance SWA.
Methods: Seventeen healthy adolescents (15.5±1.8 years; 11 female) who endorsed sleep restriction and symptoms of daytime sleepiness participated in a randomized, cross-over study. Participation

included wearing SmartSleep for two consecutive 4-night periods at home—one period with acoustic stimulation (STIM) and one without (SHAM). During STIM, SmartSleep monitors the EEG in real-time and delivers acoustic tones (50 ms, 1 second interval between) through embedded headphones at an intensity dynamically modulated by sleep depth. Stimulation is stopped when an arousal or sleep stage-shift is detected. During SHAM recording, the same stimulation protocol is applied with tones played at zero volume.

Results: No differences were observed in any measure of sleep architecture. A mixed effects linear regression model was used to analyze the impact of condition (STIM vs SHAM) on both cumulative and average SWA during N2N3 and N3 sleep. At the group level, cumulative SWA during N2N3 and average SWA during N3 were significantly increased in STIM relative to SHAM ($p=0.01$; $p=0.02$, respectively), while age ($p=0.67$) and sex ($p=0.71$) had no effect. Despite the significant group effects, not all youth were responders; an average increase in cumulative SWA ($11.5 \pm 7.1\%$) in the STIM condition was observed in 12/17 participants.

Conclusion: Consecutive nights of acoustic stimulation enhanced SWA in otherwise healthy, sleep-restricted adolescents. These data suggest that acoustic stimulation during sleep may be a viable method for optimizing slow-wave activity and minimizing the emotional and cognitive consequences of sleep restriction during this sensitive developmental period.

Support (If Any):

0105

SLEEP TIMING AND CONSISTENCY ARE ASSOCIATED WITH THE STANDARDISED TEST PERFORMANCE OF ICELANDIC ADOLESCENTS

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Introduction: Sleep has been shown to affect cognitive function in laboratory studies; however, its association to the academic performance of adolescents has largely been demonstrated using self-reported measures. Studies with objective measures of both sleep and academic performance are limited. The aim of the present study was to determine whether the free-living sleep quantity, quality, and timing of 15-year-old adolescents measured with wrist actiography are associated with their scores on national standardised examinations as an objective measure of academic achievement.
Methods: We measured sleep with wrist actiography for 1 week in 253 (150 girls) Icelandic adolescents with a mean (SD) age of 15.9 (0.3) years. Multiple linear regression was used to assess associations between sleep parameters and combined standardised examination scores in mathematics, English, and Icelandic obtained from the Icelandic Directorate of Education.
Results: We found that students went to bed at 00:49 hours (± 51.8 min) and slept for a mean (SD) of 6.6 (0.7) hr/night, with a median (interquartile range) night-to-night variation in sleep duration of 1.2 (0.7) hr and an efficiency of 88.1 (5.3)%. Combined analyses adjusted for sex, demonstrated that both bedtime and night-tonight variability in total sleep time were negatively associated with the average score across all topics. Sex-specific associations did not indicate clear differences between boys and girls.
Conclusion: These findings suggest that, in addition to appropriate sleep duration, public health guidance should also highlight the importance of early and consistent sleep schedules to academic achievement for both boys and girls.
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0106

UNITIZATION IMPROVES MEMORY FOR ASSOCIATIONS DURING SLEEP DEPRIVATION

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Introduction: Total sleep deprivation (TSD) impairs binding, i.e., the ability to form new associations. Unitization – when separate memory items are learned as a single unit (e.g., combining two words into a novel compound word) – reduces the need for binding. Unitization mitigates impaired memory for associations in amnesiacs, but whether it offsets binding problems from TSD is unknown.
Methods: N=23 healthy adults (ages 19-35, 8 women) participated in an ongoing, double-blind, 4-day/3-night in-laboratory study with a 10h baseline sleep opportunity, 38h TSD, and a 10h recovery sleep opportunity. During TSD, participants were randomized to four administrations of caffeine (200mg), modafinil (alternating between 200mg and 0mg), or placebo at 4h intervals beginning at 01:00. They completed a unitization task at 14:45 on day 2 (baseline, session 1), day 3 (TSD, session 2), and day 4 (recovery, session 3). The task began with a study phase where participants studied 60 pairs of words that were presented individually (e.g., "penny" and "tower") or as new, unitized words (e.g., "pennytower") (50% each). Afterward, in the test phase, participants indicated whether 60 presented pairs of individual words were old (presented together at study) or new (recombined into new pairs) (50% each).
Results: Repeated-measures ANOVA revealed significant effects of study pair type (individual or unitized), session (1–3), and their interaction ($p<0.05$). Performance did not differ by pair type in session 1 ($p=0.46$), and performance for pairs of individual words did not change across sessions ($p=0.34$). However, performance on unitized word pairs improved across sessions ($p=0.003$), and unitized word pairs were recognized better than individual word pairs in sessions 2 and 3 ($p<0.05$).
Conclusion: Across sessions, participants benefitted from practice on unitized word pairs, such that performance improved even during TSD. Although potentially partly attributable to drug condition (to which investigators are still blinded), no such practice effect was seen for word pairs studied individually. Whether this dissociation implies that unitization bypasses the need for binding and thus lessens the impact of TSD requires further investigation. Regardless, unitization may mitigate performance impairment from sleep loss in settings that require forming novel associations, such as eyewitness identifications.
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0107

EVERYDAY DAYTIME EXECUTIVE FUNCTIONS IN ADOLESCENTS WITH INSOMNIA

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Introduction: Current diagnostic criteria for insomnia require self-reported sleep difficulties along with a complaint of daytime impairment. Despite the high prevalence of insomnia in adolescents, its daytime correlates are not well characterized in this age group. Executive functions (EFs) are high-level cognitive processes that coordinate memory, attention and emotions, all of which are utilized in daily functioning. Sleep deprivation impairs performance on tasks requiring EFs.A number of studies have examined the associations between insomnia and EFs in adults, but there is a paucity of studies examining EFs in adolescents with insomnia. This limits the understanding of the nature of daytime functioning in adolescents with insomnia, and impedes efforts to examine the effectiveness of interventions aimed at alleviating the daytime impairment of adolescents with insomnia.Study Objectives: 1) To compare everyday executive functioning of otherwise healthy adolescents with insomnia and that of typically developing controls; and 2) To examine the associations between sleep and everyday EFs in otherwise healthy adolescents with insomnia.

Methods: 37 boys and 59 girls aged 12–16 years (mean=13.29; SD=1.1) with no medical or psychiatric disorders were divided into three groups based on their Insomnia Severity Index score: No insomnia ISI <7; Sub-threshold insomnia 8< ISI <15; Insomnia ISI> 15. Insomnia was measured using the ISI. Everyday executive functioning was measured using the Behavior Rating Inventory of Executive Function (BRIEF). Sleep was measured using Actigraphy (AW-64 series; MiniMitter, Sunriver, OR, USA) and sleep logs. The parents of each participant provided information regarding his/her demographic and health status.
Results: Adolescents in the Insomnia group had higher scores on the BRIEF's Metacognition Index ($F(2, 94)=3.1$, $p<0.05$) and Global Executive Composite ($F(2, 94)=3.6$, $p<0.05$) and marginally shorter actigraphic sleep duration compared to the other groups (($F(2, 94)=2.5$, $p<0.09$]). Negative correlations were found between actigraphic sleep duration and scores on the BRIEF's Behavioral Regulation Index, Metacognition Index, and Global Executive Composite [$r(81)= -0.35$ $p<.001$ $r(81)= -0.49$ $p<.001$ $r(81)= -0.42$ $p<.001$, respectively] and between sleep efficiency and the Metacognition Index [$r(81)= -0.23$ $p<.05$].
Conclusion: ConclusionInsomnia in adolescents is associated with poor EFs.LimitationThe cross-sectional nature of the study means that the association between insomnia and EFs could be bidirectional.
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0108

THE EFFECT OF REWARD MOTIVATION ON PLACEKEEPING PERFORMANCE AFTER SLEEP DEPRIVATION

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Introduction: Sleep deprivation impairs some higher-order cognitive processes, but this impairment may reflect changes in motivation as well as changes in the cognitive capacity to perform the task, which has implications for intervention strategies. Here, we asked whether reward motivation could offset the effects of sleep deprivation on placekeeping, a higher-order cognitive process that is prevalent in performance of everyday tasks. To conduct this study under pandemic conditions, we developed a method for online data collection that promises to facilitate sleep-deprivation research more generally, by allowing for larger and more diverse samples to be collected at lower cost compared to in-person methods.
Methods: In the evening, participants joined a Zoom meeting and completed the Psychomotor Vigilance Task (PVT) and a placekeeping task (UNRAVEL). Afterwards, participants were randomly assigned to remain in the meeting and stay awake (Deprivation) or leave the meeting and sleep (Rested). Deprivation participants were monitored remotely overnight by two research assistants. Rested participants left the meeting at 00:00 and returned at 08:30. At 08:30, all participants completed the PVT and UNRAVEL again. Some participants had the opportunity to earn a monetary reward based on their morning UNRAVEL performance (Motivated) and some did not (Nonmotivated). We analyzed morning performance with a 2 (Sleep: Rested, Deprivation) x 2 (Reward: Motivated, Nonmotivated) design using evening performance as a covariate.
Results: Preliminary results from 206 participants show Deprivation participants had more placekeeping errors and lapses in the PVT than Rested participants. Motivated participants made fewer placekeeping errors after task interruption than Nonmotivated participants. The Sleep and Reward factors did not interact.
Conclusion: These results suggest that motivational interventions can mitigate some effects of sleep deprivation on complex task performance. However, reward motivation affected Rested and Deprivation performance similarly rather than compensating for any effects specific to sleep deprivation. This pattern does not rule out an effect of sleep deprivation on motivation, but does suggest that a different approach will be necessary to isolate this effect.
Support (If Any): This research is funded by the Office of Naval Research (N00014-20-1-2739).

0109

WORKING MEMORY ACROSS SLEEP AND THE MENSTRUAL CYCLE IN YOUNG AND MIDLIFE WOMEN

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Introduction: The menses phase of a woman's menstrual cycle, compared to other phases, is more likely to be associated with poorer sleep quality and alterations in cognitive performance, specifically impaired working memory. However, the relationship among these factors has been poorly investigated, and how age impacts these relationships is currently unknown. The present study examines the effect of menstrual cycle phase and sleep on working memory performance in young and midlife women.
Methods: Fifty-five young and midlife women (n = 29, 18 – 35 years; n = 26, 45 – 56 years) completed four remote assessments at different phases of their menstrual cycle: menses, late-follicular, mid-luteal, and late-luteal, defined based on days of menses and ovulation. On each visit, participants completed the operation span (OSPAN) working memory task in the evening and were re-tested for sleep-related performance change in the morning. In addition, participants wore an Oura ring, a multi-sensor wearable sleep tracker, throughout the night. Mixed linear regression, correlation models, and paired t-tests were used to determine the relationship between menstrual phase, sleep, and OSPAN outcomes in both groups.
Results: In midlife women only, OSPAN performance improvement significantly changed across menstrual cycle phases ($p < .05$). The greatest post-sleep improvement in OSPAN performance was detected during the mid-luteal and late-follicular phases of the cycle, while lower performance gains were detected during menses and late-luteal phases. Post-hoc paired t-tests confirmed that post-sleep performance was significantly worst during menses compared to each of the other phases ($p < .05$). Additionally, during the mid-luteal phase, time spent in deep sleep positively correlated with post-sleep performance in midlife women ($r = .55$, $p < .05$). No significant effects were detected in young women.
Conclusion: These findings suggest a complex interaction between sleep, menstrual cycle phase, and cognitive performance in midlife women. Our data suggest that deep sleep may mediate post-sleep performance during specific cycle phases. Reasons why these results are not evident in younger women are yet to be determined.
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0110

NAP-RELATED CHANGE IN MEMORY PRECISION MAY BE RELATED TO SLOW-WAVE SLEEP IN EARLY CHILDHOOD

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Introduction: In early childhood (3-5 years), naps comprise part of children's 24-hr sleep. Naps support some types of learning (declarative, emotional), enhancing children's ability to correctly identify previously seen items. During this time, children's ability to form precise memories also improves, likely due to ongoing hippocampal development and maturation of processes allowing for pattern separation. Whether naps support the ability to form precise memory representations, allowing children to discriminate between previously seen vs. similar but novel items, is unclear. Here, we used a mnemonic similarity task to examine whether daytime naps support children's recall of specific images more so than a period of wake. Further, we tested whether this nap-related improvement persists across overnight sleep. We hypothesized that task improvement would be associated with slow-wave sleep (SWS), as this stage has been shown to support episodic memory in preschool-aged children.
Methods: Participants (N=7, 4 females, Mage=56.1 mos) encoded items in the morning, verbally categorizing each image as something they would find "inside" or "outside". They recalled items at three time points: immediately following encoding, after their nap/wake period, and the following morning after overnight sleep. Recall involved being shown a single image and responding whether it had been previously seen or not. Recall items included targets, foils, and lures. PSG was recorded during the nap and overnight sleep bouts.
Results: When controlling for age, children forgot fewer target items following a nap than a comparable period of wake (p=.05). Following a nap and overnight sleep, children also exhibited marginally less forgetting of target items than following a period of wake and overnight sleep (p=.102). Lure discrimination index (LDI; false alarm lures minus false alarm foils) did not differ between nap and wake conditions. Change in target recall following the nap was associated with SWS% during the nap (r=.96, p=.01), but not nap duration (p=.27).
Conclusion: Napping supported children's ability to recall target items, but not to correctly reject lures, suggesting naps' benefit towards more generalized memory. Nap SWS% was associated with less forgetting of target items, supporting its role in hippocampal-dependent memory consolidation. Analyses of overnight sleep data and inclusion of more participants may help better elucidate the relationship between preschool children's sleep and memory development.
Support (If Any): NSF BCS 1749280 NIH R21 HD094758 NIH R01 HL111695

0111

EFFECTS OF SLEEP ON WORKING MEMORY

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Introduction: Improvements in working memory (WM) are associated with increased vagal autonomic activity during sleep. Sex hormones, which fluctuate across a menstrual cycle, influence sleep, autonomic activity, and cognitive performance. Given this complex interaction, we examined whether the relation between WM improvement and autonomic activity across a night of sleep was modulated by menstrual phase.
Methods: Twenty-five healthy female participants with natural, regular menstrual cycles (age = 28.14 ± 4.41 years) were enrolled. We employed a within-subject design to investigate the role of menstrual phase on autonomic activity and sleep-dependent working memory improvement. All participants completed two in-lab visits, with one visit during their low hormones phase (LH: 0 to +2 days from the start of menses) and one visit during their high hormone phase (HH: +1 to +4 days from the start of ovulation). We measured WM with the Operation-Span Task at 9PM and 8AM. Participants' overnight sleep was monitored with EEG and ECG. We measured parasympathetic activity using the high-frequency heart rate variability (hfHRV) and the root-mean-square of successive differences between normal heartbeats (RMSSD). We used linear-mixed effect models and Pearson's r.
Results: No differences in WM were found between menstrual phases (all ps > .223). Interestingly, however, HRV during NREM positively correlated with WM improvement in LH (hfHRV: r = .329, p = .093; RMSSD: r = .327, p = .096), but not during HH (hfHRV: r = -.197, p = .355; RMSSD: r = -.179, p = .402). The differences between correlations were significant (hfHRV: p = .038; RMSSD: p = .045).
Conclusion: Prior meta-analysis revealed greater vagal autonomic activity during LH (menses), compared with other phases. Though we didn't replicate this finding, we did show a significantly stronger relation between vagal autonomic activity and overnight WM improvement during this low hormone phase. Our results suggest that menstrual phase shifts the reliance of sleep-dependent WM improvement to vagal autonomic mechanisms.
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0112

CLASSIFICATION OF RECONSTRUCTED DEPTH PROFILES SHOWS GLOBAL AND NON-GLOBAL SLOW OSCILLATIONS DIFFERENTIATE IN THE HIPPOCAMPUS AND THALAMUS

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Introduction: Sleep slow oscillations (SOs, 0.5-1.5 Hz) can be classified on the scalp as Global, Local or Frontal, where Global SOs are found in most electrodes within a short time delay and gate long-range information flow during NREM sleep. In this study, we estimate the current density within the brain that generates a Global SO, to evaluate which sub-cortical structures are involved in Global SO dynamics. We then train multiple machine learning algorithms to distinguish between Global SOs and other SO types, and probe variance of Global/non-Global SO profiles within and across subjects.Sleep slow oscillations (SOs, 0.5-1.5 Hz) can be classified on the scalp as Global, Local or Frontal, where Global SOs are found in most electrodes within a short time delay and gate long-range information flow during NREM sleep. In this study, we estimate the current density within the brain that generates a Global SO, to evaluate which sub-cortical structures are involved in Global SO dynamics. We then train multiple machine learning

algorithms to distinguish between Global SOs and other SO types, and probe variance of Global/non-Global SO profiles within and across subjects.
Methods: 32 volunteers (18 females) slept in the lab with polysomnography including 24 head EEG channels; their sleep was scored according to AASM criteria. SOs were algorithmically detected at each channel and classified as Global or non-Global using our method (Malerba et al., 2019). The depth profile of each SO was reconstructed with current source estimation (in Brainstorm followed by sLORETA), with a standardized head model including 17 regions. Each depth profile was embedded in a matrix averaging current by region and in three 200ms-long time bins: before, during and after the SO trough. Thirty classifiers were applied to this dataset, leveraging Matlab's supervised learning application. We compared accuracy within and across subjects and identified best-performing algorithms across dataset size. We then used univariate feature selection to quantify the relevance of each region-time pair to successful classification.
Results: Global/non-Global SOs current depth profiles have higher variance across subjects, and accuracy improves when data is sampled between rather than within individuals. Ensemble subspace methods reached highest accuracy (98.5%). Feature selectivity identified cortical, hippocampal, and thalamic currents at the trough of the SO as the most relevant for Global/non-Global SO classifications.
Conclusion: We introduce an analytical framework enabling the study of SO depth profiles, including their time evolution, as matrices. The predominant differentiation of Global/non-Global SOs in cortical, hippocampal, and thalamic currents supports the potential functional difference of these SO types.
Support (If Any): NIH grant (R01 AG046646) to S.C.M.

0113

DAILY PATTERNS OF SLEEP AND METACOGNITION IN COLLEGE STUDENTS

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Introduction: Sleep problems have been associated with subjective cognitive complaints (a type of metacognition) in older adults, but little research has examined if this same relationship exists in younger adults. Additionally, college students have high intra-individual variability with their sleep, making day-to-day sleep an understudied parameter of interest in this population. Considering that metacognition has been associated with academic outcomes (e.g., GPA) in college students, it is important to understand how daily sleep patterns might impact metacognition. The present study examined how intra-individual variability in sleep is associated with metacognitive ratings in college students.
Methods: College students (N=81, Mage=18.8, SD = 1.1, 64 females) completed seven days of sleep diaries reporting total sleep time (TST), sleep onset latency (SOL), number of nighttime awakenings, and wake after sleep onset (WASO). Students also provided morning metacognitive ratings regarding the perceived quality of mental functioning from very poor (0) to very good (100). Multilevel modeling analyses tested whether intraindividual variability in daily sleep variables was associated with daily metacognitive ratings, after controlling for interindividual sleep patterns, age, sex, sleep medication usage, and anxiety symptoms (via the Hospital Anxiety and Depression Scale).
Results: Daily TST was associated with metacognitive ratings (B=2.35, p=0.003), in that those who slept less than their typical average reported worse metacognitive ratings. Similarly, daily number of nighttime awakenings (B=-1.92, p=0.02) and WASO (B=-0.13, p=0.009) were also associated with metacognitive ratings, in that those with more awakenings and greater WASO than their typical average reported worse metacognitive ratings.
Conclusion: Findings suggest that deviation in typical daily sleep patterns (shorter TST, a greater number of nighttime awakenings, greater WASO) may impact daily metacognitive ratings in college students. Similar patterns are not observed at the average/interindividual level, prompting the need for future studies to examine daily sleep in college students. These findings point to the need for research examining whether sleep interventions (e.g., Cognitive Behavioral Therapy for Insomnia) for college students who experience sleep variability, could improve metacognition, which in turn could improve academic outcomes.
Support (If Any):

0114

EVOLUTION OF BRAIN CIRCUITS SUPPORTING SPATIAL NAVIGATIONAL MEMORY ACROSS SLEEP

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Introduction: Systems consolidation is one of the major theories of sleep's function in memory. Sleep is thought to be important in integrating and distributing hippocampal information to cortical structures such that there is less hippocampal activation, while at the same time increasing striatal activation, upon subsequent experience in the same environment that co-occurs with improved performance. Here we sought to examine the evidence supporting systems consolidation across sleep in spatial navigational memory.
Methods: 15 subjects (28±5 yrs., 8 female) with no prior videogame experience and no sleep disorders were recruited to undergo spatial navigational memory testing before and after a night of sleep. Spatial navigational memory was tested across two functional MR (fMRI) sessions (approx. 7PM and 8AM) separated by in-lab nocturnal polysomnography (NPSG) measured sleep using a virtual 3D Maze. Each fMRI session consisted of six runs: three maze trials interleaved with three control trials. During maze trials participants were instructed to reach a prespecified goal as quickly as possible, whereas during the control trials, participants were instructed to navigate a Z-shaped corridor with no prespecified goal. fMRI data was analyzed in 2-step procedure using Analysis of Functional Neuroimages (AFNI) software package. To estimate hippocampal activity during fMRI, parameter estimates of the %change in blood-oxygen-level-dependent (BOLD) signal using the contrast maze-control were used as the primary metric. Regions of interest were limited to the bilateral hippocampus, parahippocampal gyrus, caudate, and putamen using the Eickhoff-Zilles macro labels from the MNI-N27 template.
Results: During in-lab NPSG, participants experienced a total sleep time of 6.1±1.1 hrs (8.7±2.9%stage1, 51.2±7.6%stage2, 21.8±8.5%stage3, 18.1±6%REM). Within subjects, compared to pre-sleep, a significantly lower activation of the bilateral hippocampus and parahippocampal gyrus was observed post-sleep (evening-morning %change=0.26±0.11, p<0.05). Compared to

pre-sleep, caudate and putamen activity was not significantly different post-sleep (evening-morning %change=-0.02±0.04,p=0.5). Greater evening hippocampal activity was associated with greater change in maze completion times across sleep (rho=0.54, p=0.04).
Conclusion: In young healthy adults, a night of uninterrupted sleep supports redistribution of hippocampal contribution toward spatial navigation. Greater initial pre-sleep hippocampal contribution was associated with improved recall of spatial navigational memory after a night of sleep.
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0115

DISCREPANCIES BETWEEN ACTUAL AND IDEAL BEDTIME ARE ASSOCIATED WITH COGNITIVE PERFORMANCE

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Introduction: Experimental studies have shown that acute sleep-circadian misalignment can lead to cognitive deficits. Additionally, chronic jetlag among pilots and long-term exposure to shiftwork are associated with worse cognitive performance. This study investigated whether small daily discrepancies in actual versus perceived ideal bedtime are associated with cognitive performance.
Methods: A subset of Wisconsin Sleep Cohort study participants (N=750; 58% male; mean[range] age 59 [38-78] years) participated in a neurocognitive test battery, provided a 6-night sleep diary, and completed questionnaires at the same study visit. The neurocognitive assessment included the Controlled Oral Word Association Test, Trails Making Test Part B, Grooved Pegboard Test, Auditory Verbal Learning Test, Digit Cancellation, and Symbol Digit Modalities Test. Weekday bedtimes from the sleep diary were averaged to represent "actual" bedtime. "Ideal" bedtime was represented by the answer to the question from the Horne-Ostberg Morningness-Eveningness Questionnaire: If you were free of any schedule and could go to bed at any time you wanted, what time would that be? Bedtime mismatch was represented as (ideal bedtime – actual bedtime). Cognitive performance was regressed on bedtime mismatch (separate models for each cognitive test) in linear regression models, adjusting for age, sex, BMI, sedative and stimulant use, average total sleep time, actual bedtime, smoking, caffeine consumption, and education level.
Results: There was a significant association between bedtime mismatch and performance on both the Grooved Pegboard (p=0.02) and Symbol Digit Modalities (p=0.02) tests, and a borderline significant association (p=0.09) with performance on the Oral Word test. On average, participants that had actual bedtimes that were later than ideal bedtimes demonstrated worse cognitive performance, while actual bedtimes that were earlier than ideal bedtimes were associated with better performance. No associations were found for the other 3 cognitive tests.
Conclusion: Going to bed at a time that is later than perceived ideal bedtime may be associated with cognitive deficits, even after accounting for actual bedtime and total sleep time.
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0116

SLOW OSCILLATIONS PROMOTE LONG RANGE EFFECTIVE COMMUNICATION: THE KEY FOR MEMORY CONSOLIDATION IN A BROKEN DOWN NETWORK

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Introduction: The relation between slow oscillations (SOs, <1Hz) during non-rapid eye movement (NREM) sleep and systems-level memory consolidation is one of the most robust findings in cognitive neuroscience. However, NREM is a brain state seemingly unfavorable to systems consolidation because a hallmark characteristic of this state is a breakdown in connectivity and reduction in synaptic plasticity with increasing depth of sleep. Our study addresses this apparent paradox and how SOs orchestrate neural communication.
Methods: We employed generalized partial directed coherence to estimate directional causal information flow between EEG channels across the electrode manifold during SO and non-SO periods. We examined the magnitude of causal information flow over the phase of SOs and found two peaks of flow preceding and following the trough of the SO. We categorized source-sink pairs of flows into three groups based on distance between source and sink of information flow. All the peak flows in each group were averaged and we tested relation between averaged magnitude of the flow and overnight episodic memory improvement using correlation test.
Results: The results reveal that NREM generally (non-SO periods) and during the SO trough show dampened neural communication. Causal communication during non-rapid eye movement sleep peaks during specific phases of the SO (before and after SO trough), but only across long distances. Correlation test results showed that episodic memory improvement was predicted by peaks of information flow with longest distances between sinks and sources, and not by any other phase of the SO or non-SO period.
Conclusion: This work introduces a non-invasive approach to examine information processing during sleep, a behavioral stage whose function, until now, has been understood only at a delay. The findings represent a conceptual leap in understanding how slow oscillations unlock memory consolidation in a broken down network which is by promoting long range effective communication. This research will promote further investigations of understanding how brain oscillations alone and in nested rhythms promote network communication, as well as to investigate how these properties vary and predict patterns of deficits in clinical populations and aging humans.
Support (If Any):

0117

TWO-YEAR MEMORY CHANGE IS ASSOCIATED WITH SLEEP DISORDERS IN A SURVEY OF OLDER ADULTS

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Introduction: Insufficient sleep and sleep disorders have been previously associated with worse cognitive outcomes, such as worse memory performance. This analysis aims to assess the relationship between diagnosed sleep disorder and memory change over a period of two years.
Methods: N=17,156 older adults residing in the United States were assessed using the Health and Retirement Survey (Core) in 2018, with additional variables obtained in the previous wave (2016 on the same participants). Those who reported no sleep disorder in either wave were categorized as "no sleep disorder," and they were compared to

those who reported a sleep disorder in both waves ("sustained sleep disorder") or one wave but not the other ("new sleep disorder" or "remitted sleep disorder." Memory change was assessed using a survey item asking if the respondent's memory was "worse", "better", or "the same" as compared to two years prior. Multinomial logistic regression was used to assess the relationship between these variables, and results were adjusted for sex, age, race, ethnicity, and depression.

Results: In adjusted results, those who reported that their memory improved were 124% (OR=2.24; 95%CI[1.51, 3.31]; p<0.001) more likely to have a sleep disorder that was remitted in the past 2 years. Those who reported that their memory worsened were 103% more likely to have a new sleep disorder (OR=2.03; 95%CI[1.65,2.50]; p<0.001), and 58% more likely to have a sustained sleep disorder (OR=1.58; 95%CI[1.40,1.77]; p<0.001). Interestingly, those whose memory worsened were also 39% more likely to have a remitted sleep disorder (OR=1.35; 95%CI[1.10,1.77]; p=0.006).

Conclusion: In older adults, there is a relationship between change in memory function and sleep disorders, such that improved memory is associated with improved sleep and worsened memory is associated with worse sleep or sustained sleep problems. Unfortunately, the specific sleep disorders associated were not reported. Future work should examine these effects in terms of specific sleep disorders, additional effect modifiers/covariates, and the role of sleep health in improving memory function.

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0118

PERFORMANCE ON A COMPUTERIZED THREAT ELIMINATION TASK IN AN ANIMATED ENVIRONMENT DURING TOTAL SLEEP DEPRIVATION

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Introduction: Military and law enforcement operators must make split-second decisions on whether to shoot during confrontations. Quick responses are crucial when force is necessary, but accurate decision-making is also imperative. Often, decisions are made while fatigued, which could impair speed and/or accuracy. Furthermore, the reliability of background information may impact performance. We investigated performance on a computerized shooting task during a total sleep deprivation (TSD) study.

Methods: N=86 healthy adults (39 males, age 21-38) completed a 4-day/3-night in-laboratory study, randomly assigned to a TSD (n=56) or control (n=28) condition. A custom task was administered after 32h or 8h of wakefulness (TSD and control groups). Participants were to shoot enemy robots (press spacebar) and not shoot friendly robots (no response) within 500ms of each robot being revealed inside shipping crates (1-5s inter-trial-interval). The task introduction described which crates would contain enemies, but the intel's accuracy varied across four phases: 100% (20 trials), 80% (120 trials), and 20% (40 trials), then irrelevant in a new environment (60 trials). Reaction time (RT) and accuracy (hits and false alarms (FAs)) were analyzed using 2x4 mixed-effects ANOVAs to determine the effects of condition, phase, and their interaction.

Results: There was a significant effect of phase on RT (p<0.001); in both conditions, participants reacted faster in phase 1 than all other phases. However, there was no effect of condition (p=0.20) or phase-condition interaction (p=0.080) on RT. There were significant effects of condition on hits (p<0.001) and FAs (p=0.004); TSD had fewer hits and more FAs than the control group. There was an effect of phase on hits (p=0.045), with fewer hits in phase 1, and a condition-phase interaction (p=0.026) showing that the TSD group experienced less improvement in hits. For FAs, there was no effect of phase (p=0.86) or phase-condition interaction (p=0.86).

Conclusion: The results suggest a speed/accuracy tradeoff during TSD, where relative to the control group, RTs remained equivalent, but accuracy was worse. In both groups, the RT slowing from phase 1 to subsequent phases, suggests that participants initially used the intel to facilitate quicker decision-making, but disregarded it once it was not completely reliable.

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0119

EFFECTS OF TOTAL SLEEP DEPRIVATION ON PERFORMANCE ON A CONTINUOUS PERFORMANCE MATCHING TASK

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Introduction: Tasks requiring individuals to identify specific stimuli may create response/non-response conflict, which may impair performance depending on stimulus feature overlap. Whether sleep deprivation interacts with such impairment is unknown. We investigated the effects of total sleep deprivation (TSD) on stimulus identification in a continuous performance matching task (CPMT).

Methods: N=85 adults (ages 21–40; 50f) completed a 4-day laboratory study with 10h baseline sleep (22:00–08:00), a 38h acute TSD or 10h sleep opportunity (control condition), and 10h recovery sleep. The ~6min CPMT was administered every 2–4h during wakefulness. Participants completed 300 trials where a 3-digit number was flashed on the screen for 100ms. They were instructed to respond (mouse-click) within 900ms, but only if the number was the same as the preceding number (i.e., a repeat); for all other trials a response was to be withheld. The 5 daytime testing sessions (09:00–21:00) at baseline (day 2) and after TSD/control (day 3) were used for analysis. Trials were classified based on number of digits matching the preceding trial (stimulus feature overlap): none (180 trials), one (30 trials), two (near-repeat; 30 trials), or all (repeat; 60 trials). Hit and false alarm (FA) rates were analyzed with mixed-effects ANOVA for day, condition, trial type, and their interactions. Mean response time (MRT) was analyzed equivalently for repeat trials only.

Results: Hit rate declined from day 2 to day 3 in the TSD group (F[1,83]=0.15, p<0.001), but not the control group (F[1,83]=0.018, p=0.335). Though FA rate was low overall (<0.06), FA frequency was higher on trials with greater stimulus feature overlap. FA rate increased on day 3 for the TSD group (all p<0.004), especially for near-repeats (F[1,415]=-0.014, p<0.001). Changes in MRT were statistically significant, but negligible (<20ms).

Conclusion: Our results suggest that greater stimulus feature overlap on the CPMT was associated with greater costs required to resolve conflict. Sleep deprivation exacerbated these costs. Interpretation is limited however, because a response was not required for non-repeat trials. Implementing a two-alternative forced choice version of the task in future TSD studies would address this limitation.

Support (If Any): PRMRP W81XWH-16-1-0319 and W81XWH-20-1-0442

0120

MENSTRUAL CYCLE-RELATED CHANGES IN SLEEP-DEPENDENT EMOTIONAL MEMORY CONSOLIDATION

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Introduction: Emotional, more than neutral, experiences are preferentially consolidated during sleep. Fluctuating reproductive hormonal levels across the menstrual cycle are associated with changes in sleep features that are implicated in emotional memory consolidation. Yet, the interaction between menstrual cycle phases, sleep, and emotional memory remains unknown. The current study investigates how sleep-dependent emotional memory consolidation changes across the menstrual cycle in both young and midlife women.

Methods: Thirty-one young (MAge=25.32y, SD=5.69y) and 33 midlife (MAge=47.88y, SD=2.86y) women enrolled in the study. Each woman completed four remote visits at different menstrual phases, estimated from self-reports and measured ovulation: menses (low hormone), late-follicular (high estrogen), mid-luteal (high estrogen and progesterone), and late-luteal (falling hormones). During each visit, participants completed the Emotional Picture Task (EPT) via Pavlovia, a web-based testing platform. Participants completed encoding and immediate test in the evening (Test 1) and retested (Test 2) the following morning. During encoding, participants viewed negative and neutral images (selected from the IAPS). During testing, for each image, participants reported if it was old or new, and rated the arousal (low to high) and valence (neutral to negative). We measured dPrime at each test and calculated a difference score for overnight memory improvement. Sleep was recorded using Oura ring, a multi-sensor wearable sleep tracker. Mixed linear models determined the effect of menstrual phase on EPT, with visit as a covariate, and relevant sleep features.

Results: Irrespective of age, menstrual cycle phase ($p<0.05$) predicted overnight dPrime change score for negative images. Specifically, memory improvement was the highest during mid-luteal, while menses showed the most forgetting. In addition, longer time in bed was associated with less forgetting ($p<0.01$). These effects were not observed for neutral images ($ps>0.05$).

Conclusion: Menstrual phases are characterized by specific sex hormone profiles that can interact with both memory and sleep. The current findings indicate that sleep-dependent memory may also be affected by these changes, specifically memories that have negative emotionally content are more resilient to forgetting during the midluteal phase when both estrogen and progesterone are highest. Future studies (e.g., sleep manipulation) are required to reveal the specific sleep features associated with these effects.

Support (If Any): RF1AG061355 (Baker/Mednick)

0121

SLEEP FACILITATES MEMORY, BUT NOT NAVIGATION ACROSS THE PUBERTAL TRANSITION IN THE NOVEL MINECRAFT MEMORY AND NAVIGATION TASK

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Introduction: The hippocampus uniquely supports the acquisition and retention of spatial information, and sleep supports the consolidation of hippocampal-dependent memories. However, support for the role of sleep in spatial memory and navigation is mixed. We developed and tested a novel Minecraft Memory and Navigation (MMN) task in adults which showed that sleep uniquely supports the memory for spatial locations, but navigation improved regardless of delay condition (Simon et al., submitted). Here, we tested participants during the developmental transition from childhood to adolescence, a time known for structural and functional hippocampal maturation.

Methods: Thirty-one youth (Mage = 10.6, SD = 1.56, 9-13 years, grouped: child, early adolescent, adolescent) were administered the MNN task. Training included two free-explorations trials to learn 12 unique object-locations associations in an open-field Minecraft environment. At test, participants were cued to place objects from randomly teleported locations. They were tested twice, immediately and 12-hours later, after a period of sleep or wake. Conditions and environments were counterbalanced in a within-subject design. Each step-by-step movement was recorded for navigation analyses including path length, orientation angle, and search behaviors.

Results: We found a significant benefit of sleep, compared to wake, on the spatial location accuracy when accounting for age group ($F(1,27) = 6.153$, $p = .02$), such that similar to young adults, youth's metric accuracy of spatial locations improved. We found no change in navigation performances from Test 1 to Test 2 in either condition. Between the start and target locations, youth initiated and maintained similar trajectory angles with similar total path lengths ($p's > .068$). Spatial location memory did not correlate with any navigation metrics ($p's > .361$). Navigation metrics correlated among themselves, which withstood correction ($p's < .005$).

Conclusion: Youth demonstrated similar sleep-dependent benefits for the metric accuracy of the spatial locations. In contrast to adults, youth's navigation performance did not improve over delay, regardless condition. Our findings are in line with sleep's promotion of hippocampal-dependent information, with retention of the spatial locations. Our data are consistent with the hypothesis that sleep does not facilitate navigation, and points to potential developmental maturation required to support navigation behaviors.

Support (If Any):

0122

SLEEP HYGIENE EDUCATION INTERVENTION: SLEEP FACTORS AND COGNITION IN COLLEGE STUDENTS

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Introduction: College students often struggle to adjust to the demanding nature of college life, which can translate to decreased overall health and poor sleep. Healthy sleep practices are important for obtaining good sleep quality and quantity, leading to optimal cognitive performance. Interventions, including educational approaches to improve sleep in college students, may lead to better concentration, memory retention, and subsequent academic performance. The focus of the current study was to examine habitual sleep habits in college students, provide a brief educational intervention, and investigate potential changes in sleep and cognition.

Methods: Participants included 14 undergraduate students (6 men, average age M=20.64 years, SD=2.13) who wore wrist actigraphs to measure their typical sleep habits. After one week, participants completed questionnaires about sleep (Pittsburgh Sleep Quality Index, PSQI), sleepiness (Epworth Sleepiness

Scale, ESS), and fatigue (Multidimensional Assessment of Fatigue Scale, MAF). Participants also completed cognitive tests (Stroop, Digit Span, and Simple Reaction Time). Subjects participated in a short lecture about healthy sleep hygiene habits and the importance of sleep and then repeated the one-week observational study.
Results: Paired sample t-tests revealed a significant increase from baseline average sleep duration (M=5.83 hours) to post-intervention sleep duration (6.64 hours; t(13)=-2.532, p=.013). Sleep efficiency (actigraphy) and quality (PSQI) did not improve significantly. ESS scores decreased significantly (t(13)=3.76, p=.002 (pre M=9.29; post M=5.43) and MAF scores decreased significantly (t(13)=2.19, p=.047 (pre M=20.48; post M=15.60). A difference in reaction times for Stroop incongruent prompts approached significance (p=.083, pre M=979.46; post M=884.70), but no differences were found for errors, Digit Span, or Simple Reaction Times.
Conclusion: The results of this study suggest that one educational lecture about sleep hygiene may be a start to improving sleep in college students. Even a 48-minute increase resulted in decreased sleepiness and fatigue. However, no improvements were found in sleep quality or efficiency. Although a slight improvement was found in reaction time, no other cognitive benefits were noted. More research should be conducted on how to improve sleep habits in college students beyond an educational approach.
Support (If Any): None.

0123

THE IMPACT OF SLEEP, STRESS, AND ENVIRONMENTAL CONTEXT ON MEMORY PRE- AND DURING THE COVID-19 PANDEMIC IN THE UNITED STATES

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Introduction: The COVID-19 pandemic has disrupted the lives of many people. The risk and interpersonal cost of infection as well as the public health measures implemented to mitigate the spread likely have psychological costs. Yet, due to the ever-changing nature of the pandemic, psychological impact has been difficult to capture through research efforts. Here, we leveraged an on-going, geographically representative study to examine the relationship among sleep, stress, and memory function before and during the COVID-19 pandemic.
Methods: Participants (N=1958, aged=18+) were enrolled in a 21-day ecological momentary assessment study. All participants provided demographic information, including zipcodes, which were used to identify rural vs urban locale. Participants were instructed to complete up to three daily check-ins during set time windows—morning, afternoon, night--via a phone application. At each morning check-in, participants were asked about sleep duration and quality, and at every check-in, participants reported perceived stress ratings. Participants also completed a paired-associates memory task on Day 2 of the study. For the task, participants were instructed to encode a list of 20 unrelated word and picture pairs. Immediately after encoding, participants were tested on five picture-word pairs. Tests 2 and 3 occurred on a unique set of five words from the initial list three and six days after initial encoding, respectively. Pre- and during COVID assessments were defined as March 2019 to March 2020 and April 2020 to October 2021, respectively.
Results: Mixed effects binomial regressions revealed that pre-COVID, longer sleep durations were associated with better memory performance (ß=.09, p<.05), and counterintuitively, higher subjective sleep quality was associated with worse memory performance (ß=-.35, p<.001). During COVID, longer nighttime awakenings were associated with poorer memory performance (ß=-.01, p<.05) and living in a rural vs urban environment was associated with poorer memory performance (ß=.48, p<.01). Older age was associated with worse memory performance pre- and during COVID (ß=-.01, p<.01). Stress was not related to memory pre- or during COVID in these models.
Conclusion: Findings support that sleep difficulty before and during the pandemic likely impacts memory function. Additionally, those living in rural U.S. environments may be particularly vulnerable to cognitive changes in the pandemic context.
Support (If Any):

0124

DEXTROAMPHETAMINE BIASES THE BRAIN TOWARDS ENHANCED SPATIAL SELECTIVE ATTENTION COMPARED OVER WORKING MEMORY.

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Introduction: There is a growing trend in the non-medical use of prescription psychostimulant (PStim) in healthy adults One of the main reasons of increased usage of PStim is due to their perceived benefits on the cognitive capacity. However, evidences from empirical studies on healthy adults point to an inconclusive answer. There are various factors which could have contributed to these overall mixed findings. These factors range from differences in drug dosages, individual baseline variability and use of different tasks. However, one of the important factors that previous studies have not considered is the presence possible selective bias of PStim towards a specific cognitive domain over others which may lead to its selective enhancement at the cost of others' degradation.
Methods: To study this, we carried out a double blind, placebo-controlled study, with repeated measures design to investigate the differential influence of a stimulant drug (DEX vs PBO) on the cognitive skills of working memory (WM) and spatial selective attentive in the form multiple object tracking (MOT) across a period of a day. We compared the change in the performance of WM and MOT in DEX vs PBO conditions at 1) pre-drug baseline, 2) 75 minutes post-drug (peak concentration), 3) 12 hours post-drug intake (washout).
Results: First, we found that DEX did not have any overall significant effect on WM performance across a period of day compared to the placebo condition. We also found that MOT performance was rescued by DEX, unlike the placebo condition in which the MOT performance degraded over different testing periods across a wake day period. Importantly, we found that during the peak concentration of DEX in the body MOT performance was significantly superior to that of the WM performance. This superiority of MOT over WM was not present before the drug administration (baseline) and also returned to a level similar to baseline after a gap of 12hours.
Conclusion: Overall, our study findings suggest that DEX has a favorable bias towards MOT compared to WM and selectively enhances its performance when the brain is required to support both of these two cognitive domains concurrently.
Support (If Any):

0125

FLUID INTELLIGENCE DOES NOT MEDIATE COGNITIVE THROUGHPUT DEFICITS DURING TOTAL SLEEP DEPRIVATION

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Introduction: The Digit Symbol Substitution Test (DSST) has been used in sleep research to measure slowing of cognitive throughput. The task shows large aptitude differences in baseline performance and substantial inter-individual differences in vulnerability to performance deficits during total sleep deprivation (TSD). Fluid intelligence (Gf) is generally positively related to processing speed. However, DSST performance is typically found to be independent of Gf. The possible interaction of sleep loss with Gf on performance remains to be examined.

Methods: N=56 healthy adults (ages 22–37, 29 females) completed a 4-day/3-night in-laboratory study and were randomly assigned (2:1 ratio) to a TSD (n=37) or control (n=19) condition. Sleep opportunities were from 22:00–08:00 on the first (baseline) and last (recovery) night for the TSD group and on all three nights for the control group. Subjects completed a 4min, computerized DSST twice on day 2 (baseline) and twice on day 3 (TSD or control). At baseline, subjects also completed the Shipley Institute of Living Scale (SILS). The abstraction score was used to categorize fluid intelligence (Gf) as relatively high (≥34, n=36) or low (<34, n=20). Mean DSST throughput (number of correct responses in the 4min task) was analyzed using mixed-effects ANOVA with fixed effects for day (2, 3), condition (TSD, control), and their interaction, with and without Gf category (high, low) as a covariate.

Results: As expected, DSST throughput was significantly reduced by TSD (day by condition interaction: $F[1,166]=27.99$, $p<0.001$). Adding Gf had no effect on the day by condition interaction, and Gf category was not significant as a covariate ($F[1,166]=1.67$, $p=0.20$).

Conclusion: Our results indicate that the Gf measure from the SILS does not capture the aspects of cognition that are influenced by TSD and that lead to a decline in DSST throughput. This is consistent with findings that while the DSST has high sensitivity for cognitive dysfunction in clinical settings, it has low specificity in identifying components of cognition responsible for dysfunction.

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0126

ZONA INCERTA LHX6 NEURONS ARE MOST ACTIVE DURING NREM AND REM SLEEP AND AFTER PROLONGED WAKING

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Introduction: Emerging data shows that GABA neurons in the zona incerta (ZI) play a prominent role in regulating sleep. Transfer of the orexin gene into ZI neurons blocks cataplexy in narcoleptic orexin-knockout mice (Liu et al., JNeurosci, 2011) and vGAT GABA neurons in the ZI anticipate onset of NREM (Blanco-Centurion et al., SLEEP, 2021). To identify the subtype of GABA neurons regulating sleep, we examined the activity of Lhx6 neurons. This study tests the hypothesis that Lhx6 neurons show peak calcium fluorescence during sleep, and that the fluorescence is further increased after prolonged waking.
Methods: In Lhx6-cre mice (mice=4; all females; 4-5 mo), rAAV-DIO-GCaMP6s was delivered stereotaxically to the ZI (isofluorane anesthesia) and a GRIN lens, along with EEG and EMG electrodes were implanted. 21d later a miniscope (INSCOPIX) was attached, and after 3d of adaptation, sleep and fluorescence in individual Lhx6 neurons were recorded for 4h (baseline). On another day, the mice were kept awake for 6h (gentle handling; 9a-3p) and fluorescence in Lhx6 neurons was recorded for 2h during recovery sleep. The imaged data from the two recording periods (baseline and recovery sleep) was combined into a single data file and the change in fluorescence was determined against the mean image frame (F0). Previously, we and others found that the GCamP calcium fluorescence is a direct measure of action potentials and serves as a marker of activity.
Results: 97 neurons were automatically extracted (PCA-ICA analysis; blinded without knowledge of sleep state). In 66 neurons (68%) the average fluorescence was significantly higher during REM, NREM or both, compared to waking (Mixed Model ANOVA; SPSS25; $P<0.01$). In this population the fluorescence was significantly higher during recovery sleep compared to baseline ($P<0.001$) indicating increased activity of the sleep-active neurons during recovery sleep. With ensuing sleep, the increase in fluorescence gradually returned to baseline levels, attesting to the fluorescence as a marker of homeostatic sleep pressure. In 14 neurons (14%), fluorescence was highest in waking as compared to the other states during baseline, and in these neurons, fluorescence did not increase after sleep loss. Interestingly, six neurons (6%) were most active in waking and NREM but silent in REM (REM-off).
Conclusion: This is the first study to measure fluorescence in individual neurons after sleep loss. We find that the fluorescence in two-thirds of ZI Lhx6 neurons is tightly linked to sleep, and that the average fluorescence is further increased after prolonged waking. Microendoscopy is superior to indirect measures such as c-FOS or photometry in gauging sleep pressure in individual neurons.
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0127

BRAIN BACTERIAL PEPTIDOGLYCAN IS REGION-SPECIFIC AND CHANGES AFTER ISCHEMIC STROKE

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Introduction: Sleep disorders and ischemic stroke (IS) are large health burdens. Almost half the USA population reports disturbed sleep and 795,000 Americans suffer a stroke annually. Despite dysregulated sleep being a stroke risk factor that can exacerbate injury and prolong recovery, sleep deprivation immediately preceding experimental stroke is neuroprotective. Bacteria and microbial products associate with (patho-)physiologies, including sleep phenotypes and IS. Peptidoglycans (PGs) are bacterial cell wall components found in diseased and healthy adults, and in developing and sleep-deprived brains. Although they influence atherosclerosis, an IS risk factor, PGs have not been characterized in post-stroke brain.
Methods: Aged (63 weeks) male wildtype mice (n=5) underwent permanent left middle cerebral artery occlusion, a model that mimics atherosclerotic IS, the most common type in humans. Surgeries began at Zeitgeber time (ZT) 12, lasted 30-40 minutes, and were followed by a 2-2.5-hour recovery period before sacrifice at ZT15. Brain stem (BS), somatosensory and prefrontal cortices (Sctx, PFC) were dissected, homogenized in phosphate buffered saline, and centrifuged. A standardized murine peptidoglycan ELISA (MyBioSource) was used for PG/MP quantification in resultant supernates. Brain areas in the left (L) IS, and right (R) control, hemispheres were compared by two-way ANOVA and Tukey's HSD tests.
Results: Mean PG values are expressed as ng/mg tissue wet weight ± SEM. Post-IS PG in the injured L Sctx (4.28±0.48) was lower ($F(2,21)=49.29$, $p<0.05$) than the uninjured R Sctx (5.66±0.29; $p=0.048$). There were no hemispheric PG differences in either BS or PFC. L hemispheric PG was greater in BS (7.59±0.40) versus Sctx ($p=0.0008$) and PFC (3.82±0.21, $p=0.0002$). R hemispheric PG was also greater in BS (8.26±0.53) versus Sctx ($p=0.005$) and PFC (3.56±0.56, $p=0.0006$) and in Sctx versus PFC ($p=0.02$).
Conclusion: This study confirms our parallel study, presented in a separate abstract herein (English et al), that PG regulation is unique within brain areas. Additionally, PG values in uninjured Sctx and in BS were similar between studies. Finally, current results suggest that reduced cerebral blood flow induced by IS reduces PG in the affected brain area. Further, PG may have a role in sleep deprivation-related IS injury and recovery.
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0128

MATERNAL SLEEP QUALITY ACROSS PREGNANCY PREDICTS NEWBORN NEURODEVELOPMENT

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Introduction: The prenatal period is characterized by immense fetal neuronal growth. Such rapid growth can increase fetal susceptibility to prenatal environmental insults (Barker, 1998). A promising prenatal process that may alter fetal development is maternal prenatal sleep quality. Poor prenatal sleep quality is a public health concern affecting approximately 78% of pregnant individuals (Lucena et al., 2018). In rodents, maternal sleep deprivation across gestation predicts offspring hippocampal neurogenesis, with pups exposed to sleep deprivation early and late in pregnancy exhibiting more anxiety and depression-like behaviors (Peng et al., 2015). In humans, poor sleep quality in other developmental stages predicts hippocampi and amygdalae changes (Marshall & Born, 2007; Saghir et al., 2018). However, the relation between prenatal sleep quality and offspring brain

development in humans remains poorly understood. The present study examined associations between maternal sleep quality in early, mid, and late pregnancy, and newborn hippocampal and amygdala volume, regions implicated in memory and emotion.
Methods: Pregnant individuals (N=94; Mage=30.5; SDage=5.3) reported on sleep quality three times during pregnancy. Newborn (Mageinweeks=5.1; SDageinweeks=2.7) hippocampi and amygdalae volumes were assessed during an unsedated sleep cycle using magnetic resonance imaging (MRI). Tissue segmentation was collected using a multiatlas iterative algorithm that individually segmented the regions of interest and subsequently combined T1- and T2-weighted high-resolution images (See neonate multiatlas at https://www.nitrc.org/projects/unc_brain_atlas/). Bivariate correlations examined the association between prenatal sleep quality and hippocampus and amygdala volume. Partial correlations examined these associations in the presence of significant cofounding variables including intracranial volume, body weight percentile, sex, and postconceptional age.
Results: Partial correlations revealed that poor maternal sleep quality early in pregnancy predicted larger newborn bilateral hippocampal volume (all rs<.25; ps<.038). Associations with sleep later in gestation persisted for the right hippocampus (all rs<.25; ps<.038). Prenatal maternal sleep quality did not significantly predict newborn amygdala volume (all rs<-.06; ps>.58).
Conclusion: This study provides novel evidence linking prenatal sleep quality and newborn hippocampal volume in humans, suggesting the presence of an intergenerational link between prenatal sleep health and offspring well-being.
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0129

REGION-SPECIFIC CHANGES IN BRAIN PEPTIDOGLYCAN FOLLOWING SLEEP DEPRIVATION

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Introduction: Bacterial cell wall peptidoglycan (PG) and muramyl peptides (MPs), isolated from mammalian brains and urine following sleep deprivation (SD), promote non-rapid eye movement sleep. These PG/MPs likely originate from the host microbiome and have been quantified in neonatal murine brain. PG/MP amounts and dynamics in healthy, adult murine brain remain unknown.
Methods: Wildtype mice acclimated to standard lab conditions were sacrificed at Zeitgeber time (ZT) 3 or ZT15 with (treatment, N=8), or without (control, N=8) 3h of SD prior to time points. Hypothalamic (HT), somatosensory cortex (Sctx) and brain stem (BS) areas were dissected, homogenized in phosphate buffered saline and centrifuged. PG/MP contents in resultant supernatants were determined using an ELISA (MyBioSource), interpolating sample PG from the standard curve, and expressed as ng peptidoglycan per mg tissue wet weight (ng/mg).
Results: At ZT3 and ZT15, BS PG values were significantly higher than HT or Sctx values, while HT and Sctx values did not differ from each other. At ZT3, mean PG values from control mice were: 3.6 in HT, 3.7 in Sctx, and 8.6 ng/mg in BS. After SD, corresponding values were: 3.0, 4.8 (statistically significant increase, p<0.05), and 7.5 ng/mg. Further, within all 8 individual mice after SD prior to ZT3, PG levels in Sctx were higher than corresponding values in HT (p<0.001).At ZT15, PG control values were: 4.6 in HT, 4.6 in Sctx, and 8.9 ng/mg in BS. After SD, PG level at ZT15 was not significantly changed in any brain area assayed. However, PG values after SD at ZT15 compared to ZT3 SD values were significantly higher for HT and BS (p<0.0005 and p<0.005, respectively). In an independent experiment (see Dykstra-Aiello et. al. this volume) we confirmed PG values at ZT15 in BS were significantly higher than Sctx values.
Conclusion: Results indicate unique PG regulation by brain area, sleep loss, and time-of-day suggesting physiological roles for brain PG guiding host behaviors such as sleep. Thus, mammalian sleep-wake regulation and its various associated cognitive states, are the product of millions of years of co-evolutionary symbioses between microbes and their hosts.
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0130

CENTRAL AND PERIPHERAL MARKERS OF OXIDATIVE STRESS AND SLEEP IN MOOD DISORDER: A PILOT MR SPECTROSCOPY STUDY

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Introduction: Sleep disturbance is both a symptom of and a risk factor for mood disorders. Oxidative stress may impact the relationship between sleep disturbance and mood. However, the relationships between sleep and in vivo measurements of oxidative stress in the brain have not been examined in humans. Therefore, we tested the relationship between patient-reported sleep disturbance with peripheral and central concentrations of glutathione (GSH), the primary antioxidant in the brain.
Methods: Participants (2 women and 7 men) were individuals with (n=2) and without mood disorder (n=7), ages 35-61 years. MR spectroscopy at 7 Tesla (TE=20ms, TM=10ms, TR=3000ms) was used to measure cortical GSH levels in the brain in the anterior cingulate cortex (ACC), ventromedial prefrontal cortex (VMPFC), and dorsolateral prefrontal cortex (DLPFC). Peripheral GSH was assayed from a fasted morning blood draw. Sleep disturbance and related impairment was assessed via the PROMIS Sleep Disturbance (PROMIS-SD) and Sleep-Related Impairment (PROMIS-SRI) questionnaires. Pearson correlations were assessed between peripheral and central GSH levels with PROMIS-SD and PROMIS-SRI T-scores.
Results: We observed significant negative correlations between DLPFC GSH with sleep disturbance (r=-0.744, p=0.022) and sleep-related impairment (r=-0.753, p=0.019). We did not detect correlations between sleep-related endpoints and peripheral GSH levels or GSH levels in the ACC or VMPFC.
Conclusion: These preliminary results suggest that more sleep disturbance and related impairment may be associated with lower levels of cortical GSH and implicate a role for sleep disturbance to impact oxidative stress in a region associated with rapid eye movement sleep and modulation of affective states.
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0131

THETA OSCILLATIONS DURING REM SLEEP SYNCHRONIZE BEHAVIOR AND NEURAL ACTIVITY IN THE DEVELOPING MOTOR SYSTEM

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Introduction: Myoclonic twitches are abundantly produced during REM sleep in skeletal muscles across the body. In infant rats, movements are produced by the red nucleus (RN), with the RN both sending motor commands and receiving sensory feedback from twitches. The RN's role in producing twitches contrasts with that of primary motor cortex (M1), which does not generate motor commands at early postnatal ages. Instead, M1 functions as a sensory structure, processing sensory feedback from self-generated movements, including twitches. By postnatal day (P) 12, the RN (but not M1) also begins to exhibit a continuous theta rhythm (~6 Hz) during REM sleep that promotes sensorimotor integration with other brain areas. Given that the RN and M1 collaborate to control movement in adult rats, we hypothesized that theta emerges in M1 after P12, at which time theta synchronizes M1 and RN activity.
Methods: To determine if and when theta synchronizes activity in the RN and M1, we recorded local field potentials and unit activity in the RN and the forelimb region of M1 in unanesthetized preweanling rats at P12 and P20. Rats were head-fixed but were able to locomote and cycle freely between sleep and wake.
Results: Neurons in the RN and M1 continued to respond to twitches through P20. Further, as predicted, we observed the developmental emergence of REM-associated theta oscillations in M1 by P20 that were coherent with theta in the RN. Additionally, neural activity was phase-locked to theta; surprisingly, twitches were also phase-locked to theta, with twitches being more likely during the troughs of the oscillation. Finally, the temporal relationship between twitch-related activity in the two structures depended on the phase of theta, with twitch-related activity in M1 lagging behind twitch-related activity in the RN in the rising phase of theta. However, in the falling phase of theta, twitch-related activity in the RN and M1 showed similar time courses.
Conclusion: These results show how theta during REM sleep promotes the developmental integration of behavior with neural activity in the RN and M1. Because synchronous activity strengthens synaptic connectivity, and theta synchronized twitch-related activity in the RN and M1, these results also implicate twitches and twitch-related activity in the development of somatotopically precise functional connectivity between the RN and M1.
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0132

LOSS OF NEURONS IN THE INTERMEDIATE NUCLEUS IS RELATED TO PERTURBED SLEEP-WAKE RHYTHMS IN OLDER ADULTS

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Introduction: The ventrolateral preoptic nucleus (VLPO) is composed of neurons that are maximally active during sleep. In animal studies, VLPO lesion decreased the amount of sleep but only marginally attenuated circadian rhythm. The human intermediate nucleus (IN) is believed to be the homologue of the VLPO. Neuronal loss in IN has found to be associated with increased sleep fragmentation in older adults. We investigated whether IN neuronal loss is also associated with perturbed sleep-wake rhythms in humans.
Methods: We studied 50 deceased participants [age at death: 88.9±6.1 (mean±SD; female: 33 (66%)] from the Rush Memory and Aging Project, who had actigraphy assessment 1.6±1.3 years (range: 0.1-5.1 years) before death. Post-mortem immunohistochemical and stereological analysis was performed to quantify the count of galanin-immunoreactive neurons (Gal+) in the IN of them. Actigraphy data were used to calculate amplitude, acrophase, interdaily stability, and intradaily variability of the 24-h activity rhythms. Linear regression models were used to determine the associations of the four measures of sleep-wake rhythms with the GAL+ neuron counts, adjusting for age at death and sex. Further covariates considered included sleep fragmentation (derived from actigraphy) and the time interval between actigraphy assessment and death.
Results: The number of Gal+ neurons in IN was positively associated with interdaily stability and amplitude, and negatively associated with intradaily variability. Specifically, for one-SD decrease in Gal+ neurons, interdaily stability decreased by 0.06±0.02 (mean±standard error; equivalent to 40% SD of interdaily stability; p=0.009), amplitude decreased by 5.8±2.3 (equivalent to 35% SD of amplitude; p=0.014), and intradaily variability increased by 0.12±0.04 (equivalent to 36% SD of intradaily variability; p=0.009). Longer time interval between actigraphy and death showed a trend to attenuate these associations although not statistically significant (all p>0.1). These observations also remained statistically significant after adjusting for sleep fragmentation.
Conclusion: Neuronal loss in the IN was linked with perturbed sleep-wake rhythms in older adults. Further investigations are warranted to examine whether the observed associations are mediated by reduced sleep quantity or other aspects of sleep quality.
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0133

SLEEPING WELL OR SLEEPING POORLY: CLUES FROM BRAIN NEUROCHEMISTRY

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Introduction: Sleep problems are prevalent throughout the population, but little is known about the brain mechanisms that differentiate good and poor sleepers. We studied the association between brain neurochemistry, as measured by proton magnetic resonance spectroscopy (1H-MRS), and sleep quality as measured by actigraphy. We hypothesized that better sleep quality would be predicted by brain metabolites indicative of greater neuronal health, neural inhibition, and reduced levels of excitatory neurotransmitters.
Methods: 24 healthy adults (12 females25.4±5.6 years) wore an actigraph for seven consecutive days to collect Time in Bed (TIB), Total Sleep Time (TST), Sleep Efficiency (SE), Sleep Onset Latency (SOL), and Wake After Sleep Onset (WASO), and underwent 1H-MRS neuroimaging at 3T. Metabolite data from the medial prefrontal cortex (mPFC), dorsolateral prefrontal cortex (dlPFC), and medial

parietal-occipital cortex (P-OCC) were entered stepwise into a series of multiple linear regression models to predict each actigraphic outcome.
Results: For SE, the regression analysis yielded a significant three predictor model (adjusted R2=.59), p=.0001, including mPFC choline (Cho; β=-.60), P-OCC N-Acetylaspartate (NAA ; β=.56), and P-OCC glutamate+glutamine (Glx; β=-.33). Better SE was associated with a combination of decreased Cho within the mPFC, and increased NAA and decreased Glx within the P-OCC. SOL was predicted by mPFC Cho alone (β =.60; adjusted R2 = .33), p=.002. This suggests that greater Cho within the mPFC was associated with a longer latency to fall asleep. Finally, for WASO, the regression analysis yielded a significant two predictor model, (adjusted R2 = .39), p=.002, including mPFC Cho (β = .56), P-OCC NAA (β = -.41). This suggests that a combination of greater Cho within the mPFC and decreased NAA in the P-OCC was associated with more minutes of wake after sleep onset.
Conclusion: Sleep quality was predicted from brain metabolites within the medial default mode network (DMN), an interconnected system of cortical regions that is normally deactivated during effortful cognitive processing. Sleep quality was predicted by a combined pattern of metabolites consistent with greater neuronal integrity, reduced cellular turnover, and lower excitatory neurotransmitters. Findings suggest potential metabolic and neuroanatomic targets for enhancing brain health to facilitate sleep quality.
Support (If Any):

0134

CIRCADIAN VARIATION OF ABSENCE SEIZURES IN AN ANIMAL MODEL OF HUMAN LEUKODYSTROPHY (H-ABC)

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Introduction: Hypomyelination with atrophy of the basal ganglia and cerebellum (H-ABC) is a human leukodystrophy is due to a mutation in the tubulin b 4a (TUBB4A) and the taiep rats is the only available model of this human disease with similar signs in the magnetic resonance imaging and a mutation in the TUBB4 that induced an accumulation of microtubules in the cytoplasm and its processes in the oligodendrocytes. Taiep rats had spike-wave discharges (SWD) that are similar to absence epilepsy with a progressive increase with the age of the subjects. The aim of this study is to analyze the circadian distribution of SWD on male taiep.
Methods: We used 16 male taiep rats at 6 and 9 months of age. All rats were kept in standard conditions with a 12/12 light-dark cycle (lights on at 0700) and free access to rodent food pellets and purified water and were implanted for EEG, EMG and EOG recordings to characterize the frequency and duration of SWD. All procedures followed the NIH rules, and the protocol was approved by BUAP-IACUC.
Results: The number of SWD are higher in male rats at 9 with respect to 6 months of age (P≤0.05), and also had higher incidence during the light phase with respect to the dark phase (P≤0.05). The duration of SWD had also a greater duration during the light period than the dark phase (P≤0.05).
Conclusion: Our results showed that SWD has higher incidence of SWD and of longer duration during the light period when the rats had more sleep suggesting that the neurotransmitters that are released during sleep facilitate the discharge in the thalamo-cortical circuit that support SWD.
Support (If Any): Partially supported by PRONACES-CONACYT grant 194171, and VIEP-BUAP 2021 to CA in Neuroendocrinología. JMI is fellowship from CONACYT No. 735813.

0135

SPRINGING FORWARD: THE INFLUENCE OF DAYLIGHT SAVINGS TIME ON TEAM PERFORMANCE IN PROFESSIONAL BASKETBALL

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Introduction: Daylight Savings Time (DST) has been a well-studied occurrence in United States society. Past literature has documented numerous detriments related to cardiovascular and mental health, as well as heightened accident risk (e.g., traffic, construction, healthcare) due to this time shift. Given the scant research in professional sports though, the current study examines the impact of DST among National Basketball Association (NBA) teams.
Methods: Following the 2011-12 lockout-shortened season, data for all games played during the 2012-13 to 2019-20 NBA seasons were collected from the publicly-available sports database, Basketball-Reference. Data from the 2020-21 season were excluded due to the impact of the COVID-19 pandemic. During this period, data from 8,843 games were obtained, with 65 of these games being played the same day as DST. We investigated the influence of DST on points scored, points allowed, and game outcomes for both the home and visiting teams using mixed-effects regressions controlling for season and when applicable, winning percentage. Specifically, we compared team performance for games immediately following DST with season averages.
Results: For both home and visiting teams, our regression models revealed no meaningful variations in performance between games played following DST and season averages. There were no statistically significant differences across points scored (pHome = .98, R2Marginal = .21, R2Conditional = .29; pVisiting = .36, R2Marginal = .32, R2Conditional = .45), points allowed (pHome = .84, R2Marginal = .34, R2Conditional = .42; pVisiting = .44, R2Marginal = .22, R2Conditional = .33), and game outcomes (pHome = .77, R2Marginal = .11, R2Conditional = .11; pVisiting = .71, R2Marginal = .10, R2Conditional = .18).
Conclusion: The present analysis offers preliminary evidence that DST may not produce any observable effects on the selected indicators of team performance. However, our results could be explained by organizational and athlete sensitivity toward potential compromised performance during games played following DST. Furthermore, our study did not consider other variables that could impact teams (e.g., actual sleep schedules and travel), and was limited by a relatively small sample size of games played on DST. We suggest that future studies examine additional metrics implicated in team performance, such as shooting percentages, rebound rates, turnovers, among others.
Support (If Any): None

0136

FIREFIGHTER SLEEP BEHAVIOR AND PSYCHOMOTOR VIGILANCE COMPARED TO BIOMATHEMATICAL PREDICTIONS OF PERFORMANCE

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Introduction: Firefighters work a demanding 24-hour job in which fatigue may compromise safety. Biomathematical fatigue modeling software applications, like the Sleep, Activity, Fatigue, and Task Effectiveness Fatigue Avoidance Scheduling Tool (SAFTE-FAST) could be adapted to serve as a fatigue mitigation tool for firefighting operations. SAFTE-FAST predicts task effectiveness using objective work and sleep data. Model predictions of effectiveness (Predicted Effectiveness) have not been previously compared against actual Psychomotor Vigilance Task (PVT) speed (Actual Effectiveness) in a firefighter population.
Methods: Total sleep time across the 24-hour day (TST24) was monitored continuously throughout a 2-week study period in firefighters working 24-hour shifts using a sleep-tracking actigraphy device (Zulu Watch, Institutes for Behavior Resources). Speed on an 8-minute PVT was assessed daily on on-shift and off-shift days. Mean speeds >2 standard deviations above the grand distribution were excluded. SAFTE-FAST calculated Predicted Effectiveness (PVT Speed [1/Reaction Time] expressed as a % of individual optimum performance) from objective sleep and work data. Actual Effectiveness was computed as a percentage of the median of an individual's top 10% fastest PVT Speeds. Paired samples t-test explored differences between on-shift and off-shift PVT Speed and TST24. Linear regression explored correlation of Predicted Effectiveness to Actual Effectiveness across 5% Effectiveness bins.
Results: Two hundred twenty (N=220) firefighters provided sleep, work, and PVT data for 1-2 weeks (Mean: 8; Range: 1-15 days) between 9/2020 to 8/2021. On-shift days accounted for 37% of study days (M: 3; R: 0-10 on-shift days). PVT Speed and TST24 were not significantly different between on-shift (Speed: 2.43±0.47; TST24: 404±163 minutes) and off-shift days (Speed: 2.44±0.48; TST24: 396±156 min; all $p>0.1$). Linear regression across 5% SAFTE prediction bins revealed significant correlations between SAFTE Predicted Effectiveness and PVT Actual Effectiveness ($R2=0.861$, $p<.001$).
Conclusion: Firefighters averaged less than 7 hours of sleep per 24-hour period whether on or off-shift. Average PVT speed was similar to performance from chronically-sleep-deprived or alcohol-impaired individuals. SAFTE-FAST Predicted Effectiveness and PVT Actual Effectiveness were distributed similarly across 5% bins. While preliminary, these findings suggest that firefighters may suffer from chronic sleep debt and impaired psychomotor vigilance that can be predicted using biomathematical modelling.
Support (If Any): N/A

0137

PHASE RESPONSE CURVE FOR EFFECTS OF SCHOOL START TIMES ON STUDENTS' DIURNAL LEARNING RHYTHM

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Introduction: School start times impose constraints on sleep-wake behaviour that can result in social jet lag. Here, we used university archived datasets (1) to test whether social jet lag was associated with lower grades, and (2) to assess the phase resetting effects of school start times on students' diurnal learning behaviour.
Methods: Social jet lag was estimated in 33,645 university students by measuring the phase shift in their Learning Management System (LMS) login rhythm on school days relative to non-school days (LMS social jet lag). ANCOVA was used to test the association between LMS social jet lag and grade point average, adjusting for demographic variables. We constructed a phase response curve by plotting phase shifts on school days (LMS social jet lag) against the initial phase when students' first class of the day took place. The initial phase was expressed relative to students' LMS login rhythm on non-school days (LMS chronotype).

Results: Students with greater LMS social jet lag had a lower grade point average (ANCOVA: $F_{9,32269} = 44.8$, $P < 0.001$). Social jet lag was larger in students with a later LMS login rhythm on non-school days (later chronotype) and for earlier school start times. The phase response curve revealed that the direction and magnitude of social jet lag were strongly dependent on the phase of students' diurnal rhythm when their first class of the day took place. Phase shifts of up to 12 h were observed when school start times occurred out of phase with students' diurnal rhythm.
Conclusion: School start times have a profound impact on students' diurnal behaviour. Students whose diurnal patterns of LMS logins were similar on both school days and non-school days obtained better grades than their peers with LMS social jet lag. Universities can potentially improve learning by scheduling classes at times that are better aligned with students' diurnal learning rhythm.
Support (If Any): Data storage and management were supported by the NUS Office of the Senior Deputy President & Provost and ALSET. The work was funded by the Ministry of Education, Singapore (MOE2019-T2-2-074) and the National Research Foundation, Singapore (NRF2016-SOL002-001).

0138

EXPLORING THE INFLUENCING FACTORS OF SLEEP DISTURBANCE AND WORK WELL-BEING AMONG SHIFT-WORK NURSES IN TAIWAN

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Introduction: Job-related stress and sleep disturbances are common problems among registered nurses (RNs). At present, more than half of the nursing staff in Taiwan have the intention to leave, so this is a problem that cannot be ignored. This cross-sectional correlational research based on Job Demands-Resources Model aimed to explore the influencing factors of work well-being from sleep and job crafting perspective.
Methods: A total of 220 (13.3% was male) shift-work RNs (mean age= 30.6, SD= 6.5), were recruited from seven intensive care units of a teaching hospital in central Taiwan. All nurses completed a battery questionnaires measuring their job-related stress, sleep disturbances, fatigue severity, self-efficacy, job crafting, and work well-being. In addition, a 7-day sleep diary were collected to estimate their total sleep time (TST).
Results: Majority of the RNs reported poor sleep quality (61.5%), insufficient sleep quantity (62.8%), and poor daytime functioning (49.5%). According to the sleep diary, their average TST (464 minutes, SD= 91.7) was close to what they needed to feel refreshed (472 minutes, SD= 87.5); however, more than three-quarters of them experienced clinically significant fatigue before bedtime (92.3%) and after waking up (72.7%). Job-related stress was measured by the Copenhagen Psychosocial Questionnaire II, the top three stressors were from value at work level, interpersonal relations and leadership, and work organization. Sleep disturbances was correlated with poor work well-being. After controlling for personal factors (age, gender, and years in nursing) and sleep disturbances, self-efficacy, job-related stress, and job crafting explained 49.8% of work well-being; work organization, value at work level, and job crafting are the significant predictors.
Conclusion: Most RNs in this study reported sleep disturbances and severe fatigue, which had a negative impact on their work well-being. Job-related stress contributed to sleep disturbances, and calls for further study on job-crafting and shift work coping.
Support (If Any): Changhua Christian Hospital,Taichung, Taiwan

0139

WORK DURATION AFFECTS HOW PRIOR-NIGHT SLEEP PREDICTS NEXT-DAY ENERGY EXPENDITURE IN EMERGENCY RESPONSE SYSTEM TELECOMMUNICATORS

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Introduction: ERS telecommunicators are the first of the first responders challenged with solving complex, time-sensitive problems while managing workplace presence. Very little is known about sleep, work, and lifestyle factors among workers in this industry. One study demonstrated that 85% of ERS telecommunicators are overweight, suggesting that job-related factors may place these workers at risk for sedentary lifestyles. To test this hypothesis, we examined whether 14 day total work duration moderated the daily relationship between prior-night total sleep time and next day energy expenditure.
Methods: Over the course of 14 days (M = 6.9 days on-shift; SD = 1.9 days), 47 ERS telecommunicators were instructed to (a) wear actigraphs on their waist to gather estimates of average energy expenditure (EE, kcal/hour), (b) wear actigraphs on their wrist to gather estimates of total sleep time (min), and (c) complete daily shift logs to gather information about work duration (hours). Mixed linear modeling was employed to examine whether prior night within-subject total sleep time (TST) predicted next day energy expenditure, as moderated by between-subject work hours (n = 525 cases).
Results: A significant cross-level Work Duration x TST interaction (Estimate = .007, SE = .002, $p < .001$, 95% CI [.003, .011]) indicated that less prior-night TST was associated with less next-day EE among telecommunicators who worked more hours over the last 14 days. Conversely, telecommunicators who worked fewer hours expended more energy per hour the next day when they slept less than usual. Simple effects indicated that for each extra 102 minutes sleep (+1 SD), telecommunicators expended 5 kcal/hr (90 kcal over 18 hours awake). These results remained stable when controlling for between-subject differences in sleep and within-subject changes in work duration, night-shift work, and other relevant covariates.
Conclusion: The effect of total sleep time on next-day EE is unique to each telecommunicator's typical sleep levels and the total hours worked over the course of two weeks. These two risk factors operate on EE as a function of one another. Findings provide support for the implementation of policy-level intervention to minimize chronic overwork and individual-level intervention to support sleep prioritization.
Support (If Any): UA Canyon Ranch Center for Health Promotion and Treatment

0140

OPERATIONALIZING SLEEP FOR THE MILITARY: ADVANCING AN INFRASTRUCTURE FOR FATIGUE RISK MANAGEMENT WITH WEARABLE TECHNOLOGY

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Naval Health Research Center [1] Naval Health Research Center; Leidos Inc. [2] Commander, Naval Surface Force, US Pacific Fleet [3]

Introduction: A recent investigation on fatigue within United States (US) Naval Surface Force by the Government Accountability Office recommended that the US Navy incorporate methods to empirically monitor and manage fatigue-related threats. In response, a feasibility effort was undertaken to assess two commercial wearable devices previously evaluated against polysomnography by our group for potential use within a novel fatigue monitoring system onboard US warships.

Methods: 501 Sailors from three warships (415 men, 85 women, 1 response missing; 29.1±7.4 years, mean±SD) were included in analyses. During multi-day missions at sea, participants were instructed to continuously wear a wrist-worn Fatigue Science Readiband and an Oura Ring. Participants met with the research team daily to sync wearable devices and complete self-ratings of sleep and fatigue on a tablet. While returning to port, participants completed a user experience questionnaire that included 5-point scales for device comfort and interference with daily activities (larger values indicate greater comfort or interference).

Results: There were no overall differences in total sleep time (TST) and sleep efficiency (SE) between devices (TST: Ring=352.23±87.1, Readiband=353.89±97.79; p=0.45, d=-0.01; SE: Ring=84.59±7.08, Readiband=84.20±10.24; p=0.06, d=0.04). There were 9 days for TST and 4 days for SE (of 66 total days) that resulted in effect sizes >0.50 between devices (for >0.20: TST, 39/66; SE, 29/66). Preliminary analyses between TST and self-reported exhaustion and inability to function suggest predictive relationships with the wearables (Ring: r=-0.20; Readiband: r=-0.21), with no relationship with SE across devices (both r<0.01). Average comfort ratings for Ring (3.74) exceeded Readiband (3.59), but this difference was small (p=0.04, d=0.12). Interference with daily activities was also similar between devices (Ring=2.10, Readiband=2.20; p=0.14, d=0.08).

Conclusion: Both commercial wearables performed similarly for their TST and SE assessments, and TST was associated with self-rated fatigue within this operational environment. While the ring form factor was selected more for comfort than the wrist form factor, the difference was small. Collectively, findings indicate that both devices show promise for operational use within fatigue monitoring systems. Further testing is being conducted to better understand the strengths and limitations of wearable devices for monitoring sleep in warship environments.

Support (If Any): Military Operational Medicine Research Program

0141

DAILY SELF-REPORTED SLEEP DURATION PATTERNS AMONG MALE AND FEMALE COLLEGIATE ATHLETES

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Introduction: Student-athletes' time demands include scholastic, athletic, and social events that may influence sleep duration; and the association between sleep duration, athletic performance, and injury risk are inconclusive. Further, limited research investigates long-term habitual sleep patterns in collegiate student-athletes. We aimed to describe the feasibility of monitoring long-term self-reported sleep duration, within-person sleep duration patterns, and test sex differences across a semester in a collegiate student-athlete cohort.

Methods: We monitored daily self-reported sleep in a prospective cohort study using ecologic momentary assessment. Each day, a smartphone application prompted student-athletes to record total sleep hours obtained in the previous 24 hours(h). We provide descriptive statistics for response frequency, and within-person sleep, percentage of days below recommended (7-9) hours, and coefficient of variation (CV) [(standard deviation/mean)*100]. We tested sex differences using chi-squared tests, and within-person median hours of sleep on weekdays verses weekends with paired t tests ($p<.05$).

Results: Sixty-three student-athletes (male: 57.1%) on eight teams responded. Out of a possible 54 responses, response frequency was <25% for 27.0% of student-athletes, 25-50% for 19.1% of student-athletes, 50-75% for 20.6% of student-athletes, and ≥75% for 33.3% of student-athletes. Among those responding ≥50% of days (n=34), median self-reported sleep ranged 6.5-9h per 24h and the percent of days below recommended hours of sleep ranged from 0-53.6%. The CV ranged from 6.2-31.8% overall, and from 7.0-24.1% among athletes with response rate ≥50%. There was a significant association between sex and quartile of response rate ($\chi 23=15.91$, $p<.001$); the highest percent of males (41.7%) had <25% response rate, whereas 55.6% of females had ≥75% response rate. There was no association between sex and reported sleep above or below recommended hours ($\chi 22=2.25$, $p=0.32$). There was no difference between median within-person weekday and weekend hours of sleep ($t51=0.75$, $p=0.46$).

Conclusion: Student-athletes generally self-reported obtaining the recommended total sleep; however, participation was variable as response frequency was ≥75% for one-third of student-athletes and females responded more often than males. This suggests future studies should validate the reliability of self-report with objective data in this population to obtain complete data to appropriately assess associations between habitual sleep patterns and injury risk, performance, and recovery outcomes.

Support (If Any): Pilot funding through the Penn Injury Science Center (CDC R49 CE 003083) supported this study.

0142

FROM SHORE TO SHIPBOARD: SEVERITY OF SLEEP DISTURBANCE AND SLEEP-RELATED IMPAIRMENT OF SAILORS ABOARD US NAVY WARSHIPS

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Introduction: Sleep quality is known to be negatively impacted during military operations at sea. Yet, there are limited naval studies that explore measures of sleep disturbances and sleep-related impairment, especially in relation to different warship classes. This analysis compares sleep disturbances and sleep-related impairment across two warship classes during similar at-sea periods.

Methods: 432 sailors (77.6% male; 27.4±7.1 years) participated in a training evolution aboard either a destroyer (DDG; n=194) or an amphibious class ship (LHD; n=238). Participants completed a 7-day recall questionnaire assessing their sleep and health behavior prior to getting underway (baseline) and 1–2 days prior to completing a 2-week underway (underway). Primary outcomes included the PROMIS Sleep-Related Impairment scale (P-SRI) and the PROMIS Sleep Disturbance scale (P-SD). While underway, participants self-reported their diet quality, daily caffeine and nicotine intake, overall health, and daily time spent exercising; these factors were included as covariates in all analyses. Linear mixed effects models were used to explore the within-subject effect of baseline vs. underway sleep and a between-subjects effect by ship class (i.e., DDG or LHD). Independent t tests and chi-square tests were used to compare ship groups at baseline.
Results: Participants within ship class had a similar age, time in military service, and sex (p≥.06). Across both ship classes, there were increases in severity of sleep-related daytime impairment and sleep disturbances between baseline and underway (P-SRI: B=5.2±0.6; P-SD: B=3.4±0.5; p<.001). Additionally, DDG participants had a significantly greater increase in sleep-related impairment between baseline and underway compared with their LHD-class counterparts (Group*Time interaction effect: B=4.3±0.9, p<.001; LHD: 54.5±0.6 [baseline] vs. 54.5±0.5 [underway], DDG: 54.9±0.6 [baseline] vs. 60.2±0.6 [underway]).
Conclusion: These results suggest sleep-related impairment and sleep disturbances are greater while underway compared with an in-port environment. Although preliminary, these results suggest that differential impacts on sleep-related impairment may occur across ship classes, even when undergoing similar underway events. Further research is needed to understand how insufficient sleep and its consequences change in shipboard environments and how these effects may vary between ship classes so as to better inform targeted naval-focused sleep health improvement strategies.
Support (If Any): Military Operational Medicine Research Program under work unit no. N2010.

0143

FIREFIGHTERS' SLEEPINESS AND TOTAL SLEEP TIME VARIES THROUGHOUT THEIR SHIFT SCHEDULE.

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Introduction: Most career firefighters in the US are allowed to rest and sleep, yet at the same time must be ready to respond to emergencies. We recently found that inter-daily rhythms in firefighter total sleep time (TST) and that the rhythms are related to their shift schedule. Considering the relationship between sleep duration and health outcomes, the purpose of this research is to assess the daily relationship between preceding TST and sleepiness throughout two popular fire department shift schedules.
Methods: Firefighters participated in a pre-experimental, longitudinal sleep study that assessed sleep over 18 days on the 24-hours on and 48-hours off (24/48) (n=22) and again 18 days, six-months after firefighters transitioned to the 48-hours on and 96-hours off (48/96) shift schedules (n=20). Daily TST was assessed using actigraphy and the Emergency Services Sleep Diary and daily sleepiness was assessed using the Epworth Sleepiness Scale (ESS), completed every afternoon at 1:00 PM.
Results: The results of the one-way repeated measures ANOVA for each schedule indicated a statistically significant difference in ESS scores among days within the 24/48 ($F(2,42) = 8.56$, $p<0.01$) and 48/49 shift schedule ($F(5,95) = 7.40$, $p<0.05$). Using pre-shift as baseline, differences of preceding TST and afternoon sleepiness were related in the 24/48 ($r(64)= -.62$, $p \leq .001$) and 48/96 ($r(118)= -.54$, $p \leq .001$) shift schedule. The greatest mean levels of sleepiness occurred on days in which firefighters commuted to and from the fire station. During non-workdays, mean afternoon sleepiness decreased as firefighters returned to baseline TST.
Conclusion: Firefighters experienced an inverse relationship between preceding TST and afternoon sleepiness. The least TST occurred on commute days; firefighters begin shift with insufficient sleep and drove home with insufficient sleep. Subsequently, firefighters experienced greatest levels of sleepiness during those afternoons. The findings of daily variation in TST and sleepiness highlight the importance for firefighters to prioritize sleep so that they begin shift well rested and commute home well rested. In addition, the implication of the results questions whether other acute health outcomes also vary within fire department shift schedules.
Support (If Any):

0144

IDENTIFICATION OF SLEEP FACTORS RELATED TO BLOOD PRESSURE IN EMERGENCY MEDICINE HEALTHCARE WORKERS

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Introduction: Emergency Department (ED) healthcare workers (HCWs) may be at elevated risk for the development of cardiovascular disease (CVD), due in part to sleep and/or circadian disturbances. This study aimed to evaluate the relationship of sleep factors with blood pressure, a primary marker of CVD risk, in ED HCWs.
Methods: Participants were HCWs (physicians, nurses, advanced practice providers, technicians, etc.) from 4 EDs in New York City who completed study procedures between November 2020-October 2021. Participants completed a 2-week data burst, which included sleep/activity (Fitbit Inspire) and home blood pressure monitoring (Omron 5 Series BP7250; preceding and following their main daily sleep episode). Linear regression models, adjusted for age, gender, and race/ethnicity, were conducted predicting blood pressure from sleep factors.
Results: The sample included n=74 ED HCWs (mean [SD] age=38.4 [8.7] years). Most were female (62.2%) and non-Hispanic/Latino White (55.6%). Mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) were 116.1 (12.5) mmHg and 75.1 (7.6) mmHg, respectively. Actigraphy-derived sleep factor means for the data burst period were: a) Total sleep time (TST): 6.8 (1.0) hours; b) Sleep efficiency (SE): 94.5 (2.2)%; c) Percentage of main sleep episodes throughout the burst with TST <6 hours: 25.9 (20.8)%; d) Sleep start time: 24:06 (01:24); and e) Within-subject inter-daily bedtime variability (i.e., SD of sleep start times): 2.4 (1.8) hours. Higher TST was associated with lower SBP (B [SE] =-0.50 [0.30] mmHg/10 min, p=.04) and DBP (B [SE] =-0.50 [0.20] mmHg/10 min, p=.01). Greater SE was associated with lower SBP (B [SE] =-1.23

[0.55], mmHg/%, p=.03) and DBP (B [SE] =-1.05 [0.39], mmHg/%, p=.01). A higher proportion of nights with TST <6 hours was associated with higher DBP (B [SE] =1.4 [0.40], mmHg/10%, p<0.01) but not SBP. Sleep start time and bedtime variability were not associated with BP.

Conclusion: These findings provide support for the relationship between sleep and blood pressure. Of note, data were collected during the COVID-19 pandemic, which may impact observed relationships. Because this is a cross-sectional analysis, the causal direction of the association may be (at least partially) reversed. Further research should examine psychological and work-related factors in ED HCWs that may modify these relationships, e.g., stress/anxiety, burnout, and job strain, and include assessments of the circadian system.

Support (If Any): R01HL146911

0145

BREATHING PATTERN ESTIMATED BY BREATHING RATE VARIABILITY CORRELATED WITH AMPLITUDE OF LOW FREQUENCY RESTING STATE MRI FLUCTUATIONS MAY PREDICT SLEEP QUALITY

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Introduction: We recently showed that people with obstructive sleep apnea (OSA) have higher breathing rate (BR) variability (BRV) in population (Pal et al. 2021)1. Simultaneously, Lynch et al. 20202 had assessed impaired breathing in the resting state healthy Human Connectome Dataset, and identified 21 people in each of the three groups of breathing patterns: eupnea (clean), sighs (deep breath) and suspected apnea breathing pattern (burst). During resting state functional MRI recordings, increased amplitude of low frequency fluctuations (ALFF) were found within areas related to hyperarousal such as the midbrain and bilateral extra-nucleus, whereas decreased ALFF were found within areas associated with memory and attention involving the parietal and occipital lobule and others; furthermore, the altered ALFF was associated with sleep efficiency (Ran et al. 20173). Could altered breathing pattern reflect an altered spontaneous neuronal activity state measured by fractional ALFF (fALFF) and associated psycho-physiological markers of sleep quality? Our goal was to characterize BRV and fALFF from the resting state HCP data in the three breathing pattern groups identified in Lynch et al. 2020 along with their psycho-physiological states including sleep quality measured by Pittsburg Sleep Quality Index (PSQI).

Methods: In the three groups (n=21 X 3), clean group (6 males) age (mean±std. dev) 29±4 years, deep breath group (5 males) 29±4 years, burst group (14 males) 30±4 years - we calculated BR, absolute BRV (Interquartile range of BR) and relative BRV% from 15 minutes of resting state respiration belt data; and, fALFF from the minimally preprocessed resting state fMRI data filtered at 0.1-0.08 Hz and smoothed. We correlated fALFF with BR, BRV. Additionally, in the three groups, we report the mean±stdev of PSQI, BMI, systolic and diastolic blood pressure (BP), self-reported anxiety, attention problem, aggression scores along with their correlations with the absolute BRV.

Results: Absolute BRV was lower in deep breath group 3±3 breaths per minute (bpm) compared to clean (4±2 bpm) and burst (4±3 bpm) groups. BR was also lower in deep breath 14±7 bpm and correlated with BRV at Pearson R = 0.57 ($p<0.05$), compared to 18±2 bpm, R = -0.51 ($p<0.05$) in clean group and 18±3 bpm, R = 0.2 in burst group. In the deep breath group, the relative change in BRV 24±14%, correlated less with absolute BRV R = 0.78 ($p<0.05$) compared to the clean 24±13%, R = 0.98 ($p<0.05$) and burst groups 24±18%, R = 0.97 ($p<0.05$) indicating some voluntary sighs in the deep breath group as also validated by visual data inspection. The sleep quality (lower PSQI better sleep quality) was best in the clean 4±2 points, compared to both deep breath 5±3 and burst groups 5±3. Improved psychophysiological state in the clean and deep breath group compared to burst group was indicated by the systolic BP (121±12, 121±13 and 128±14 mmHg), BMI (25±5, 26±5, 28±6 kg/m2), anxiety (5±5, 5±5, 7±7)/attention problems (5±3, 5±4, 7±4)/aggression (3±2, 3±3, 5±2) scores in clean, deep breath and burst groups respectively. Only in the burst group, higher BRV correlated with higher BMI (R = 0.5, $p<0.05$). fALFF correlated with BRV ($p<0.05$, FWE corrected), not BR in all three groups at the cerebrospinal fluid (CSF) ventricles. With BRV as co-variate, burst group showed higher fALFF activity ($p<0.001$, uncorrected) compared to both clean and deep breath groups at the visual and somatosensory regions. Additionally, fALFF at the central executive network (CEN) was higher ($p<0.001$, uncorrected) for both clean and deep breath groups compared to burst. Interestingly, the clean group as well as the burst group had higher right somatosensory fALFF activity compared to deep breath group, that corresponded to the lower BRV in deep breath group.

Conclusion: Higher fALFF activity of burst compared to clean and deep breath groups in the visual and somatosensory regions were associated with sleep deprivation states (Dai et al., 20124; Wang et al., 20165 , Ran et al. 20173). Higher CEN fALFF activity indicating better sleep and physiological states (Zeighami et al., 20216, Ran et al. 20173) were found in the clean and deep breath groups compared to burst. Higher right somatosensory fALFF activity in the clean and burst groups compared to deep breath indicating higher breathing related movements in the groups having higher BR and BRV (clean and burst) compared to the deep breath group. The fALFF results are consistent with the indication of breathing coupled hemodynamic and CSF low-frequency oscillations that indicate sleep/wakefulness states during resting state (Fultz 20197). Overall, our study supports that BRV could be a potential indicator of psychophysiology, and taking sighs or deep breaths could potentially improve some psycho-neurophysiological states but not necessarily sleep quality. As indicated earlier by Lynch et al. 20202, males report more burst breathing pattern while females report more deep breathing pattern indicating the ability to take deep breaths may counteract potential sleep disordered breathing problems.

Support (If Any): HL135562

0146

SEVOFLURANE PRECONDITIONING PROMOTES SLEEP REINTEGRATION FROM LIPOPOLYSACCHARIDE INDUCED SHATTERED SLEEP

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Introduction: Anesthesia and sleep partially share neural circuits, yet little is known regarding the effect of anesthetics on sleep. Anesthetic agents exhibit a variety of biological effects concomitant with anesthesia. Sevoflurane, one of the wildly used volatile anesthetics, is known to increase the survival of sepsis model mice. Systemic inflammation like sepsis increases the inflammatory mediators in the brain affecting sleep dynamics with increase in NREM and decrease in REM. We hypothesized that sevoflurane preconditioning positively impacts disturbed sleep caused by systemic inflammation.

Methods: We conducted a prospective, randomized laboratory investigation in C57BL/6J mice. A mouse model of lipopolysaccharide (LPS)-induced systemic inflammation was employed to investigate the effects of sevoflurane on sleep recovery. We evaluated symptoms recovery through electroencephalography/electromyography (EEG/EMG) and histological studies. The mice were exposed to 2% sevoflurane before and after peritoneal injection of LPS. The EEG and EMG were recorded for 24 h after the procedure. Brain tissue was harvested after the sevoflurane/LPS procedure and was immunostained using individual antibodies against choline acetyltransferase (ChAT) and Fos.[YI1] We quantitatively analyzed the ChAT-positive and ChAT/Fos double-positive cells

in the pedunculopontine tegmental nucleus and laterodorsal tegmental nucleus (PPTg/LDTg).

Results: Compared to control mice, mice preconditioned with sevoflurane but not post-conditioned showed a significant recuperation in rapid eye movement (REM) sleep and waking time during EEG recording following the LPS challenge. They also demonstrated shorter REM latency and restored theta power, indicating an early recovery from LPS-altered sleep. The bouts of REM episodes were retained with sevoflurane preconditioning. The number of ChAT/Fos double-positive cells in the PPTg/LDTg decreased by LPS challenge. However, group with sevoflurane preconditioning followed by LPS challenge showed higher number of activated neurons, restoring physiological degree of activation.

Conclusion: Compared to control mice, mice preconditioned with sevoflurane but not post-conditioned showed a significant recuperation in rapid eye movement (REM) sleep and waking time during EEG recording following the LPS challenge. They also demonstrated shorter REM latency and restored theta power, indicating an early recovery from LPS-altered sleep. The bouts of REM episodes were retained with sevoflurane preconditioning. The number of ChAT/Fos double-positive cells in the PPTg/LDTg decreased by LPS challenge. However, group with sevoflurane preconditioning followed by LPS challenge showed higher number of activated neurons, restoring physiological degree of activation.

Support (If Any):

0147

ELECTROPHYSIOLOGIC LOCALIZATION OF PATHOLOGICAL BRAIN TISSUE IS ACCOMPLISHED WITH INTRACRANIAL SLEEP STAGING

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Introduction: Low Frequency brain rhythms facilitate communication across large spatial regions in the brain and high frequency rhythms are thought to signify local processing among nearby assemblies. A heavily investigated mode by which these low frequency and high frequency phenomenon interact is Phase-Amplitude Coupling)PAC). This phenomenon has recently shown promise as a novel electrophysiologic biomarker, in a number of neurologic diseases. In 10 patients undergoing phase-2 monitoring for the evaluation of surgical resection and in whom temporal depth electrodes were implanted, we investigated electrophysiologic relationships of PAC in epileptogenic (seizure onset zone or SOZ) and non-epileptogenic tissue (non-SOZ). That this biomarker can differentiate pathologic from non-pathologic brain and has been established with ictal and pre-ictal data, but less so with interictal data. Here we show that this biomarker can differentiate interictally. We also show PAC activity is related to interictal epileptiform discharges and high frequency activity. Importantly, we also show a differential level of PAC in slow-wave-sleep from NREM1-2 and awake. And finally we show that localization of pathologic tissue sensitivity and specificity is optimal when utilizing beta or alpha phase onto high-gamma or Ripple with knowledge of the sleep stage. Illustrating some of the physiologic nature of this biomarker in human epilepsy will provide a basis for understanding the mechanism of neurologic disease and normal physiology of brain communication, details which are at this point ready to be utilized in neurotechnological therapies to treat and understand both.

Methods: Per Institutional Review Board protocol, 10 patients who were under evaluation for resective surgery for MRE at Mayo Clinic in Rochester MN were included in this study. IRB approved the study and necessary consenting procedures were followed prior to any data acquisition. All subjects had bilaterally placed intracranial depth electrodes with usually 8 contacts. In some cases not all contacts could be used for data acquisition (hardware or recording problems). 6 Subjects of this cohort had scalp and EMG recordings concurrently placed for the purposes of sleep scoring. Subject recordings were ignored for POD-1 as anesthetics were dissipating. Subjects then stayed in the ICU ranging from 3-12 days before explanation.Pathological tissue identified as seizure onset zone (SOZ) was determined from phase II monitoring and determined by a trained neurologist. Sleep staging was done with expert-in-the-loop semi automated methods described elsewhere but overseen by a trained neurologist. Behavioral state was determined with scalp EEG signals and verified by a neurologist board certified in sleep medicine. All EEG recordings were bandpass filtered 0.3-75Hz and 60Hz notch filtered for scoring. Visual sleep scoring was in accordance with standard methods with modification for replacing the electrooculogram (EOG) recording with FP1, FP2, FPZ scalp electrodes. Wakefulness was determined by the presence of eye blinks visualized in fronto-parietal scalp leads, accompanied by posteriorly dominant alpha rhythms (8 - 12 Hz) comprising >50% of the epoch. Slow-wave sleep (N3) was scored when high-voltage (>75 uV) delta (0.5 - 3 Hz) frequency scalp EEG activity was present in at least 20% of the epoch (i.e., at least 6 s within a 30 s epoch) in the frontal derivations using conventional International 10-20 System electrode placements (FP1, FP2, FZ, F3, F4, CZ, C3, C4, O1, O2, and Oz). Phase Amplitude Coupling with Coherency Angle CFC. A Hanning taper n points is the length of the sliding time window. Next, the coherency CFC(fmodulating,fmodulated) was estimated between signal {Xt} and the estimate of the time-course of power{Pt(fmodulated)} for a given frequency fmodulating. The coherence was the absolute value of the CFC . The phase difference between the signal at fmodualting and the power at fmodulated is given by the angle of the coherency arg(CFC). In this case $_{\gamma}$ refer to a 1024 points Hanning window and * to the complex conjugate. This allowed us to characterize the phase-to-power cross-frequency interaction with respect to f and fmodulated sensor by sensor. The spike detection algorithm was utlized to evaluated successive 1 minute blocks of iEEG and removes artifact channels. Individual channels were defined as average slope greater than 10 SD outside of mean slopes of all channels. Second, iEEG was bandpass filtered 20-50Hz to identify possible spikes, where a sharp discharge must last between 20-70ms. Absolute amplitudes of peaks greater than 4SD of channel mean amplitude were noted as potential spike locations for further consideration. Third, raw iEEG was bandpass filtered (2nd order Butterworth) 1-35Hz. A scaling factor is determined by finding a value that will bring the median of all channel amplitudes to 70uV. All channels are multiplied by this scaling factor. Once the data have been scaled, the amplitude and slope of each half-wave of the potential spikes identified previously in step 2 are calculated and the values are compared to static thresholds (Total amplitude of both half-waves > 600μV, slope of each half-wave > 7μV/ms, duration of each half-wave > 10ms). Potential spikes with half-waves that exceed these thresholds are marked as interictal spikes.HFOs were detected using a Hilbert transform-based method, as previously reported. Here, the discrete time series is transformed into an analytic signal, where the real part is the original signal, and the imaginary part is the Hilbert transform of the original, x(t).

Results: Holding constant the frequency for amplitude to include all high activity (30-175Hz), beta is the best localizing (not statistically significant from alpha) band. Holding the frequency for phase,

constant, there is no statistical difference between LG, HG, and ripple in terms of pathological bain tissue localization. Examining different frequencies for phase in varied behavioral/sleep states using 12 minute awake segments were used in all 10 patients, localization is best via AUROC when delta is the frequency band used to calculate PAC in Slow Wave Sleep / NREM3.Interictal Epileptiform spiking is seen with much higher regularity, although correlated and seen in the SOZ. A great deal of the associated elevations in wide-spectrum (0.5-30 modulating 65-175Hz) PAC (here defined as >2 SD across the entire 2 hour period and assessed across all channels) occurred with IEDs. Since 3 second segments were used to calculate PAC values, sometimes 2 IEDs were within a single epoch although in a small minority of observations. PAC elevations are seen with IEDs and with HFO, although to a greater extend with spikes. However, some IEDs are not associated with elevations in PAC. In fact most detected IEDs were not associated with elevated PAC values or with HFOs for that matter. A minority of IEDs are associated with elevated PAC values and HFOs. At the group and individual levels the average spike count per patient, grouping all SOZ and non-SOZ electrodes together, there is not a statistically significant effect, but if the average count is taken per electrode within a single patient, a significant difference was noted at p = .0031. Subjects on average had 15 (SEM 0.15) electrodes and SOZ electrode counts of 3 (SEM 0.71). When analyzing IED + elevated PAC, grouped SOZ electrodes among patients and within individuals show a strongly significant effect (.0004). When taking into account electrode numbers within each group this significance only increases (.0001). At the individual level, significance of $p<0.05$ is seen for all but one patient in this cohort.

Conclusion: Sleep Stage is critical in the analysis of pathological brain from non-pathological brain and electrophysiologic biomarkers behave differently in the different behavioral states. Here we found evidence to support his proposition in the following ways: low frequency delta phase modulates a broad high frequency amplitude in N3 and has relevance for brain pathology. Phase-Amplitude Coupling is increased in pathologic tissue. Peaks in PAC occur sporadically and infrequently in these patients. PAC is correlated with Interictal Epileptiform Discharges and High Frequency Oscillations however most Interictal Epileptiform Discharges are unrelated to peaks in Phase-Amplitude Coupling. Low Frequency Activity in Beta-band modulates broad high frequency power across low gamma, high gamma, and ripple bands.

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0148

ASSOCIATIONS BETWEEN SUBJECTIVE AND OBJECTIVE SLEEP OUTCOMES AND NIGHTLY PAIN CHANGES IN A CHRONIC PAIN SAMPLE

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Introduction: Patients with chronic pain often experience poor sleep. Research demonstrating the bidirectional nature of the pain/sleep association has focused on interindividual patterns based on between person averages, leaving acute, intraindividual patterns based on night-to-night fluctuations understudied. Because both pain and sleep fluctuate considerably, better understanding of those fluctuations may provide important insight into the pain/sleep relationship. Here we examine inter- and intraindividual associations between subjective and objective sleep outcomes and nightly pain changes in individuals with chronic pain and sleep complaints.

Methods: Adults with chronic pain and sleep complaints (n=169, Mage=52, SD= 12, 95% female) completed 14 days of actigraphy and sleep diaries each morning and evening. Evening diaries recorded pain and sleep medication use (yes/no), and evening pain intensity (0-none, 100-most intense). Actigraphy and morning diaries recorded sleep onset latency (SOL), wake after sleep onset (WASO), total sleep time (TST), and morning pain intensity (0-none, 100-most intense). A nightly pain difference score (morning – evening) was calculated, where positive values indicate worse morning pain relative to previous evening pain. Multilevel models examined the inter- and intraindividual associations between sleep (subjective and objective SOL, WASO, TST) and nightly pain difference scores. Analyses controlled for age, sleep, and pain medication use.

Results: Greater interindividual subjective WASO was associated (B=0.06, SE=0.03, p=0.02) with greater interindividual pain difference scores. Other interindividual sleep outcomes (subjective and objective) were not significantly associated with interindividual pain difference scores. There were no associations between sleep outcomes (subjective and objective) and pain difference scores at the intraindividual level.

Conclusion: Findings show sleep and pain were not linked at the daily, intraindividual level. However, on average, greater WASO was linked with worse morning relative to evening pain. Thus, although a single night of poor sleep may not impact pain, the buildup of fragmented sleep over time may interfere with restorative properties of sleep and exacerbate morning pain. Future work should investigate mechanisms underlying sleep fragmentation (e.g., sleep architecture, physiological arousal) and how such factors relate to nightly pain changes.

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0149

RELIABILITY OF HEART RATE VARIABILITY DURING STABLE AND DISRUPTED POLYSOMNOGRAPHIC SLEEP

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Introduction: Heart rate variability (HRV) is a common metric to estimate autonomic activity during sleep. Frequency-domain HRV is quantified as low (LF) and high (HF) frequency, whereas HRV time-domain indices include root mean square of successive R-R interval differences (RMSSD), and percentage of successive R-R intervals differing by more than 50 ms (pNN50). Despite high HRV use during sleep, it is unknown whether sleep disturbance changes overall reliability of frequency- and time-domain HRV. The purpose of this present study was to determine whether HRV was reliable across arousal-free and arousal-containing periods of sleep.

Methods: Twenty-seven participants (11 male, 16 female, 26±1 years, 27±1 kg/m2) were given an 8-hour sleep opportunity, equipped with continuous two-lead electrocardiography (ECG) and overnight polysomnography (PSG). The ECG recordings were analyzed via fast-Fourier transformation for frequency-domain HRV in a custom software as LF (0.04-0.15 Hz) and HF (0.15-0.4 Hz) HRV. Time-domain HRV was

quantified as RMSSD and pNN50. Two separate stable sleep periods (range, 5-10min) absent of arousals were recorded, along with two separate disrupted periods of sleep with at least one arousal were selected in stage II sleep (N2), slow wave sleep (SWS), and rapid eye movement (REM) sleep. LF and HF HRV was log10 transformed due to non-normal distribution. Statistical analysis included intraclass correlations (ICC) of HRV across the four stable and disrupted periods of sleep, with separate ICC analyses across sleep stages ($\alpha = 0.05$).

Results: Time-domain measures (RRI, RMSSD, pNN50) were reliable across arousal-free and arousal-containing sleep cycles, for all three stages (ICC>0.9, p<0.05). HF HRV exhibited similar reliability patterns across N2 sleep (ICC=0.960, p<0.001), SWS (ICC=0.955, p<0.001), and REM sleep (ICC=0.924, p<0.001). LF HRV was reliable in two stages of stable and disrupted sleep in N2 (ICC=0.903, p<0.001), REM (ICC=0.907, p<0.001) sleep, and trending in SWS (ICC=0.616, p=0.089) sleep.

Conclusion: Time- and frequency-domain HRV were reliable between stable sleep with and without cortical arousals, with the exception of LF HRV during SWS. Taken together, HRV may provide a reliable, indirect index of autonomic activity across stable and disrupted sleep.

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0150

AFTERNOON NAPPING DOES NOT IMPACT AUTONOMIC FUNCTION IN HEALTHY ADULTS

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Introduction: Proper overnight sleep is important for autonomic nervous system function. However, less is known about the effects of daytime napping on wake autonomic regulation. In the present study, we assessed autonomic function following a daytime nap. We hypothesized that a 90-minute afternoon nap would significantly improve wake heart rate variability (HRV) and blood pressure (BP).

Methods: Fourteen participants (7 female, 24±1 years, 24 ±1 kg/m2) took part in the study. Subjects completed an autonomic function test after no nap (control condition) or a 90-minute nap opportunity (nap condition) on separate days using a randomized, crossover design. During the autonomic test, participants were fitted with three-lead electrocardiography (ECG), continuous beat-to-beat blood pressure (Finapres NOVA, Netherlands), and respiratory monitoring (pneumobelt). The autonomic function test consisted of 5-minutes of spontaneous breathing, 5-minutes of controlled breathing (15 breaths/min), and a 2-minute cold pressor test (CPT). Frequency-domain HRV in the low (LF, 0.04-0.15 Hz) and high frequency (HF, 0.15-0.4 Hz) components were determined via Fast Fourier transformation. Time-domain HRV was quantified using RMSSD and pNN50. Paired sample t-tests were completed between the control and nap sessions.

Results: Mean total sleep time (TST) for the nap session was 74±5 minutes. Contrary to our hypothesis, an afternoon nap did not change wake heart rate (HR, Control: 70±3 vs. Nap: 68±3 bpm, p = .31) or mean arterial pressure (MAP, Control: 77±3 vs. Nap: 83±3 mmHg, p = 0.70). Similarly, no differences were observed in HF (Control: 2632±628 vs. Nap: 2150±494 ms2, p = .33), LF (Control: 1702±373 vs. Nap: 1345±257 ms2, p = .20), or LF/HF (Control: 92±16 vs. Nap: 92±17%, p = .97) between conditions. RMSSD (Control: 82±12 vs. Nap: 79±11 ms, p = .723) and pNN50 (Control: 43±6 vs. Nap: 47±6%, p = .30) were not impacted by a daytime nap. Lastly, changes in HR (Control: Δ14±3 vs Nap: Δ18±3 bpm, p = .114) and MAP (Control: Δ23±4 vs. ΔNap: 27±4 mmHg, p = .28) during CPT were not different between conditions.

Conclusion: An afternoon nap does not appear to significantly influence autonomic function at rest or during CPT in young healthy adults.

Support (If Any):

0151

SUBJECTIVE SLEEP ONSET LATENCY IS INFLUENCED BY THE SLEEP STRUCTURE AND BODY HEAT LOSS IN HUMAN SUBJECTS.

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Introduction: Humans can estimate the time that has elapsed during sleep (time estimation ability; TEA). Although research on the TEA during sleep has advanced in the field of sleep research, few studies have focused on the relationship between the subjective sleep onset latency (SOL), which is an indicator of TEA, and objective sleep structures, body heat loss, and body temperature. This paper investigates the association of the subjective SOL with sleep structures such as the objective SOL, duration of each sleep stage, subjective sleep parameters, and body heat loss in healthy young participants.

Methods: Twenty six participants (7 men and 19 women, mean age of 21.5 ± 0.5 years) having no sleep problems participated in a 1-hour polysomnographic recording that obtained objective sleep parameters during the daytime while temperatures of the skin (i.e., dorsum of the hand and foot, forehead, and subclavian) and eardrum were recorded at intervals of 1 min. The distal–proximal skin temperature gradient (DPG), which is a good predictor of body heat loss and sleepiness, was calculated. Subjective parameters, such as the subjective SOL, sleep time, sleep depth, sleepiness, and mood, were evaluated before and after sleep. We examined the association of the subjective SOL with objective sleep parameters, DPG, and other subjective parameters.

Results: Most participants estimated their sleep latency to be longer than their actual SOL (mean objective SOL of 7.6 min vs. subjective SOL of 13.7 min). The objective SOL was significantly correlated with each sleep stage parameter whereas the subjective SOL was negatively correlated with the stage N2 sleep duration (Rho = −0.454, p = 0.020) and correlated with the stage N2 sleep latency (Rho = 0.402, p = 0.051). Participants who estimated a shorter subjective SOL had a higher DPG before sleep periods than that after sleep onset (Rho = −0.692, p < 0.001). Additionally, the subjective SOL was correlated with the subjective sleep depth, subjective wake after sleep onset, and restorative sleep.

Conclusion: The subjective sleep onset latency in the healthy young participants was affected by the degree of body heat loss before sleep onset and stable shallow nonrapid-eye-movement sleep.

Support (If Any):

0152

A FUNCTIONAL ROLE FOR GLOBAL SLOW OSCILLATIONS IN MAJOR DEPRESSIVE DISORDER WITH HYPERSOMNIA

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Introduction: Sleep slow oscillations (SOs, 0.5-1.5Hz) during stages N2 and N3 sleep facilitate cortical communication and are important to the restorative properties of sleep. Spatiotemporal clustering analysis of SOs on the electrode manifold has identified 3 topographically distinct patterns of SOs: Frontal, Local, and Global. Global SOs are spatially widespread cortical events implicated in anterior-posterior long-range communication. However, their precise functional significance is not fully understood. Patients experiencing Major Depressive Disorder (MDD) with comorbid hypersomnia show local deficits in parieto-central slow wave activity, suggesting that frontally-initiated SOs are not propagating to parietal-central regions. Hypersomnolence in MDD may therefore be connected to insufficiently restorative sleep. Here, we retrospectively examine associations between Global SOs in N2 and N3 sleep and hypersomnia severity in healthy controls and MDD patients.

Methods: MDD patients with (n=22) and without (n=22) hypersomnia, and age-gender balanced healthy controls (n=22) underwent overnight polysomnography studies with 256-channel hdEEG. After detection of SOs, our previously developed classification method was applied retrospectively to all SOs in this dataset, including leveraging a k-means clustering algorithm naïve to the MDD/Hypersomnia label. Fractions of global SOs during stages N2 and N3 were compared across healthy controls and MDD patients. Finally, the fraction of global SOs occurring during the night was correlated against all subjects' individual scores on the Hypersomnia Severity Index (HSI).

Results: Analysis of EEG data revealed pronounced, but not statistically significant deficits in global SOs during N3 sleep in MDD patients with comorbid hypersomnia. These deficits were significantly correlated with HSI when examining MDD patients together (Pearson's $r = -0.397$, $p<0.01$).

Conclusion: Our findings suggest that MDD patients with higher hypersomnia severity experience more pronounced deficits in Global SOs. Given the importance of SOs for the restorative properties of sleep, it is possible that MDD patients with hypersomnia might incur an enhanced sleep need driven by the homeostatic cost of a deficit in Global SOs.. Future studies are necessary to investigate causal mechanisms underlying these findings.

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0153

BRIGHT LIGHT EXPOSITION POTENTIATES THE VASODILATION PROMOTED BY DYNAMIC HANDGRIP EXERCISE

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Introduction: Bright light (~5000 lux) directed at human skin increases plasma nitric oxide concentration promoting vasodilation, with increased skeletal muscle blood flow (BF) and decreased blood pressure (BP). The same stimulus directed at the eyes increases sympathetic activity, promoting vasoconstriction and increased BP. If bright light potentiates or mitigates the vasodilation promoted during exercise is unknown. Therefore, this study aimed to compare the effect of different intensities of lights on vasodilation of the active skeletal muscle during dynamic handgrip exercise.

Methods: Eleven healthy and physically inactive adult men (29±6 years) participated of the current study. All experiments were conducted between June and July 2021, beginning at 5 PM and under constant environmental conditions. Subjects performed dynamic handgrip exercise using the dominant arm at a 90º angle in the supine position with 2 s cycles of contraction and relaxation for 6 min at 40% of maximal voluntary contraction during the three experimental condition in a randomized order: (BL) 5000 lux, Control light (CL) 500 lux, and Dim light (DL) ≤8 lux. In each condition, (BL, CL or DL), subjects remained in a rested state for 20 min before 1 min of baseline assessment followed by exercise. Conditions were always separated by 20 min of washout (under CL). Assessments comprised BF, vascular conductance (VC), and diameter of brachial artery of exercising arm (Ultrasound); BP measured in the rest arm (Photoplethysmography) and heart rate (ECG). Two-way ANOVA for repeated measures, $p\leq0.05$.

Results: Baseline were not different ($p>0.05$). During exercise, BF and VC increased in the three conditions, however it was potentiated by BL ($p < 0.0001$ and $p < 0.0001$, respectively) compared with CL (+19% and +15%, respectively) and with DL (+12% and +11%, respectively). Arterial diameter increased similarly in the three conditions. Mean BP increased in the three conditions, however it was attenuated in the BL compared with DL (-23%) and similar to CL (<0.0001).

Conclusion: Bright light can potentiate skeletal muscle vasodilation during a small-mass muscle exercise attenuating the increase of BP.

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0154

DIFFERENCES IN MONOCYTE ACTIVATION BETWEEN PEOPLE WITH TREATED HIV INFECTION WITH OR WITHOUT OSA

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Introduction: Obstructive sleep apnea (OSA) has been associated with low grade systemic inflammation and greater cardiovascular risk, but the specific pathways mediating these effects are unclear. Monocyte activation is implicated in the development of cardiovascular disease in people with treated HIV infection. We sought to evaluate the impact of OSA on monocyte activation in people living with human immunodeficiency virus (HIV) infection.

Methods: Ten HIV seropositive participants with undetectable (<50 copies/mL) HIV viremia and at least one year of antiretroviral therapy underwent home sleep apnea testing to evaluate for the presence (apnea-hypopnea index -AHI4% ≥15 events/hour) or absence (AHI4% <5 events/hour) of OSA. Mononuclear cells were extracted and analyzed by flow cytometry. The composition of monocyte subsets (classical, intermediate, patrolling) was assessed using surface markers. Intracellular tumor necrosis factor alpha (TNFα), interleukin 1β (IL-1β), and interleukin 6 (IL-6) levels were measured by median fluorescence intensity (MFI, unit: au) and log-transformed. Differences in monocyte subset composition and intracellular cytokine levels between those with and without OSA were analyzed by t-test.
Results: Participants had a mean ± SD age of 61 ± 4.7 years, were 50% female, 80% Black race and had well-constituted CD4+ counts (mean ± SD: 934 ± 283 cells/ml). The mean AHI4% among participants with OSA (n=4) was 21.8 ± 4.4 events/hour whereas controls (n=6) had an AHI4% of 2.4 ± 2.0 events/hour (p-value = 0.001). There was no difference in the proportion of classical monocytes between groups (mean ± SD 83.8% ± 11.5% in participants with OSA vs. 84.9% ± 7.5% in controls, p=0.86). Intracellular TNFα was greater in monocytes from participants with OSA vs. controls (log-transformed MFI 3.49±0.20 au vs. 3.00±0.35 au, p=0.03). Additionally, there was a trend toward greater intracellular concentrations of IL-1β (mean log-transformed MFI 3.24±0.15 au vs. 2.95±0.48 au, p=0.22) and IL-6 (log-transformed MFI 3.28±0.16 au vs. 2.91±0.64 au, p=0.23), in participants with OSA vs. controls.
Conclusion: Pro-inflammatory cytokine levels are greater in monocytes obtained from people with treated HIV infection with OSA compared to those without OSA. Our findings suggest OSA may exacerbate chronic inflammation and cardiovascular risk in chronic HIV infection.
Support (If Any): HL082610 and American Thoracic Society ASPIRE Fellowship

0155

AGREEMENT BETWEEN SURVEY AND ACTIGRAPHY-ASSESSED SLEEP TIMING AMONG ADOLESCENTS IN THE FAMILY LIFE, ACTIVITY, SUN, HEALTH, AND EATING (FLASHE) STUDY

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Introduction: Epidemiologists often deploy questionnaires or wearable monitors to quantify sleep. The extent to which self-report and device-derived sleep measures agree among adolescents are not well known. This study describes the agreement between survey and actigraphy-assessed sleep timing among adolescents in the 2014 Family Life, Activity, Sun, Health, and Eating (FLASHE) study.
Methods: FLASHE survey and motion substudy participants provided data for analyses. FLASHE participants (12–17y) completed a survey that captured self-reported usual sleep and wake times on weekdays and weekends. A subset of participants also wore an ActiGraph GT3X+ accelerometer on the wrist for 24-hours for seven days and completed a daily log for time in/out of bed. Actigraphy-assessed sleep periods were estimated using the Sadeh algorithm. Total sleep time (TST) and sleep midpoint for weekday and weekend, social jetlag, and chronotype were computed for survey and actigraphy and means and standard deviations were examined. Paired t-tests were used to test mean differences between measures overall and stratified by sex and school level (middle vs. high school).
Results: The analytic sample included 372 U.S. adolescents: 49% were female, 53% were high schoolers, 28% had overweight/obesity, and 62% identified as non-Hispanic White. Compared to actigraphy, surveys overestimated TST by an average of 2.6h on weekdays (8.7h [SD:1.4h] vs. 6.1h [SD:1.5h], $p<0.001$) and 3.1h on weekends (9.5h [SD:1.5h] vs. 6.4h [SD:1.8h], $p<0.001$), and resulted in earlier weekday sleep midpoints (02:49 [SD:1h:24 min] vs. 03:40 [SD:1h, 42 min], $p<0.001$); differences were not significant for weekend midpoints. Survey estimates were larger than actigraphy for social jetlag (1.7h [SD:1.2] vs. 0.9h [SD:1.3], $p<0.001$) and resulted in an earlier chronotype (04:16 [SD:1h, 38min] vs. 04:30 [SD:1hr, 43 min], $p=0.004$). Findings remained consistent when stratified by sex and school level except for chronotype: estimates were not significantly different among females or high schoolers.
Conclusion: The large discrepancies between survey and actigraphy-based sleep timing highlight the importance of understanding what type of data each assessment method is capturing in adolescents (self-report vs. objective measures; average vs. daily sleep). Differences between self-report and device-derived sleep data should be considered during study development and when comparing results across studies.
Support (If Any):

0156

REST-ACTIVITY PROFILES AMONG U.S. ADULTS IN A NATIONALLY REPRESENTATIVE SAMPLE: A FUNCTIONAL PRINCIPAL COMPONENT ANALYSIS

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Introduction: The 24-hour rest and activity behaviors are fundamental human behaviors essential to health and well-being. Functional principal component analysis (fPCA) is a flexible approach for characterizing rest-activity rhythms and does not rely on a priori assumptions about the activity shape. The objective of our study is to apply fPCA to a nationally representative sample of American adults to characterize variations in the 24-hour rest-activity pattern, determine how the pattern differs according to demographic, socioeconomic and work characteristics, and examine its associations with general health status.
Methods: The current analysis used data from adults 25 or older in the National Health and Nutrition Examination Survey (NHANES, 2011-2014). We applied fPCA to derive profiles of the rest-activity cycle for overall, weekday and weekend activity patterns. We examined the association between each rest-activity profile in relation to age, gender, race/ethnicity, education, income and working status using multiple linear regression. We also used multiple logistic regression to determine the relationship between each rest-activity profile and the likelihood of reporting poor or fair health.
Results: We identified four distinct profiles (i.e., high amplitude, early rise, prolonged activity window, biphasic pattern) that together accounted for 86.8% of total variation in the study sample. We identified numerous associations between each rest-activity profile and multiple sociodemographic characteristics. We also found evidence suggesting the associations differed between weekdays and weekends. Finally, we reported that the rest-activity profiles were associated with self-rated health.
Conclusion: Our study provided evidence suggesting that rest-activity patterns in human populations are shaped by multiple demographic, socioeconomic and work factors, and are correlated with health status.
Support (If Any):

0157

SLEEP ICEBREAKERS AND BEHAVIORAL CHANGE: IF YOU COULD TELL PEOPLE ONLY ONE THING ABOUT SLEEP, WHAT SHOULD IT BE?

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Introduction: Insufficient sleep is widespread in the general population, but education and outreach can combat this problem. Informal learning settings, like museums, provide unique opportunities for educating a local community. However, in such settings, engagement with the content relies on the topic's ability to immediately incite interest. Therefore, we developed and tested a series of sleep "icebreakers" (brief, informal facts) to determine their effectiveness in eliciting interest in sleep science and encouraging behavioral change.
Methods: Five hundred and twenty-one participants were recruited via the local museum (n=103) and Amazon Mechanical Turk (n=418). Participants viewed eight sleep icebreakers (randomly-selected from a bank of 16 icebreakers) and rated whether they knew it already,

if they found it interesting, and if it made them want to learn more. Participants also completed questionnaires on demographics, sleep health/attitudes, and future intended sleep behaviors.
Results: Both the museum member and general population samples showed substantial interest in sleep science, regardless of age, gender, race/ethnicity, socioeconomic status, neighborhood disadvantage, prior sleep knowledge, and prior sleep health/attitudes. The most effective icebreakers related to REM sleep behavior disorder, sleep in Alzheimer's disease, unihemispheric sleep, dreaming, and sleep state misperception. Importantly, the more the icebreakers interested participants, the more likely they were to formulate a specific plan to change their sleep behaviors (OR: 1.55, $p = .001$), express willingness to post to social media platforms (OR: 1.46, $p < .01$), and indicate willingness to donate to an exhibit on sleep (OR: 2.51, $p < .001$), even after controlling for psychosocial, sleep health/attitudes, and demographic measures.
Conclusion: If you could only tell someone one thing about sleep, there are a lot of good options. This interest in sleep science was enjoyed by individuals regardless of psychosocial, educational, and demographic backgrounds, and the icebreakers encouraged half of participants to form an intention to change their sleep behaviors. Coupling icebreakers with opportunities for personalized learning, and providing structure to formulate specific plans to change sleep behaviors, are promising directions for sleep health outreach efforts.
Support (If Any): National Science Foundation (1920730 and 1943323)

0158

RISK PERCEPTION, OUTCOME EXPECTANCY, AND TREATMENT SELF-EFFICACY AMONG WOMEN AND MEN WITH OBSTRUCTIVE SLEEP APNEA (OSA)

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Introduction: Continuous positive airway pressure (CPAP) is the first-line therapy for OSA. CPAP improves OSA severity, sleep architecture, and daytime symptoms. The effectiveness of CPAP, however, is limited to poor adherence. Individual's risk perception, outcome expectancy, and treatment self-efficacy predict CPAP adherence. CPAP adherence also differs by sex. However, it is unknown if predictors of CPAP use are different for women and men. We thus assessed sex differences in risk perception, outcome expectancy, and treatment self-efficacy among those with OSA.
Methods: Individuals enrolled to date (target n=267) in the NICEPAP study (NCT05067088), a prospective, observational cohort examining predictors of CPAP adherence, were included. Adults newly diagnosed with OSA prescribed CPAP therapy were included, while those with a need for non-CPAP therapy or unstable medical conditions (e.g., cancer receiving chemotherapy, severe lung, heart, or mental health disorders) were excluded. The exposure was sex. Co-primary outcomes were sub-scale scores from the Self-Efficacy Measure for Sleep Apnea (SEMSA) tool: Perceived Risk, Outcome Expectancies, and Treatment Self-Efficacy before starting CPAP. In addition, we assessed a comprehensive set of established psycho-social and biomedical CPAP adherence predictors using validated measures. SEMSA sub-scale scores for males and females were compared using Kruskal-Wallis statistics.
Results: We analyzed data for 33 females and 19 males. Females and males were 52 (41.0, 60.5) and 52 (35.0, 58) years old respectively (median [Q1, Q3]). Ten of 33 females and 4 of 19 males were Black with majority of others being White. The apnea-hypopnea index was 17.0 (9.1, 27.0) and 19.0 (13.3, 38.4), Epworth sleepiness scale and insomnia severity index scores were 9.0 (5.0, 12.0) & 15.0 (11.0, 18.0) and 6.0 (4.0, 9.0) & 17.0 (8.0, 19.5) for females and males respectively. There were no statistical differences in scores of Perceived Risk 2.4 (1.6, 2.9) vs 2.1 (1.8, 2.5) ($p=0.717$), Outcome Expectancies 2.8 (2.3, 3.4) vs 3.3 (2.4, 3.5) ($p=0.371$) or Treatment Self-Efficacy 3.1 (2.3, 3.7) vs 3.1 (2.0, 3.5) ($p=0.977$) for females vs. males.
Conclusion: We found no statistically significant differences in determinants of self-efficacy between women and men. Our findings may reflect a small sample size recruited to date or that self-efficacy of CPAP therapy is independent of sex.
Support (If Any): This work was supported by Parker B. Francis Foundation and National Heart, Lung, and Blood Institute/NIH (1K23HL159259-01).

0159

SLEEP-WAKE STABILITY AND VARIABILITY IN THE MIDDLE-AGED ADULT POPULATION: A UK BIOBANK STUDY

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Introduction: Given the increasing use of consumer, wrist-worn devices with triaxial accelerometry (actigraphy), understanding whether 24-hr activity patterns are associated with specific mental and physical health deficits is of paramount importance. The UK Biobank, a community-based sample of adults in the United Kingdom, provides an opportunity to examine this question given its size (more than 100,000 actigraphy records) and scope (association health records). As a first step in understanding these relationships, understanding the impact of missing data, ways to interpolate missing data, and the general characteristics of 24-hr patterns is necessary.
Methods: A subset (n=70) of complete (i.e., no missing data) actigraphy records from individuals participating in the UK Biobank were used to examine the impact of missing data on intradaily variability (IV; rhythm fragmentation) and interdaily stability (IS; rhythm regularity). Data were intentionally removed and imputed and the impact of the manipulations was examined with Bland-Altman statistics. After determining the best imputation method and the limits of the method, it was applied to missing data in the full cohort, resulting in 82,840 actigraphy records. These were examined for IV and IS, as well as relative amplitude and the timing of L5 and M10. Data were categorized by age, gender, ethnicity, BMI and material deprivation. ANOVA with eta^2 effect sizes were used for comparisons. Data shown as median (interquartile range).
Results: Relative to IV and IS, median and mean imputation methods corrected for missing data of up to 24 hours. Linear imputation of long (>3 hours) missing data worsened IV and IS scores. Non-parametric patterns in the general population were within expected range, with IV=0.89(0.74-1.05), IS=0.55(0.46-0.63), RA=0.90(0.85-0.99), L5-timing=00:52 (00:07-01:37), and M10-timing=08:25(07:40-09:20). Stratifying by gender, age, ethnicity, BMI and material deprivation resulted in significant

differences within all groups (p<0.0001), but small effect sizes (0.0019-0.00052).
Conclusion: Median imputation is useful for correcting for missing data (<24 hours) when examining IV and IS. Non-parametric analysis of the general population indicated values within the expected range. Even though there were significant differences in non-parametric outcomes between genders, age groups, ethnicities, body-mass index and material deprivation, none of these had significant effect sizes.
Support (If Any): This research has been conducted using the UK Biobank Resource

0160

SLEEP AND HIGH BODY MASS INDEX IN ADOLESCENTS: ETHNICITY AND SOCIOECONOMIC STATUS AS MODERATORS

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Introduction: Sleep deficiency and obesity disproportionately affect racial/ethnic minorities and those with lower socioeconomic status (SES). Considerable research has linked sleep deficiency to overweight/obesity. Less clear is the interactive effects of sleep duration (SD) and social determinants (i.e., SES, race/ethnicity) on weight status in adolescents. This study examined the role of race/ethnicity and SES as moderators of associations between SD and overweight/obesity in a nationally representative adolescent sample.
Methods: Using the National Survey of Children's Health 2017-2018 dataset, we included adolescents (10-17 y.o.) with available SD and Body Mass Index (BMI) data (n=24,337). Parents reported children's SD and sleep regularity. Adolescents with a BMI ≥85th percentile were classified as overweight/obese. We used a stepwise approach to identify SES factors and covariates to include in the model. Accounting for complex survey design, as well as sleep regularity and selected covariates (i.e., age, sex, smoking, exercise, and depression, diabetes), logistic regression (STATA 16.0) estimated the interaction between SD and selected social determinants (i.e., race/ethnicity, family income, primary caregiver education, neighborhood condition) in adolescents.
Results: Every hour increase in SD was associated with a 7% decrease in the odds of high BMI (OR=0.93, p=0.03) regardless of race/ethnicity and SES. There were significant interactions between SD and social determinants. Compared with the White (OR=0.88, p<0.001), the association between longer sleep and lower odds of high BMI was weakened and even reversed in Hispanic adolescents (OR=1.20, p=0.02). Similarly, family income below 100% FPL (versus 300% or above) (OR=1.19, p=0.02) and primary caregiver having education below high school (versus high school or above) (OR=1.15, p=0.03) also attenuated the associations. Poor neighborhood condition was not a moderator but independently associated with high BMI (OR=1.57, p=0.02).
Conclusion: Adolescence may be a sensitive period that sets the stage for the interaction between sleep and social risk factors on overweight/obesity. Increasing sleep duration is associated with decreased risk of overweight/obesity, but the protective role is dampened in Hispanic adolescents and those with the low SES. Our findings suggest that sleep-related prevention and intervention efforts should target at-risk populations who experience health disparities.
Support (If Any):

0161

STRATEGIES FOR ENHANCING RECRUITMENT OF ADULTS FOR RANDOMIZED CONTROLLED TRIAL AMONG HETEROGENOUS SAMPLE OF CANCER SURVIVORS WITH INSOMNIA AMID THE COVID PANDEMIC

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Introduction: Challenges associated with recruiting participants in a longitudinal research study have been recognized yet remain a major barrier for researchers. The current study details strategies used in recruiting a heterogenous sample of cancer survivors with insomnia from multiple clinical sites, referral sources and outreach.
Methods: Enrollment goals were 158 participants over 3 years (June 2019 to May 2022). Recruitment strategies included 1) face-to-face (FTF) recruitment at hospital clinics; 2) posting recruitment flyers in clinical settings; 3) completion of insomnia screening instrument at community clinic sites; 4) research registries; 5) institutional social media outreach; 6) community events; 7) PI interview and request for study volunteers in local newspaper; and 8) ongoing engagement and communication with recruited participants.
Results: 108 of 158 participants have been recruited and completed baseline surveys; 9 participants dropped out. To date, 42 of 49 (85.7%) participants have completed the 12-month study. June 2019 through December 2019 FTF recruitment occurred, where 104 were eligible and 32 (30.76%) were enrolled. Due to changes in study personnel and the COVID pandemic restricting access to in-person recruitment and enrollment, the study pivoted to develop protocols for electronic consent and enrollment using video conferencing. In addition, research databases, institutional social media, community events and local newspaper were utilized, where 76 of 239 (31.79%) interested participants enrolled. The most effective recruitment strategies included on-site FTF recruitment (57.9%) and local newspaper interview (13.88%). The local newspaper interview was the most cost-effective considering personnel costs associated with FTF recruitment.
Conclusion: Despite the onset of the COVID pandemic during the recruitment phase, we were able to pivot and employ innovative techniques to meet our targeted enrollment goal for the projected study deadline. FTF recruitment, perceived value by clinic staff in benefitting cancer survivors, and participants' acceptance of video-conferencing were significant contributors. The importance of building and maintaining relationships with providers and nurses in local clinical sites cannot be underestimated.
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0162

SLEEP IN PACIFIC OCEAN POPULATIONS: A SCOPING REVIEW

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Introduction: Sleep research focused on individuals categorized as Native Hawaiian/Pacific Islander suggests that sleep deficiencies(short sleep, insomnia symptoms) are highly prevalent among adults. Given the large degree of diversity related to family origin of Pacific ocean populations and assimilation, a more robust understanding of unique risk factors related to sleep challenges for these heterogenous communities is warranted. We are conducting a scoping review of studies that examine associations of health, practice, sociodemographic, and influential mechanisms with sleep in Pacific ocean populations.
Methods: A literature search conducted in Medline, Embase, Psychinfo, and Cochrane encompassed three domains: sleep-related and sleep-disorder terms, oceanic island and ancestry names, and sub-population names inclusive of the geographic regions of Polynesia, Micronesia, and Melanesia. The primary search retrieved 2364 articles. Studies were selected by abstract and full text analysis by one reviewer, followed by independent data extraction by four reviewers. Using a standardized form, synthesis of results and assessment of sample demographics, sampling strategy, sleep data source and findings, theoretical framework, and covariates was conducted per article. Inclusion criteria included articles with at least one quantitative sleep-related finding for a Pacific island population. We excluded non-primary research articles. Studies that categorically combined other racial/ethnic groups with Pacific ocean populations(Asian/Pacific Islander) or geographic regions(Asian-Pacific region) in reporting findings were excluded.
Results: Of the 99 articles included in the review, 18 included children/adolescents, 56 included adults, 13 included multiple age groups, and 12 reported no or only mean participant age. Seventy-two studies allowed participants to self-identify their major ethnic group as a single race(e.g., Tongan, Kirbati). Seventeen studies included objective methods(e.g., actigraphy). The most common sleep-related factors were issues of sleep patterns(n=51), physical health(n=43), mental health(n=28), socioeconomic deprivation(n=26), daytime sleepiness/fatigue(n=20), sleep disorders or symptoms (snoring)(n=17), sleep-supporting practices(n=9), and integration into main culture/born in US(n=3).
Conclusion: Preliminary results suggest that few studies have examined identifiable factors that may impact sleep within diverse Pacific ocean communities, with most studies focused on adults, self-reporting, and sleep pattern problems. Future studies should examine underlying mechanisms related to sleep deficiencies in both children and adults to better understand variability in risk across the lifespan.
Support (If Any):

0163

THE DIFFERENTIAL RELATIONSHIP BETWEEN BERTHING HABITABILITY, JOB STRESS, AND WORKLOAD ON SELF-REPORTED SLEEP DEFICIENCY IN A REPRESENTATIVE SAMPLE OF SAILORS ATTACHED TO U.S. NAVY WARSHIPS

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Introduction: Berthing habitability factors (e.g., noise, temperature, lighting) and workload are known to negatively impact sleep for Sailors serving onboard United States (U.S.) Navy warships. However, it is unknown what factors have the strongest relationship with sleep outcomes. Using data from a representative sample of warships, the relationships between berthing habitability, job stress, and workload on sleep were explored.
Methods: Participants (N = 3,313; 84% ≤ 35 yrs, 55% white) from 33 warships voluntarily completed an online survey. Using structural equation modeling, latent factors of workload, job stress, and berthing habitability were modeled to test relationships with self-reported sleep deficiency. Sleep deficiency was calculated by dividing the sleep obtained on their ship ("How many hours of sleep (to include naps) per day do you get when sleeping onboard your current ship?") by their required sleep amount ("How many hours of sleep do you require to feel well-rested?"). Job stress was modeled with three scores from questions related to job stress (1=strongly disagree, 5=strongly agree). Habitability was modeled by the degree in which environmental factors disturbed sleep (1=not at all, 5=extremely). Workload was modeled by the hours completed performing job-related tasks (e.g., work center, watch team, training, meetings).
Results: On average, participants reported shorter sleep durations on their ship than they require (Ship: 5.2±1.4 hrs; Required: 7.0±1.3 hrs, mean±SD). Overall, habitability, job stress, and workload were negatively related to sleep deficiency (standardized βs=-0.16 to -0.26, ps < 0.001, CFI/TLI > 0.90, RMSEA=0.056). Among all latent constructs, larger coefficients were found for the direct path from workload to sleep deficiency than those from habitability (β1=-0.16 vs β2=-0.12). Additionally, watch team duties loaded most heavily onto the construct of workload, suggesting that it contributed most to the relationship of workload with sleep deficiency.
Conclusion: These results confirm that workload and berthing habitability are related to sleep deficiency in Sailors while serving onboard U.S. Navy Ships. Additionally, greater workload may have a stronger relationship with sleep deficiency than other factors such as habitability. Future research should utilize objective measures of sleep and workload to better estimate their relationships with sleep.
Support (If Any): Military Operational Medicine Research Program (MOMRP) under work unit no. N2010.

0164

OVERNIGHT OXIMETRY IN GENERATIONALLY UN-ADAPTED RESIDENTS OF HIGH-ALTITUDE

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Introduction: A recent population shift has increased residents of high-altitude locations. Additionally, travel infrastructure has created the opportunity for rapid displacement to high altitudes without adaptation. Residing at high-altitude is a physiological challenge, which increases the risk of overnight hypoxia from sleep disordered breathing. Sleep disordered breathing, including sleep apnea, is a risk factor for a variety of additional negative health outcomes. Additional information is needed to understand the physiology of high-altitude adaptation in generationally un-adapted residents and prevent negative health outcomes.
Methods: Healthy residents of high altitude participated in this community-supported observational study. Health and altitude history were gathered. Participants completed one night of overnight oxygen monitoring with finger pulse oximetry. Participants with BMI >30 kg/m2, sleep time <4 or >10 hours were excluded.
Results: Total of 41 participants included, 68.3% female, 44.9±13.0 years (SD), BMI 23.7±2.5 kg/m2. Participants resided at altitudes between 2500–3048 m. Participants were also characterized by their years at altitude and percent of life spent at altitude, average 15.9±12.2 years (median 13) and average 33.0±21.7% of life at altitude. Neither years or percent of life at altitude were predicted percent of time below 88% O2 on overnight pulse oximetry (R2 = 0.04 and 0.03, both p>0.12). Multiple Linear Regression indicated BMI was the only factor that explained a signification portion of the variance in adaptation (p<0.01).
Conclusion: In a generationally un-adapted population of high-altitude residents, years at altitude and percent of life at altitude do not explain the variance of adaptation to altitude as measured by percent of night spent hypoxic with less than 88% SpO2. While these data do not provide support for an adaptation response based on time at altitude, they indicate future directions in human altitude adaptation should focus on other covariates, potentially including genetic differences.
Support (If Any):

0165

PREVALENCE OF INSOMNIA AND/OR OBSTRUCTIVE SLEEP APNEA IN A SAMPLE OF FIT-FOR-DUTY U.S. NAVY SAILORS

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Introduction: Obstructive sleep apnea (OSA) and insomnia are prevalent sleep disorders, known to negatively impact sleep and well-being in civilian populations. Studies of these sleep disorders in military populations have focused on individuals seeking treatment for a sleep disorder, rather than the general active-duty service member (ADSM). In this study, we investigated the prevalence of OSA and insomnia in U.S. Navy sailors serving on surface ships.
Methods: We analyzed pre-collected data from 548 fit-for-duty sailors (MD age=25 years, IQR=9; 79.4% males) serving on nine US Navy surface ships. Sailors reported their demographic information, health-related habits, and whether they had been diagnosed with OSA and/or insomnia. Sleep was assessed with wrist-worn actigraphy (371 sailors).
Results: Approximately 66.8% of sailors reported having an exercise routine, 83.6% reported drinking caffeinated beverages, and 29.1% used nicotine products. In terms of disorders, 15 (2.7%) male sailors reported having been diagnosed with OSA, 12 (2.2%) with insomnia (8 males, 4 females), and one (0.2%) male sailor with comorbid insomnia and OSA. Compared to sailors without a sleep disorder, sailors with OSA were older (MD=34 years, IQR=7; p<0.001) and had a higher proportion of nicotine users (53.3%) (p=0.041). Sailors with insomnia did not differ from sailors with no sleep disorder in terms of demographics and habits. The average daily sleep duration was 6.4±1.0 hours, which did not differ between disorder groups. However, sailors with insomnia had more sleep episodes per day (MD=1.7; IQR=0.9) than sailors without a sleep disorder (MD=1.3, IQR=0.5; p=0.042).
Conclusion: Only ~5% of the sailors in our study reported a diagnosis of OSA and/or insomnia, whereas one in three people in the general population has a sleep disorder. Notably, all sailors, regardless of sleep disorder diagnosis, exhibited short sleep durations. Previous studies of ADSMs found that ~48% reported poor enough sleep quality to meet the diagnostic criteria for a sleep disorder. Thus, our results suggest that, despite evidence that many Sailors exhibited sleep problems, sleep disorders are significantly underdiagnosed in ADSMs.
Support (If Any): This work was supported in part by the Naval Medical Research Center's Naval Advanced Medical Development Program (MIPR N3239820WXHN007).

0166

THE ROLE OF VITAMIN B12 SUPPLEMENTATION IN THE ASSOCIATION BETWEEN DEPRESSION SYMPTOMS AND DAYTIME SLEEPINESS

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Introduction: A substantial body of literature has demonstrated an association between depression and sleep disturbances. While depressive symptoms are strongly associated with limited sleep duration and quality, high depressive symptomology has been also linked to symptoms of hypersomnolence. Vitamin B12 supplementation is associated with reduced risk of depression and the enhancement of pharmacological treatment for depression, but less is known about the role of vitamin B12 on sleep disturbances associated with depressive symptoms. Thus, our current study examined vitamin B12 intake as a moderator of depression and daytime sleepiness in a national sample of adults.
Methods: The sample consisted of 5,553 adults who completed the 2017-18 National Health and Nutrition Examination Survey (M age=49.8, SD=18.6; 51.7% female). Participants reported on prescription and nonprescription dietary supplement use in the last 30 days, sleep habits and disorders adapted from the Munich Chronotype Questionnaire, and completed the Patient Health Questionnaire-9 for depression screening. All measures were administered by trained interviewers. A moderation analysis was performed using R statistical programming. The analysis controlled for age, gender, ethnicity, sleep duration, and other B-complex vitamins (e.g., B1, B2, B3, and B6).
Results: Depressive symptoms were significantly associated with greater daytime sleepiness (b=.06, p <.001). Furthermore, there was a significant interaction between depressive symptoms and vitamin B12 consumption (b=-.002, p=.003, R2=.12). Higher vitamin B12 consumption buffered the relationship between depressive symptoms and daytime sleepiness. In contrast, a stronger positive relationship between depressive symptoms and daytime sleepiness was observed among participants with lower Vitamin B12 consumption. Thus, the findings suggest that consuming vitamin B12 may be beneficial for counteracting daytime sleepiness associated with depression.
Conclusion: Findings from the current study suggest that vitamin B12 supplementation provides a small, but significant buffering effect on the relationship between depressive symptoms and daytime sleepiness. Although existing pharmacological and behavioral interventions for sleep and depression are clinically effective, vitamin B12 intake may be an additional modifiable behavior that could increase prognosis of treatment. Given the very modest interaction effect, further
Support (If Any):

0167

OBESITY-INDUCED BREATHING VARIABILITY DURING SLEEP IS NOT ENTIRELY ATTRIBUTED TO APNEAS AND SLEEP FRAGMENTATION

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Introduction: Obesity is a major cause of sleep-disordered breathing (SDB). Conventional metrics of SDB can be confounded by the effects of obesity on oxygenation and lack of standard definitions. Sleep fragmentation is frequently observed in obese individuals, but whether it occurs independently of SDB remains unknown. Quantitative analysis of ventilation may delineate the effects of obesity on breathing patterns and sleep fragmentation. We aimed to examine the effects of obesity on respiratory patterns during sleep and the relationship between obesity-related respiratory variability and sleep fragmentation.
Methods: Sleep recordings were performed in 15 lean C57BL/6J and 17 diet-induced obese (DIO) mice on the same genetic background. We applied Poincaré analysis of minute ventilation (VE) during sleep to estimate the breathing variability. Arousals were classified as respiratory when associated with ≥30% drops in VE from baseline.
Results: Breathing variability was significantly higher in DIO mice during NREM sleep, but not during REM sleep. Obesity-induced breathing variability could not be entirely attributed to apneas or arousals. Sleep fragmentation was 45% greater in DIO mice. Respiratory arousals comprised 15% of the arousals in both strains. Breathing variability was inversely associated with sleep fragmentation regardless of obesity.
Conclusion: Obesity increased respiratory variability during NREM sleep, which was not fully attributed to apneas and macro-sleep architecture. Obesity caused sleep fragmentation that was not entirely explained by SDB severity. Our quantitative analysis of VE identified differences in breathing variability in obesity that were not captured by traditional SDB metrics, which may be applicable for human SDB.
Support (If Any): NHLBI NIH R01 HL135483, 2R01 HL133100-05, R01 HL128970, and R01 HL13892; NINDS NIH R01 NS112266; American Academy of Sleep Medicine Foundation 238-BS-20; American Thoracic Society Unrestricted Award; Johns Hopkins Blaustein Pain Research Grant; American Heart Association Postdoctoral Fellowship Award 828142.

0168

SUBJECTIVE AND OBJECTIVE MARKERS OF SLEEPINESS IN DRIVERS

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Introduction: Sleepiness is associated with a decrease in cognitive abilities with effects comparable to those of alcohol. It remains one of the main causes of fatal road accidents. Various tools are available to assess sleepiness subjectively and objectively, such as questionnaires and multiple sleep latency test. However, the former are subject to intra- and inter-individual variability, and the latter is only feasible in a sleep laboratory. The main objective of this study was to explore new potential markers (biological, neurocognitive) to assess sleepiness in drivers. In this perspective, the easy-to-use BLAST attention test allows the evaluation of micro-fluctuations in vigilance. In addition, salivary markers are good physiological markers, easily accessible and non-invasive to collect. Recent studies have suggested that salivary a-amylase and oxalate may be biomarkers of sleep pressure.
Methods: 185 drivers (median age 44 years, 72% male, 15% obese) were included during a break at a highway service area, in the morning, while on the road for vacation. Questionnaires on sleepiness, sleep the day before departure, an attention test and two salivary samples (alpha-amylase and oxalate) were taken. Associations between subjective and objective measures of sleepiness, sleep characteristics and salivary concentrations were tested using regression models adjusted for confounding factors.
Results: The night before departure, 57% of drivers reduced their sleep time and more than ¼ slept 5 hours or less. The higher the number of miles to drive, the shorter the sleep time. 16% of the drivers complained of poor sleep quality and difficulty falling asleep. At the time of the test, 46% of the drivers felt drowsy. Poor sleep quality or difficulty falling asleep the night before departure was associated with increased sleepiness as assessed by the Stanford Sleepiness Scale and decreased attentional ability as assessed by the BLAST. No association between salivary samples and sleepiness was observed.
Conclusion: Sleep characteristics on the day before departure were associated with sleepiness and attentional performance. The Stanford Sleepiness Scale and the BLAST could be used by individual drivers in a self-evaluation context.
Support (If Any): This study was funded by the Vinci Foundation.

0169

USING SERIAL AWAKENINGS TO EXPLORE THE SPECTRAL SIGNATURE OF SLEEP STATE MISPERCEPTION

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Introduction: Sleep state misperception, or paradoxical insomnia, is a condition whereby an individual reports being awake even though polysomnographic evidence confirms they were asleep. Normally, an indication of sleep state misperception is determined by asking a patient to estimate the amount of wakefulness experienced after a full night of laboratory-monitored sleep. While clinically useful, this crude, post-hoc assessment does little to inform the neurobiological underpinnings of sleep state misperception. Here we used serial awakenings to exploit instances where a direct confirmation of sleep was followed by a subjective report of wakefulness.
Methods: 256 channel EEG with EMG, EOG and ECG was recorded in 19 primary insomnia (PI) subjects and 19 age- and sex-matched good sleeping controls (GSC) after a baseline sleep night ruled out comorbid disorders. After periods of stable sleep, participants were probed every 30 seconds with increasing intensity tones until a full awakening was achieved. Subjects were then asked to report whether they were awake or asleep before hearing the sound before going back to sleep. EEG data prior to the awakening was examined using multi-taper spectral analysis.
Results: Out of 464 serial awakenings (average 12 per subject, range 4-16), roughly 10% resulted in subjective wake reports during sleep (35 in NREM, 11 in REM; 24 in PI, 22 in GSC). Many of these occurrences included obvious arousals or other signs of wakefulness prior to the awakening tone. Altogether, 8 clean wake reports (4 in PI), occurred during stage N2 or N3 that could be matched with similarly clean data when the same subject reporting being asleep. Interestingly, spectral analysis of the 10 seconds prior to the awakening revealed significantly more alpha activity (9.1-11.3Hz paired t-test, $p < .05$) but no significant difference in slow wave activity. The alpha increase was localized to a mid-central region, similar to the alpha difference seen previously during deep sleep between PI and GSC groups, but also extended frontally.
Conclusion: Sleep state misperception may result from a localized increase in alpha activity while sleep persists. Serial awakenings are a useful tool for examining this paradoxical state.
Support (If Any): Funded by the MERCK Sharp and Dohme Corporation.

0170

SLOW OSCILLATION POWER AND HEART RATE VARIABILITY DURING SLEEP PREDICTS NEXT-DAY SUBJECTIVE SLEEPINESS IN HEALTHY, YOUNG ADULTS.

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Introduction: High amplitude, slow oscillations in the electroencephalogram (EEG) often characterize the central nervous system's homeostatic drive for sleep. Slow oscillations dominate the first part of the night and often dissipate as sleep need is satiated. These physiological changes are also reflected in next day subjective measures of sleepiness. Fluctuations in the autonomic nervous system, particularly parasympathetic activity, also coincide with slow wave sleep and are understood to represent bodily homeostasis. However, it is unclear if autonomic indicators effectively predict next-day sleepiness. Here, we investigated whether slow oscillatory (SO) power and cardiac autonomic activity during a night of sleep can predict next day subjective sleepiness.
Methods: 88 young (aged 18-35), healthy participants spent the night in a University sleep lab. Before and after sleep, participants completed the Karolinska Sleepiness Scale (KSS) to measure subjective sleepiness. Each participant slept with polysomnography, including electroencephalography and electrocardiography. From these measures, we assessed slow oscillation power (0.5-1Hz) and

high frequency heart rate variability (HRV; 0.15-0.45 Hz) --an indicator of parasympathetic, vagally-mediated cardiac tone-- during the first quartile of slow wave sleep. Paired T-tests compared the differences in KSS scores pre- and post-sleep. Pearson's correlations assessed bivariate associations between slow oscillatory power, high frequency HRV, and KSS scores. Mixed linear models assessed the ability of SO power and high frequency HRV to predict next day subjective sleepiness.
Results: No significant differences were found in KSS ratings pre- (M±SD = 4.23±1.92) and post-sleep (4.38±1.80). No bivariate correlations were present between pre-sleep KSS, SO, or high frequency HRV. A significant correlation between KSS-post sleep and SO power emerged (r=0.286, p=0.001). In Model 1, we found that SO power was a predictor of subjective sleepiness (p<0.001; AIC: 777.469). In Model 2, we included high frequency HRV and reduced the AIC to 515.588. Both slow oscillatory power (p<0.001) and high frequency HRV (p<0.001) were significant predictors of KSS after sleep in Model 2.
Conclusion: We found evidence that both central and autonomic indicators of sleep predict psychological measures of sleepiness. Using autonomic indicators to characterize physiological sleepiness, compared to in-lab polysomnography, may be a more generalizable and cost-effective approach.
Support (If Any):

0171

PARABRACHIAL-CGRP NEURONS REGULATE AWAKENINGS TO PAIN STIMULUS

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Introduction: The external lateral part of the PB (PBel), receives spinal afferents carrying pain-signals, which are then relayed to other brainstem and forebrain arousal areas. Many PBel neurons that express calcitonin gene-related peptide [CGRP; PBelCGRP] also receive spinal afferents carrying pain signals. Selective activation of PBelCGRP neurons, in CGRP-CreER mice, cause short latency cortical arousal, while inhibition of these neurons prevents waking to hypercapnia. Also, blocking CGRP receptors has a potential to reverse opiate tolerance in rodents, however, mechanism of action or the circuitry remains unknown.
Methods: To test if PBelCGRP is the critical relay node transmitting pain to induce cortical arousals, we conducted either genetic deletion or acute optogenetic inhibition of this node, in both inflammatory pain and opto-pain models. All mice were implanted for recording sleep. Inflammatory-pain model: CGRP-creER mice were bilaterally injected with AAV-Flex-DTA (n=10) to delete CGRP neurons in PBel or AAV-GFP (n=6; control). Both groups received a foot injection of either 5% formalin or saline (10 µl) and were recorded for the sleep.Opto-pain model: CGRP-ChR2 mice were injected in the PB with AAV-Flex-JAWS (n=5) and implanted with bilateral optical fibers directed to the PB, and miniature probes in the foot pad to facilitate stimulation of the nociceptors. We recorded sleep while stimulating nociceptors every 5 min with or without opto-inhibition of PBelCGRP.
Results: In mice with intact CGRP neurons, foot stimulation with formalin produced 100% wakefulness for the first three hours, while with deletion of PBCGRP neurons, pain induced sleep loss could be attenuated in both males (by 83%) and females(by 60%). This recovery of NREM sleep significantly correlated with loss of PBelCGRP. In the opto-pain model, opto-stimulation of nociceptors at 10Hz for 5 sec woke up mice in 100% of the trials with a short latency of 4.4 ± 0.78 sec, while opto-inhibition of PBelCGRP that expressed JAWS, by red laser that preceded the nociceptive stimulus by 20s, prevented stimulus-induced awakenings.
Conclusion: This suggests that PBelCGRP is the main relay node for awakening to pain. We are now investigating the terminal fields of the PBelCGRP neurons to assess which of them contribute to pain induced arousal.
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0172

BEHAVIORAL DRIVE IN FAMILIAL NATURAL SHORT SLEEPERS AND THEIR UNAFFECTED FAMILY MEMBERS

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Introduction: Those with familial natural short sleep (FNSS) report short sleep duration since youth. Mutations in four different genes in five families have been described leading to this autosomal dominant sleep pattern. Individuals with FNSS also have a cluster of other traits in addition to short sleep than can be termed "behavioral drive." Here we describe a new behavioral drive scale that aims to capture the distinct phenotype of those with FNSS.
Methods: Individuals reporting fewer than 6.5 hours of sleep when allowed to sleep ad libitum without any sleep-related complaint were interviewed to determine FNSS affected status from 2009 to 2021. Seven distinct non-sleep related traits were selected by consensus within the study team based on interviews with participants. Participants provided a self-rating on their degree of energy, pain tolerance, physical activity, ability to handle stress, productivity, hours working, and mental activity compared to other of the same age. Symptoms of mania and ADHD were also rated.
Results: 77 individuals meeting criteria for FNSS were enrolled along with 27 unaffected family members. Compared to unaffected family members, those with FNSS reported significantly more energy, pain tolerance, physical activity, ability to sit still, hours working, and mental activity. There was a trend towards significance for productivity. Four features of bipolar disorder were also queried, reckless decisions, rapid speech, impulsivity, and irritability, and there was no significant difference for any of these items between groups. Two symptoms of ADHD were included, concentration trouble and ability to sit still. Those with FNSS reported less concentration trouble than peers and an equal ability to sit still.
Conclusion: Those with FNSS have multiple distinct traits including greater energy, pain tolerance, physical activity, ability to handle stress, hours working, and mental activity compared to unaffected family. When grouped together these traits can be titled "behavioral drive." Further work will aim for validation of this scale in gene carriers and larger populations.
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0173

KYNURENINE AMINOTRANSFERASE II INHIBITION IMPROVES SLEEP ARCHITECTURE IN ADULT MALE AND FEMALE RATS EXPOSED TO KYNURENIC ACID ELEVATION DURING DEVELOPMENT

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Introduction: Dysregulated sleep and cognitive impairments are commonly reported in individuals with psychotic disorders, including schizophrenia (SZ) and bipolar disorder (BPD). Emerging evidence implicates the kynurenine pathway (KP) of tryptophan catabolism in the pathophysiology of psychotic disorders. Kynurenic acid (KYNA), a KP metabolite synthetized by kynurenine aminotransferases (KATs) from its biological precursor kynurenine, is elevated in brain tissue and the cerebrospinal fluid of patients with SZ and BPD. KYNA is hypothesized to play a key role in sleep disturbances, thus, we presently investigate if pharmacological inhibition of KAT II to reduce brain KYNA formation may overcome sleep.
Methods: We employed the embryonic kynurenine (EKyn) paradigm to induce KYNA elevation in the fetal brain (Pocivavsek et al 2014 Psychopharm). Wistar dams were fed either kynurenine (100 mg/day) (EKyn) or control wet mash (ECon) from embryonic day (ED) 15 to ED 22. Adult (postnatal day 56-85) male and female offspring were used in sleep studies (EEG/EMG telemetry) to evaluate the effectiveness of PF-04859989 (30 mg/kg, s.c.), an irreversible KAT II inhibitor. Each subject was treated at zeitgeber time (ZT) 0 with either vehicle or PF-04859989 and rapid-eye movement (REM) sleep, non-REM (NREM) sleep, and wakefulness parameters were assessed.
Results: KAT II inhibition significantly increased REM duration during the second half of the light phase in both male ($P<0.01$) and female ($P<0.05$) EKyn compared to vehicle treatment. PF-04859989 increased NREM duration and reduced wakefulness during the latter part of the dark phase in both ECon and EKyn male rats, accompanied with significant decrease in relative cage activity, but no differences were determined in female rats across 24 hr. Light phase analysis of spectral power during NREM sleep in EKyn rats revealed significant frequency by treatment interaction ($P<0.0001$) in males only, with enhanced delta power (0-4 Hz) after PF-04859989 treatment.
Conclusion: Acute decrease in brain KYNA mitigates sleep deficits and elicits higher quality sleep in male EKyn offspring, suggesting KAT II inhibition as a novel mechanistic approach to treating sleep deficiencies in a translationally-relevant preclinical paradigm.
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0174

THE ODDS RATIO PRODUCT AS A MARKER OF SLEEP HOMEOSTASIS

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Introduction: Classic EEG markers of sleep homeostasis (process S) usually study the level and amount of slow wave activity (SWA). In recent years, the odds ratio product (ORP) has been described as a novel quantitative measure of sleep depth (and conversely, arousability), which is derived from a four-digit permutation of the power in four respective frequency bands. Therefore, we sought to determine whether the ORP can also be used as a novel quantitative marker of process S.
Methods: Utilizing C3/C4 electrodes with TP9/TP10 reference, ORP was calculated from 25 nights in 15 patients. We used ORP from REM and NREM1-3 segments/bouts in each person's night(s) with varying number of data points per REM segment(s) in each night(s). Artifacts and wake segments were discarded from analysis. Average ORP is calculated for an individual bout per night per patient. Generalized Estimating Equation (GEE) modelling used GEEQBOX MATLAB toolbox to identify change in sleep depth over bouts. Resultant beta (β) values represented change in nightly sleep depth over sequential NREM/REM segments per patient. Significance was $p\leq0.000833$.
Results: From 15 people in the epilepsy monitoring unit, 3 did not have epilepsy. In NREM, the average ORP for C3/C4 is 1.26/1.19 (n=146307/125709). Average number of nightly NREM segments for C3/C4 are 4.64/4.9 (n=1261.27/1282.74 average ORP values per nightly segment). In REM, the average ORP for C3/C4 is 1.44/1.44 (n=47629/43528). Average number of nightly REM segments for C3/C4 are 4.36/4.38 (n=418.68/453.33 average ORP values per nightly segment). Signifying the change in sleep depth the beta values from C3/C4 were consistently positive: REM (epilepsy 0.033/0.018, non-epilepsy 0.096/0.053), NREM (epilepsy 0.047/0.053, non-epilepsy 0.026/0.064).
Conclusion: As a marker of sleep homeostasis, SWA decreases across a period of sleep. Consistently positive beta values derived from ORP in both REM and NREM are comparable because they demonstrate shallower sleep depth (i.e. greater arousability) across segments over nights as sleep debt is repaid. Also as expected, REM has a higher ORP than NREM. Furthermore, our findings of positive beta values are robust against sleep stage and pathology (i.e. epilepsy). Therefore, these findings may represent a novel quantitative marker of sleep homeostasis that includes REM.
Support (If Any):

0175

SLEEP CHARACTERISTICS IN OLDER ADULTS AND THE RISK OF ALZHEIMER'S DISEASE MORTALITY: THE NIH-AARP DIET AND HEALTH STUDY

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Introduction: Alzheimer's Disease (AD) is the most common form of dementia (1) and the 6th leading cause of death in the U.S. (2). Additionally, it is estimated that currently 5 million individuals are living with AD in the U.S. and this number is expected to triple by 2050 (3). Decades of research has identified various risk factors for AD and a wide array of cardiometabolic risk factors, such as hypertension, type 2 diabetes, metabolic syndrome and obesity (4, 5, 6, 7). Several behavioral factors have also been suggested to play a protective role against AD, including Mediterranean-type diet (8), physical activity (9), and cognitively stimulating activities (10, 11). More recently, growing evidence has pointed sleep deficiency as a modifiable risk factor for AD. (12).
Methods: The purpose of our study was to determine if sleep and napping were associated with AD mortality. We used data from the NIH-AARP Diet and Health Study. Sleep duration and napping were self-reported and AD death were ascertained via linkage to the National Death Index. Of 566,398 members (aged 50-71) who completed baseline questionnaire in 1995-1996, 337,373 participants were included (195,656 men and 137,018 women).
Results: Long sleep and napping were both associated with increased AD mortality. Specifically, 9+ hours of sleep was associated with 50% increase (Hazard Ratio 1.50, 95% CI (1.17-1.92)) in AD mortality when compared 7-8 hours, while napping for 1+ hours was associated with 29% increase (1.29 (1.08, 1.55)) when compared to no napping. Results appeared to be stronger in men and remained after removing AD deaths within first 5 years after baseline.
Conclusion: The results of this study showed that 9+ hours sleep duration was associated with a 50% increase in AD mortality risk when compared to people who slept between 7 and 8 hours, particularly in men. Additional longitudinal studies that follow middle-aged adults through death and include objective measures of sleep and AD related biomarkers are needed to further elucidate the mechanisms contributing to cognitive decline and AD death. Such studies would be useful for informing interventions designed to reduce risk of AD and AD-related death.
Support (If Any):

0176

COMPARING SLEEP AND HOMEOSTATIC SLEEP DRIVE BETWEEN RETIRED NIGHT SHIFT WORKERS AND RETIRED DAY WORKERS

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Introduction: Retired night shift workers report poorer sleep quality compared to retired day workers, even after returning to a nocturnal sleep schedule, suggesting a potential "scarring" of night shift work on sleep. History of sleep deprivation and sleep at an unfavorable circadian phase may compromise sleep and homeostatic sleep regulation, potentially contributing to poor sleep quality in retired night shift workers. This study compared sleep efficiency and homeostatic sleep regulation in response to sleep deprivation (delta EEG power during NREM sleep, theta EEG power during wakefulness) between retired night shift workers and retired day workers.
Methods: Participants (N = 75, mean age: 68.3 +/-5.5 years, 51% females, 87% non-Hispanic White) were 35 retired night shift workers and 40 age-, sex-, and race-equated retired day workers. Participants completed a 60-hour laboratory study including one baseline night of sleep, followed by 36 hours of sleep deprivation, followed by one recovery night of sleep. Sleep efficiency and NREM delta EEG power were measured by polysomnography on both nights, and waking theta EEG power was measured every other hour during the 36-hour sleep deprivation period. We analyzed the effects of group (retired night shift workers vs. retired day workers), time (baseline vs. recovery night for sleep efficiency and delta EEG power, hour for theta EEG power), and their interaction on each outcome using linear mixed models.
Results: Groups did not differ in sleep efficiency averaged across nights ($F=1.48$, $p>0.05$) or from baseline to recovery nights ($F=0.05$, $p>0.05$). Delta EEG responses to sleep deprivation did not differ by group ($F=0.33$, $p>0.05$). Compared to retired day workers, retired night shift workers showed greater overall waking EEG theta power during sleep deprivation ($F=13.20$, $p<0.001$). The group by time interaction was not significant ($F=0.36$, $p>0.05$), suggesting that group differences in theta EEG power were not due to increased sleep deprivation.
Conclusion: Sleep efficiency and homeostatic sleep regulation appeared to be preserved in retired night shift workers. Theta EEG power findings suggested greater sleep propensity during wakefulness in retired night shift workers. Interventions to improve sleep quality in retired night shift workers may leverage intact homeostatic sleep regulation mechanisms.
Support (If Any): R01AG047139, T32HL082610, T32HL07560, T32MH019986

0177

RELATIONSHIP BETWEEN SLEEP ARCHITECTURE AND AGE BY GENDER IN BRAZIL: BAEPENDI HEART STUDY

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Introduction: Sleep stage duration has been associated with age. However, few studies have examined sleep stages across adulthood in both men and women. The objective of this analysis was to describe sleep architecture across age by gender in a large cohort of Brazilian adults.

Methods: This ancillary study added polysomnography (PSG) recordings to the Baependi Heart study, a prospective family-based cohort of Brazilian adults. Preliminary analyses used data from 812 participants (517 women). Sleep was staged following standard criteria. Generalized linear models were used to assess associations between age (cubic polynomial) and sleep outcomes in analyses stratified by gender.

Results: Age ranged between 18 and 88 years. Mean age was 50.0 (SD = 13.3) for women and 49.9 (SD = 14.9) for men. Expected means for women at age 50 were 6.35 hours total sleep time (TST) (95% CI: 6.22, 6.48), 213.5 minutes in N2 (95% CI: 207.2, 219.9), and 75.6 minutes (95% CI: 71.9, 79.3) in REM. These were similar to expected means for men at age 50, which were 6.3 hours TST (95% CI: 6.12, 6.48), 212.9 minutes in N2 (95% CI: 204.0, 221.8), and 78.3 minutes (95% CI: 73.7, 82.8) in REM. Expected N3 at 50 years was higher in women (44.7 minutes i, 95% CI: 44.0, 45.5) than men (30.2 minutes,95% CI: 29.4, 31.1) and WASO duration was lower for women (62.6 minutes; 95% CI: 61.7, 63.5) than for men (69.8 minutes; 95% CI: 68.5, 71.1).Nonlinear relationships with age were demonstrated for N3, REM, and WASO. For example, in women there appears to be a steeper decline in N3 between approximately ages 20-40 years, a plateau until approximately 55-60 years and then another decline. Men also exhibit a steeper decline at younger ages followed by a more gradual decline that begins around 35-40 years. By contrast, TST showed a stable, linear decline with age in men and women.

Conclusion: Preliminary analyses suggest that the relationship between age and some sleep outcomes differ by gender. Future analyses on the full sample will consider splines for age to investigate further these non-linear relationships.

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0178

EXAMINING RATES AND CHANGE IN INSOMNIA SEVERITY AMONG VETERANS ENROLLED IN AN OUTPATIENT EXERCISE PROGRAM

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Introduction: Exercise moderately improves middle insomnia and sleep quality in older adults. GeroFit is a national structured exercise program for Veterans over age 60 that offers 14 virtual classes per month. Each 60-minute class has a combination of cardiovascular, resistance, flexibility, and balance training and is modified to accommodate the range of functional abilities. The purpose of this analysis was to characterize insomnia symptoms (using the Insomnia Severity Index [ISI]) among GeroFit participants across different time points and examine the impact of attendance on change in insomnia symptoms over time.

Methods: Veterans in the VA Boston GeroFit program (n=69; 60-93years; Meanage=74.3±8.3; 80.6%male; 80.6%White) were administered the ISI at baseline (n=32), 3-months (n=38), 6-months (n=23), and 12-months (n=21) after enrollment. Participants were categorized by ISI scores: no clinically significant insomnia (ISI=0-7), subthreshold insomnia (ISI=8-14), moderate clinical insomnia (ISI=15-21), and severe clinical insomnia (ISI=22-28). A repeated measures ANOVA was performed to assess for ISI score change over time by attendance rate.

Results: Veterans attended 64% of the 14 classes per month and exhibited a range of functional ability (Physical Function Subscale [SF-36] scores ranged from 11-29 at baseline). The rates of subthreshold and moderate insomnia were: baseline (15.6%;6.3%), 3-months (26.3%;13.2%), 6-months (30.4%;8.7%), and 12-months (38.1%;9.5%), respectively. Overall, ISI scores remained consistent over time as there were no significant score changes over the first 6 months (p=.121); however, participants with <50% attendance demonstrated a significant increase in ISI scores from baseline to 3months (p=.002).

Conclusion: Of Veterans participating in the VA Boston GeroFit program, about 1 in 10 reported moderate insomnia and 1 in 4 had subthreshold insomnia. Increasing attendance rates is important for improving sleep quality and more research is needed to clarify the "dose" of exercise required to reap meaningful gains in insomnia symptoms, particularly among Veterans with more severe symptoms. Given that 1/3 of participants reported at least subthreshold insomnia, future studies are needed to better understand whether supplemental interventions (e.g., sleep psychoeducation, stimulus control) might be offered to GeroFit participants with clinically significant insomnia symptoms, to dually target sleep and physical functioning.

Support (If Any):

0179

FACTOR ANALYSIS OF MULTIDIMENSIONAL SLEEP HEALTH DOMAINS IN OLDER ADULTS WITH ACTIGRAPHY: RESULTS FROM THE EINSTEIN AGING STUDY

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Introduction: The concept of Sleep Health, based on self-reports in the RU-SATED model, has been recently extended using parameters derived from 4 days of actigraphy in a cohort of older adults, yielding a 5-component model. Using a longer actigraphy time series from a separate study, the current factor analysis evaluates and extends a theoretically-driven, multi-dimensional sleep health construct in older adults.

Methods: Participants (N=291, mean age=77.2 years, 33% males; 47% white, 40% Black, 13% Hispanic/others) enrolled in The Einstein Aging Study were included. A random subsample of

100 participants were used for exploratory factor analysis (EFA); data from the remaining participants (N=191) were used for confirmatory factor analyses (CFA). All 23 objective measures (mean 15.6 valid days +/-SD=1.2) were derived from wrist actigraphy, including 16 from the actigraphy summary statistics, and 7 from extended cosinor models. Fit of CFA models were evaluated by CFI, TLI, RMSEA, SRMR.

Results: Consistent with prior research, beta was not included in the final factor structure because of its low loading on all six factors. CFA was performed on each factor and model fitting results were satisfactory (CFI > 0.94, TLI >0.92, RMSEA 90% confidence interval ranges from 0 to 0.23, and SRMR <0.05). EFA identified 6 factors, 5 consistent with prior research, and a sixth hypothesized factor (Rhythmicity) not identified previously.REGULARITY (of sleep across days): standard deviations of four sleep measures; midpoint, sleep onset time, night total sleep time (TST), and 24h TST.ALERTNESS/Sleepiness (daytime): amplitude, napping (mins and #/day).TIMING: sleep onset, midpoint, waketime (of nighttime sleep); up-Mesor, acrophase, down-Mesor. EFFICIENCY: sleep maintenance efficiency, wake after sleep onset.DURATION: night sleep duration, night TST, 24h sleep duration, 24h TST.RHYTHMICITY (pattern across days): mesor, alpha, and minimum.

Conclusion: These findings extend a multidimensional Sleep Health construct to include a Rhythmicity dimension when informed by extended objective data from older adults. Factors can be considered predictors of health outcomes, and targets for sleep interventions.

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0180

SEX DIFFERENCES IN THE ASSOCIATION BETWEEN MOOD AND ACTIGRAPHIC SLEEP VARIABILITY IN ADOLESCENTS

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Introduction: Poor mental health in adolescents has been linked to more variable sleep. However, most studies use self-reported measures of sleep. There is also a lack of research on sex differences in these associations, which is important given that poor emotional health is more common in female than male adolescents. The current study examined whether sleep variability measured through actigraphy was associated differently with self-reported mood in female versus male adolescents in between-person analyses.

Methods: Data were collected from a micro-longitudinal substudy of the age 15 wave of the Fragile Families and Child Wellbeing Study. Adolescents wore a wrist-actigraphy device and completed daily surveys for approximately one week (mean=5.6 actigraphy days; n range: 577-604 depending on the mood variable) where they reported levels of loneliness, happiness, excitement, and anger on a five-point Likert scale (0, not at all, to 4, extremely). Separate mixed models assessed whether sex moderated the association between mean mood and actigraphy-measured sleep variability measures including residual standard deviation (riSD) of sleep duration, onset, and offset; sleep regularity index (SRI), and social jetlag (|midpoint of sleep on school nights – midpoint of sleep on free nights|; n for social jetlag ranged from 363-376 depending on the mood variable).

Results: In both sexes, greater average happiness (β=−.11, p=.009) and excitement (β=−.11, p=006) were associated with less variability in sleep duration, and greater average excitement was associated with higher SRI (β=.13, p=.001). Male adolescents reporting greater average happiness and excitement had less variability (riSD) in sleep onset (happiness β=−.15, p=.008; excitement β=−.14, p=.016) and lower levels of social jetlag (happiness β=−.25, p<.001; excitement β=−.22, p=.005), but these associations were null in female adolescents (all p>.20). Neither loneliness nor anger were associated with sleep variability measures in either sex (all p>.15).

Conclusion: Greater positive moods are associated with lower sleep variability, which may protect mental and physical health. Boosting positive mood in adolescents may assist in normalizing sleep schedules, and decreasing sleep variability may aid in the maintenance of positive emotional health, particularly for males. Future research may use a within-participant design to examine the direction of these associations.

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0181

CHARACTERIZING SLEEP REGULARITY FROM ACTIGRAPHY IN YOUNGER AND OLDER ADOLESCENTS

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Introduction: Many adolescents experience variable sleep timing and restricted duration attributable to biopsychosocial influences. The Sleep Regularity Index (SRI) captures inter-daily stability of sleep/wake intervals as the likelihood of being asleep/awake at consistent times day-to-day. The SRI may capture unique dimensions of adolescent sleep given the ability to capture highly variable sleep/wake timing (including napping); however, SRI's relative role in maturational sleep processes remains unknown. This study characterizes the SRI and sleep correlates (bedtime, midpoint, risetime, duration, and efficiency) in younger and older adolescents, including age-based comparisons.

Methods: Cross-sectional data were drawn from two cohorts: 30 younger (ages 9-10 years; 13 female; 24 White) and 38 older (ages 15-16 years; 20 female; 26 White) adolescents. Participants provided 7 consecutive nights (M=6.93±0.36) of sleep diaries and actigraphy on a self-selected sleep schedule while attending school. SRI was calculated as the probability of being asleep/wake at two points 24-hours apart (Philips et al., 2017), with higher scores demonstrating more regular sleep across days.

Results: SRI scores and distributions were similar between younger (M=79±9, range=58-94) and older (M=80±7, range=64-91) adolescents (t[66]=-0.58, p=.56). On average, younger adolescents reported a bedtime of 21:41±31, midpoint of 02:14±30, risetime of 06:47±36, and sleep duration of 9.11±0.52 hours. In contrast, older peers reported a later bedtime of 22:46±41 (t[66]=-7.21, p<.001) and midpoint of 02:47±29 (t[66]=-4.66, p<.001), with consistent risetime 06:49±29 (t[66]=-0.17, p=.87), and thus shorter sleep duration of 8.06±0.70 hours (t[66]=6.84, p<.001). In both cohorts, SRI was correlated with less wake-time after sleep onset (rs=-.93 to -.83, ps<.001) and greater sleep efficiency (rs=.80-.93, ps<.001), but not sleep duration or timing (ps=.18-.62).

Conclusion: This adolescent sample demonstrated greater sleep/wake regularity compared to previous reports of college students and adolescents/young adults, supporting the hypothesis that SRI may be a proxy for regularity of other aspects of daily living (e.g., fixed school start times). Adolescent SRI appears to be independent of sleep duration (consistent with previous findings) and timing, suggesting that SRI captures a distinct dimension of sleep. This research team plans to proceed with longitudinal analysis to clarify developmental trends, further explicating the potential informative role of SRI.

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0182

CHILDHOOD SLEEP IS LONGITUDINALLY ASSOCIATED WITH ADOLESCENT ALCOHOL AND MARIJUANA USE

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Introduction: Worse sleep health has been linked with greater substance use among adolescents. However, most studies have only cross-sectionally examined this relationship or examined these longitudinal effects in children with sleep disorders. This study investigates whether childhood sleep is longitudinally associated with adolescent alcohol or marijuana use.

Methods: We analyzed data from the Fragile Families and Child Wellbeing Study, a longitudinal birth cohort. Parents reported their child's bedtime at ages 3, 5, and 9, and their child's average sleep duration at ages 5 and 9. At age 15, adolescents self-reported their bedtime, time in bed, whether they ever drank alcohol without parents, and whether they ever tried marijuana. Only participants with complete data were included (N=1,493). Logistic regression analyses for each substance use outcome were adjusted for age, sex, race, family socioeconomic status, family structure, and caregiver education level.

Results: Later bedtime at age 3 was longitudinally associated with lower odds of ever drinking alcohol at age 15 (OR=0.73, CI=0.58, 0.91, p<0.01) whereas later bedtime at age 9 was associated with greater odds (OR=1.44, CI=1.10, 1.89, p<0.01). Later bedtime at age 15 was cross-sectionally associated with greater odds of ever drinking alcohol (OR=1.40, CI=1.23, 1.59, p<0.01). Later bedtime at age 5 was associated with greater odds of ever trying marijuana (OR=1.25, CI=1.00, 1.57, p<0.05), as was later bedtime at age 15 (OR=1.34, CI=1.19, 1.51, p<0.01). Additionally, longer sleep duration at age 9 was longitudinally associated with lower odds of ever trying marijuana (OR=0.84, CI=0.74, 0.97, p<0.02). Adolescents who had longer time in bed at age 15 had lower odds of ever drinking alcohol (OR=0.72, CI=0.63, 0.81, p<0.01) and ever trying marijuana (OR=0.89, CI=0.79, 0.99, p<0.04).

Conclusion: In general, earlier bedtimes and longer sleep duration during childhood and adolescence were associated with lower odds of ever using alcohol or marijuana during adolescence. These results are consistent with current literature indicating that healthy sleep is associated with reduced risk-taking behaviors. Future research should further investigate whether sleep patterns across childhood are linked to decision-making and risk-taking behaviors in adolescence.

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0183

DAILY SLEEP PREDICTS ADOLESCENTS' NEXT-DAY PSYCHOMOTOR VIGILANCE, SLEEPINESS, AND FATIGUE: ECOLOGICAL MOMENTARY ASSESSMENT ACROSS 28 DAYS OF SCHOOL AND VACATION

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Introduction: Few studies have examined the associations between daily sleep and daytime functioning in adolescents during naturalistically-occurring constrained (school term) and unconstrained (vacation) sleep opportunities.

Methods: Adolescents (n = 205; 54.1% females, age M ± SD = 16.9 ± 0.87 years) completed daily measures of sleep and daytime functioning over 28 continuous days (2-week school, and the subsequent 2-week vacation). Total sleep time (TST) and sleep efficiency (SE) were measured using actigraphy and sleep diary. Participants self-reported sleepiness and fatigue every morning and afternoon, and completed the brief, 3.2-minute psychomotor vigilance task (PVT; Joggle Research) on an iPad every afternoon. Using cross-lagged multilevel models, daily TST and SE were examined as predictors of next-day sleepiness, fatigue, and PVT performance. The associations did not differ between school and vacation. The non-significant interaction terms were dropped, and school/vacation status was maintained as a covariate. Previous-day outcome, day of the week, study day, school/vacation and sociodemographics were adjusted. Between-person associations (differences between individuals) and within-person associations (daily deviations from individual's own mean capturing whether nights with longer- or better-than-average TST or SE respectively, relative to the individual's average TST/SE, predict next-day outcomes) were tested simultaneously.

Results: Adolescents performed better on the PVT (faster reaction time and fewer lapses) following nights with longer-than-average TST (actigraphy and diary, p-values ≤ .044). Longer-than-average TST (actigraphy and diary) and higher diary SE also predicted lower self-reported sleepiness the next day (morning and afternoon, p-values ≤ .002). Similarly, longer-than-average TST and higher-than-average SE predicted lower self-reported fatigue the next day (morning and afternoon, all p-values ≤ .032). Compared to the vacation, school term was associated with higher self-reported fatigue in the morning and afternoon (p-values ≤ .014), but not higher sleepiness or poorer PVT performance.

Conclusion: Fluctuations in daily sleep were associated with adolescents' next-day functioning. Importantly, longer- and better-than-average sleep consistently predicted better daytime functioning the next day. Findings were consistent across objective sustained attention and self-reported sleepiness and fatigue, highlighting the short-term effects of sleep restriction on adolescents' daytime functioning. Protecting adolescents' sleep duration and promoting good quality sleep on a daily basis could support optimal daytime functioning.

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0184

TOO JITTERY TO SLEEP? TEMPORAL ASSOCIATIONS OF ACTIGRAPHIC SLEEP AND CAFFEINE IN ADOLESCENTS

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Introduction: The majority of adolescents report consuming a caffeinated beverage on a typical day, which has been linked to poor sleep health in cross-sectional studies. However, it is unknown whether poor sleep predicts caffeine consumption, and/or whether caffeine consumption predicts poor sleep, particularly when sleep is measured objectively. The current study examined within- and between-person associations of actigraphic sleep dimensions with caffeinated beverage consumption in adolescents.
Methods: Data were collected from a micro-longitudinal substudy of the age 15 wave of the Fragile Families and Child Wellbeing Study (n=589). Adolescents wore a wrist-actigraphy device and completed daily surveys for approximately one week (mean=5.6 days). Daily surveys assessed sleep quality and caffeinated beverage consumption (0=no caffeine, 1=any caffeine). Separate mixed models assessed whether actigraphy-measured sleep duration, timing, maintenance efficiency, and subjective quality predicted next-day caffeinated beverage consumption within and between adolescents. Variability of sleep duration and timing (SD), sleep regularity index, and social jetlag were tested as additional between-person predictors. Lagged models tested whether daily caffeinated beverage consumption predicted sleep that night (n=458; mean=5.2 days).
Results: Between-person results showed that adolescents who had more variable actigraphic sleep duration (OR=1.21, p=.042) and sleep midpoint (OR=1.27, p=.045) had greater odds of consuming caffeinated beverages compared to others. Within-person results showed that on days when adolescents consumed ≥1 caffeinated beverage, they had later sleep onset by (b±SEM) 17±6 mins (p=.003) that night and later wake time by 19±7 mins (p= .011) the next morning, compared to days when they did not consume caffeine. Sleep duration, timing, maintenance efficiency, and subjective quality did not predict next-day caffeinated beverage consumption (all p>.10).
Conclusion: Greater variability in sleep duration and timing and later sleep timing are risk factors for poor emotional and cardiometabolic health. Curbing caffeinated beverage consumption may aid in the maintenance of regular sleep schedules and advance sleep timing in adolescents, potentially improving physical and psychological health.
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0185

N2 SLEEP SPINDLE ACTIVITY IS ASSOCIATED WITH BETTER NEXT-DAY EMOTION REGULATION IN HEALTHY CHILDREN

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Introduction: Children's day-to-day mental health is dependent on adequate quantity and quality of sleep, but far less is known about the microstructural sleep features that support emotional functioning in children. NREM sleep spindles (rhythmic EEG oscillations between 10 and 15 Hz) are closely linked with intellectual abilities and cognitive processing, and have also been shown to relate to children's emotional behavior, both concurrently and longitudinally. For example, socially-anxious youth showed reduction in sleep spindle activity compared to healthy controls, which correlated negatively with subjective reports of arousal in response to negative images (Wilhelm et al., 2017). In younger children, greater NREM 2 spindle density was associated with greater prosocial behavior concurrently and fewer behavioral and social problems one year later (Mikoteit et al., 2012; 2013). However, studies in pediatric samples are limited overall and haven't examined spindles in relation to objective measures of emotion regulation.
Methods: We examined relationships between spindle activity during NREM stage 2 (N2) and next-day subjective and objective emotional responses among N=26 healthy children, 7-11 years old. Children completed a full-night of at-home PSG monitoring (10hr sleep opportunity) followed by two in-lab tasks. In task 1, children rated arousal/reactivity in response to negative images from the International Affective Pictures System (IAPS). In task 2, respiratory sinus arrhythmia (RSA) was measured while children were directed to suppress all facial expressions of emotion (i.e., regulate emotional responses to negative content) while watching negatively-valenced movie clips. All analyses controlled for total sleep time on PSG night and RSA analyses controlled for a resting baseline period.
Results: Greater C3 spindle count ($r = .51$, $p < .05$) and density ($r = .53$, $p < .05$) were significantly associated with less child-reported arousal towards negative images. Greater F3 peak spindle frequency was positively associated with higher RSA during negative movies ($r = .54$, $p < .05$), suggesting better regulatory control of emotional responses to correspond with greater spindle peak frequency.
Conclusion: Together with previous data, our findings suggest that sleep spindle activity may partially reflect children's capacity to regulate emotional responses in relation to stressful situations, thereby potentially reducing risk of mental health problems.
Support (If Any):

0186

POST-BIRTH FEEDING EXPERIENCES ARE ASSOCIATED WITH ACTIGRAPHY-ASSESSED SLEEP PATTERNS AMONG NEWBORNS

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Introduction: Exclusively breastfed (EBF) newborns wake more often at night than partially breastfed, or exclusively formula fed (EFF) newborns. Contextual factors during the first weeks of life related to these associations are understudied. We examined relationships among post-birth experiences, objectively-estimated sleep-wake patterns, and feeding practices through three weeks post-delivery.
Methods: English or Spanish speaking mothers (n=20) and their full-term (≥37wk), singleton infants were recruited from Phoenix, Arizona. Mothers were 32.7±5.1y, 30.0% identified as Hispanic, 20.0% with < high school degree, and 15.0% were enrolled in the federal Women, Infants, and Children program. Infants were born normal weight (2500-4000g) and without major complications. At three weeks post-delivery, infants wore a Micro Motionlogger (Ambulatory Monitoring Inc.) on their left ankle for five 24hr periods at three weeks of age. Mothers completed an accompanying

sleep diary and an adapted Infant Feeding Practices Study-II questionnaire. Pearson correlations and t-tests examined relationships between nocturnal sleep-wake patterns and feeding practices at birth and 3-weeks post-delivery.

Results: At birth, all mothers attempted breastfeeding, 40.0% of infants received formula, and mean time for milk to come in was 2.7 days (range: 1-4). At three weeks, one mother was EFF, 55.5% (n=11) were EBF, and 40.0% (n=8) were mixed feeding. Infant sleep-wake patterns included midpoint of 2:40±1:01, long wake episode (≥5min) frequency of 5.8±2.3, longest sleep bout duration of 127.2±34.9min, WASO of 124.1±54.3min, and TST of 434.7±79.7min. Breastmilk feeding frequency was positively related to long wake episode frequency (r=.49, p=0.03) and WASO (r=.47, p=0.04), and negatively related to longest sleep bout (r=-.59, p=0.006). Formula feeding frequency was positively related to longest sleep bout (r=.58, p=0.007). Greater time for milk to come in was positively related to long wake episode frequency (r=.53, p=0.02) and WASO (r=.56, p=0.01), and negatively related to longest sleep bout (r=-.47, p=0.04). Receiving formula in the hospital was associated with later sleep midpoint (t[18]=3.2, p=0.005), regardless of current formula feeding.

Conclusion: Feeding experiences and ability to breastfeed during the first few days of life may play a role in the quality and patterning of actigraphy-estimated sleep among newborns. Future research should investigate whether these associations persist into later infancy.

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0187

BRAIN CONNECTIVITY AND PARENTING: ASSOCIATION BETWEEN FAMILIAL FACTORS AND SLEEP EEG COHERENCE IN INFANCY

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Introduction: Brain connectivity is tied to cognitive development and behavior. Previous work suggests that interactions with the environment tune the maturing patterns of brain connectivity. As the relevant environmental factors remain largely unknown, we examined whether the sleep-related familial context is associated with infant brain functional connectivity measured through sleep EEG coherence.

Methods: At-home 124-channel sleep EEG was recorded in 31 healthy infants aged 5.5 to 7.4 months (mean age=5.9±0.5mo; 15 females). Coherence was calculated for the first 80 20-second epochs of NREM sleep in delta (0.75–4.25Hz) and sigma (9.75–14.75Hz) bands, frequencies undergoing pronounced maturational dynamics. We averaged coherence within three regions over the frontal lobe (left, central, right) identified as regions with the strongest connectivity through data-driven clustering. For these regions and bands, linear regression models quantified the association between coherence and familial context, i.e., scores from the Brief Infant Sleep Questionnaire (i.e., sleeping arrangement and bedtime routine), Baby Care Questionnaire (i.e., Structure and Attunement subscales reflecting parental principles regarding infant sleep regularity), Maternal Cognitions about Infant's Sleep (i.e., total score), age and sex. The best-fitting model was selected through backward selection (Akaike information criterion).

Results: Surprisingly, sex was the most consistent contributor across regions and bands, with girls exhibiting greater coherence than boys (FDR-corrected $0.004 \leq p \leq 0.038$). Furthermore, older infants showed lower sigma coherence over the right frontal lobe (FDR-corrected $0.002 \leq p \leq 0.004$). Additionally, infants co-sleeping with parents or siblings demonstrated lower delta and sigma coherence over the right frontal lobe than infants sleeping in their own bed (FDR-corrected $0.001 < p \leq 0.025$). Similarly, fewer maternal worries regarding the infant's sleep were associated with lower sigma coherence in the right frontal region (FDR-corrected p=0.014). Finally, more regular bedtime routines were linked to increased delta coherence over the left frontal lobe (FDR-corrected p=0.014).

Conclusion: Based on previous observations indicating that in healthy children the right hemisphere develops first with a subsequent shift in asymmetry to the left, we propose that environmental factors such as co-sleeping, fewer parental worries, and more structured sleeping routines in infancy may serve as targets for early interventions to support this process and thereby healthy brain development.

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0188

ASSOCIATIONS BETWEEN PRESCHOOLERS' BEHAVIORAL DIFFICULTIES AND VARIABILITY IN SLEEP DURATION AND BEDTIME

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Introduction: Variability in children's sleep patterns has been linked with health outcomes including obesity, poor mood, and behavioral difficulties. However, much of this evidence stems from parent-reported measures of sleep. Understanding these associations in preschool-age children using device-based measures is important as sleep habits tend to develop and stabilize during this time. The purpose of this study was to examine associations between parent-reported behavioral difficulties and device-measured sleep among preschoolers.

Methods: Ninety-five preschool-aged children (3-5 years, 51% female, 30% Black) with at least two valid nights of sleep were in included in this analysis. Children were asked to wear an Axivity AX3 accelerometer on their non-dominant wrist for 30 days. Parents completed the Strengths and Difficulties Questionnaire which assessed child behaviors over the past 6 months. Raw accelerometry data were processed with GGIR (v2.3). We used MixWild to conduct mixed effects location scale models with a random intercept and scale predicting nocturnal duration variability and bedtime variability. Time invariant behavior subscales (conduct problems, hyperactivity/inattention, peer relationship problems, emotional symptoms, prosocial behavior, and total difficulties) were included as predictors of child sleep duration and bedtime variability.

Results: Children had an average of 13.4 ± 7.4 (range 2-29) nights of valid data. Average nocturnal sleep duration was 9.7 ± 1.4 hours and average bedtime was 9:48 PM. There were no statistically significant associations between any SDQ subscales and variability in children's sleep duration and bedtime. There was an association between random location and scale such that

participants with later average bedtimes also had more variability in their bedtime ($p < 0.001$).
Conclusion: Variability in nocturnal sleep was not associated with parent reported behavioral difficulties, which is contrary to recent findings. It is unclear if sleep duration and bedtime variability are associated with day-level changes in children's behavior. Additional work that emphasizes aspects of sleep beyond sleep duration is needed to advance our understanding of preschool-age children's sleep.
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0189

HIGH LEVELS OF SLEEP DISTURBANCE ACROSS EARLY CHILDHOOD INCREASES CARDIOMETABOLIC DISEASE RISK INDEX IN EARLY ADOLESCENCE: LONGITUDINAL SLEEP ANALYSIS USING THE HOME STUDY

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Introduction: Sleep is a predictor of cardiometabolic disease (CMD) risk, and new evidence links early childhood sleep to later CMD risk. This study examines the impact of early childhood sleep duration, bedtime timing, and sleep disturbance on a CMD risk score in early adolescence.
Methods: Within the Health Outcomes and Measures of Environment (HOME) Study, a prospective pregnancy and birth cohort study, we assessed sleep patterns among 346 children using the Children's Sleep Habits Questionnaire from ages 2 to 8 years. We calculated cardiometabolic risk scores ate age 12 for 183 of these children from visceral adiposity area, blood pressure, fasting serum triglyceride, high density lipoprotein, leptin, and adiponectin concentrations. We used a group-based semi-parametric mixture model to identify distinct trajectories in sleep duration, bedtime timing, and sleep disturbance for the entire sample. We then examined the associations between sleep trajectories and CMD risk score using general linear models for children with a CMD risk score, using both an unadjusted model (no covariates) and an adjusted model (adjusting for child pubertal stage, child sex, duration of breastfeeding, household income, and maternal education).
Results: Three sleep trajectories emerged for bedtime timing (late timing, medium timing, and early timing) and for sleep disturbance (high, medium, and low), and two for sleep duration (high and low). In the unadjusted model, we found significant differences in CMD risk scores by trajectories of sleep disturbance. Children in the 'high' trajectory had higher CMD risk scores (Least Square Mean=1.51; 95% CI: 0.39, 2.64) than those in the 'low' trajectory (Least Square Mean =-0.51; 95% CI: -1.16, 0.15; p=.002) and 'medium' trajectory (Least Square Mean=-0.15; 95% CI: -1.14, 0.85; p=.03). These findings only approached significance after adjusting for covariates. No significant differences in CMD risk were observed for bedtime timing or total sleep time trajectories in the unadjusted or adjusted models.
Conclusion: In this cohort, parent-reported sleep disturbance in early childhood was associated with more adverse cardiometabolic profiles in early adolescence. Our findings suggest that trials to reduce CMD risk via sleep interventions – which have been conducted in adolescents and adults – may be implemented too late.
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0190

ASSOCIATION OF SLEEP SPINDLE ACTIVITY WITH COGNITION IN YOUTH FROM THE GENERAL POPULATION

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Introduction: Sleep spindle activity has been increasingly studied as an underlying mechanism of cognition. In youth, it appears the relationship between spindle activity and cognition depends upon the spindle metric and cognitive domain examined. Prior research has been conducted primarily in highly selective experimental studies of typically developing youth. We aimed to clarify the relationship between spindle activity and lower and higher order cognitive functions in children and adolescents from the general population.
Methods: We studied 639 children aged 5-12y (median 9y) and 418 adolescents aged 12-23y (median 16y) from a population-based cohort. All subjects underwent a 9-hour, in-lab polysomnography. We calculated sleep spindle density (SSD), the total number of spindles per minute of stage 2 of non-rapid eye movement sleep, and peak spindle frequency (PSF) in the 10-16 Hz range at central, frontal and fronto-occipital derivations. Wechsler intelligence testing assessed verbal and non-verbal intelligence quotients (IQ), processing speed (coding) and working memory (digit span backward [DSB]). Multivariable-adjusted linear regression models with age, sex, race/ethnicity, body mass index, apnea/hypopnea index, and insomnia symptoms as covariates examined the association between SSD and PSF with cognitive outcomes.
Results: At ages 5-12, central SSD was positively associated with verbal IQ ($p=0.04$), non-verbal IQ ($p=0.03$), coding ($p=0.01$) and DSB ($p<0.01$); additionally, frontal SSD was positively associated with coding and DSB (both $p<0.01$) and fronto-occipital SSD with DSB ($p<0.01$). Also, central ($p<0.01$) and frontal ($p=0.01$) PSF was positively associated with DSB. At ages 12-23, fronto-occipital SSD was positively associated with non-verbal IQ ($p=0.02$), while no other statistically significant associations were observed for SSD or PSF with cognitive outcomes (all $p\geq0.08$).
Conclusion: Spindle density is a strong correlate of general ability (both verbal and non-verbal IQ) in childhood, and it remains for non-verbal IQ in adolescence. Both increased spindle density and peak frequency are associated with better working memory in childhood, yet not in adolescence. These developmental differences may be due to cortical (e.g., synaptic pruning) and thalamocortical (e.g., increased myelination) maturational changes occurring during adolescence.
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0191

CHARACTERISTICS OF SLEEP SPINDLES ACROSS DEVELOPMENT IN MALES WITH DUCHENNE/BECKER MUSCULAR DYSTROPHY DISORDER

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Introduction: Sleep supports cognition, in particular, the consolidation of memories. Sleeping brain rhythms, such as slow oscillations

(1hz) and spindles (9-15 Hz), play a key role in facilitating this consolidation. Our prior research reported age-associated declines in slow oscillations in Duchenne and Becker Muscular Dystrophy (DMD/BMD) (Simon et al., 2020). Here, we characterize age-associated changes in sleep spindle characteristics across development in this group.

Methods: Following our 2020 analysis, we retrospectively analyzed the clinical sleep studies of 28 DMD/BMD males (Age span: 4 to 20 years). We applied our spindle detection algorithm to six electrodes (F3, F4, C3, C4, 01, O2). We assessed spindle density, frequency, and amplitude based on age (child, early adolescent, and late adolescent).

Results: We conducted rmANOVAs to evaluate each spindle characteristics using within-factors (Stage and Electrode) and between-factor (Age). We found significantly more spindles with longer durations in N2 than N3; greater spindle density at frontal compared to occipital regions; and higher amplitudes at central compared to frontal sites. We found no age-associated changes in these spindle metrics. We did find an age-associated change in the frequency of spindles, with significantly greater average spindle amplitude increasing significantly with age.

Conclusion: In line with prior research, we found more spindles in N2 than N3 and greater spindle density at frontal compared to posterior electrodes. In contrast to our previous research demonstrating age-associated declines in slow oscillations, our current analyses show minimal age-associated changes in spindle characteristics from 4 to 20 years. Further analysis is required to assess for age-associated changes in spindle-slow oscillation coupling occur across development. Our findings have implications for functional changes in sleep-dependent cognition mechanisms across development in BMD/DMD.

Support (If Any):

0192

EFFECTS OF EMERGING ALCOHOL USE ON DEVELOPMENTAL TRAJECTORIES OF FUNCTIONAL SLEEP MEASURES IN ADOLESCENTS.

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Introduction: Adolescence is characterized by developmental changes in sleep timing and architecture as well as alcohol use initiation. While the effects of acute and chronic alcohol use on sleep in adults are well-documented, much less is known in adolescents. We used longitudinal data from the National Consortium on Alcohol and Neurodevelopment in Adolescence (NCANDA) to examine how emerging alcohol use affected sleep architecture in adolescents.

Methods: Overnight polysomnographic recordings were made each year, for 4 years, in 94 adolescents (12–21 years at baseline, 43% female) from the NCANDA cohort. All participants were no or low (youth adjusted Cahalan score of zero) alcohol users at baseline. These data were used to examine developmental trajectories of sleep macro-architecture and sleep electroencephalographic (EEG) measures using linear mixed effect models (LMMs), considering age, sex, family history of alcohol use, body mass index, ethnicity, and alcohol use class (i.e., no-to-low, moderate or heavy) at each annual assessment.

Results: There were strong developmental changes in sleep macro-structure and EEG, most notably, a decrease in slow wave sleep percentage and slow wave (delta) EEG activity with advancing age (p=0.02). Compared to those who remained no-to-low drinkers, participants who became moderate/heavy drinkers during the follow-up period, had different sleep trajectories, especially those older at baseline at baseline, including higher slow wave activity (p = 0.04), higher REM sleep percentage (p = 0.03), poorer sleep efficiency (p=0.003), and longer latency to sustained sleep (p = 0.03). The effects of alcohol use depended on sex, with male heavy drinkers having more REM sleep than female heavy drinkers (p = 0.04). Overall, a positive family history of alcohol use was associated with less NREM sleep and shorter sleep duration.

Conclusion: Our results present novel findings showing that emerging alcohol use during adolescence exerts complex effects on sleep macro- and micro-structure, over and above normal developmental changes in sleep. These effects could, in part, be alcohol effects on brain maturation processes underlying sleep regulation.

Support (If Any): AA021696, AA021690

0193

MOVING WHILE SLEEPING: ON THE PARADOXICAL CO-OCCURRENCE OF MUSCLE ATONIA AND TWITCHING

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Introduction: During active (or REM) sleep, discreet, jerky movements called myoclonic twitches occur against a background of muscle atonia. The neural mechanisms that allow these two seemingly contradictory phenomena to co-occur remain unclear. One view holds that twitches are produced when a large descending motor signal overpowers the inhibition on spinal motor neurons. An alternative view is that atonia and twitching are coordinated by the same brainstem structures that produce and regulate active sleep. One such structure is the sublaterodorsal tegmental nucleus (SLD), which plays a key role in adult rats to the production of atonia, but whose contribution to twitching has not been examined. Here, we investigated the relationship of SLD neurons to atonia and twitching during a period in early development when twitching is abundant.

Methods: We recorded extracellular neural activity from the SLD in 8 12-day-old (P12) head-fixed rats as they cycled freely between sleep and wake. To assess the relationship between twitches and neural activity, we also recorded limb movements using high-speed video.

Results: Consistent with the adult literature, the majority of SLD neurons (35/56) were significantly more active during periods of sleep-related atonia. Interestingly, a subgroup of neurons (n=15) was inhibited at the onset of a burst of twitches, whereas another subgroup of neurons (n=26) was excited around the onset of a burst of twitches. Thus, together, the activity of 41 of 56 SLD neurons was modulated by twitches.

Conclusion: These results demonstrate that the activity of SLD neurons is associated with both atonia and twitching. This finding suggests that these two early-developing components of active sleep are coordinated within the brainstem. These initial findings open new avenues for further research into the neural mechanisms that coordinate the co-occurrence of twitching and atonia during active sleep.

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0194

SOURCES OF VARIATION IN THE SPECTRAL SLOPE OF THE SLEEP EEG

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Introduction: The 1/f spectral slope of the electroencephalogram (EEG) estimated in the gamma frequency range has been shown to reflect neural excitation/inhibition ratio and synchronization level within local neural populations. It was proposed as an arousal marker that differentiates wake, non-rapid eye movement (NREM) sleep, and rapid eye movement (REM) sleep. These stages exhibit progressively steeper 30-45 Hz slopes, interpreted in terms of increasing cortical inhibition. Here we sought to replicate these findings in a larger sample and provide a comprehensive characterization of how slope changes with age, sex, and its test-retest reliability as well as potential confounds that could affect the slope estimation.

Methods: After stringent exclusions and quality control, our final sample included 10,255 whole-night polysomnograms (PSGs) on 7,312 individuals 2,943 of whom had a second PSG, from the National Sleep Research Resource (NSRR). All preprocessing steps were performed using an open-source Luna package and the spectral slope was estimated by fitting log-log linear regression models on the absolute power from 30 to 45 Hz separately for wake, NREM and REM stages. We described sources of variation in the spectral slope (both within and between individuals) and its relationship to other sleep parameters including power and interhemispheric coherence.

Results: There was unambiguous statistical support for the hypothesis that, within individuals, the mean spectral slope grows steeper going from wake to NREM to REM sleep. We found that the choice of mastoid referencing scheme modulated the extent to which electromyogenic or electrocardiographic artifacts were likely to bias 30-45 Hz slope estimates, as well as other sources of technical, device-specific bias. Nonetheless, within individuals, slope estimates were relatively stable over time. Both cross-sectionally and longitudinal, slopes tended to become shallower with increasing age, particularly for REM sleep; males tended to show flatter slopes than females across all states. Although conceptually distinct, spectral slope did not predict sleep state substantially better than other summaries of the high-frequency EEG power spectrum (>20 Hz, in this context) including beta band power, however. In contrast to the common conception of the REM EEG as relatively wake-like (i.e. 'paradoxical' sleep), REM and wake were the most divergent states for multiple metrics, with NREM exhibiting intermediate profiles. Under a simplified modeling framework, changes in spectral slope could not, by themselves, fully account for the observed differences between states, if assuming a strict power-law model.

Conclusion: Although the spectral slope is appealing, theoretically inspired parameterization of the sleep EEG, we underscore some practical considerations that should be borne in mind when applying it in diverse datasets. Future work will be needed to fully characterize state-dependent changes in the aperiodic portions of the EEG power spectra, which appear to be consistent with, albeit not fully explained by, changes in the spectral slope.

Support (If Any):

0195

INTEGRATED ACTIGRAPHY-BASED BIOMARKER FOR THE RISK OF ALZHEIMER'S DEMENTIA

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Introduction: Many physiological measures derived from actigraphy including physical activity, sleep, circadian/daily rhythm, and temporal correlations have been shown to predict Alzheimer's dementia (AD). This study aimed to combine these actigraphy-based measures to develop an integrated actigraphy biomarker (IAB) for AD and to test its link to the genetic risk for AD.

Methods: We analyzed data of 1107 participants (age 80.9±7.3(mean±SD)) from the Rush Memory and Aging Project who were non-demented and had actigraphy (~10 days) at baseline, and had annual cognitive assessment during the follow-up (1-15 years). 270 developed AD (mean = 7.4 years). To construct the IAB for the AD's risk, we trained a random forest survival model, in which time to incident AD was the outcome, and inputs included 10 features derived from actigraphy data: physical activity level, 3 features for sleep (sleep duration, sleep fragmentation, activity fragmentation), 4 features for circadian rhythmicity (amplitude, acrophase, interdaily stability, and intradaily variability of 24-hr rhythms), and 2 features for temporal correlations (at timescales between 1-90 min and 120-480 min). Polygenic risk score (PRS) was calculated using 457 independent SNPs strongly associated with Alzheimer's disease ($p<0.001$). Cox proportional hazard ratio models were performed with different combinations of IAB, PRS, age, sex, and education, and the concordance score (C-score) was used to evaluate model performance.

Results: The derived IAB was 0.6 SD larger in the AD group as compared with the controls. The IAB alone achieved a C-score = 0.61 in predicting AD, with a hazard ratio=1.5 for 1-SD increase in IAB. The IAB and PRS were not correlated ($r2=0.0004$, $p=0.25$), and both significantly contributed to the prediction (both $p<=0.0001$) when included in one model, giving a C-score of 0.65. C-score was 0.7 in the model using only age, sex and educations yielded, and increased to 0.74 after including IAB and PRS (both effects remained significant $p<0.0001$).

Conclusion: The integrated actigraphy biomarker may provide complementary information for early prediction and detection of AD, independent of the known demographic and genetic risk factors.

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0196

RETINAL RESPONSIVITY IS ASSOCIATED WITH CIRCADIAN PHASE AND CIRCADIAN ALIGNMENT BUT NOT SLEEP TIMING

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Introduction: Light entrains the central circadian clock, with projections from the retina to the SCN through melanopsin-containing retinal ganglion cells (ipRGCs). Altered responsivity to light

reflects ipRGC functioning and may be a physiological vulnerability for disrupted photoentrainment. Understanding how retinal responsivity relates to sleep and circadian timing may inform who might most benefit from sleep and circadian interventions.
Methods: 64 participants (85 observations) ages 20-66 years old were recruited during winter (n=35) and summer months (n=50), and included individuals with seasonal depression (n=33) and nonseasonal, never depressed controls (n=31). The post-illumination pupil response (PIPR) to red and blue light was used to measure the responsivity of ipRGCs (average 1:30pm; 10am-7pm). Circadian phase was assessed using Dim Light Melatonin Onset (DLMO), collected every 30-minutes on Friday evenings. Midsleep timing was measured using actigraphy (average number nights=4), and circadian alignment was calculated as the DLMO-midsleep phase angle. We performed a multilevel regression to determine the relationship between PIPR and markers of sleep and circadian timing, accounting for repeated seasonal assessments with a random intercept of participant. Covariates included age, gender, diagnostic group, and circadian time of PIPR assessments. We ran sensitivity analyses including photoperiod length on the day of PIPR assessment to account for potential light exposure on the PIPR.
Results: Greater retinal responsivity was associated with later DLMO (b=4.45; partially standardized b=0.28; SE=1.84; p=0.03), and shorter DLMO-midsleep phase angle (b= -7.33; partially standardized b= -0.32; SE=2.51; p=0.004), but not midsleep (b= -3.44; partially standardized b= -0.14; SE=2.35; p>0.05). Individuals with later DLMO had PIPR assessments at earlier circadian times (b= -0.12; SE=0.04; p=0.01). Older participants (b= -0.04; SE=0.02; p=0.04) and controls (b= -0.95; SE=0.44; p=0.04) had earlier sleep midpoints, but covariates were not associated with circadian markers. The association between circadian timing and PIPR became nonsignificant (b=4.15; partially standardized b=0.26; SE=1.88; p=0.06) when including photoperiod.
Conclusion: Retinal responsivity was associated with circadian but not behavioral sleep timing, suggesting ipRGC functioning may have downstream effects on circadian entrainment. Assessing circadian variation of retinal responsivity remains a crucial next step prior to testing whether retinal responsivity impacts response to circadian-focused interventions.
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0197

INCREASED BRAIN KYNURENIC ACID ELICITS SEX-DEPENDENT ABNORMALITIES IN NREM SLEEP SPINDLE DYNAMICS

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Introduction: Sleep spindles are thalamocortical oscillations which occur during non-rapid eye movement (NREM) sleep. NREM sleep spindle aberrations are a consistent clinical sleep deficiency associated with psychotic disorders and exacerbation of cognitive symptoms. Kynurenic acid (KYNA), a tryptophan metabolite synthesized from kynurenine via kynurenine aminotransferases (KATs) and modulator of glutamatergic and cholinergic neurotransmission, is elevated in the brain of patients with psychotic disorders, including schizophrenia and bipolar disorder. Currently, we sought to understand the neurodevelopmental and transient impacts of brain KYNA elevation on sleep spindle dynamics.
Methods: In Experiment #1, sleep spindles were evaluated in adult offspring, postnatal day (PD) 56 from embryonic kynurenine (EKyn) treated rat dams (Rentschler et al., 2021 Sz Bull) (N=7-9 per group). EKyn KYNA male, but not female, offspring have elevated KYNA during the light phase (Wright et al., 2021 Frontiers in Psychiatry). In Experiment #2, sleep spindles were evaluated in adult rats injected with kynurenine (100 mg/kg; i.p.) to acutely elevate brain KYNA levels at zeitgeber time 0 (N=8-12 per group). Polysomnography was recorded via EEG/EMG telemetry. Sleep spindles were evaluated using a custom-made manual scoring system during the first 4 hr of the light cycle.
Results: Male EKyn, but not female, exhibited a decrease in spindle density compared to ECon (2-wayANOVA: ***P<0.001). FFT spectral power for peak spindle frequency (10-15 Hz) was reduced for all EKyn offspring (3-way ANOVA; frequency x treatment interaction: ****P<0.0001; treatment: *P<0.05). Kynurenine challenge reduced spindle density for both sexes (2-way ANOVA: ***P<0.001; M: **P<0.01; F: *P<0.05). Frequency x treatment interaction for males (2-way ANOVA: ***P<0.001) was observed with lower FFT spectral power for 10-10.5 Hz (*P<0.05) and greater power for 14-14.5 Hz (*P<0.05).
Conclusion: We determined conspicuous sex differences in spindle dynamics in the EKyn paradigm that may be related to brain KYNA levels; only males exhibited a decrease in spindle density, however all EKyn offspring had reduced FFT spectral power. Kynurenine challenge reduced spindle density in both sexes, however only males had changes in FFT spectral power. Future work will consider the efficacy of KYNA synthesis inhibition to prevent NREM sleep spindle abnormalities induced by KYNA elevation.
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0198

REMOTE SALIVA SAMPLE COLLECTION FOR DIM LIGHT MELATONIN ONSET (DLMO) MEASUREMENT IN URBAN CHILDREN WITH ASTHMA DURING THE COVID-19 PANDEMIC

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Introduction: The COVID-19 pandemic has challenged researchers to use remote data collection. Our project includes determining DLMO phase, requiring a family-friendly without face-to-face interaction. We describe here our protocol, experiences, lessons learned, and findings from the first 15 participants.
Methods: Fifteen urban-dwelling children with moderate to severe persistent asthma [7 girls, ages 7 (n=1) to 10 years; and 8 boys, 8 or 9 years] and caregiver (CG) participated. CG tracked bedtimes and risetimes in daily diaries for 10-14 days; average bedtimes from 5 nights preceding saliva collection were used to determine timing for 10 half-hourly samples. CG and child were oriented and then watched a demo video. A "spit-kit" was delivered to the home the afternoon of the study. Kits included a small cooler bag with bottle of water, 10 numbered and 5 spare Salivette tubes (Starstedt, Germany), plastic bag, dark wraparound glasses with securing strap, and log sheet. Data collection began with a zoom call with staff, CG, and child to reiterate the instructions, answer questions, and observe the first sample. Thereafter, a staff member telephoned the caregiver every 30 minutes to prompt the next sample and query whether glasses had been kept on. CG placed kit outside the home for morning pick up. Samples were centrifuged and frozen (-20°) until sending to the assay lab (SolidPhase, Portland, ME) for melatonin radioimmunoassay (Alpco, Windham, NH).

Results: DLMO phase was determined with a 4pg/ml threshold for 11 children. DLMO phases (mtime=21:46±68 min) and average bedtimes (mtime=20:40±88min) were positively correlated (r=.87). Challenges identified for missed DLMOs included: one child supervised by a teenaged sibling (not CG); one child/CG identified as potentially uncooperative. The other two "misses" likely arose from low saliva quantity, inconsistencies with staff training, and inadequate description of requirements for wearing glasses. Procedure modifications included strategies tailored to families' needs, experiences, and home environment that can challenge adherence to protocol, greater emphasis on wearing glasses, and cartoon reminder card and scales added to kit. Subsequent samples were successful.
Conclusion: Our approach was effective for determining DLMO phase in children using a remote approach with careful application of methods.
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0199

IRIS COLOR PREDICTS MELANOPSIN-DRIVEN RETINAL RESPONSES IN OLDER BUT NOT YOUNGER INDIVIDUALS

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Introduction: The retina contains melanopsin-containing retinal ganglion cells, which underlie non-image forming responses to light. The Post-Illumination Pupil Response (PIPR) can assess melanopsin cell responsivity, with applications for sleep disorders, mood disorders, and circadian entrainment. Lighter pigmented irises allow more light to pass through the retina. The present study tested an association between the PIPR and iris pigmentation.
Methods: Participants (N=49) included seasonal depression (n=26) and never-depressed controls (n=23). Photos of participants' irises were rated using both the Franssen (2008) scale, a set of 24 standardized iris photos, and the Mackey (2011) scale, a 9-category rating system. Red and blue stimuli 13.5 log photons/cm2/s were presented, and infrared pupillometry measured pupil diameter for 40 seconds. We used multilevel regression with a random intercept of participant to predict the PIPR from each iris rating system separately, controlling for age, gender, and circadian time of testing determined from Dim Light Melatonin Onset.
Results: Agreement between raters, calculated using Cohen's κ, was moderate for both scales (Franssen, κ=0.57, 95% CI: 0.42 to 0.71, p<0.001; Mackey, κ=0.67, 95% CI: 0.53 to 0.81, p<0.001). Bivariate correlations showed age was inversely associated with iris color: older individuals had lighter iris pigmentation. Analyses were therefore stratified by age (older >=31 years: n=24; younger <31 years, n=25). Greater retinal responsivity was associated with lighter iris pigmentation in the older sample (Mackey: unstandardized b=-0.016; SE=0.005; p=0.002; Franssen: unstandardized b=-0.006; SE=0.002, p=0.002), but not the younger sample (Mackey: unstandardized b=-0.0008; SE=0.003; p=0.770; Franssen: unstandardized b=-0.0009; SE=0.002, p=0.619). There was no effect of iris color on PIPR in the whole sample (p's >0.13).
Conclusion: Iris color explained ~8% of variance in the PIPR, indicating that PIPR studies should recruit samples with similar distributions of iris pigmentation across conditions and ages, as this finding was only seen in the older sample with more individuals with lighter iris pigmentation. Future studies will test iris pigmentation by light exposure interactions on the PIPR. Light stimuli focused to a point on the pupil (i.e., Maxwellian) would eliminate variation in the amount of light incident on the retina due to iris pigmentation.
Support (If Any): NIMH K.A.R. MH103303

0200

DOES SLEEP PREDICT ANTIBODY RESPONSE AND MAINTENANCE TO THE COVID-19 VACCINE?

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Introduction: There is growing evidence that insufficient sleep can negatively impact the immune system, including vaccination response. Prior laboratory studies have shown that acute sleep restriction can result in impaired antibody resposne to the hepatitis A and influenza vaccine. Similarly, prospective studies have shown that short sleep duration, measured by self-report and wrist actigraphy, is associated with muted antibody responses. These prior findings have critical implications for the COVID-19 pandemic and the efficacy and durability of the COVID-19 vaccines currently available. Whether sleep accounts for variability in response to the COVID-19 vaccination series has not been investigated.
Methods: We recruited 530 healthy participants (mean age= 52.4, SD=12.1, range: 18-88 years; 64.1% female) who were naive to the COVID-19 vaccination series. Participants completed self-report questionaires (e.g., Pittsburgh Sleep Quality Index) and morning sleep diaries for 7-consecutive days surrounding COVID-19 vaccine administrations. Additionally, 198 participants wore a sleep tracking device (Oura ring) continuously for ~2 months beginning prior to vaccination, which provides behavioral sleep data on days prior to and following the COVID-19 vaccination series. Blood samples were collected prior to vaccination, +1 month after their final vaccine shot (peak response), and +6 months after their final vaccine shot (maintenance); neutralization assays using pseudotype virus will be carried out to quantify antibody titers.
Results: Data collection concludes December 2021, with antibody assays to be completed February 2022. Initial baseline data indicates that most participants reported poor overall global sleep quality (PSQI mean=6.3, SD=3.6; 52% PSQI>5). Linear mixed models will be conducted to test associations between habitual sleep duration (averaged over the measurement time points), sleep efficiency, and subjective sleep quality with antibody responses over time. Additionally, we will report on the relevance of sleep timing (midpoint) and vaccination timing (receiving the vaccine in the morning vs afternoon vs evening), and the role of self-reported sleep disorders (e.g., obstructive sleep apnea) and shift worker status. Covariates in these analyses will include age, gender, race, body mass index, prior COVID infection, and vaccine type (Moderna, Pfizer, Johnson and Johnson).
Conclusion: These analyses will provide new knowledge about the role of sleep in mounting and maintaining antibody response to the COVID-19 vaccination series. These findings may provide novel insights into when and for whom improvements in sleep may result in better vaccine efficacy.
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0201

SLEEP DURATION AND TIMING IS PROSPECTIVELY LINKED WITH INCREASES IN INSULIN RESISTANCE OVER LATE ADOLESCENCE

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Introduction: During puberty, adolescents experience a period of transient insulin resistance (IR) that normalizes upon full maturation. Yet, IR continues to rise for some adolescents, increasing metabolic disease and type 2 diabetes risk in adulthood. Whether short sleep duration and/or later sleep timing are risk factors for persistently increasing IR in late adolescence has not been explored.
Methods: The study population includes 362 adolescents from Mexico City enrolled in a longitudinal birth cohort (ELEMENT study). Beginning in 2015, when participants were between the ages of 9 and 17, there were 2 clinic visits that occurred approximately 2 years apart. During the visit, a fasting blood sample and anthropometric measurements were taken. Insulin resistance was assessed with glucose and insulin via HOMA-IR. Four groups were defined using puberty-specific cutpoints for IR: normal HOMA-IR over the follow-up period (reference), transition from normal to IR, transition from IR to normal, and IR at both time points. Baseline sleep assessments (sleep duration, timing, and variability of both duration and timing) were measured with 7-day actigraphy. Multinomial logistic regression models were used to evaluate associations between sleep duration and timing with HOMA-IR categories, adjusting for age, sex, and baseline pubertal status
Results: Seventeen percent of the sample developed insulin resistance over the follow-up period. Adolescents ≥1 hour below the sleep duration recommendations-for-age were over twice as likely to be in the group that developed IR compared to the normal group (95% CI 1.1, .9; P for trend=0.03). Similarly, adolescents who had a sleep midpoint later than 4:36 AM were 2.77 times as likely to be in the increasing HOMA-IR category (95% CI 1.0, 7.5; P for trend=0.05). Interestingly, there was no evidence that changes in adiposity over follow-up mediated associations between sleep and insulin resistance.
Conclusion: Insufficient sleep duration and late sleep timing were independently associated with development of IR over a 2-year period in peri-puberty. Adequate sleep during the pubertal period may promote metabolic health into young adulthood, independent of any changes in adiposity.
Support (If Any): Dr. Jansen is supported by K01HL151673. The study is supported by P01 ES02284401.

0202

PREDICTING SLEEP INERTIA IN A BIOMATHEMATICAL MODEL OF FATIGUE AND PERFORMANCE: A NOVEL APPROACH

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Introduction: Biomathematical models of fatigue typically include sleep inertia as an additive process during wakefulness. However, there is predictive information to be gained from tracking the

propensity for sleep inertia through sleep periods. We propose a novel approach involving a neurobiological sleep inertia process with relatively fast dynamics (in the order of several minutes) interacting with the much slower dynamics of the established processes of sleep/wake regulation. This sleep inertia process is captured by the addition of two ordinary differential equations (ODEs) in the model framework of McCauley and colleagues (2009, 2013, 2021) – one for wakefulness to track impairment from sleep inertia, and one for sleep to track the propensity for sleep inertia upon awakening. A single time constant is introduced to control the dynamic behavior of these ODEs to capture the dynamics of sleep inertia.

Methods: 398 healthy young adults (ages 21–49 years) each participated in one of eight multi-day laboratory studies of total sleep deprivation, sustained sleep restriction, or simulated shift work. At 2–4 hour intervals while awake, participants performed a Psychomotor Vigilance Test (PVT), for which number of lapses (RT>500ms) was assessed, and rated their sleepiness on the Karolinska Sleepiness Scale (KSS). Sleep periods were recorded polysomnographically. Data were divided into a calibration set (five studies) used to estimate a single new model parameter capturing sleep inertia, and a validation set (three studies) used to independently verify model validity.

Results: Based on the calibration data set, the sleep inertia time constant estimate was 0.71h±0.01. Based on the validation data set, goodness-of-fit root-mean-square-error was 2.28 for PVT and 0.733 for KSS, indicating high predictive accuracy. A dynamic buildup and then decline of predicted propensity for sleep inertia during sleep emerged, peaking 2–3h into the sleep period.

Conclusion: The model expansion with a one-parameter sleep inertia process captured the transient effect of sleep inertia accurately across a range of sleep deprivation, sleep restriction, and simulated shift work scenarios. The emerging dynamic of sleep inertia propensity during sleep is consistent with findings on the magnitude of sleep inertia as a function of sleep duration and stage of awakening.

Support (If Any): WSU HPC

0203

RISE AND SHINE! THE EFFICACY OF A MULTIMODAL ENVIRONMENTAL ALARM SYSTEM ON MITIGATING THE EFFECTS OF SLEEP INERTIA

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Introduction: Sleep inertia is a temporary period of reduced alertness and impaired physical and cognitive performance that immediately follows waking. Sleep inertia can have devastating consequences necessitating an intervention to successfully mitigate symptoms. Previous work has demonstrated modest benefits for individual environmental interventions which manipulate either lighting, sound, or temperature. The current study sought to expand on previous work and measure the impact of a multimodal intervention that collectively manipulated light, sound, and ambient temperature on vigilance, mood, and sleepiness.

Methods: 37 adults (M=27.13 years, 19 F) who self-reported taking longer than 30 minutes to wake up for 60% of their work week slept in the lab for four nights. They were woken up each morning with either a traditional alarm sound or the multimodal intervention (two control nights and two intervention nights, counterbalanced across participants). Feelings of sleep inertia were measured each morning through completion of the Psychomotor Vigilance Test and ratings of sleepiness and mood at five different time-points (5, 15, 30, 60, and 90 min after wake).

Results: While there was little impact of the intervention on all outcome measures, there were differential impacts depending on a person's chronotype and the length of the lighting exposure during the intervention condition. Moderate evening-types who received a shorter lighting exposure (£15 min) demonstrated more vigilance lapses ($p = 0.04$) relative to the control condition whereas intermediate-types demonstrated better response speed ($p < 0.005$) and fewer lapses ($p = 0.002$). Conversely, moderate evening-types who experienced a longer light exposure (>15 min) during the intervention exhibited fewer false alarms over time ($p = 0.03$). Participants who received a longer light exposure also reported marginally lower negative affect the longer they were awake ($p = 0.06$).

Conclusion: Collectively, the results suggest that the length of the environmental intervention may play a role in mitigating feelings of sleep inertia, particularly for groups who may exhibit stronger feelings of sleep inertia including evening-types. Results may help inform the efficacy of "smart alarms" that activate based on entering light sleep. Future studies should measure this impact using additional measures of cognitive performance.

Support (If Any):

0204

SLEEP IRREGULARITY IS ASSOCIATED WITH INCREASED RISK OF HYPERTENSION: DATA FROM OVER TWO MILLION NIGHTS.

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Introduction: Sleep irregularity has been associated with worse cardio-metabolic health compared to regular sleep, but prior studies have been limited in sample size and have assessed sleep irregularity by actigraphy or questionnaires over a relatively short duration (~ 14 days). The current study investigated associations between sleep regularity and hypertension in a large, global sample over multiple months.

Methods: Data from 12,300 participants (aged 18-90 years) who used an under-mattress sleep device and a portable blood pressure monitor between July 2020 and March 2021 were included in this study. Sleep duration regularity was assessed as the standard deviation via device-assessed total sleep time. Sleep timing regularity was assessed as the standard deviation in sleep onset time and in sleep midpoint. Logistic regressions controlling for age, sex, BMI, and mean total sleep time were conducted to investigate potential associations between sleep regularity and hypertension.

Results: Participants were typically middle-aged (Mean ± SD; 50 ± 12 years) and predominantly male (12% females). Each participant had ~180 nights of recordings and ~70 blood pressure entries. There were 2,499 cases of hypertension defined as SBP>140 and/or DBP >90mmHg (20% of the sample). Across total sleep time quartiles, high sleep duration irregularity was consistently associated with a 9 to 15% increase in hypertension risk. A 38-minute increase in sleep midpoint irregularity was associated with an 11% (1.11 [1.03, 1.20]) increase in hypertension

risk, independent of mean total sleep time and mean sleep midpoint. Similarly, a ~31-minute increase in sleep onset time irregularity was associated with a 29% increased risk of hypertension (1.29 [1.18, 1.42]).
Conclusion: These novel findings provide insight into the potential important impact of sleep irregularity on cardiovascular health. Further assessment of day-to-day fluctuations in sleep duration and timing for potential effects on next-day blood pressure and other cardiovascular health outcomes are warranted.
Support (If Any): This was an unfunded investigator-initiated study. De-identified data were provided by Withings for unrestricted investigator-led analysis. PE serves as a consultant for Withings.

0205

SLEEP NEED: MORE INFLUENTIAL ON HEALTH AND DAYTIME FUNCTION THAN SLEEP DURATION?

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Introduction: Most prior research into relationships between sleep and health and daytime functioning have focused on average sleep duration or efficiency and ignored individual differences in sleep need. This study tested if sleep need is more strongly correlated with self-rated health and daytime function than sleep duration.
Methods: Data were drawn from the 2019 Sleep Health Foundation online survey of adult Australians (N=2,044, aged 18-90 years). Hierarchical multiple regressions assessed variance explained (R2 and R2 change) by demographics (Model 1: age, sex, BMI), self-reported sleep duration (Model 2: Model 1 + weighted variable of typical weekday/weekend sleep duration), and individual sleep need (Model 3: Model 2+ rating on a 5-point scale to 'how often you get enough sleep to feel your best the next day') on daytime function items for fatigue, concentration, motivation, and overall self-rated health (visual-analog scale from 0-100).
Results: Sleep need explained an additional 17.5–18.7% of the variance in fatigue, concentration, motivation, and health rating (all $p < 0.001$ for R2 change) in Model 3. In contrast, Model 2 showed that sleep duration alone only explained an additional 2.0–4.1% variance in these outcomes after accounting for demographic variables. Findings were similar when stratified by sex. Sleep need also explained greater variance for older adults than for younger and middle-aged adults, especially on health rating (Model 3: R2 change = 0.11 for ages 18-24y, 0.14 for 45-54y, 0.27 for 75y+).
Conclusion: Sleep need appears to explain considerably more variance in daytime function and self-rated health than sleep duration. The effect of sleep need on other daytime consequences, and in clinical populations, needs further exploration. Validated assessments of sleep need are also needed to elucidate its importance for understanding the effect of sleep on health and functioning.
Support (If Any): The 2019 Sleep Health Foundation online survey was supported by the not-for-profit Sleep Health Foundation using an unrestricted grant from Merck Sharp & Dohme (Australia) which did not inform nor restrict study design, methodology, or presentation.

0206

REST-ACTIVITY RHYTHMS ARE ASSOCIATED WITH SLEEP CHARACTERISTICS AND COGNITIVE FUNCTIONS IN PEOPLE WITH HEART FAILURE OVER 6 MONTHS

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Introduction: People with Heart failure (HF) often suffer from sleep deprivation and poor cognitive function. The purpose of this study was to examine the extent to which repeatedly measured rest-activity rhythms (RARs) measured with wrist actigraphy predict sleep characteristics and cognitive function in people with HF.
Methods: We measured insomnia severity (ISI), sleep quality (Pittsburgh sleep quality index: PSQI), sleepiness (Epworth sleepiness scale: ESS), psychomotor vigilance (Psychomotor vigilance test: PVT), and quality of life (Euroqol 5D) among people with HF patients who participated in a randomized controlled trial of cognitive behavioral therapy for insomnia vs. HF self-management education at baseline, 3-, and 6-months post-intervention. We performed cosinor analysis with 24-hour rest-activity counts obtained with 7 days of wrist actigraphy at each time point and calculated the circadian quotient, which represents the strength of RARs. We used the Generalized Linear Mixed Model with random intercepts to examine the association between the circadian quotient, sleep characteristics, cognitive function, and quality of life after adjusting for time-group interactions over 6 months. Statistical significance for standardized coefficients was accepted at 5% type I error.
Results: The analysis included 162 participants with HF and insomnia (Insomnia severity index >7) who completed actigraph monitoring for at least 7 days at baseline There was no significant change in the mean circadian quotient (Mean=0.78, SD=0.16) over 6 months. After adjusting for significant intervention effects, a greater circadian quotient was statistically associated with lower insomnia severity (-0.11±0.05), sleepiness (-0.12±0.05), sleep quality (-0.15±0.05), longer sleep duration (0.33±0.04) and better sleep efficiency (0.13±0.05). The circadian quotient was positively associated with cognitive function measured by fewer PVT lapses (-0.11±0.05) and quality of life (0.12±0.05).
Conclusion: In addition to the significant intervention effects for insomnia, HF patients may benefited from strengthening RAR to improve sleep characteristics, cognitive function, and quality of life. Further research to assess the contributions of RAR in people who received the intervention for insomnia and the HF self-education separately is recommended.
Support (If Any): R01NR016191 and P20NR014126

0207

MOTHERS' ADVERSE CHILDHOOD EXPERIENCES AND PROTECTIVE FACTORS ARE ASSOCIATED WITH REST-ACTIVITY RHYTHMS IN THEIR CHILDREN

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Introduction: Mothers' history of adverse childhood experiences (ACEs; e.g. maltreatment, household dysfunction) are associated with poor health outcomes in their children, but mechanisms underlying this intergenerational transmission are poorly understood. Given links between circadian rhythm and the stress-response system, we test the hypothesis that maternal ACEs influence child

health through disrupted rest-activity rhythm (RAR) in the mother and child. We also explore whether mothers' benevolent childhood experiences (BCEs) are protective against disrupted RAR.

Methods: We conducted a cross-sectional pilot study of maternal-child dyads with preschool-age children. Mothers reported history of childhood adversity (ACEs Scale, Childhood Trauma Questionnaire) and protective factors (BCE Scale). Dyads wore wrist actigraphs for 8-10 days and mothers completed daily electronic diaries. Nonparametric measures of RAR (e.g. interdaily stability [IS], intradaily variability [IV]) were calculated. We used linear regression to examine associations between mothers' childhood history and maternal and child RAR measures, controlling for household size and maternal employment.

Results: Maternal-child dyads (N=20) identified as white (75%), Black (15%), and Hispanic/Latina (10%). Mean child age was 4.2 years (40% female). Average household size was 4.5 ±.1.1 and 65% of mothers were employed. Forty-two percent of mothers reported 1-2 ACEs and 25% reported 3 or more ACEs. Maternal childhood history was not associated with mothers' RAR. However, maternal ACEs and CTQ total score were associated with decreased child IS (ACEs: β= -0.47, SE=0.01, p=.02; CTQ total: β= -0.53, SE=.01, p=.001) and increased child IV (ACEs: β=0.29, SE=.01, p=.051; CTQ total: β=0.38, SE+.00, p=.03). CTQ subscales revealed maternal childhood physical abuse (β= -0.54, SE=.01, p<.0001), emotional abuse (β= -0.42, SE=.00, p=.002), and sexual abuse (β= -.73, SE=.00, p<.0001) were associated with decreased child IS, while maternal childhood emotional neglect was associated with increased child IV (β= 0.39, SE=.01, p=.04). Maternal BCEs were associated with decreased child IV (β= -0.44, SE=.01, p=.03).

Conclusion: Maternal ACE history may influence child health through effects on children's circadian rhythm (i.e. decreased synchronization, increased fragmentation), while maternal BCEs may protect against rhythm fragmentation. Additional research is needed to support these novel preliminary findings.

Support (If Any): National Institute of Nursing Research (K99NR018876) and American Nurses Foundation.

0208

DAYTIME ALERTNESS QUANTIFICATION AND MODELLING: RESULTS FROM A LARGE OBSERVATIONAL STUDY

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Sleep Number Labs [1]

Introduction: Subjective alertness variations throughout the day can be characterized using the two-process model (TPM) of sleep regulation, which combines sleep homeostasis and the circadian rhythm to derive a theoretical daytime alertness curve. The TPM has been adopted to model the effect of sleep deprivation on memory, circadian misalignment, temperature regulation, and brain function; however, despite its broad influence, evidence supporting the TPM-derived alertness comes largely from small-scale, controlled studies. Here, we show that a similar three-parameter alertness measure can scale to a large study sample under real-world conditions.

Methods: Subjective alertness was voluntarily rated on a scale from 1 to 10 by Sleep Number smart bed users (N=22 499) through the SleepIQ app. Three age groups (18–40, 41–65, and 66–90 years) were analyzed. A 3-parameter version of the TPM-derived alertness curve was fit to the self-rated alertness responses using nonlinear least-squares fitting.

Results: A total of 65 528 sleep sessions were gathered over 95 days and analyzed. Overall, subjective alertness followed a similar trend to that reported in published literature: mean hourly alertness increased in the morning, dipped slightly in the afternoon, increased during the evening, and dropped again during the night. In contrast to previous studies, mean alertness ratings only changed by approximately 1 unit from low to high, and a greater increase in alertness occurred from afternoon to evening. Age-group analyses found that youngest sleepers' mean daily alertness was more stable throughout the day, and the amplitude of alertness variation decreased with age. These experimental results showed high agreement with model prediction ($R2=0.96$, $P<0.001$).

Conclusion: Overall, our results were similar to previous reports, with the exception of a small absolute change over the course of the day (about 1 unit) and an evening peak in alertness that was more pronounced in our data. These results show that the TPM-derived alertness can effectively predict daily alertness trends in a large sample under real-world conditions.

Support (If Any): This study was funded by Sleep Number Corporation. Medical writing support, provided by Rachel C. Brown, PhD, from Oxford PharmaGenesis Inc., Newtown, PA, USA, was funded by Sleep Number Corporation.

0209

THE EFFECT OF TIME OF DAY OF COVID-19 VACCINATION AND OTHER COVARIATES ON SIDE EFFECTS

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Introduction: Circadian rhythms have critical roles in human health. We quantified the effect of time-of-day of COVID-19 vaccination and other covariates on self-reported side effects post vaccination.

Methods: The dataset was created from MassGeneralBrigham (MGB) electronic health records and REDCap survey that collected self-reported symptoms for 1-3 days after each immunization. Variables are demographics (age, sex, race, and ethnicity), vaccine manufacturer, clock time of vaccine administration/appointment, any COVID-19 diagnosis/positive test prior to vaccination, any history of allergy, and any note of epinephrine self-injection (e.g., EpiPen) medication. Time of day groupings were morning (6 am–10 am), midday (10 am–2 pm), late afternoon (2 pm–6 pm) or evening (6 pm–10 pm). Side effects were classified as Allergic (Rash; Hives; Swollen lips, tongue, eyes, or face; Wheezing) and Non-Allergic (New Headache, New Fatigue, Arthralgias, Myalgias, Fever) symptoms. The study was approved by the MGB IRB.Machine learning (ML) techniques (e.g., extreme gradient boosting) were applied to the variables to predict the occurrence of side effects. Stratified k-fold cross validation was used to validate the performance of the ML models. Shapley Additive Explanation values were computed to explain the contribution of each of the variables to the prediction of the occurrence of side effects.

Results: Data were from 54,844 individuals. On day 1 after the first vaccination, (i) females, people who received the Moderna vaccine, and those with any allergy history were more likely to report Allergic side effects; and (ii) females, people who received the Janssen vaccine, those who had prior COVID-19 diagnosis ,and those who received their vaccine in the morning or midday and were more likely to report

Non-Allergic symptoms. Older persons had fewer side effects of any type.
Conclusion: ML techniques identified demographic and time-of-day-of-vaccination effects on side effects reported on the first day after the first dose of a COVID-19 vaccination. We will use these techniques to test for changes on days 2 and 3 after the first dose, and the first 3 days after the second dose and for the influence of recent night or shiftwork. Future work should target underlying physiological reasons.
Support (If Any):

0210

SOCIAL RHYTHM REGULARITY: ASSOCIATIONS WITH SLEEP, CIRCADIAN, MENTAL HEALTH, AND ALCOHOL USE OUTCOMES IN ADOLESCENTS

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Introduction: Circadian rhythms and sleep regularity relate to a range of negative health outcomes, such as mental illness and substance abuse including binge drinking. According to the social zeitgeber hypothesis, the timing of key modifiable daily behaviors serves as time cues that entrain circadian rhythms, ostensibly stabilizing them and thereby improving health. The cross-day stability in timing of these behaviors (i.e., social rhythm regularity) is measured by SRM5; however, studies have not tested whether SRM5 correlates with circadian rhythm regularity based on physiological measures, such as dim light melatonin onset (DLMO). The current study examined whether SRM5 was associated with: (1) the regularity of circadian rhythms and/or sleep regularity metrics, and (2) sleep quality, depression, and binge drinking.
Methods: Late adolescents aged 18 to 22 years old who drink alcohol (n = 36; 61.1% female, Mage = 21.26) completed a self-reported sleep diary (including SRM5 items for first contact, start work, and dinner time), wore a wrist actigraph for 14 days, and completed 2 overnight visits to assess DLMO. We used the self-reported data to calculate SRM5 and standard deviation (StDev); actigraphy data to calculate composite phase deviation (CPD), social jet lag (SJL), and interdaily stability (IS); and DLMO data to calculate the stability of the circadian phase (Sunday minus Thursday). Participants also completed surveys that assessed global sleep quality, depressive symptoms, and frequency of binge drinking. Correlational analysis and hierarchical linear regression modeling were used.
Results: Higher SRM5 scores (i.e., higher social rhythm regularity) were associated with higher regularities of mid-sleep timing ($r = –.48$, $p < .001$) and total sleep duration ($r = –.41$, $p = .01$) based on StDev metrics but were not associated with IS ($r = 13$, $p = .45$), CPD ($r = –.19$, $p = .28$), SJL ($r = –.07$, $p = .68$), and stability of DLMO ($r = –.003$, $p = .99$). A post-hoc analysis found that higher stability of the "out of bed" item of SRM5 was related to higher stability of DLMO ($b = –.11$, $se = .05$, $p = .03$, $r2 = .33$). Higher SRM5 scores were associated with better sleep quality ($b = –.73$, $se = .30$, $p = .02$, $r2 = .21$), but were not with depressive symptoms or binge drinking
Conclusion: In contrast with the social zeitgeber hypothesis, SRM5 was not associated with circadian rhythm regularity measured by DLMO. However, social rhythm regularity is an important factor in predicting better sleep quality. This study provides a foundation for future research with better power to determine the extent to which social rhythms influence circadian stability and to better understand why social rhythm regularity relates to sleep quality.
Support (If Any): This research was supported by the NIH NIAAA (R21AA023209-02), NHLBI (T32HL082610), and NIMH (T32MH019986)

0211

A 10-WEEK OBSERVATIONAL RESEARCH STUDY IN INDIVIDUALS WITH DELAYED SLEEP-WAKE PHASE DISORDER (DSWPD) SYMPTOMS

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Vanda Pharmaceuticals Inc. [1]

Introduction: We conducted an observational research study in suspected delayed sleep-wake phase disorder (DSWPD) participants. The objective was to measure sleep-wake patterns and to conduct exploratory genetic analyses to delineate the landscape of DSWPD.
Methods: We measured the sleep-wake patterns of participants by daily post-sleep diaries for 10 weeks. Participants also completed questionnaires on demographics, medical/surgical history, sleep history, and concomitant medications. Altogether, 119 participants were consented and 76 participants provided samples for whole genome sequencing.
Results: Sleep diary analysis confirmed delayed sleeping patterns in the study population. Midpoint of sleep was 4:50 AM (SD = 2:06) versus 3:06 AM (SD = 0:59) in controls, a statistically significant difference ($t (df) = 6.57 (72.063)$; $p \leq 0.0001$). Mean total sleep time (TST) was 6.88 h (SD = 1.35) versus 7.79 h (SD = 0.56) in controls, a statistically significant difference ($t (df) = -5.38 (70.863)$; $p \leq 0.0001$). This effect was driven by shorter participant-reported TST on work nights (6.33 h) versus free nights (7.22 h). Sleep latency was significantly later on work nights than free nights. Altogether 17% of participants reported at least one psychiatric condition.We observed an enrichment of the minisatellite 54bp (1: 7829913-7829966 (GRCh38)) variable number of tandem repeat (VNTR) PER3 rs57875989 4 allele. Significantly higher frequencies of the 4/4 and 4/5 variants were observed when compared to controls (n = 1937; recessive: OR 3.3, CI 2.1177 to 5.4304, $p < 0.0001$).We analyzed the putative loss-of-function and missense variants. We report on presence of cases with PER3 rs144178755 (NM_001289862:p.T1049), PER3 rs228696 (NM_001289861:p.L835P), and PER2 rs76355956 (NM_022817:p.V197M), among other rare nonsynonymous variants. We observed higher frequency of missense variants in core clock genes when compared to controls.
Conclusion: Sleep diary data confirmed significantly delayed sleep patterns, with more pronounced results during work nights and larger SDs across all sleep parameters, suggesting more variable sleep patterns. Genetic analysis confirmed these individuals are more likely to harbor variants within their core clock genes with enrichment of the VNTR variant, potentially leading to a pronounced delay in sleep period.
Support (If Any): Vanda Pharmaceuticals Inc.

0212

HABITUAL HEAVY ALCOHOL DRINKING IN HEALTHY ADULTS IS ASSOCIATED WITH REDUCED CIRCADIAN PHOTORECEPTOR RESPONSIVITY TO LIGHT

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Introduction: Habitual alcohol consumption and circadian timing are interconnected. Numerous studies have reported that heavy alcohol use is associated with eveningness. Only two studies have assessed the dim light melatonin onset (DLMO) in the context of habitual alcohol use, and both reported a shorter DLMO-midsleep

interval was associated with heavier alcohol consumption. A gap in this research is the potential impact of alcohol use on the primary circadian photoreceptor, the intrinsically photosensitive retinal ganglion cells (ipRGCs), which influence circadian timing. This study aimed to compare sleep, circadian timing, and photoreceptor responsivity between light and heavy alcohol drinkers.
Methods: Participants were healthy (average age 27 years) and included 28 light (average 2.6 drinks/week) and 50 heavy (average 17.9 drinks/week) drinkers. They participated in an 8-day study protocol: 1 week of adlib sleep monitored with wrist actigraphy, followed by a 9-hour laboratory session with a photoreceptor responsivity (post-illumination pupil response, PIPR) and circadian phase assessment. Participants passed a breathalyzer test at the start of the laboratory session.
Results: Both drinking groups were good sleepers with minimal mood disturbance. Consistent with earlier studies, the heavy drinkers had more eveningness (p=0.029), and a trend for a shorter DLMO-midsleep interval (p=0.059) as compared to the light drinkers. The PIPR in the heavy drinkers was significantly smaller than in the light drinkers (p=0.006), suggesting reduced circadian photoreceptor responsivity in the heavy drinkers. In the light drinkers, a larger PIPR in the evening, reflecting greater sensitivity to phase-delaying light, was significantly associated with a later DLMO (r=0.42, p=0.028). However, this relationship was absent in the heavy drinkers (r=-0.07, p=0.68).
Conclusion: The findings replicate previous work examining the relationship between chronotype, DLMO, and habitual alcohol consumption. For the first time, circadian photoreceptor responsivity was examined, and found to be significantly reduced in heavy alcohol drinkers as compared to light alcohol drinkers. This finding is consistent with prior rodent studies that found reduced phase shifts to light with acute or chronic alcohol consumption, and suggests that habitual heavy alcohol use may impair the circadian response to light in humans.
Support (If Any): Grant awarded from NIAAA R01 AA023839.

0213

CIRCADIAN ENTRAINMENT AND COGNITION IN COLLEGE STUDENTS USING ANTIDEPRESSANTS

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Introduction: Depression, sleep disturbances, and cognitive deficits often co-occur. Compared to non-medicated controls, people using antidepressant medications (particularly serotonin agonists) often have improved sleep including increased slow wave sleep, quality and continuity. Improvements to cognition after antidepressant treatments are also common including benefits to reaction time, inhibition, and memory. Importantly, circadian deficits, including sleep onset latency, fragmentation, and phase shifts are common in patients with depression, yet the effect of antidepressant medication on circadian indicators is unclear. The current project examined sleep, circadian entrainment, and cognition in college students who were diagnosed with depression and using serotonin agonists and in those without depressive symptoms.
Methods: Participants completed cognitive tasks that assessed reaction time, memory, attention, inhibition, and logical reasoning via the Automated Neuropsychological Assessment Metric between 1100-1700 two times, first at study enrollment and second after a two-week study interval. After initial cognitive assessments, participants wore actigraphs for two weeks from which we extracted their sleep-wake patterns, total sleep time(TST), time in bed(TIB), sleep-onset latency(SOL), sleep efficiency, and wake after sleep onset(WASO). Study 1 included 15 undergraduate students (11F, 7 antidepressant users, Mage=19.53) and Study 2 included 25 graduate students (21F, 13 antidepressant users, Mage=25.37), all recruited from James Madison University.
Results: Study 1 found that undergraduate antidepressant users had longer TIB, TST, and SOL. No cognitive or entrainment differences were found between drug use conditions. Within the antidepressant group, higher dosage predicted shorter TIB(r^2=.64, p<.05), poorer spatial processing speed(r^2=.73, p<.05) and logical relation performance(r^2=.81, p<.05). In study 2, no circadian or cognitive differences were present across drug conditions. Deficits in WASO and sleep efficiency for antidepressant users were present. Within the antidepressant group, years of antidepressant use and dosage predicted poorer reaction time(r^2=.84, p<.05), inhibition(r^2=.70, p<.05), and spatial processing(r^2=.98, p<.05). Self-reported wake episodes also predicted poorer reaction time and inhibition. Years of antidepressant use, dosage, and time of antidepressant use predicted TIB(r^2=.73, p<.05), and time of antidepressant use predicted TST(sr^2=.79, p<.05).
Conclusion: Future studies should use longitudinal research designs and prospective methods to examine the impact of antidepressant medications on circadian rhythms, sleep and cognition.
Support (If Any):

0214

EFFECTS OF SIMULATED NIGHT-SHIFTWORK INDUCED CIRCADIAN MISALIGNMENT ON THE HUMAN PLASMA METABOLOME

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Introduction: Circadian misalignment occurs when behaviors such as food intake and sleep happen at inappropriate endogenous circadian times, is common among shift-workers, and is a risk factor for cardiometabolic disease. Identifying mechanisms underlying adverse cardiometabolic risk linked to circadian misalignment could help develop new countermeasure strategies to mitigate health consequences of shiftwork. Thus, we analyzed 24-hour profiles of plasma metabolites during circadian alignment and misalignment in a night-shiftwork protocol.
Methods: 14 healthy adults (6M/8F), aged 26.4±1.2y (mean±SD), completed a 6 day in-laboratory simulated night-shiftwork study. The protocol comprised 2 baseline days (circadian alignment) followed by a transition day to shiftwork, and then 2 simulated night-shiftwork days (circadian misalignment). Participants consumed energy-balanced diets throughout the protocol, starting 3 days prior to laboratory admission. Plasma was collected every 4h during circadian alignment and misalignment conditions and was analyzed via untargeted metabolomics (liquid chromatography/mass-spectrometry). A model selection approach (best fit) with circadian and behavioral cosine models identified metabolites influenced by circadian (central circadian clock measured via dim-light melatonin onset) versus behavioral cycles (food intake/sleep).
Results: 5,171 metabolites were detected with average abundance of 424 (~8%) changing between conditions (false discovery rate (FDR)<0.05). 380 metabolites had significant (FDR<0.05) 24-h time-of-day patterns. Of these 380 metabolites, 248 had 24-h

time-of-day patterns during circadian alignment, 283 had 24-h time-of-day patterns during misalignment, and 141 had 24-h time-of-day patterns during both conditions. Of the metabolites with 24-h time-of-day patterns in both conditions, 50 were circadian-influenced (e.g., arachidinoyl-serine) and 91 were behaviorally-influenced (e.g., propionylcarnitine).
Conclusion: Almost twice as many metabolites were influenced by the behavioral versus circadian cycle suggesting altered timing of behaviors like food intake and sleep have a significant impact on 24-h time-of-patterns in the human plasma metabolome. For example, propionylcarnitine is involved in energy metabolism and likely reflects 24h time-of-day patterns altered by food intake. Alternatively, arachidinoyl-serine was circadian influenced, is involved in vasodilation, and thus may contribute to circadian regulation of blood pressure. Further understanding circadian and behavioral regulation of the metabolome could have application in identifying mechanisms of physiological dysregulation and targets for intervention to mitigate health consequences of circadian misalignment.
Support (If Any): NIH-DK092624, NIH-TR001082, NIH-DK048520, NIH-HL132150, NIH-HL145099, NIH-DK111161

0215

IMPACT OF SLEEP INERTIA ON VISUAL SEARCH PERFORMANCE DURING COMBINED SLEEP RESTRICTION AND CIRCADIAN MISALIGNMENT.

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Introduction: Circadian phase and homeostatic sleep drive affect selective visual attention during sleep inertia (SI), a period of cognitive performance decrement upon awakening that dissipates with time. This study examined the combined effects of circadian misalignment and sleep restriction on visual search performance during SI.
Methods: Twenty adults (mean±standard deviation [SD] age 25.7±4.2 years; 12M, 8F) completed a 39-day protocol. Prior to a 4-day in-laboratory visit, participants maintained habitual 8h sleep schedules for 2 weeks at home. In-laboratory sleep opportunities (1 per day) were timed to induce varying levels of both circadian misalignment and sleep restriction: 8h on night 1, 3h on night 2, and 3h on mornings 3 and 4. After 3 days of recovery sleep at home (unscheduled), participants repeated the entire protocol. SI was assessed with the Serial Visual Search Task, a measure of selective visual attention, ~ 1, 16, and 31 min after electroencephalogram (EEG) verified awakening following each 3h sleep opportunity. The task required participants to determine whether a target was present or absent among nontarget distractors. Outcomes included median reaction times (RT) and number of missed targets. Sleep opportunities with ≥4.5 min of EEG-verified wakefulness in the 30 min prior to scheduled awakening were excluded from analysis. Data were analyzed with mixed-model ANOVA.
Results: Mean±SD average amount of wakefulness in the 30 min and 10 min prior to SI testing was 1.2±0.11 and 0.43±0.06 minutes, respectively. Following all sleep opportunities, median RT for overall correct responses and for correct response to target absent trials improved with time since awakening (all $p<0.05$). In contrast, median RT for correct responses to target present trials improved and number of missed targets worsened with time since awakening following the morning 3 sleep opportunity only (all $p<0.05$).
Conclusion: Reaction speed was impaired during SI regardless of circadian timing or level of homeostatic sleep drive, whereas missing targets appears to be dependent upon circadian phase and the level of homeostatic sleep debt. These findings have important implications for military and first responders.
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0216

ENVIRONMENTAL BRIGHT LIGHT EXPOSURE IS ASSOCIATED WITH SLEEP TIMING: THE MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS

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Introduction: Light influences sleep via the circadian system, but few studies have examined objective light exposure and sleep outcomes in the general population. We investigated the relationship between daily average time above 1,000 lux white light (TALT1000), a proxy for outdoor light exposure, and actigraphy measures of sleep timing and regularity in the Multi-Ethnic Study of Atherosclerosis (MESA).
Methods: Light and actigraphy data collected over 5+ days (wrist-worn Actiwatch Spectrum) were analyzed. Relationships between TALT1000 and dichotomized sleep timing measures (sleep midpoint regularity, defined as <30 minutes variability in sleep timing; late sleep onset, defined as 12AM or later) were evaluated with logistic regression models, adjusted for age, self-reported race/ethnicity, sex, federal poverty level, partner status, employment, smoking, BMI, depression score, sleep duration, day length by month and site, chronotype, number of days measured, ActiWatch off-wrist time, and average physical activity during active period. Stratified analyses for employment status and sleep duration were also conducted. Covariates associated with quartiles of TALT1000 were evaluated with ordinal logistic regression.
Results: 2,135 MESA participants with valid actigraphy data were included (mean age=68.6 years, 53.8% female, mean TALT1000=61 minutes, mean sleep midpoint variability=70.6 minutes). There was a dose-response relationship between quartiles of TALT1000 and sleep timing regularity, with participants in the highest quartile of TALT1000 exposure (equivalent to 90+ minutes daily bright light exposure) having 87.7% increased odds of sleep timing regularity (adjOR=1.88, CI=1.35-2.62); the highest quartile of TALT1000 was also associated with a 41% decreased odds of sleep onset timing ≥12AM (adjOR=0.59, CI=0.43-0.81). Age, race/ethnicity, partner status (single), and day length were negatively associated, while BMI, sex (male), earlier chronotype, and physical activity were positively associated with quartiles of TALT1000 ($p<0.05$).
Conclusion: Greater average bright light exposure is associated with greater sleep timing regularity and earlier sleep onset in a large sample of U.S. adults. Future analyses will investigate timing of light exposure and associated multi-omic signatures.

Support (If Any): NIH-NHLBI T32HL007901, R35HL135818, R01HL098433, R24HL114473, 75N92019R002.

0217

IS THE TIMING OF THE ENDOGENOUS CIRCADIAN RHYTHM OF NEUROBEHAVIORAL FUNCTIONING INHERENTLY TASK-DEPENDENT?

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Introduction: Changes in waking neurobehavioral functioning (NF) over time are governed by homeostatic and circadian processes. It has been reported that peak circadian timing varies inherently between tasks, such that the optimal timing for NF would be task-dependent. Here we investigated this idea with a simulated shift work study protocol followed by a 24h constant routine (CR) protocol to experimentally and statistically separate the circadian from the homeostatic process.
Methods: N=13 healthy adults (ages 25.5±3.2y; 9 men) completed a 7-day/6-night in-laboratory study. They were randomized to a 3-day simulated day shift condition (n=7) with nighttime sleep (22:00–06:00) or a 3-day simulated night shift condition (n=6) with daytime sleep (10:00–18:00). They then underwent a 24h CR protocol, during which they stayed awake under constant behavioral and environmental conditions and blood was collected at 1–3h intervals for the assessment of dim light melatonin onset (DLMO). During scheduled wakefulness, subjects completed three functionally distinct NF tasks at ~2h intervals: the Karolinska Sleepiness Scale (KSS), Digit Symbol Substitution Test (DSST), and Psychomotor Vigilance Test (PVT). Data from these tasks taken during the CR protocol were analyzed with non-linear mixed-effects regression to separate endogenous circadian effects from the homeostatic process.
Results: Following simulated night shift, compared to simulated day shift, on average there was a modest, 1.4h (±0.8h SE) delay in DLMO ($F_{1,11}=3.68$, $p=0.082$). As such, the simulated night shift condition produced a 10.6h shift in alignment of the homeostatic process relative to the circadian process. Regardless of prior shift condition, the peak of the circadian rhythm effect on NF occurred post-DLMO by 16.8h (±1.0h) for KSS, 15.9h (±1.4h) for DSST, and 18.6h (±1.0h) for PVT, which was not significantly different ($F_{2,9}=1.55$, $p=0.26$).
Conclusion: As proof of principle, we studied three distinct NF assays, and found only small, non-significant differences between them in the timing of underlying circadian rhythmicity. While a larger sample could have yielded statistical significance in our comparison of circadian peak times, the small magnitude of the observed difference does not support the idea of inherent task-dependent differences in the timing of the endogenous circadian rhythm's influence on NF.
Support (If Any): CDMRP W81XWH-16-1-0319 and W81XWH-20-1-0442

0218

N2 AND WAKEFULNESS DRIVE SUBJECTIVE SLEEP SATISFACTION IN ADULTS

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Introduction: The measurable aspects of brain function derivable from polysomnography (PSG) that are correlated with sleep satisfaction are poorly understood. Previously, a weak association of PSG measures with subjectively rated sleep depth and restfulness was shown. Using recent developments in automated sleep scoring, which remove the within- and between-rater error associated with human scoring, we revisit whether whole night PSG measurements are associated with sleep satisfaction. Additionally, we investigate if PSG data collected closer to wake time explains the subjective sleep experience better than whole night PSG.
Methods: Random Forest machine learning was used to investigate the relationship between PSG data from the Sleep Heart Health Study (N=3,165, middle-aged and older adults) and self-reported sleep satisfaction (restfulness, depth). PSG were rescored using a novel automated algorithm that generates both a sleep stage for each 15-s epoch as well as a stage matching probability. Data were also parsed into 20 minute-fragments based on time relative to wake.
Results: Models explained 30% of subjective sleep depth and 27% of subjective sleep restfulness, with a similar top four predictors: minutes of N2 and wake after sleep onset (WASO), sleep efficiency, and age, capturing 28% (restfulness) and 26% (depth) of the relative model variance. With increasing subjective sleep quality, there was a progressive increase in N2 and decrease in WASO of similar magnitude, without systematic changes in N1, N3 or REM. In comparing those with the best and worst subjective experience of sleep, there is a range of approximately 30 minutes more N2, 30 minutes less WASO, an improvement of sleep efficiency of 7-8%, and an age span of 3-5 years. Random Forest models derived from PSG fragments closer to the offset of sleep did not provide better explanatory power compared to the whole-night data set.
Conclusion: Approximately one-third of the variance in two measures of self-reported sleep experience can be explained by whole-night PSG variables, notably an increase in N2 and decrease in wake that led to improved sleep efficiency. Interventions that specifically target these may be suitable for improving the self-reported sleep experience.
Support (If Any):

0219

INTERPLAY OF SCHOOL DAYS AND FREE DAYS WITH SLEEP MIDPOINT ON THE ASSOCIATION OF VISCERAL ADIPOSITY WITH BLOOD PRESSURE IN ADOLESCENTS

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Introduction: The circadian timing of sleep, including its variability, has emerged as an important contributor to obesity and cardiovascular health, such as elevated blood pressure. Adolescence is a particularly vulnerable period for circadian misalignment, which may express differently if youth are in school or on free-days. We examined whether deviations in sleep midpoint increase the impact of visceral adiposity on elevated blood pressure in adolescents as a function of being entrained to school or not.

Methods: We analyzed cross-sectional data from the Penn State Child Cohort follow-up study, a random population-based sample of 303 adolescents (16.2 ± 2.2 y; 47.5% female; 21.5% minority). Actigraphy-measured sleep midpoint was calculated as the midpoint (zeroed to midnight) of the sleep period for weekdays (5-nights) and weekends (2-nights). Actigraphy-measured sleep regularity was calculated as the intra-individual standard deviation of the 5-night weekdays sleep midpoint. Visceral adipose tissue (VAT) was measured via dual-energy X-ray absorptiometry scan. Systolic (SBP) and diastolic (DBP) blood pressure was measured three times in the seated position. Multivariable linear regression models were stratified by "in school" and "on break" to test sleep midpoint and sleep regularity as effect modifiers of VAT on SBP/DBP levels. Analyses were adjusted for sex, race/ethnicity, age, actigraphy-measured sleep duration and polysomnography-measured apnea/hypopnea index.
Results: When participants were studied while "in school", significant interactions were found between VAT and weekdays sleep midpoint on SBP (p-interaction=0.027) and DBP (p-interaction=0.046), so that the later the sleep midpoint on school days, the greater the association of VAT with SBP/DBP. When participants were studied while "on break", a significant interaction was found between VAT and weekdays sleep regularity on SBP (p-interaction=0.039), so that the higher the sleep irregularity on weekdays, the greater the association of VAT with SBP. No other significant interactions were found.
Conclusion: A delayed and an irregular sleep midpoint during school days and during breaks, respectively, best identified those adolescents with greater cardiovascular risk associated with visceral obesity. These data suggest that not only the circadian timing of sleep contributes to adverse cardiovascular outcomes but its distinct biomarkers require measurement under different entrainment conditions in adolescents.
Support (If Any): National Institutes of Health (R01HL136587, UL1TR000127)

0220

CHANGES IN LIGHT EXPOSURE DURING THE DAYLIGHT SAVING TIME TO STANDARD TIME TRANSITION

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Introduction: Although sunrise and sunset do not change, the Daylight Saving Time (DST) to Standard Time (ST) transition results in an earlier clock hour of sunrise and sunset. It has been hypothesized that ST results in brighter mornings and dimmer afternoons/early evenings compared to DST. However, how the time change from DST to ST influences light exposure measured at the level of the individual has not been quantified. Thus, we aimed to determine if the time change from DST to ST increases morning and decreases evening light exposure under typical living conditions.
Methods: 25 young healthy adults [7 males (25.6±7.8yr; mean±SD)] completed a ~2 week-long at home protocol. Light exposure was collected with wrist worn Actiwatch Spectrum Plus (Philips Respironics, Bend, OR) one week prior and one week after the transition from DST to ST in Fall 2020. Participants were instructed to continue with their typical work/school schedule, to maintain a nighttime sleep schedule, and to not stay up all night throughout the study. Data were analyzed comparing light exposure levels in the morning (0600-1200h) and afternoon/early evening hours (1200-1800h) across the work/school week with mixed model ANOVA and planned comparisons assessed.
Results: A significant week by time-of-day by week interaction ($p<0.05$) was observed showing brighter light exposure levels in the morning during the week after the change from DST to ST ($p < 0.01$), whereas similar light exposure levels were observed in the afternoon/evening hours across weeks ($p = 0.64$).
Conclusion: Consistent with expectations, individuals were exposed to brighter mornings but contrary to expectations individuals were not exposed to dimmer afternoons/early evenings during ST versus DST. Early morning light exposure is important for entrainment of the on average longer-than-24-hour human circadian period to the 24h day, and for maintenance of sleep schedules that are conducive to work/school start times. Future research is needed to highlight the health, performance, and safety benefits of brighter morning light exposure demonstrated here during ST, especially given current efforts to end the time change between DST and ST.
Support (If Any):

0221

PRE-SLEEP BREATH ALCOHOL CONCENTRATIONS (PSBRAC) AND SLEEP POLYSOMNOGRAPHY (PSG)

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Introduction: Alcohol use before bedtime has been shown to alter sleep including decreasing sleep latency, decreasing sleep efficiency, and fragmenting sleep stage distribution. Few studies manipulate pre-sleep alcohol concentration, instead focusing on a target dose or peak alcohol concentration during the night. Thus, we investigated how presleep breath alcohol concentrations (psBrAC) level (targeting a BrAC of 0.08), are associated with same-night sleep.
Methods: Thirty (15F; ages=22-57, mean=33yr) healthy adults who self-reported moderate drinking were instructed to maintain a consistent sleep schedule (8-9h time in bed) for a least 7-days before entering a cross-over design involving two sets (separated by>3 days) of 3 consecutive nights of in-lab polysomnography. For all nights in each condition, participants drank either mixer alone or mixer+alcohol in 3 portions across 45 minutes ending 1h before lights out. psBrAC was measured within 5 minutes of lights out. PSGs were staged according to Rechtschaffen and Kales (1968). We computed: slow wave sleep (SWS) and REM as percentages of total sleep for the full night (%SWS) & (%REM), %SWS in the first third of the night (%SWST1), %REM in the last third of the night (%REMT3), minutes until sleep onset from lights out (Sleep Latency), and minutes after sleep onset until REM onset. Linear regressions tested if psBrAC on the first mixer+alcohol night predicted changes in sleep using the average of the three nights of sleep in the mixer-only condition as a covariate.
Results: psBrAC values ranged from 0.038 to 0.087 (mean = 0.066) mg/L. We identified minimal influence of BrAC on sleep: % SWS ($\beta = -0.78$; $p = 0.07$), % REM ($\beta = 0.032$; $p = 0.96$), % SWS T1 ($\beta = -0.52$; $p = 0.522$), % REM T3 ($\beta = -1.01$; $p = 0.125$), REM latency ($\beta = 3.95$; $p = 0.302$), and sleep latency ($\beta = -1.23$; $p = 0.13$).
Conclusion: These findings indicate that psBrAC was not associated with any of our sleep variables, when adjusting for sleep on nights without alcohol. Future work will examine peak BrAC as well whether the effects observed change over multiple nights of pre-sleep alcohol consumption.
Support (If Any): R01AA025593

0222

A SHIFT IN THE CIRCADIAN TIMING OF CALORIES AND AN INCREASE IN SLEEP VARIABILITY ARE ASSOCIATED WITH CHANGES IN CARDIOMETABOLIC HEALTH IN A REAL-WORLD SETTING

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Introduction: Obesity and cardiovascular disease are commonplace in industrialized societies, particularly in nightshift workers. To investigate whether a shift in the circadian timing of energy intake or an increase in sleep variability may be mechanisms for adverse cardiometabolic health, we leveraged a natural experiment that occurs in newly-hired bus operators as they transition from a regularly-timed training schedule into an erratically-timed (i.e., early-morning or late evening) work schedule.

Methods: Twenty-one newly-hired bus operators (8 females, 37.1y±6.4y [mean±SD]) were studied in an ~90-day protocol. During dayshift training (i.e., baseline), participants underwent a battery of in-laboratory cardiometabolic health assessments (i.e., blood pressure [BP], blood draw, body fat percentage), and a salivary dim-light melatonin assessment (DLMO). Participants then completed daily sleep-wake diaries and recorded all food and beverages consumed using a photographic time-stamped phone application (MealLoggerTM) for one week. These measurements were repeated ~30 and ~90 days after starting their new work schedules operating a bus. Caloric intake was determined via registered dieticians and DLMO was defined using a 3pg/ml threshold. As indices of caloric timing we used the time when participants consumed 50% of daily calories (caloric midpoint), and the percent of daily calories consumed within 4h of DLMO. Sleep variability was measured as the standard deviation of sleep onset timing. Associations were calculated using Pearson's correlations.

Results: After 90-days of working, caloric midpoint occurred 2h later than baseline (16:22±02:41 vs. 14:24±02:07; $p<0.01$). This shift in timing was correlated with increases in systolic BP ($r2=0.28$; $p=0.02$) and low-density lipoprotein cholesterol ($r2=0.28$; $p=0.03$). An increase in sleep variability at 90-days was also positively correlated with systolic BP ($r2=0.31$; $p=0.02$). The change in percent of calories consumed within 4h of DLMO was positively correlated with change in percentage body fat ($r2=0.27$; $p=0.03$). Last, there was no significant correlation between the change in daily calories consumed and body fat percentage ($p=0.24$).

Conclusion: Changes in the timing of caloric intake relative to DLMO, along with increases in sleep variability, may be mechanisms for increased cardiometabolic risk. These behaviors are potential targets for intervention to improve cardiometabolic health.

Support (If Any): R01HL105495, K01HL146992

0223

SLEEP DURING LAYOVERS OF DIFFERENT LENGTHS AFTER LONG-HAUL FLYING ACROSS MULTIPLE TIME ZONES IN DIFFERENT GEOGRAPHIC DIRECTIONS

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Introduction: Long-haul pilots experience high levels of fatigue and circadian disruption due to long work hours and trans-meridian travel. The aim of this study was to characterize sleep timing and duration during layovers of different lengths after crossing multiple time zones.

Methods: All pilots flying long-haul operations from a single airline were eligible to participate. While following their normal work schedule within airline operations, pilots collected data for ~2 weeks including at least two long-haul rotations, with rest days and layovers. Participants wore an Actiwach (Phillips Respironics) throughout the entire study period and completed a sleep diary (at bedtime and upon waking up). Based on the data, we categorized layovers as follows: layover type 1: 34 h after crossing five time zones in westward direction; layover type 2: 34 h, no time zone change; layover type 3: 55 h after crossing six time zones in eastward direction. Each flight left the home base at the same time of day (23:00) and the flight duration was between 10.5 and 12 h. We calculated descriptive statistics for each category.

Results: Forty-four long-haul pilots participated in the study (5 female; mean age 44.25 ± 10.06 yrs; mean flight hours 9834.3 ± 5334.1 h). We found that for layover type 1, the mean sleep duration (h) per 24 h was 6.90 (±1.04), mean sleep efficiency (%) was 81.08 (±10.89), and mean Wake After Sleep Onset (WASO, min) was 33.23 (±20.42); for layover type 2, the mean sleep duration (h) per 24 h was 6.91 (±1.06), mean sleep efficiency (%) was 81.71 (±6.80), and mean WASO (min) was 30.10 (±11.00); for layover type 3, the mean sleep duration (h) was 7.07 (±1.32), mean sleep efficiency (%) was 83.93 (±6.04), and mean WASO (min) was 36.94 (±17.95).

Conclusion: Our preliminary analyses showed that sleep duration and sleep efficiency were similar for the layovers of the same length regardless of time zone change. Additional analyses will be conducted to investigate sleep on additional layovers of different lengths and the effects of sleep obtained during layover on the performance and alertness on the return flights.

Support (If Any): This research was supported by the NASA System-Wide Safety Program.

0224

THE IMPLICATION OF THE UNDERSTUDIED DRUGGABLE ORPHAN GPCRS IN SLEEP AND CARDIOMETABOLIC TRAITS

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Introduction: G-protein coupled receptors (GPCRs) are the largest class of membrane receptors. They are involved in various sleep and cardiometabolic disorders; however, 150 out of 900 GPCRs remain orphans (oGPCRs) with unknown endogenous ligands; thereby, limiting our understanding of their biological function. GPCRs are targeted by 36 % of FDA-approved drugs; thus, the understudied oGPCRs are druggable and have a high potential to impact human health once disease associations are made.

Methods: This study aimed to use a genomic approach from a large dataset to deorphanize oGPCRs whose genetic variations significantly impact sleep and cardiometabolic disorders. First, we used the UK Biobank study summary statistics to identify oGPCRs loci where multiple sleep and cardiometabolic traits colocalized at a false discovery rate < 5%. Next, in the metabolic disease knowledge portal, we performed PheWAS analysis of the variants to identify new phenotypic traits in other datasets of European ancestry. We then used GTex to identify quantitative trait loci to highlight variants that affect gene expression.
Results: Our study identified variants in oGPCRs GPR61, GPR146, and GPRC5B that have a pleiotropic effect in sleep and cardiometabolic traits in the UK Biobank cohort. The variant rs12044778 is an intronic variant in GPR61 associated with ease of waking up and morningness chronotype. GPR146's intronic variant rs1997243 showed an association with cholesterol level (HDL and LDL) and blood pressure; additionally, rs1997243 significantly increased the expression of GPR146 in adipose tissues. Finally, the intronic variant rs11639988 is associated with a decrease in BMI, and that it significantly decreased GPRC5B gene expression in the nucleus accumbens and adipose tissues.
Conclusion: Overall, our study provides new insight into the functions of oGPCRs genetic variants in sleep and cardiometabolic processes.
Support (If Any): 5T32HL007609-35

0225

AN ASSESSMENT OF THE INFORMATION QUALITY, UNDERSTANDABILITY, AND ACTIONABILITY OF POPULAR YOUTUBE VIDEOS ON SLEEP AND SLEEP DISORDERS

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Introduction: The Internet and social media are widely used and surprisingly trusted sources of sleep health information. Despite the tremendous promise as platforms for sharing evidence-based information and supporting decision-making about sleep health and sleep disorders, this may not be the case. Few studies have examined the quality, understandability, and actionability of popular sleep health messages on the Internet and/or social media.
Methods: We identified the most widely viewed videos about "sleep" and "insomnia" on YouTube, which is the most widely used social media platform in the U.S. Two trained coders reviewed each video using two validated assessment tools: (1) DISCERN which rates the quality of information (scores ranging from 1 to 5, with 3 as the threshold for moderate to good quality), and (2) the Patient Education Material Assessment (PEMAT) tool for understandability and actionability (with scores from 0 to 100%, with 70% used as the threshold value). We also documented video reach (the number of times the video was viewed) and likability (the number of times a viewer provided a "thumbs up" after viewing), metrics provided by YouTube.
Results: Our search identified 21 popular videos on sleep and insomnia. The average reach of the videos analyzed was 8.4 million (range: 915,639 to 39,201,665) and average likability was 257,167 (19,000 to 1,600,000). The average DISCERN score was 2.6, below the threshold for information quality. The average PEMAT scores for understandability (67%) and actionability (63%) were below the threshold for understandability and actionability.
Conclusion: The most widely viewed videos about sleep and insomnia on YouTube had generally poor information quality, and were frequently difficult to understand.
Support (If Any): SL is supported by the NYU Perlmutter Cancer Center Developmental Project Program, which is partially supported by the Cancer Center Support Grant P30CA016087

0226

CIRCADIAN INFLUENCE ON FOOD INTAKE AMONG ADOLESCENTS WITH OVERWEIGHT AND HEALTHY WEIGHT

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Introduction: Meal timing has been linked to obesity in adults and children; however, evidence for an endogenous influence of the circadian system on food intake is unknown. We measured food intake during forced desynchrony (FD) in adolescents with healthy weight (HW) or overweight (OW), hypothesizing that circadian timing would affect food intake independent of the environmental cycle and that the food intake rhythm would be delayed in adolescents with OW compared to HW.
Methods: Participants were 51 (29m) adolescents (12-15yr); 24 were HW and 27 OW determined by CDC norms. Participants completed seven, 28h-FD cycles; 6 meals occurred at fixed times each cycle with foods selected ~1h before meals and weighed before and after. Each meal's energy intake was computed relative to total energy consumed in that FD cycle. Endogenous circadian period was determined using salivary dim-light melatonin onset (DLMO) phases (DLMO=0°). Time awake effect was assessed using mixed effect models and circadian phase with multilevel cosinor that included time awake as a categorical covariate.
Results: Circadian period was not significantly different between OW and HW (mean, StDev; HW =24.19h,0.22; OW=24.22h,0.14). Overall, participants consumed more calories on the cycles' first meals (22.0% [21.3;22.6]) compared to the last meal (12.4% [11.8;13.0]). Adolescents with OW vs. HW consumed a higher proportion of calories later in the wake episode ($F(5,2081)=2.63, p=.02$). As hypothesized, circadian phase influenced caloric intake with an amplitude of 2.66% [2.19;3.14] percent daily calories and an acrophase of 301°[291;310], equivalent to ~17:52 in this population. The circadian influence differed by weight category (likelihood ratio test of both amplitude and acrophase; $\chi2(2)=10.7, p<.01$), with those with OW showing a lower amplitude (OW = 2.11%[1.40;2.82], HW=3.53%[2.94;4.12] and later acrophase (OW=301° [287;314], HW=290° [278;302]).
Conclusion: Results show for the first time an independent influence of the endogenous circadian timing system on caloric intake of humans that differed as a function of body weight: caloric intake for adolescents with OW had a circadian rhythm with blunted amplitude and delayed peak phase. These observations show circadian control of food intake that may be stronger in HW than OW adolescents.
Support (If Any): P20GM139743; R01DK101046; R01HL153969

0227

THE EFFECT OF LIGHT ON CIRCADIAN ENTRAINMENT FOR SHIFTING FROM DAY TO NIGHT FLIGHT OPERATIONS

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Introduction: A midair collision during a routine nighttime air refueling training mission in the early morning hours of December 6, 2018, resulted in the tragic deaths of six Marine aircrew members and the loss of two US Marine Corps aircraft. Fatigue and the transition from day to night flights were called out as a problem area that continues to plague aviation commands. The goal of this study was to provide recommendations to the fleet regarding the limitations and best practices for shifting aviators from day to night operations to mitigate aviator fatigue and facilitate circadian re-alignment.
Methods: Longitudinal (10-day) within-subject assessment of aviators (N=9) in hybrid conditions. Aviators completed validated questionnaires for sleepiness and workload. Performance was assessed in simulated flight scenarios (one morning and three night sessions). The efficacy of a single 4-hour exposure of blue-enriched white light (~1000 lux) was assessed with the dim-light melatonin onset procedure. The study protocol attempted to replicate the work and rest patterns of aviators in the field who work during the day but could potentially be required to quickly shift their schedules to support night flight operations.
Results: The circadian phase of all participants was successfully delayed an average of 1.3 hours (range: 0.88-1.93 hours). Despite the lack of control over light exposure or other activities over the study period, participants reported less sleepiness and reduced subjective workload with improved flight performance.
Conclusion: Conclusions from the literature review and our study indicate that circadian entrainment in complex military operational settings should use light management as the dominant method for shifting the circadian clock. Based on these conclusions, we developed general recommendations and two circadian synchronization plans for aircrew switching from day to night operations. One plan shows a schedule that prepares for night operations by steadily shifting the daily schedule over multiple days. The other plan shows a schedule for aircrew who are required to shift from day to night operations abruptly without notice.
Support (If Any): Supported by the Assistant Commandant of the Marine Corps.

0228

USING BLUE LIGHT THERAPY TO FACILITATE RECOVERY OF SLEEP AND PSYCHOLOGICAL FUNCTIONING IN PTSD

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Introduction: Sleep problems are often described as the "hallmark symptoms" of post-traumatic stress disorder (PTSD). Patients with PTSD show numerous disruptions of emotional functioning. Experimental evidence has shown that the ability to retain extinction memories following fear conditioning is impaired in people with PTSD. Because of the key role of sleep in memory consolidation and emotional regulation, we hypothesized that regulating sleep and circadian rhythms with morning blue-wavelength light therapy would facilitate emotional recovery and the ability to retain extinction memories.
Methods: Eighty-four individuals with PTSD (56 female; Age=31.38, SD=8.9) underwent a well-validated fear conditioning and extinction protocol and were then randomly assigned to receive either 6-weeks of BLUE (469 nm; n=44) or placebo AMBER (578 nm; n=40) morning light therapy for 30-minutes daily. Participants returned to undergo post-treatment extinction recall when exposed to the same previously conditioned stimuli, and a functional magnetic resonance imaging (fMRI) while the same images were presented. Participants also completed a variety of emotional and mental health outcome measures and wore an actigraph to measure sleep over the 6-weeks.
Results: There was a significant interaction between light condition and time in bed and total sleep time ($p<.05$) indicating significant increases in sleep with blue versus amber light over treatment. Additionally, declines in symptoms of PTSD on the Clinician Administered PTSD Scale (CAPS-5) correlated with improvements in sleep for the blue, but not the amber light, group (all p-values <.05). During the fear conditioning and extinction paradigm, blue light was associated with significantly greater extinction recall compared to the amber light condition ($p=.05$). Finally, blue light resulted in decreased fMRI activation within the right amygdala and increased activation within the ventromedial prefrontal cortex to the previously feared and extinguished stimuli.
Conclusion: Blue light treatment was more effective than amber placebo at increasing sleep quantity, shifting circadian bedtime, reducing PTSD symptom severity, facilitating the retention of extinction memories, and reducing neural fear responses to previously feared stimuli. We suggest that improvements in sleep led to greater consolidation of extinction memories. These findings suggest that blue light treatment may facilitate treatment gains by improving sleep.
Support (If Any):

0229

CONCERNS ABOUT THE FUTURE LINKED WITH POOR SLEEP QUALITY IN U.S. ARMY SOLDIERS WITHDRAWING FROM AFGHANISTAN

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Introduction: A special operations unit of U.S. Soldiers rotated through Afghanistan from October, 2001 to the U.S. drawdown in 2020-2021. For these Soldiers, the drawdown has led to uncertainties about the future of the unit and their careers. Psychological stress resulting from these uncertainties could lead to sleep disturbances. This study assessed the relationship between attitudes about the Afghanistan drawdown and sleep.
Methods: A survey was broadly distributed in July-August 2021. To assess attitudes about the drawdown, participants were asked whether they felt changes in their personal readiness had occurred since the drawdown began. They were asked how they believed the unit should support Afghanistan in the future (remain in Afghanistan, support only through airstrikes, or no further support). Lastly, Soldiers were asked whether the drawdown made them more likely to switch to another unit, get out of the Army, or no change. Subjective sleep quality and duration from the month prior was assessed. Due to the abrupt fall of Kabul, the survey was discontinued earlier than planned, resulting in 35 participants.
Results: Soldiers were 32.80±5.99 years old. They had been in the unit for 8.89±5.71 years and had deployed to Afghanistan 5.14±3.14 times. The average sleep duration was 6.66±0.79 hours, and the average sleep quality was 63.39%±21.63%. There were no relationships between attitudes and sleep duration. However, regression analyses showed those who reported increased stress (B=18.16, p=.01), decreased morale (B=2.97, p=.006), and decreased motivation (B=2.69, p=.01) since the drawdown began had poorer sleep quality. ANOVA tests showed Soldiers who believed the unit should remain in Afghanistan had poorer sleep quality than those endorsing only air support or no involvement (F(2,29)=6.39, p=.005). Further, those who endorsed being more likely to make a career change had poorer sleep quality than those with no changes in career plans (F(2,29)=3.53, p=.04).
Conclusion: These results indicate that psychological distress resulting from the drawdown may be impacting sleep quality in this unit. Continuous monitoring of sleep quality may prove to be a sensitive indicator of elevated stress at the unit level.
Support (If Any): Support for this study came from the Military Operational Medicine Research Program (MOMRP) of the United States Army Medical Research and Development Command (USAMRDC). Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the authors, and are not to be construed as official, or as reflecting true views of the Department of the Army or the Department of Defense. The investigators have adhered to the policies for protection of human subjects as prescribed in AR 70–25. The authors have no conflicts of interest to disclose.

0230

VAPING AND SLEEP AS PREDICTORS OF ADOLESCENT SUICIDALITY

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Introduction: Suicide is a leading cause of death for adolescents aged 14-18. Because of the challenges of suicide prevention interventions (e.g., cost or effectiveness), it is critical to examine potential, modifiable risk factors related to adolescent suicide. This study examined self-reported suicidality, vaping, and sleep quantity among high school students in the U.S. We investigated sleep quantity as a moderator of vaping and multiple aspects of suicidality (thoughts, plans, and attempts). This study is, to our knowledge, the first to examine the effects of both vaping and sleep on suicide outcomes.
Methods: Authors utilized responses from adolescents with complete data on the primary outcome of a suicide attempt in the past year in the 2019 Youth Risk Behaviors Survey (n=10,520). Logistic regression was utilized to estimate the main effects of vaping in the past 30 days, sleep hours on school nights, and the interaction of vaping and sleep on suicide attempts (primary outcome), suicidal thoughts (secondary outcome), and suicide plans (secondary outcome).
Results: Students who vaped in the past month had 2.78 (95% CI = [2.171-3.549]) times the odds of a suicide attempt in the last year compared to students who did not vape. Students who slept less than seven hours had 1.93 (95% CI = [1.583-2.352]) times the odds of a suicide attempt in the last year compared to students who slept seven or more hours. Sleep quantity moderated the relationship between vaping and suicidal thoughts in the past year but did not moderate the relationship between vaping and a suicide plan or suicide attempts. Specifically, vaping had a reduced effect on suicidal thoughts among students who slept under seven hours.
Conclusion: Adolescents who vaped in the past month or who reported less than 7 hours of sleep on school nights had significantly higher odds of reporting a suicide attempt in the past year. Students who vape or report low sleep quantity would be ideal participants in suicide prevention interventions as they may be at higher risk for suicidality. Organizations implementing sleep or vaping interventions should incorporate information regarding the higher odds of suicide among students with low sleep quantity or vaping habits.
Support (If Any):

0231

DAILY RELATIONSHIPS BETWEEN SLEEP AND STRESS DURING THE COVID-19 PANDEMIC: ROLES OF PERSEVERATIVE COGNITION AND PHYSICAL ACTIVITY

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Introduction: The onset of the COVID-19 pandemic disrupted and changed sleep as well as elevated stress levels worldwide. Previous research has demonstrated a bidirectional relationship between stress and sleep, in that stress contributes to poorer sleep and poor sleep leads to higher stress. It is hypothesized that perseverative cognition (i.e., worry, racing thoughts) is a key cognitive mechanism in this relationship. The goal of our study was to examine the relationships between stress and sleep during a major global

stressor, testing key cognitive and behavioral factors that may influence this relationship.
Methods: Adults aged 18 and above were recruited to complete a text-message survey twice per day for 3 weeks over a 4-month period. Sleep duration and efficiency during the previous night and evening/overnight perseverative cognition was measured in the morning survey, daily stress levels were measured in the evening survey. Physical activity was measured by the International Physical Activity Questionnaire (IPAQ). Results were analyzed using mixed effects models controlling for age, gender and race/ethnicity.
Results: Participants included 191 adults (91 F, mean age= 43, SD= 16 years). Results demonstrate that stress ratings were associated with higher sleep duration (p= 0.04) but perseverative cognition was associated with lower sleep duration and efficiency (p values <0.001). Participants who were more physically active had higher sleep duration (p=0.02) and efficiency (p< 0.001). Sleep did not predict next-day stress.
Conclusion: Results demonstrate that perseverative cognition is a key factor in the daily relationships between stress during the day and sleep at night. Higher physical activity was related to better sleep. These results indicate that interventions to reduce perseverative cognition may improve sleep during times of stress, including reducing the sleep-disrupting effects of the COVID-19 pandemic.
Support (If Any): University of Utah i3 COVID-19 pilot grant, UL1TR002538

0232

AN INTRAINDIVIDUAL VARIABILITY OF SLEEP HEALTH AND PERCEIVED STRESS IN COLLEGE STUDENTS DURING THE COVID-19 PANDEMIC

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Introduction: Pandemic-related societal response and uncertainty have generated marked changes in sleep-wake patterns and psychosocial well-being especially among first year college students. The current study sough to describe the changes in the sleep health domains determined from Actigraph and self-report, and examine the associations between the repeated-measure and intraindividual variability (IIV) of these domains and perceived stress in young college students over the course of a semester in the midst of an on-going COVID-19 pandemic (i.e., Fall, 2020).
Methods: A repeated measure design at 1-month interval across a 3-month period was conducted among a group of diverse racial and ethnic groups of college students (N=23, 78.3% female, age range 17-18). Participants completed a 7-days of wrist Actigraph, daily sleep diaries, and other surveys at each interval. A multidimensional sleep health was determined using Actigraph and daily sleep diary measures of sleep duration, efficiency, timing and regularity, and self-reported surveys of sleep satisfaction and alertness during daytime. Participants also completed the Perceived Stress Scale. Non-parametric tests were used to assess the changes in sleep health across 3 intervals, and a series of linear mixed effects model and regression analysis were conducted to assess associations between stress and subjective sleep health, adjusting for sex.
Results: Actigraph-determined sleep timing and regularity, and sleep diary-determined sleep timing and alertness during daytime demonstrated statistically significant changes between given timepoints. Among the sleep diary-determined sleep health domains, greater perceived stress was associated with more irregular (B=2.25 [.87–3.62], p<.001), more dissatisfied (B=.04 [.02–.19], p<.01), and sleepier during daytime (B=.18 [.05–.31], p<.001), across 3 timepoints. Moreover, greater perceived stress was associated with greater IIV (i.e., fluctuations) in sleep satisfaction, but no significance was found among IIV of other domains.
Conclusion: This study aids understanding of the relationship between stress and sleep health in this population, and offers insight to future research questions that can facilitate intervention development to promote both mental and sleep health among young college students.
Support (If Any):

0233

SLEEP QUALITY AND DISTURBANCES, EMOTIONAL REGULATION AND RESILIENCY IN ADOLESCENTS DURING THE COVID-19 PANDEMIC

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Introduction: The COVID-19 pandemic continues to evolve internationally, increasing levels of psychological stress in adolescents around the world, and thereby increasing their risk for emotional disorders associated with chronic stress. This ongoing threat to adolescents' mental health requires that we identify factors that contribute to their ability to cope with situations shown to carry significant risks, such as the COVID-19 pandemic (i.e., their resiliency).Negative emotions are associated with chronic stress, and factors that reduce levels of negative emotions are associated with improved resiliency. Healthier sleep is associated with lower levels of negative emotions. Cognitive reappraisal (changing the way one thinks about potentially emotion-eliciting events) is an emotional regulation strategy that downregulates negative emotions. However, there is little information about the associations between sleep quality, emotional regulation, and resiliency in adolescents. The present study sought to fill this gap by examining the associations between adolescents' sleep quality and disturbances, emotional regulation strategies and adolescents' resiliency during the COVID-19 pandemic.
Methods: Forty-five adolescents (M=13.47, SD=1.7 years) participated in the study during the first wave of the COVID-19 pandemic in Canada (May 15 to June 30, 2020). The Pittsburgh Sleep Quality Index was used to assess adolescents' self-reported sleep quality and disturbances. The Emotion Regulation Questionnaire was used to assess respondents' tendencies to regulate their emotions using cognitive reappraisal or expressive suppression. The Connor-Davidson Resilience Scale was used to measure resilience. Behavioral/emotional problems were assessed before the pandemic using the Youth Self Report (YSR).
Results: Hierarchical multiple linear regression analyses revealed that lower levels of sleep disturbances and frequent use of cognitive reappraisal to regulate emotions were associated with a higher level of resiliency during the COVID-19 pandemic, above and beyond the contributions of gender or pre-pandemic emotional or behavioral problems.
Conclusion: Better sleep quality and the habitual use of an emotional regulation strategy that is effective in downregulating negative emotions are associated with higher resiliency in adolescents facing the COVID-19 pandemic. The cross-sectional nature of the study does not allow the inference of causation.
Support (If Any): CIHR 418638 to Reut Gruber RGPIN-2015-04467 to Reut Gruber

0234

SALIVARY A-AMYLASE RESPONSE TO REPEATED EXPOSURE TO ACUTE STRESSORS IS ALTERED BY SLEEP DEPRIVATION

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Introduction: Salivary α-amylase (sAA), a biomarker of autonomic nervous system (ANS) activity, is believed to reflect physiological responsiveness to stressors. Although exposure to stressors often co-occurs with sleep deprivation, little is known about their combined effects. We investigated the sAA response following repeated exposure to acute stressors at well-rested baseline and during total sleep deprivation (TSD).
Methods: As part of a larger study, N=8 healthy subjects (ages 29.0±6.6; 4 females) participated in a 4-day/3-night laboratory-based experiment. Subjects had 38h TSD preceded and followed by 10h sleep opportunities (22:00–08:00). On days 2 (baseline) and 3 (TSD), subjects completed two (A, B) deadly-force decision-making simulations in a high-fidelity shooting simulator with 30min rest between sessions. During each simulation, subjects (who were civilians) acted as police officers while viewing interactive videos depicting stressful law enforcement emergency response scenarios involving deadly-force decision-making. In these scenarios, subjects attempted to de-escalate the situations in the scenarios using verbal commands. If unsuccessful, they were to determine if the use of (simulated) deadly force was necessary and respond accordingly. Saliva samples were collected immediately before the first simulation of the baseline and TSD days, and immediately, 15min, and 30min after each simulation. Samples were assayed in duplicate using a sAA kinetic enzyme assay; results were normalized against the first pre-stressor sample of the baseline day.
Results: Post-simulation sAA values normalized to reference were analyzed with mixed-effects ANOVA with fixed effects of day and sample and their interaction and a random effect over subjects on the intercept. There was a significant effect of sample ($F[5,76]=3.38$, $p=0.008$) indicating that sAA spiked immediately after each deadly-force decision-making simulation. Planned comparisons revealed significantly blunted sAA during TSD compared to baseline immediately after the second simulation of the day ($t[76]=2.09$, $p=0.040$).
Conclusion: In our sample of civilian subjects, the deadly-force decision-making simulations elicited a sAA response, which was blunted after the second simulation on the day subjects were sleep-deprived, suggesting that TSD mediates the biological response to repeated exposure to acute stressors. Whether this result generalizes to police officers and military personnel trained in deadly-force decision-making remains to be determined.
Support (If Any): ONR grant N00014-13-1-0302

0235

A SYSTEMATIC REVIEW OF SLEEP HEALTH AND OUTPATIENT OPIOID USE DISORDER TREATMENT IN ADULTS

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Introduction: Opioid Use Disorder (OUD) affects 2 million people in the United States and poor sleep health (satisfaction, alertness, timing, efficiency, and duration) is a primary driver of medication-assisted treatment (MAT) failure and relapse. It is known that people in therapy for OUD have a high prevalence of sleep problems (>75%) and poorer sleep health compared to people without OUD (e.g., lower sleep efficiency, shorter duration, and more awakenings). However, sleep health is not routinely assessed. Thus, in this systematic review, we examined original studies on sleep health within the context of adults receiving outpatient MAT for OUD.
Methods: We conducted a systematic review of original research on sleep health in adults receiving outpatient treatment for OUD. Multiple electronic databases (PubMed, PsycINFO, and CINAHL) were searched for relevant studies published in English from the establishment of each database to September 14, 2021. Quality was assessed with the Mixed Methods Appraisal Tool (v. 2001).
Results: Sixty two studies were selected including 17,913 adults with OUD and 604 comparison participants without OUD (mean age = 37.4 ± 6.6 years; 54.1% male). Sixty-one studies were quantitative (50 cross sectional, 6 longitunal, 5 interventional) and 1 was mixed methods. Participants with OUD had poorer satisfaction (Pittsburgh Sleep Quality Index mean 7.4 ± 2.2 v. 4.7 ± 2.3), shorter polysomnography (PSG) measured total sleep time (336.6 ± 41.4 mins (5.6 h) v. 411.8 ± 33.3 mins (6.8 h), spent less time in PSG measured slow wave N3 sleep (7.2 ± 5.8% v. 13.4 ± 6.4%), and had a lower percentage of PSG measured rapid eye movement sleep (14.6 ± 4.6% v. 21.7 ± 4.0%) than comparison participants without OUD.
Conclusion: Studies were predominantly observational ranging from a period of 1-2 nights to 2 years with participants at various points in treatment. More work is needed to understand the multidimensional depth of sleep health in adults with OUD. Optimizing sleep health in adults with OUD may improve their addiction trajectory and should be a priority in practice and research.
Support (If Any): American Academy of Sleep Medicine (220-BS-19).

0236

THE FIRST NIGHT EFFECT IN ADOLESCENTS WITH AND WITHOUT INSOMNIA

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Introduction: Insomnia in adolescence is a common and debilitating condition, and vulnerability to stress is known to play a major role its development. In this study, we investigated the effects of sleeping under stress in a sample of adolescents with and without clinically significant insomnia symptoms. The first night in the laboratory was used as an established experimental paradigm for eliciting stress through exposure to an unfamiliar environment.
Methods: Forty-one postpubertal adolescents (18.4 ± 0.7 years) with (n=14, 9 girls) and without (n=27, 16 girls) DSM-5 insomnia symptoms completed two non-consecutive polysomnographic (PSG) nights in the laboratory. Repeated-measures ANOVAs were used to analyze differences in PSG sleep measures between the first and subsequent night, with group (insomnia vs. control) and sex as between-subject factors.
Results: Both groups showed a robust stress effect on the first night, characterized by lower sleep efficiency (↓2.2%)

and total sleep time (↓6.4%), and more awakenings (↑12.4%) compared with the subsequent night ($p<0.05$). Both groups also had less non-rapid-eye-movement (NREM) (↓4.9%) and REM (↓18.8%) sleep on the first night. Girls with insomnia had lower amounts of REM sleep than boys with insomnia on both nights ($p<0.05$). Both groups perceived higher levels of pre-sleep somatic (↑10.3%) and total (↑7.2%) arousal on the first night compared to the subsequent night ($p<0.05$). For cognitive arousal, there was a night-group-sex interaction effect: while controls showed no changes between the two nights, boys with insomnia reported significantly lower pre-sleep cognitive arousal levels on the subsequent laboratory night compared to the first night (↓32.9%), whereas cognitive arousal levels remained elevated on the subsequent night in girls with insomnia ($p<0.05$).

Conclusion: Sleeping for the first time in the laboratory leads to greater pre-sleep arousal and disrupts sleep in adolescents with and without insomnia symptoms. Longitudinal studies are needed to examine the female vulnerability in the manifestation of stress-related hyperarousal, particularly in the context of insomnia development during adolescence.

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0237

SLEEP REACTIVITY PROSPECTIVELY PREDICTS DISTRESS REACTIONS TO THE COVID-19 PANDEMIC 3-4 YEARS LATER

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Introduction: The 2019 coronavirus disease (COVID-19) pandemic is a protracted stressor with far-reaching effects on daily life. Although most individuals exhibit resilience in the wake of adversity, it is not clear which characteristics reliably predict resilience versus longstanding distress. It is vital to delineate predictors of pandemic-related distress to highlight modifiable risk factors that can be targeted to enhance psychological resilience. Sleep reactivity may be an important predictor of pandemic reactions because it reflects a vulnerability to experience pronounced sleep disturbances in response to stress, which serve as barriers to healthy adjustment to adversity. Therefore, this study tested sleep reactivity as a prospective predictor of pandemic-related distress.

Methods: Participants were recruited from a previous randomized controlled trial (RCT) comparing self-guided digital CBT-I against a sleep education control in treating insomnia and preventing depression. Participants in the RCT were enrolled between 2016-2017 and were eligible for this follow-up study conducted between April and May 2020 (N = 208; dCBT-I: n = 102; control: n = 106). Pre-treatment sleep reactivity was measured in 2016-2017 (T1) using the Ford Insomnia Response to Stress Test (FIRST). COVID-19 distress was measured in April 2020 (T2) using the Impact of Events Scale (IES) and Quick Inventory of Depressive Symptomatology (QIDS). All analyses controlled for treatment condition and COVID-19 impact.

Results: T1 FIRST predicted T2 IES ($b = 0.29$, + 0.14 SE, $p < .05$) and QIDS ($b = 0.16$, + 0.04 SE, $p < .001$), such that higher sleep reactivity pre-pandemic predicted more severe stress responses and depressive symptoms during the pandemic 3-4 years later. Exploratory analyses revealed T1 FIRST was a predictor of the IES subscales arousal and intrusions (bs = 0.02, + 0.01 SEs, ps < .05), but not avoidance.

Conclusion: These findings build on evidence that sleep reactivity prospectively predicts reactions to trauma and demonstrate its predictive utility generalizes to pandemic responses. Sleep reactivity is a modifiable risk factor that may be targeted using cognitive-behavioral or mindfulness-based approaches, and thus may offer a new pathway to resilience.

Support (If Any): Support for P.C. was provided from the National Heart Lung and Blood Institute (K23HL138166).

0238

PERCEIVED CHILDHOOD NEIGHBORHOOD SAFETY AND SLEEP HEALTH DURING ADULTHOOD

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Introduction: Neighborhood safety has been cross-sectionally associated with sleep health at different life stages. However, few studies have investigated childhood neighborhood safety and adulthood sleep despite the possibility that childhood neighborhood safety may serve as a modifiable target for primordial prevention of poor sleep health.

Methods: Using data from 1,611 Black/African-American women enrolled in the Study of Environment, Lifestyle and Fibroids, we investigated associations between perceived childhood neighborhood safety and adulthood sleep. Participants reported safety of their childhood neighborhoods as unsafe vs. safe at ages 5,10, and 15 years. Participants also self-reported current (ages 23-35 years) sleep duration and quality (i.e., frequently wake feeling unrested [≥4 days/week] and frequent insomnia symptoms [≥15 days/month of difficulty falling or staying asleep]). Adjusting for childhood socioeconomic characteristics, log binomial models estimated prevalence ratios (PRs) and 95% confidence intervals (CIs). For perceived safety at ages 10 and 15 years, we applied inverse probability weights to models to adjust for perceived neighborhood safety at prior ages.

Results: Mean age ± standard deviation was 29 ± 3.5 years. Prevalence of residence in a childhood neighborhood perceived as unsafe increased with age (Age 5- 20%, Age 10- 22%, Age 15- 31%), and 17% reported an unsafe neighborhood at every age. Both short sleep duration (<7 hours) and frequently waking feeling unrested during adulthood were reported by approximately 60% of women, and 10% reported frequent insomnia symptoms. Participants in perceived unsafe vs. safe neighborhoods at every age were more likely to frequently wake feeling unrested as adults (PR=1.12 [95% CI: 1.00-1.25]). Perceived unsafe neighborhood at ages 5 and 15 years was associated with frequent insomnia symptoms and frequently waking feeling unrested, respectively. Perceived unsafe neighborhood at age 10 years was marginally associated with a higher prevalence of both frequently waking feeling unrested (PR=1.11 [0.98-1.27]) and frequent insomnia symptoms (PR=1.58 [0.99-2.52]) during adulthood.

Conclusion: Perceived unsafe neighborhood during childhood was associated with poorer sleep during adulthood among a cohort of young Black women.
Support (If Any): Division of Intramural Research, National Institutes of Health (NIH), National Institute of Environmental Health Sciences (Z1AES103325[CLJ] and 1ZIAES049013[DB]), and the American Recovery and Reinvestment Act funds designated for NIH research

0239

A LATENT PROFILE ANALYSIS OF ACTIGRAPHIC SLEEP AND PHYSICAL ACTIVITY MEASURES AMONG CAMBODIAN-AMERICANS: RELATIONSHIP WITH SPECIFIC TRAUMA SYMPTOMS

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Introduction: Sleep and physical activity are related to psychological trauma. Less is known about how individuals with distinct sleep and activity profiles differ on specific clusters of trauma symptoms. Cambodian-Americans who survived the Pol Pot genocide experienced severe collective trauma. This analysis explored group differences between sleep/activity profiles on specific trauma symptoms among Cambodian-Americans.
Methods: Participants in a diabetes prevention trial for Cambodian-Americans (NCT02502929) met inclusion criteria for depression and high diabetes risk (but did not have diabetes). They wore wrist actigraphy (sleep) and hip actigraphy (physical activity) for 7 days (≥3 days to be included) and completed the 16-item trauma symptom scale of the Harvard Trauma Questionnaire (HTQ; N=166). Latent Profile Analyses identified profiles using 3 mean actigraphic sleep and activity variables: total nightly sleep time, sleep maintenance efficiency, and minutes in moderate-vigorous physical activity. ANOVAs explored differences between sleep/activity profiles on the HTQ, specifically total scores and the "Avoidance/Numbing" and "Re-experiencing/Hyperarousal" subscales. Models were adjusted for psychotropic medication use.
Results: Participants were predominantly women (79%), mean age 55.3, with elevated trauma symptoms (17% were higher than 2.5 cutpoint; mean±SD= 1.90±0.61). Sleep and physical activity patterns yielded a BIC best fit with 3 sleep/activity profiles: Inactive Poor Sleepers (n=30, 18%), Highly Active Short Sleepers (n=35, 21%), and Moderately Active Good Sleepers (n=101, 61%). Differences were observed between profiles on the HTQ total score (p=0.03). Tukey's post hoc test revealed that Inactive Poor Sleepers exhibited greater HTQ scores than Highly Active Short Sleepers ($p<0.05$), but did not differ from Moderately Active Good Sleepers. There was also a significant difference between profiles in the Avoidance/Numbing subscale (p=0.01); Inactive Poor Sleepers had higher Avoidance/Numbing than Highly Active Short Sleepers ($p<0.05$, Cohen's d: 0.47). There were no differences between profiles on the Re-experiencing/Hyperarousal subscale (p=.09).
Conclusion: Individuals with contrasting actigraphic sleep/activity profiles differed on trauma symptoms. Inactive Poor Sleepers may benefit from specific interventions for Avoidance/Numbing symptoms. Future analyses will evaluate how changes in sleep/activity profiles are longitudinally related to psychological health and diabetes risk following interventions.
Support (If Any): 5R01DK103663

0240

INVESTIGATING THE POTENTIAL FOR ACTIGRAPHY AS A COMPLEMENTARY CLINICAL TOOL FOR EVALUATION OF SLEEP IN PATIENTS WITH RHEUMATOID ARTHRITIS

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Introduction: Poor sleep is a common complaint among patients with rheumatoid arthritis (RA), but few actively recognize the problem or discuss it with their rheumatologist during the clinical visit. Challenges to identification of sleep issues include a lack of standardized sleep measures used within clinical care and lack of confidence on the part of patients' articulating how sleep is affected by RA. Clinical management is further complicated by insufficient evidence between sleep quality and disease symptomology. The objective of this study was to identify correlations between sleep measures assessed through self-report and actigraphy with disease activity for patients with RA.
Methods: In a prospective, cross-sectional study, a sample of 15 participants diagnosed with RA were recruited through convenience sampling. Consenting participants self-reported sleep quality and disease activity using Pittsburgh Sleep Quality Index (PSQI) and Routine Assessment of Patient Index Data 3 (RAPID-3). Participants' sleep quality was also measured using actigraphy which monitors wrist movement by wearing a watch. Daily actigraphy measures of sleep efficiency, latency, and fragmentation were averaged over 6 nights. Actigraphy measures were correlated to the PSQI and RAPID-3 through Spearman correlations.
Results: The sample was mostly Caucasian women with an average age of 55 years, generally reflective of the population with RA. The results demonstrated weak, nonsignificant correlations between self-reported measures of sleep and average sleep efficiency (0.12, p=0.66), latency (0.10, p=0.72), and fragmentation (-0.13, p=10). Additionally, weak, nonsignificant correlations existed between disease activity and average sleep efficiency (0.09, p=0.75), latency (0.35, p=0.19), and fragmentation (-0.12, p=65).
Conclusion: This study's implications suggest actigraphy may provide complementary information to self-reported measures of sleep. Such information may support patients' articulation of sleep issues to the rheumatologist. Further research is necessary to understand how actigraphy measures can be effectively summarized for use by the patient and rheumatologist to discuss sleep issues during the clinical encounter as well as their ability to support clinical diagnosis of sleep disorders.
Support (If Any): Support: Prisma Health Upstate Seed Grant 2019-2020. University of South Carolina Magellan Scholar & Apprentice Programs funding Shelby Rader. Furman University Center for Engaged Learning for summer internship funding for Ava Cox.

0241

N3 SLOW WAVE DURATION CORRELATES WITH NEXT-DAY SAVORING BEHAVIOR IN PRE-PUBERTAL CHILDREN

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Introduction: Recent meta-analysis (Tomaso et al., 2020) indicates sleep loss to have more profound adverse effects on positive than negative emotion, and experimental studies in adults suggest disruption of slow wave sleep (SWS) in particular mediates these effects (Finan et al., 2015; 2017). In pre-pubertal children, greater SWS has been shown to protect against next day negative affect (Palmer & Alfano, 2017) as well as the development of depression years later (Silk et al., 2007); however specific emotion-based mechanisms underlying these effects have rarely been explored. Pre-pubertal years especially represent a critical developmental window for probing these relationships due to dramatic decreases in SWS that occur during pubertal transition (Carskadon & Dement, 2011).
Methods: We detected slow waves (0.5 – 4 Hz) during N3 sleep using an automated algorithm among N=18 pre-pubertal children (7-11 years) during a night of normal sleep in relation to next-day savoring; a positive emotion regulation strategy that includes using thoughts and actions to increase the intensity, duration, and appreciation of positive experiences and emotions. Healthy children without any psychiatric disorders completed a night of at-home PSG monitoring (10 hr sleep opportunity). The next morning at 11:00, children returned to the clinic for an in-lab emotional assessment. Before and during the assessment, children were told/reminded that they would be given a piece of chocolate to enjoy at the end of the assessment. After children consumed the chocolate, they were asked several questions about how much they 'savored' the experience. All analyses controlled for total sleep time on the PSG night and there were no differences in SWA based on gender.
Results: Results indicated that the average duration of detected N3 SWs (F3/F4) correlated significantly with the extent to which children enjoyed the chocolate overall ($r = .50$, $p < .05$), felt they did a good job enjoying the chocolate while eating it ($r = .44$-$.49$, $p < .05$) and looked forward to eating the chocolate during the assessment ($r = .46$-$.50$, $p < .05$).
Conclusion: Although preliminary, these novel findings suggest that greater intensity of SWS may have a modulatory effect on subsequent emotional responses to positive experiences/events, which could be protective for longer term affective health.
Support (If Any):

0242

INTRAINDIVIDUAL VARIABILITY IN SLEEP DURATION BLUNTS RESPONSE TO ACADEMIC STRESSORS

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Introduction: Cross-sectional studies indicate that greater intra-individual variability (IIV) in sleep is correlated with poorer cognitive-emotional outcomes. Yet, the causal direction of these relationships is unclear. Therefore, we conducted an experimental study to compare cognitive and stress outcomes following random assignment to normal sleep, sleep restriction, and irregular/IIV sleep conditions.
Methods: Ninety college students (mean age=19.16, SD=0.98; 77.78% female) completed an Organic Chemistry virtual lecture during session 1. Then, for the next five days, participants were randomly assigned to the following conditions: normal sleep (8h in bed every night), sleep restriction (6h in bed every night), or IIV sleep (nightly oscillation between 6.5h and 9.5h in bed, with mean of 8h/night). Adherence was confirmed using actigraphy. On the sixth day (session 2), participants took a test on the Organic Chemistry lecture (retention measure) and then completed a new lecture and test (acquisition measure). Participants reported their stress levels across the lectures and tests.
Results: ANCOVA tests showed that sleep condition did not affect retention ($F = 0.50$, $p = .611$) or acquisition of Organic Chemistry knowledge ($F = 1.33$, $p = .275$; adjusted for Grade Point Average). Interestingly, participants in the IIV condition reported lower stress levels throughout session 2 than students in the normal sleep condition, adjusting for baseline stress levels ($p = .025$). Furthermore, when collapsing across conditions, correlation analyses confirmed that greater IIV in TST predicted lower stress throughout session 2, after adjusting for mean TST and baseline stress level ($r = -.33$, $p = .014$). This "blunted" stress response following nightly sleep fluctuations was in contrast to the heightened stress levels that were associated with shorter mean TST ($r = -.22$, $p = .051$).
Conclusion: Brief sleep variability and mild sleep restriction had minimal impact on laboratory measures of STEM knowledge retention and acquisition. However, greater sleep IIV blunted reactivity to academic stressors, which may reflect altered hypothalamic–pituitary–adrenal axis functions and have implications for student metacognition and course persistence. Future research should investigate the chronic effect of maintaining irregular sleep patterns and whether improving regularity of sleep across longer time intervals promotes cognitive and emotional functioning.
Support (If Any): American Psychological Association, APAGS, Psi Chi, National Science Foundation (1920730, 1943323)

0243

RELATIONSHIPS BETWEEN PRE-PANDEMIC TRAUMA AND STRESS WITH SLEEP DURING THE COVID-19 PANDEMIC IN YOUNG ADULTS

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Introduction: Young adults, particularly those with histories of interpersonal trauma or stress, are more likely to experience to adverse psychosocial outcomes (e.g., depression) during the COVID-19 pandemic, compared to those without these histories. However, few studies have examined sleep and most rely on retrospectively-reported pre-pandemic experiences. We tested whether pre-pandemic trauma and stress were prospectively related to worse ecological momentary assessment (EMA)-reported sleep during the pandemic.
Methods: The sample includes 114 regular drinkers aged 21-30 years from two ongoing studies of alcohol use and sleep who completed a shared assessment battery and a 10-17-day EMA protocol before and during the pandemic (conducted July-November 2020; M=13.9 months after baseline). Participants reported past-month perceived stress (10-item Perceived Stress Scale) and interpersonal traumas (e.g., abuse, conflict), via scores on the "Current Partner" and "Personal" (persons other than spouse/partner) subscales of the Difficult Life Circumstances Scale. The EMA protocol measured daily sleep (total sleep time [TST]; sleep

efficiency [SE]), relational stress (1-5 ratings for family, spouse/partner, friends), and alcohol use. Paired t-tests compared pre-pandemic vs. pandemic sleep. Separate linear regressions tested associations between pre-pandemic trauma and stress with average pandemic TST and SE, adjusted for baseline age and sleep, racial identity, assigned sex at birth, time between assessments, and drinking days (averaged across timepoints).

Results: Participants were on average 23.8 years old (61% female; 7% Asian; 39% Black; 1.8% Mixed race; 0.9% Other race; 0.9% Pacific Islander; 55% White). Average TST increased from baseline to pandemic (7.5 vs. 7.8; t(113)=-2.57, p=.01); no change was observed in SE (95% vs. 94%; t(113)=1.01, p=.31). Pre-pandemic perceived stress (B[SE]=-.003[.001], p=.02) and average EMA-reported family stress (B[SE]=-.04[.02], p=.05) predicted worse pandemic SE. No associations emerged with friend or partner stress, trauma, or TST (ps>.11).

Conclusion: Pre-pandemic perceived stress (but not trauma nor relational stress) predicted worse sleep during the pandemic. Perceived stress reflects feeling overwhelmed and difficulty coping, which is relevant given dramatic pandemic-related impacts on daily life. The overall accumulation of stress, versus day-to-day stress in specific relationships, may be most detrimental for sleep during the pandemic. Perceived stress is amenable to evidence-based (and remotely-delivered) interventions, including mindfulness-based stress reduction.

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0244

ASSOCIATIONS AMONG PRE-SLEEP AROUSAL, FACETS OF EMOTION DYSREGULATION, AND SLEEP QUALITY AND EFFICIENCY DURING PREGNANCY

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Introduction: Pre-sleep arousal contributes to over 50% of pregnant people experiencing poor sleep quality and clinical insomnia. Given that poor sleep during pregnancy is associated with depression and suicide ideation, there is a critical need to identify intervention targets, such as difficulties with emotion regulation. However, emotion dysregulation is multifaceted and warrants further investigation in sleep research, particularly during pregnancy. Thus, the present study examined associations among pre-sleep arousal, various dimensions of emotion dysregulation, and sleep outcomes during pregnancy.

Methods: Participants (N = 62; Mage = 29.89, SD = 4.19 years) were recruited during pregnancy and enrolled to represent a range of scores on the Difficulties in Emotion Regulation Scale. For 7 days during the 3rd trimester, they wore CamNtech MotionWatch-8 wrist actigraphs and completed the Pre-Sleep Arousal Scale and Consensus Sleep Diary.

Results: Hierarchical linear regression analyses indicated that high pre-sleep arousal predicted low sleep efficiency (measured via actigraphy) above and beyond facets of emotion dysregulation (B = -.316, p = .026). High pre-sleep arousal also predicted poor sleep quality (measured via diary) above and beyond total emotion dysregulation (B = -.038, p = .010). However, an interaction emerged between pre-sleep arousal and one particular facet of emotion dysregulation: access to emotion regulation strategies (B = -.005, p = .023). Specifically, high pre-sleep arousal was associated with poor sleep quality only among those who reported limited abilities to use emotion regulation strategies. Among participants who reported that they could access effective emotion regulation strategies, pre-sleep arousal did not predict sleep quality.

Conclusion: This study indicates that high pre-sleep arousal may not always be associated with poor sleep quality during pregnancy. Equipping pregnant people with emotion regulation strategies may buffer this association and promote long-term health. It is recommended that perinatal sleep scientists continue investigating relations between facets of emotion dysregulation and sleep.

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0245

WHEN DO EMOTIONS IMPACT SLEEP? A STATE OF THE EVIDENCE

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Introduction: While theories often highlight the bi-directional nature of sleep and emotional processes, the impact of emotions on sleep has been comparatively neglected. To appraise the state of evidence for the causal influence of emotions on sleep, a meta-analysis of the existing literature was conducted, alongside a diary study to estimate naturalistic effects.

Methods: First, a pre-registered meta-analysis using PRISMA guidelines evaluated the strength, form, and context of experimental effects of emotion inductions on sleep parameters (k=27). Quality of primary experiments was evaluated by independent raters, and theoretically-relevant features were extracted and examined as moderating factors of observed effects (i.e., sleep parameter, design, sleep context, types of emotion inductions and emotions). Random-effect models were used to aggregate effects for each parameter. Second, a complementary pre-registered diary study of young adults (N=89) tracked the links of their global emotions (reported separately in the evening and morning) with actiwatch-assessed sleep across two weeks (Nobs=1,188).

Results: First, across the meta-analyzed experiments, there was a significant impact of emotion inductions on delayed sleep onset latency (D=2.80 min, 95%CI 1.01, 4.52, g = .47), but no significant effects on other sleep parameters. While there was little evidence of publication bias, the studies overall were often of weak methodological quality and the typical study could only detect moderate-to-large impacts. There was also large heterogeneity pointing to substantive differences in effects. Second, multi-level regressions of sleep parameters on emotions reported in the evening from the diary study provided some evidence for delayed sleep on evenings with higher negative affect (b = .05, p < .10), with again no changes in other sleep parameters. Also, higher positive emotions predicted earlier and shorter sleep. The estimates were robust to accounting for emotions at the previous point.

Conclusion: These pre-registered investigations support the hypothesis that negative emotions delay sleep onset, but evidence regarding other sleep parameters was not conclusive. A diary study of real-life functioning partially replicated delayed sleep onset following more negative emotions, but the effect was modest. The results call for more targeted investigation that disambiguate distinct features of emotions and sleep.

Support (If Any):

0246

SLEEP HYGIENE MEDIATES THE RELATIONSHIP BETWEEN DEPRESSION AND SLEEP QUALITY IN COLLEGE FRESHMAN

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Introduction: A variety of attitudes, behaviors, and health attributes can influence sleep quality. Depression and sleep quality interact bidirectionally, with depressed individuals often sleeping worse. College freshman may be prone to worse sleep and depression due to significant lifestyle changes, including sleep hygiene (a set of behaviors and conditions promoting sleep). This study sought to examine the relationship between sleep hygiene and depression in predicting sleep quality in first-year college students.
Methods: 165 participants were recruited to investigate sleep behaviors associated with stress, mental health, physical activity and eating as they entered college. Data were recorded using the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989), the Sleep Hygiene Practice Scale (SHPS; Lin et al., 2007; Yang et al., 2010) and the Center for Epidemiological Studies-Depression (CESD; Radloff, 1977). A simple mediation analysis was run using the PROCESS macro for SPSS (Model 4; Hayes, 2018) with age and gender as covariates to examine direct and indirect associations of depression on sleep quality via sleep hygiene practices.
Results: In the model predicting sleep hygiene ($R2 = .33$, $p < .001$), depression had a significant effect ($b = 1.90$, $p < .001$), suggesting individuals scoring higher for depression engaged in more unhealthy sleep hygiene behaviors. The model predicting sleep quality ($R2 = .47$, $p < .001$) had significant effects from depression ($b = .11$, $p = .005$) and sleep hygiene ($b = .09$, $p < .001$) suggesting both higher depression scores and poor sleep hygiene behaviors associate with worse sleep quality. The indirect pathway was also significant ($b = .17$, CI: .11 - .24), suggesting depression's impact on sleep hygiene behaviors also contributes to sleep quality.
Conclusion: One connection between depression and reduced sleep quality may be indirect via maladaptive sleep hygiene. Future research should look at addressing mental health with incoming students and promoting healthy lifestyle behaviors.
Support (If Any): NA

0247

SLEEP DISTURBANCE IS ASSOCIATED WITH DYSREGULATION OF POSITIVE AND NEGATIVE AFFECT SYSTEMS

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Introduction: Sleep disturbance is a risk factor for the development of mood disorders and up to 90% of mood disorder patients report sleep problems. However, the neural mechanisms by which poor sleep contributes to mood disorders are not well understood. We investigated whether sleep disturbance was associated with dysregulation of positive and negative affect systems, including passive reactivity and active emotion regulation.
Methods: Participants (n=55, Mage=24.4 years, 53% female) selected for high, medium, and low scores on the PROMIS Sleep Disturbance scale completed a cognitive reappraisal task in an fMRI scanner. Participants were presented with International Affective Picture Stimuli (30 positive, 30 negative, 15 neutral) and were instructed to either passively view or actively up- or down-regulate their emotional experience. We tested five conditions: view-positive, upregulate-positive, view-negative, downregulate-negative, view-neutral. Participants also completed objective (i.e., 7-day actigraphy) and self-report (i.e., Insomnia Severity Index [ISI]) measures of sleep prior to the scan. Analyses in AFNI were constrained within an emotion regulation network, identified using a Neurosynth mask, and treated as a single region of interest. Voxelwise (puncorr<.005) and clusterwise thresholds (p<.05) were used to correct for multiple comparisons.
Results: Actigraphy-assessed sleep duration was associated with supplementary motor area (SMA) activity when upregulating positive affect relative to passively viewing positive images (k=44 voxels, clusterwise p=.04); participants who slept less showed greater SMA activity. ISI score was marginally associated with dorsolateral prefrontal cortex (dlPFC) activity when downregulating negative affect relative to an implicit baseline (k=30 voxels, clusterwise p=.10); individuals with greater insomnia severity showed more dlPFC activity. PROMIS Sleep Disturbance showed no significant associations.
Conclusion: Markers of poor sleep (i.e., lower sleep duration, greater insomnia severity) were associated with heightened SMA and dlPFC activity during cognitive reappraisal. This may suggest inefficiency in modulating positive affect via verbal and motor processes (i.e., SMA) and negative affect via cognitive control (i.e., dlPFC). Alternatively, individuals with poor sleep may have greater emotional reactivity to modulate. Mood disorders are commonly associated with increased negative affect and blunted positive affect. Our findings suggest a plausible neural substrate for how sleep disturbance contributes to dysregulation of these systems.
Support (If Any): NIMH R21 MH102412.

0248

THE INFLUENCE OF CIRCADIAN SHIFTS ON POST MISSION EVENT SUBJECTIVE FATIGUE DURING A 72H LIVE-FIRE MISSION SIMULATION

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Introduction: Circadian misalignment from sustained 24/7 operations and sleep loss are common occurrences in military operations, and operational demands can often lead to high levels of fatigue. Although the relationship between the circadian system and fatigue is well characterized, the relationship between magnitude of the circadian shift and fatigue during operational mission events has not been widely explored.
Methods: Twenty-one male participants aged 23.3±3.9 years (mean±SD) were recruited from a sample of active-duty Soldiers. The study consisted of a single day baseline data collection and then a month later the Soldiers participated in a sustained live-fire mission simulation consisting of a pre-mission day, the 72-hour live-fire exercise, and post-mission day. During the simulation, Soldiers completed the following mission events: Tactical Stress Marksmanship Assessment (TSMA), Individual Shooter Scenario (ISS), Small Unit Performance Analytics (SUPRA), Reconnaissance (RECON), infiltration and extraction ruck-march (INFIL/EXFIL RUCK), and RAID, to model actual combat or operational activities. Subjective fatigue was assessed using a Visual Analog Scale (VAS) after each mission event. Circadian phase was measured by salivary dim light melatonin onset (DLMO)

at baseline and then again following the post-mission day. Half-hourly saliva samples were collected under dim light (<10lux) sedentary conditions. The circadian phase shift was calculated as the difference between the two DLMO collections.
Results: Twenty of the twenty-one participants advanced their circadian rhythm with a total mean shift of 0.91±0.88 SD hours. Of the six mission events, significant correlations were found between the magnitude of the phase shift and subjective fatigue for three of the events. The magnitude of the circadian phase shift was negatively correlated with fatigue for RECON r=-0.59 (p=0.008), RAID r=-0.55 (p=0.01), and EXFIL RUCK r=-0.44 (p=0.046). The amount of sleep in the 24 hours prior to each of these events had no significant correlation.
Conclusion: For the RECON, RAID, and RUCK, we found that the greater the magnitude of the phase shift, the less fatigue individuals endorsed. Yet, there was no significant relationship with sleep prior to the events. This suggests a potential greater need to consider the impact of the circadian system on military operations, especially with regard to circadian effects on fatigue.
Support (If Any): Department of Defense Military Operational Medicine Research Program (MOMRP); DEVCOM SC

0249

SLEEPING IN TO AVOID ACTING OUT: THE ASSOCIATION BETWEEN SLEEP REGULARITY AND EMOTION REGULATION

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Introduction: Sleep and emotions are closely intertwined facets of individuals' mental health and well-being. Previous studies have consistently shown that sleep is critical in the maintenance of emotion regulation; however, few research studies have examined the association between sleep regularity and emotion regulation skills. The current study seeks to answer this question by examining whether sleep regularity is associated with individual facets of emotion regulation, as well as overall emotion regulation ability.
Methods: Secondary analysis was performed on data obtained from 999 individuals (M age=44.17, SD=16.23; 47.7% female) who participated in the Investigating Sleep Longitudinally Across Normal Development (ISLAND) online study. The Sleep Regularity Questionnaire was used to measure the degree to which individuals engage in consistent sleep behavior. The Difficulties in Emotion Regulation Scale was used to measure perceived overall emotion regulation ability, as well as individual facets of emotion regulation. Regression analyses were used to determine whether sleep regularity predicted difficulties in emotion regulation while controlling for age, race, gender, sleep quality, and total sleep time. Total sleep time and sleep quality information were obtained from item #4 and item #6 of the Pittsburgh Sleep Quality Index, respectively.
Results: Less sleep regularity significantly predicted greater overall emotion regulation difficulties (p=.021, B=-.13). Less sleep regularity was associated with greater difficulty in individual facets of emotion regulation including emotional clarity (p<.001, B=-.05), impulse control (p<.001, B=-.05), nonacceptance of emotional responses (p=.009, B=-.04), and access to emotion regulation strategies (p<.001, B=-.06). Surprisingly, greater sleep regularity was associated with more difficulties with emotional awareness (p<.001, B=.09). Sleep regularity was not associated with difficulty engaging in goal-direct behavior (p=.103, B=-.02).
Conclusion: Poorer sleep regularity significantly predicted greater overall emotion regulation difficulties. Findings from the current study add to the literature supporting the close links between sleep and emotion regulation, and suggest that the promotion and enhancement of consistent, regular sleep may be an important factor that leads to improved emotion regulatory skills beyond the sleep experience (i.e., sleep quality and duration). Additional research is needed to disentangle this association and identify additional factors or mechanisms that may further elucidate this association.
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0250

GREATER SLOW WAVE ACTIVITY IN PRE-PUBERTAL CHILDREN IS ASSOCIATED WITH LESS NEGATIVE EMOTIONAL RESPONSES THE FOLLOWING DAY

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Introduction: Inadequate sleep quantity and/or quality in children is known to forecast development of emotional problems, but how sleep microstructure relates to children's day-to-day emotional functioning remains unclear. Slow wave activity (SWA), or slow fluctuations of cortical activity during slow wave sleep (SWS) in the frequency range 0.75–4.5 Hz, is a marker of homeostatic sleep regulation and reflects synaptic reorganization of cortical areas early in life (Campbell & Feinberg, 2009). Findings regarding SWA among clinically depressed adolescents are mixed, with evidence of SWA reductions (Lopez et al., 2012) and increases (Tesler et al., 2016) compared to controls. Tesler et al. (2016) also showed SWA in frontal areas correlates positively with depressive thoughts. However, we are unaware of studies examining SWA in relation to depressive symptoms and next-day emotional responses among pre-pubertal children, before developmental declines in SWA (Jenni & Carskadon, 2004).
Methods: We examined relationships between N3 SWA, depressive symptoms, and next-day emotional responses among N=17 un-medicated, healthy children ages 7-11 years (Tanner 1/2). Children completed a baseline assessment and one night of at-home PSG monitoring (10-hour sleep opportunity) then an in-lab emotional assessment the next day where they provided arousal and valence ratings for negative affective images from the International Affective Picture System. Analyses controlled for PSG night total sleep time, and SWA did not differ by gender.
Results: Results indicated non-significant associations between SWA and child- and parent-reported depressive symptoms. Greater SWA density across frontal (r=-.66; p< .01), central (r=-.70; p< .001) and occipital regions (r=-.61; p< .01), along with frontal SWA amplitude (r=-.61; p< .01), significantly negatively related to valence ratings for negative images (images were rated as less negative).
Conclusion: While preliminary, findings suggest potential relationships between SWA and emotional functioning in pre-pubertal children. We have previously shown greater SWS corresponds with less same-week negative affect among pre-pubertal anxious children (Palmer & Alfano, 2017); additionally, in a longitudinal study of pre-pubertal children at risk for depression, greater SWS in childhood protected against later development of depression (Silk et al., 2007). Collectively, findings suggest greater SWA prior to pubertal transition may buffer against negative daytime emotional experiences and later depression.
Support (If Any):

0251

THE ROLE OF PARENTAL ABSENCE AND PARENTAL CONFLICT ON CHILD AND ADOLESCENT SLEEP

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Introduction: Parents are one of the most salient contexts for child development, and parental divorce and death are substantial stressors for children. Previous research suggests parental conflict is related to difficulties in attachment, emotion regulation, self-esteem, and academic performance in children. A growing body of research suggests parental conflict can negatively affect sleep duration, latency, sleepiness, and wake after sleep onset. There is limited evidence that some children who experience parental death report worse sleep. Our goal was to begin to investigate the impact of parental divorce and death on multiple sleep measures in a lifespan archival sample.
Methods: Data was refined from the Terman Life Cycle Study, which has followed 1,528 gifted Californian children since 1921. For this analysis, we utilized cross-sectional data from the 1921 assessment (max. N=1202; 44% female, M age=12y, range=6-21y). Participants or their parents reported whether parental death (N=123) or divorce (N=62) had occurred, as well as the child's usual hour of sleeping or waking, how long it took them to fall asleep, the quality of their sleep, and whether they had night terrors. In this preliminary analysis, we evaluate exposure to parental divorce and death on children's sleep descriptively.
Results: Parental divorce was associated with sleep quality (p=.01), but we mostly found no significant impact relations of parental divorce or death on children's sleep (ps=.21-.90). In this sample, 97% of children from intact families (N=1112) had good sleep quality compared to the 92% of children from families with divorced parents (N=62).
Conclusion: In this well-characterized archival longitudinal study of children followed since 1921, we found little evidence that parental divorce or death were related to sleep cross-sectionally. Multiple waves of sleep data are available, and we will evaluate associations longitudinally in follow-up analyses, as well as possible associations between time-limited effects (length of time since the event) or sensitive periods in terms of age. Our null results may be the result of cohort differences (the sample was born, on average, in 1910) or limited reporting on sleep by participants and their parents.
Support (If Any): AG027001

0252

SLEEP HYGIENE EDUCATION INTERVENTION: PSYCHOLOGICAL AND PHYSIOLOGICAL ASSOCIATIONS WITH SLEEP IN COLLEGE STUDENTS

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Introduction: College students tend to struggle with managing healthy sleep habits; these unhealthy behaviors can lead to poor sleep and impact their overall mental and physical health. More specifically, sleep is intimately connected to psychological and physiological factors such as anxiety, depression, and blood pressure. The focus of the current study was to examine habitual sleep habits in college students, provide a brief educational intervention, and investigate potential changes in psychological and physiological health.
Methods: Participants included 14 undergraduate students (6 men, average age M=20.64 years, SD=2.13) who wore wrist actigraphs to measure their typical sleep habits. After one week, participants completed questionnaires about sleep (Pittsburgh Sleep Quality Index, PSQI), sleepiness (Epworth Sleepiness Scale, ESS), fatigue (Multidimensional Assessment of Fatigue Scale, MAF), and psychological symptoms (i.e., depression, anxiety, and stress; Depression Anxiety Stress Scales, DASS-21). Blood pressure and heart rate were measured using a wrist device. Subjects participated in a short lecture about healthy sleep hygiene habits and the importance of sleep and then repeated the one-week observational study.
Results: Paired sample t-tests revealed a significant increase from baseline average sleep duration (M=5.83 hours) to post-intervention sleep duration (6.64 hours; t(13)=-2.532, p=.013). Sleep efficiency (actigraphy) and quality (PSQI) did not improve significantly. ESS scores decreased significantly (t(13)=3.76, p=.002 (pre M=9.29; post M=5.43) and MAF scores decreased significantly (t(13)=2.19, p=.047 (pre M=20.48; post M=15.60). No significant differences were found in depressive, anxiety, or stress symptoms when comparing DASS-21 scores pre- vs post-intervention. Baseline systolic blood pressure (M=114.88) significantly decreased compared to post-intervention recordings (M=108.21). Diastolic blood pressure and heart rate did not differ significantly.
Conclusion: The results of this study suggest that one educational lecture about sleep hygiene may be a start to improving sleep in college students. Even a 48-minute increase resulted in decreased sleepiness and fatigue. However, no improvements were found in sleep quality or efficiency. Although a slight improvement was found in systolic blood pressure, no other physiological or psychological benefits were noted. More research should be conducted on how to improve sleep habits in college students beyond an educational approach.
Support (If Any): None.

0253

THE ASSOCIATION BETWEEN SLEEP HEALTH AND MOOD IN SEDENTARY DESK WORKERS

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Introduction: Poor sleep, most commonly insufficient sleep duration or low sleep quality, has been linked with disruptions of mood. However, it is unclear how sleep health—more broadly, other multiple dimensions of sleep—is associated with mood. The purpose of this study was to investigate the associations between sleep health and mood in a sample of desk-working sedentary adults.
Methods: This cross-sectional study used baseline data from inactive adults with desk-based jobs (N=125, 49.6% female, 43.9±10.6 years) who enrolled in an ongoing clinical trial. Sleep was assessed using validated questionnaires and 7 nights of actigraphy. Collectively, these measures were utilized to assess six different sleep dimensions: regularity, satisfaction, alertness, timing, efficiency, duration. Each dimension was categorized as "good" or "poor". A sleep health score was calculated by summing the number of good dimensions (range: 0-6; higher is better).

Mood was assessed using Profile of Mood States (POMS); its 7 subscales (tension, anger, fatigue, depression, esteem-affect, vigor, confusion) were summed (with a constant of 100) to create a Total Mood Disturbance (TMD) score. Multiple linear regression models examined associations between sleep health and mood adjusting for age, gender, and whether pre- or post-COVID-19.

Results: The mean sleep health score was 4.7±1.1; the mean TMD score was 96.6±18.5. Better sleep health was associated with lesser TMD (β=-0.32, $p<0.001$) and better mood on each of the POMS subscales ($\beta \geq 0.18$, $p<0.05$), aside from esteem-related affect ($p=0.31$). Of the individual sleep dimensions, only satisfaction, alertness, and efficiency were associated with TMD ($\beta \geq 0.18$, $p<0.05$). Satisfaction was the only individual sleep dimension that was consistently associated with better mood on each subscale ($\beta \geq 0.17$). Alertness, efficiency, and duration were inconsistently associated with individual mood subscales. Regularity and timing were not associated with any mood subscales ($p \geq 0.267$ and $p \geq 0.073$, respectively).

Conclusion: Better sleep health was associated with less TMD. Satisfaction was the sleep dimension that consistently associated with each subscale of mood. The cross-sectional, observational design limits casual inference between sleep health and mood disturbance due to a lack of temporality and the potential for residual confounding.

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0254

ASSOCIATION OF SLOW WAVE ACTIVITY AND ODDS RATIO PRODUCT WITH INTERNALIZING AND EXTERNALIZING PROBLEMS IN CHILDREN AND ADOLESCENTS

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Introduction: The association of metrics of sleep microstructure with internalizing and externalizing problems in youth has remained elusive. While one study found increased frontal slow wave activity (SWA) in depressed adolescents, there is lack of evidence for a relationship between dimensional measures of behavior and metrics of sleep depth/intensity. We examined the association between two measures of sleep depth/intensity, slow wave activity (SWA) and odds ratio product (ORP), with internalizing and externalizing problems in children and adolescents.

Methods: We calculated SWA and ORP during non-rapid eye movement (NREM) sleep at central, frontal and fronto-occipital derivations in 639 children (5-12y, median 9y) and 418 adolescents (12-23y, median 16y) from the Penn State Child Cohort via in-lab polysomnography. ORP provides a standardized measure of NREM sleep depth, while ORP-9 (average ORP in the 9-seconds following NREM arousals) provides a metric of arousability. SWA (0.4-4Hz) absolute power (μV2) was determined during NREM sleep. Internalizing and externalizing problems were assessed on Achenbach's Behavior Checklist by parent (subjects≤17y) or self-report (subjects≥18y). For each scale, T-scores with a mean of 50 and standard deviation of 10 were obtained following standardized scoring. Multivariable-adjusted linear regression models examined the association between SWA/ORP and clinical outcomes.

Results: At ages 5-12, fronto-occipital SWA was negatively associated with externalizing behaviors ($p=0.05$), while fronto-occipital and frontal ORP, and frontal ORP-9 were positively associated with internalizing symptoms (all $p<0.01$). At ages 12-23, central SWA was negatively associated with internalizing symptoms ($p=0.05$), while central ($p=0.05$) and frontal ($p=0.03$) ORP and central ORP-9 ($p=0.03$) were positively associated with externalizing behaviors.

Conclusion: Reductions in SWA in childhood or adolescence are associated with developmentally appropriate behavioral problems, as depression/anxiety are more prevalent in adolescence. In contrast to SWA, increased ORP (lighter sleep) and ORP-9 (greater arousability) are associated with more anxiety/depression in childhood, yet more externalizing behaviors in adolescence. These distinct associations, such as SWA with externalizing behaviors and ORP with internalizing symptoms during childhood, may reflect how SWA captures local/synaptic control, while ORP global/state control, of sleep depth, making both sleep EEG biomarkers important from a developmental standpoint.

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0255

SLEEP HYGIENE INDEX: ASSOCIATIONS WITH SLEEP AND MENTAL HEALTH IN COLLEGE STUDENTS

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Introduction: Typically, college students practice unhealthy sleep hygiene behaviors, obtain too little sleep, and experience poor sleep quality. Sleep hygiene includes the routines or practices that prepare a person for the best possible night of sleep. Good sleep hygiene habits, like creating a sleep-friendly environment and making time for sleep, promote healthy duration and quality of sleep. Stress is also an important factor to consider during the college experience. Sleep and mental health are tightly connected, and stress can negatively impact the sleep and mental health of individuals. The focus of the current study was to examine habitual sleep habits in college students, in association with sleep quality and psychological health.

Methods: Participants included 51 undergraduate students (18 men, average age M=20.25 years, SD=1.78) who wore wrist actigraphs to measure their typical sleep habits for one week. After one week, participants completed questionnaires about sleep quality (Pittsburgh Sleep Quality Index, PSQI) and sleep hygiene practices (Sleep Hygiene Index, SHI). Higher scores on PSQI represent poorer quality; higher scores on SHI represent unhealthy sleep hygiene behaviors. Mental health symptoms were measured by the Depression, Anxiety, and Stress Scale (DASS-21).

Results: Overall sleep duration was 6.59 hours and sleep efficiency was 82.55% as measured by actigraphy. PSQI scores (M=6.86) demonstrated poor sleep quality and SHI scores (M= 24.80) indicated overall poor sleep hygiene practices. SHI scores predicted higher PSQI scores ($F(1, 50) = 18.05$, $p<.001$), but did not predict sleep duration or efficiency. Depression, anxiety, and stress scores on the DASS predicted poorer sleep hygiene ($F(1, 50) = 18.05$, $p<.001$; $F(1, 50) = 5.82$, $p=.020$; $F(1, 50) = 13.42$, $p<.001$; respectively).

Conclusion: As expected, college students' sleep was short in duration, poor in efficiency, and poor in quality. Additionally, poor sleep hygiene practices predicted poorer sleep quality. Interestingly, scores that indicated worse depression, anxiety, and stress predicted poorer sleep hygiene practices, suggesting that mental health may contribute to healthy sleep practices. More research is needed to understand the complex relationship between mental health, sleep, and healthy sleep practices

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0256

CHILD MALTREATMENT AND MULTIDIMENSIONAL SLEEP HEALTH AMONG INCOMING FIRST-YEAR COLLEGE STUDENTS

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Introduction: Despite the growing body of evidence linking child maltreatment to compromised sleep health in adulthood, links in emerging adults are understudied. We examined associations between child maltreatment (CM) and multidimensional sleep health among emerging adults undergoing the major life transition of starting college.

Methods: First-year college students (N=682, 41% male, 48% Non-Hispanic White, 22% Non-Hispanic Asian, 15% Hispanic all races, 6% Non-Hispanic Black, and 9% Non-Hispanic other races) completed daily sleep diaries (DSDs) for 9 weeks, and completed the Childhood Trauma Questionnaire (CTQ), Epworth Sleepiness Scale (ESS), and Pittsburgh Sleep Quality Index (PSQI) following DSD completion. We used linear regression models to examine associations between CTQ-derived CM (0=none, 1=any [moderate to severe emotional abuse/neglect, physical abuse/neglect, or sexual abuse]) and sleep health (Buysse, 2014) using a multidimensional score encompassing components from the RUSATED model (regularity [DSD sleep midpoint SD: 0= >1 hour, 1= ≤1 hour], satisfaction [PSQI sleep quality item: 0=fairly or very bad, 1=very or fairly good], alertness [ESS score: 0= >10, 1= ≤10], timing [DSD sleep midpoint: 0= <3:30 or >5:30, 1= ≥3:30 and ≤5:30], efficiency [DSD sleep efficiency: 0= <93%, 1= ≥93%], and duration [DSD sleep duration: 0= <7 hours or >10 hours, 1= ≥7 hours and ≤10 hours].

Results: In the full sample 20.5% reported CM (within-group prevalences: females 21%, males 20%, Non-Hispanic Whites 12%, Non-Hispanic Asians 28%, Hispanics of all races 26%, Non-Hispanic Blacks 34%, and Non-Hispanics of other races 30%). Those with CM had significantly worse sleep health (B=-0.25, 95% CI=-0.46, -0.04) compared to those without CM, but not after adjustment for sex and race/ethnicity. In logistic regression models, the only individual sleep health component significantly associated with CM was sleep satisfaction. After adjustment for sex, race/ethnicity, and depressive symptoms, those who experienced CM had a 52% lower odds of reporting good sleep quality (OR=0.48, 95% CI=0.30, 0.76).

Conclusion: CM is associated with worse sleep satisfaction among first-year college students, which aligns with previous research in older adults. Additional research should examine neurophysiological correlates of sleep satisfaction in the context of child maltreatment and effects on subsequent health.

Support (If Any): P206M139743, MH079179, T32HD101392.

0257

TESTING THE DIRECTIONALITY OF SLEEP AND STRESS DURING THE PERINATAL PERIOD: WHAT'S THE IMPACT ON PERINATAL DEPRESSION?

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Introduction: Pregnancy is a time of pronounced sleep disturbance, with a majority (~85%) of women endorsing shorter, more fragmented sleep as gestation progresses. While new-onset antenatal depression (AND) is a known risk factor for postpartum depression, its etiology remains less understood, despite well-established evidence that incidence is the same among healthy first-time mothers as compared to women with established riskfactors inclusive of family or personal history of psychopathology. Heightened daily stress appraisals may be one critical pathway through which disrupted sleep gives rise to AND. The current study tested the directionality of the relationship between habitual nighttime sleep parameters and daytime stress ratings using a prospective amulatory field study design.

Methods: Fifty primiparous women (38% White; 32% Black; 30% Other race/ethnicity; mean age = 32 years, 28 weeks gestation) without a history of sleep disorders nor psychopathology completed 10-days (9-nights) of actigraphy and sleep diaries. They also engaged in 3-days of superimposed ecological momentary assessments (EMA) rating stress, positive, and negative affect at four intervals throughout the day. Analyses examined negative affective responses to social conflict and task-based demand througout days of EMA, at the within-person and between-women levels. Sleep variables explored included total sleep time (TST), sleep efficiency (SE; log-transformed), sleep onset latency (SOL) and sleep quality as measured by the Pittsburgh Sleep Quality Index. Cross-lagged hierarchical mixed models tested directionality of sleep-stress relationship. Time-varying covariates included time-of-day, previous day stress for sleep outcomes, and previous night sleep for stress outcomes, at the within-person levels.

Results: After days of greater stress (demand and conflict), women experienced significantly shorter, less efficient sleep and took longer to fall asleep (by both diary and actigraphy; [Beta(SE)=-6.3(1.4); 1.2(.12,), R^2=.27, .32, respectively; ps<.01]. Following nights of shorter sleep, women endorsed greater negative affective responses to stress (Beta=.12, SE=.01, p<.001; R^2=.27). Over the assessment period, women who had shorter, less efficient sleep experienced greater frequency, higher severity stressors, after adjusting for time-of-day, and baseline sleep characteristics, depression and anxiety levels (Betas = -7.4(2.6); .14(.01), ps<.001, respectively). Given this bidirectional support, stress was examined as a moderator of the relationship between TST and depression severity at 34-36 weeks gestation, indicating that greater stress explained the relationship between shorter TST and heightened AND after adjustment for baseline measures.

Conclusion: This is the first study to explore directionality of sleep-stress relationships in a perinatal sample; results provide support for the idea that heightened daily stress engenders greater sleep disturbance (difficulty initiating and maintaining sleep; shorter duration). Bidirectional support for shorter sleep duration and increased stress appraisal was also found. The current project provides preliminary evidence for stress "spill-over" effects (i.e., stress transmission) as a potential mechanism for heightened antenatal depression symptoms.

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0258

SYSTEMIC DETERMINANTS AND CONSEQUENCES OF SLEEP DISTURBANCE IN FAMILY MEMBERS OF THE CRITICALLY ILL

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Introduction: Family members of intensive care unit (ICU) patients are at increased risk of experiencing sleep disturbances, which in turn can exacerbate symptoms of anxiety and depression. However, little is known about how sociocultural determinants influence their predisposition to sleep disturbances, and how such sleep disturbances contribute to symptoms of anxiety and depression across the trajectory of the patient's ICU stay. Therefore, we sought to: 1) identify individual and interpersonal sociocultural predictors of sleep disturbance symptoms, and 2) describe the influence of select sociocultural determinants and sleep disturbances on subsequent symptoms of anxiety and depression.
Methods: Using a repeated-measures, correlational design, we recruited family members of incapacitated, mechanically ventilated patients within four adult intensive care units at a tertiary medical center in northeast Ohio. We collected baseline data (T1) after obtaining informed consent and seven (T2) days post-baseline. We measured individual and interpersonal sociocultural determinants, as well as symptoms of sleep disturbance, anxiety, and depression with self-report instruments. To test our aims, we used step-wise linear regression.
Results: For aim 1 (N = 30), participants who were female, non-white, married, and had prior healthcare decision-making experience reported more severe sleep disturbance symptoms ($R2 = .69$, $F(11,18) = 3.59$, $p = .008$). For aim 2 (n = 20), the aforementioned determinants and T1 sleep disturbance scores significantly predicted T2 anxiety ($R2 = .62$, $F(5,14) = 4.61$, $p = .01$) and depression ($R2 = .65$, $F(5,14) = 5.24$, $p = .006$) severity. None of the predictors were statistically significant for the full anxiety model; notably, the effects of gender and prior healthcare decision-making experience were statistically significant until T1 sleep disturbance was inserted in the model. T1 sleep disturbance scores were the only statistically significant predictor in the full depression model.
Conclusion: We provide preliminary evidence that sleep disturbances among family members of ICU patient may contribute to the severity of depressive symptoms in family members of ICU patients. We encourage future researchers to replicate and expand upon these findings to understand the development of sleep disparities in this vulnerable population.
Support (If Any): Sayre Memorial Fund; Midwest Nursing Research Society; NCATS (1KL2TR002547)

0259

CHRONOTYPE AND AFFECTIVE RESPONSE TO SLEEP RESTRICTION, SLEEP DEPRIVATION, AND CIRCADIAN MISALIGNMENT

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Introduction: Late chronotypes have been shown to have decreased positive affect during the day and during sleep loss. Findings for negative affect are inconsistent. The present analysis examined the effect of chronotype on positive and negative affect during two sleep and circadian challenges.
Methods: In both studies, chronotype was determined by habitual mid-sleep time. In Study 1, 10 healthy adults (5 early, 5 late chronotypes) completed a 10-day protocol of sleep restriction followed by total sleep deprivation. Participants maintained habitual 8h sleep schedules at home for 1 week, then completed a 2-day in-laboratory protocol: 4h of sleep restriction, followed by a 4h sleep opportunity, followed by 28h of sleep deprivation. Affect was assessed with the Positive and Negative Affect Schedule (PANAS) every hour during scheduled wakefulness. In Study 2, 14 healthy adults (7 early, 7 late chronotypes) completed a 39-day protocol of combined sleep restriction and circadian misalignment. Participants maintained habitual 8h sleep schedules at home for 2 weeks, then completed a 4-day in-laboratory protocol with the following sleep opportunities: 8h on night 1, 3h on night 2, and 3h on mornings 3 and 4. After 3 days of at-home unscheduled recovery sleep opportunities, the protocol was repeated. Affect was assessed with the PANAS every 3h during scheduled wakefulness. Data from each study were analyzed separately with mixed-model ANOVA.
Results: Positive affect decreased during sleep restriction+sleep deprivation and sleep restriction+circadian misalignment ($p<.05$), regardless of chronotype. However, late chronotypes reported lower positive affect than early chronotypes across both sleep/circadian challenges ($p<.05$), and this effect was accounted for by baseline positive affect. Negative affect was not consistently impacted by sleep/circadian challenges or chronotype, with or without considering baseline negative affect. In both studies, chronotype did not interact with sleep/circadian challenges.
Conclusion: These findings are consistent with prior work showing later chronotypes have lower positive affect. Chronotype and sleep loss/circadian misalignment may impact affect through independent mechanisms. Future work is needed to replicate these findings in larger samples with more extreme chronotypes.
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0260

DOES MULTI-DIMENSIONAL IMPULSIVITY MEDIATE THE RELATIONSHIP BETWEEN POOR SLEEP HEALTH AND DEPRESSIVE SYMPTOMS IN LATE ADOLESCENTS?

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Introduction: Abundant evidence links poor sleep health to problems with mental health, including depression. Poor sleep is also associated with deficits in impulse control, which have been linked in turn to depressive symptoms, perhaps most notably suicidality. However, whether impulsivity may partly account for the relationship between poor sleep health and depressive symptoms remains understudied. Here, we examined whether multi-dimensional impulsivity mediated the relationship between sleep health and depressive severity in a sample of late adolescent drinkers.
Methods: The sample consisted of 96 late adolescents (58.3% female; mean age 17.6 years) reporting regular alcohol use. Daily sleep duration, timing (sleep midpoint), and continuity (efficiency) were assessed using wrist actigraphy. Five facets of impulsivity (namely, negative urgency, lack of perseverance, positive urgency, lack of premeditation, and sensation seeking) were assessed via the UPPS-P Impulsive Behavior scale. Depressive symptoms were assessed via the Inventory of Depressive Symptomatology (IDS-SR-30).
Results: Mediation analyses showed that the associations between sleep health and depression severity were not mediated through impulsivity. However, results indicated that negative urgency and lack of perseverance were associated with increased severity in depression (B = .75, 95% CI, .27, 1.23 for negative urgency; B = .55, 95% CI, .12, .97 for lack of perseverance), whereas lack of premeditation was inversely associated with depression severity (B = -.72, 95% CI, -1.15, -.29).
Conclusion: Our findings suggest that sleep duration, timing and continuity were not related to any of the multi-dimensional impulsivity components used. However, findings show that negative urgency and lack of perseverance were related to heightened depressive severity but lack of premeditation was known to decrease depression severity. Further analysis may be needed to examine the mediational paths in the associations between sleep health and depressive symptoms, for example, by using latent constructs of sleep health and impulsivity, thus taking measurement errors into account.
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0261

PRE-SLEEP AROUSAL PREDICTS SUBSEQUENT NIGHT'S REM FRONTAL THETA POWER IN A NATURALISTIC CONTEXT

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Introduction: Decreased rapid eye movement (REM) frontal theta spectral activity during sleep has been identified following intense negative experiences in both naturalistic and experimental settings. It is unknown, however, whether this spectral marker a) also appears following lower intensity naturalistic negative affective experiences, and b) whether it is responsive to arousal, to negative valence, or to both.
Methods: In a community sample of adults (N = 50, age range 21-49 [M = 30.30, SD = 7.85]) with no mental health or sleep disorders except bruxism, we separately measured naturalistic experiences of negative valence and arousal 40-60 minutes prior to bedtime, then assessed at-home sleep using a single night of ambulatory polysomnography with 8 electroencephalography channels. REM frontal theta was calculated as the mean relative spectral power density between 4.9-8 Hz at F3 and F4 during REM. Affective experience was assessed with a 0-100 slider rating filled out on participants' smartphones. Negative valence was assessed by asking, "How negative are you feeling right now?" Arousal was assessed using a composite of somatic and cognitive arousal that reverse scored and averaged two ratings, "How calm is your body?" and "How quiet is your mind?" Analyses were conducted with Bayesian general linear models using flat priors.
Results: Contrary to our hypothesis, pre-sleep arousal was linearly associated with increased REM frontal theta (ß = 2.06 [0.95, 3.20], pMAP < 0.001). A quadratic association fit the data better than the linear model (Bayes Factor = 250.47), such that, for low to moderate pre-sleep arousal, REM frontal theta power increased as arousal ratings increased, but for moderate to high pre-sleep arousal, REM frontal theta power decreased as arousal ratings increased (ß = -2.04 [-3.18, -0.90], pMAP < 0.001). Both associations remained significant even adjusting for negative valence. Contrary to expectations, pre-sleep negative valence was not associated with REM frontal theta.
Conclusion: Separately measuring affect dimensions revealed that REM frontal theta power was selectively responsive to naturalistic pre-sleep arousal. At higher arousal ratings, our results matched prior findings. However, at lower arousal ratings, the association was reversed, suggesting that spectral markers may vary across affective intensities and contexts.
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0262

SLEEP-WAKE CYCLE CIRCADIAN DISRUPTION AFTER CHRONIC ALCOHOL INTAKE IN A RAT MODEL OF ANXIETY

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Introduction: Alcohol intake can produce disruptions in sleep-wake cycle, including circadian alterations like phase shifts. Alcohol intake is increased in subjects with anxiety to diminish its symptoms. We have selectively bred two sublines from Sprague-Dawley rats that differs on its yawning frequency. The high-yawning (HY) rats have a mean of 20 yawns/h, whereas the low-yawning (LY) rats have only 2 yawns/hour. LY male rats had high anxiety-like behavior in standardized tests and high preference for alcohol intake. The aim of this study was to assess circadian disruption of sleep-wake cycle after chronic alcohol consumption.
Methods: We used 8 male rats from HY and LY at 3 months of age. All rats were kept in acrylic boxes with food pellets and

purified water ad libitum under a light-dark cycle of 12:12 (lights on at 0700) and temperature of 21 ± 1 °C. All subjects were implanted for EEG, EMG and EOG recordings to characterize sleep-wake phases. A basal sleep-wake recording was obtained for 24 h. A second and third recording were made after a 7 days of alcohol administration as a single source of hydration (AL1) and a 3 week two-bottle choice alcohol preference protocol (AL2) were carried out. We used COSINOR analysis to determine phase and cycle alterations of sleep-wake circadian rhythm of all subjects.

Results: After alcohol intake, there was a significant difference only in the acrophases of awake periods ($P<0.01$) and slow wave sleep (SWS, $P<0.001$) in both AL1 and AL2 conditions for the HY subline, with a phase delay of 90 min for awake, 30 min for SWS and an advanced phase of 40 min for rapid eye movement sleep (REM) with respect to basal condition. In the case of LY subline, there was a significant difference only in SWS ($P<0.001$) and REM sleep ($P<0.05$) acrophases for both AL1 and AL2 conditions, with a phase delay of 7 h for wake, 40 min for SWS and 1 h for REM sleep.

Conclusion: It has been reported that alcohol disrupt circadian synchronization of the sleep-wake cycle, producing a general delay of SWS and REM sleep phases. Additionally, subjects with basal circadian disruptions are more susceptible to increase their intake of alcohol and other addictive drugs. So, LY male rats are an adequate model for higher susceptibility to alcohol intake.

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0263

SLOW-WAVE DISRUPTION IMPROVES IRRITABILITY IN MALES WITH MAJOR DEPRESSION: POTENTIAL IMPLICATIONS FOR UNDERSTANDING THE IMPACT OF SEX DIFFERENCES ON SLEEP AND NEUROPLASTICITY

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Introduction: Irritability has been proposed to be a core symptom of male-specific major depressive disorder (MDD), with a greater propensity to experiencing anger attacks and overreacting to minor annoyances compared to females with MDD. Males with MDD have also been shown to exhibit a pattern of reduced slow-wave sleep (SWS) that is not characteristic of females. Because SWS has been implicated in the homeostatic regulation of neuroplasticity, it is possible that this mood dysfunction in males is a result of SWS alterations via impairments in neuroplasticity. Therefore, in this study we aimed to manipulate SWS and examine its impact on mood.

Methods: 19 individuals (11 F) with MDD were recruited for an ongoing clinical trial. Participants spent two nights in the sleep laboratory one week apart: a baseline (BL) night, and a night of slow-wave sleep disruption (SWD) utilizing auditory stimulation. Irritability was assessed in the morning following each overnight visit using the 5-item Brief Irritability Test (BITe). Repeated measures ANOVA was used to evaluate the change in irritability following SWD with condition (BL, SWD) as the within-subject factor and sex (M, F) as the between-subjects factor.

Results: Results revealed a significant Condition x Sex interaction ($F(1,17) =10.1$, $p=.006$) for change in irritability scores, with post-hoc t-tests indicating that males with MDD showed a significant decrease in irritability following SWD, $t(7)=2.22$, $p<.05$ while women showed a significant increase in irritability, $t(10)=-2.34$, $p<.05$. Changes in irritability were not found to be associated with changes in N3.

Conclusion: These data demonstrate that experimentally reducing SWS decreases irritability, a core symptom of mood dysfunction, in males with MDD. As SWS has been theorized to facilitate synaptic downscaling, these results may indicate that maintaining waking levels of synaptic strength in males improves depressive symptomatology and may point to the importance of sex differences in sleep and psychopathology. Moreover, these results suggest that the modulation of neuroplasticity via sleep manipulation may be a potential therapeutic target.

Support (If Any): K23MH118580 (JG)

0264

SLEEPINESS IN COGNITIVELY UNIMPAIRED OLDER ADULTS IS ASSOCIATED WITH CSF BIOMARKERS OF INFLAMMATION AND AXONAL INTEGRITY.

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Introduction: We have previously shown that older adults with excessive daytime sleepiness (EDS) appear to be more vulnerable to longitudinal amyloid PET accumulation before the onset of the dementia. It remains unclear whether this vulnerability is specific to amyloid or extends to other biomarkers of Alzheimer's disease pathology, or axonal integrity and inflammation, which can also contribute to neurodegeneration and cognitive changes.
Methods: For this cross-sectional analysis, we identified 260 cognitively unimpaired adults (>60 years old) without neurologic disorder who underwent CSF quantification of AD biomarkers (CSF Aβ-42, p-tau181, p-tau217) along with at least one other biomarker of interest (neurofilament light chain [NfL], IL-6, IL-10, and TNF-α) from the Mayo Clinic Study of Aging – a longitudinal population-based cohort in Olmsted County, Minnesota. CSF biomarkers were available in 251-260 individuals, depending on the biomarker. We fit linear regression models to assess whether the CSF biomarkers were associated with sleepiness as measured by the Epworth Sleepiness Scale (ESS), after controlling for age, sex, APOE4 genotype, BMI, hypertension, dyslipidemia, and OSA diagnosis (by chart review).
Results: Higher ESS scores were independently associated with higher CSF IL-6 and NfL, but not with the other biomarkers in the whole sample. For every single-point increase in the ESS score, there was a .008 ([95% CI .001-.016], p=0.033) increase in the log of IL-6 and .01 ([95% CI .002-.018], p=0.016) increase in the log of NfL. A sensitivity analysis showed a correlation between ESS scores and log of p-tau/Aβ-42 ratio only in participants with abnormal ratio (>0.023), after controlling for APOE4 (partial r=.27, p=039).
Conclusion: Our results corroborate previous literature suggesting that higher inflammatory milieu reflected by increased CSF IL-6 is associated with sleepiness. The association between NfL and sleepiness suggests that sleepiness may be related to disturbed connectivity due to axonal damage. Alternatively, NfL may be a surrogate of active axonal injury associated with more disrupted sleep. A correlation between sleepiness and CSF p-tau/ab-42 ratio was only seen in patients with abnormal ratio, suggesting a stronger association between sleepiness and AD pathology as the disease progresses, possibly because AD pathology worsens sleep quality and/or vice-versa.
Support (If Any): NIH/NIA

0265

SAMELISANT (SUVN-G3031), A HISTAMINE H3 RECEPTOR INVERSE AGONIST IN ANIMAL MODELS OF NARCOLEPSY

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Introduction: Samelisant (SUVN-G3031) is a potent and selective H3 receptor (H3R) inverse agonist with hKi of 8.7 nM. It lacks measurable affinity against 70 other targets which includes GPCRs, ion channels, transporters, enzymes, peptides, steroids, second messengers, growth factors and prostaglandins. Samelisant exhibited desired pharmacokinetic properties and favorable brain penetration in preclinical species. Samelisant blocked R-α-methylhistamine induced dipsogenia in rats and increased tele-methylhistamine levels in brain and cerebrospinal fluid as well. Samelisant is currently being evaluated in a Phase-2 study as monotherapy for the treatment of excessive daytime sleepiness (EDS) in patients with narcolepsy with and without cataplexy (ClinicalTrials.gov Identifier: NCT04072380).
Methods: In brain microdialysis, samelisant was evaluated for its effects on modulation of neurotransmitters like histamine and norepinephrine in prefrontal cortex. In male orexin knockout mice, electroencephalography (EEG), electromyography and activity were monitored using telemetric device. Effects of samelisant on sleep/ wake profile and cataplexy episodes were evaluated during active period of animals. Animals were allowed three weeks of recovery from surgery prior to EEG recording.
Results: Samelisant significantly increased histamine, dopamine and norepinephrine levels in the prefrontal cortex. Samelisant did not change dopamine levels in the striatal and accumbal. These suggest that samelisant may not have propensity to induce abuse liability. Samelisant produced a significant increase in wakefulness with concomitant decrease in non-rapid eye movement sleep in orexin knockout mice. It also significantly decreased number of cataplectic episodes in orexin knockout mice.
Conclusion: The results from non-clinical studies presented here provide a strong evidence for the potential utility of samelisant for the treatment of EDS and cataplexy in patients with narcolepsy.
Support (If Any): None

0266

SLEEP SPINDLE-DURATION: A POTENTIAL BIOMARKER FOR NEURODEGENERATIVE DISORDER PHENOTYPING

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Introduction: Decreased sleep spindle oscillations were previously associated with cognitive decline in older adults, increased tau levels, and phenoconversion to dementia in patients with Parkinson disease (PD). We analyzed quantitative sleep spindle measures to determine if this biomarker was associated with particular neurodegenerative disorder syndromes.

Methods: Sleep spindle oscillations ascertained in patients broadly characterized as presumed Parkinsonian-spectrum disorders (PSD), which included the subtypes dementia with Lewy Bodies/Parkinson Disease Dementia (DLB/PDD, n=16), PD (n=16), isolated REM sleep behavior disorder (iRBD, n=19), and progressive supranuclear palsy (PSP, n=13), were compared with non-PSD subtypes Alzheimer Disease dementia (AD, n=22), mild cognitive impairment (MCI, n=35), and normal cognition (NC, n=61). Sleep Profiler studies were conducted in all participants. The automated spindle detection algorithms recognized temporal excursions in the alpha (8-12 Hz) and sigma (12-16 Hz) power of 250 milliseconds or greater, with spindle duration being the sum of all spindle elapsed times. Night-to-night variability was assessed in PSP=13, PD=16, DLB/PDD=12, AD=17, MCI=25, and NC=53. Statistical analyses included intraclass correlations (ICC) and Bland-Altman plots for two-night data, and Mann-Whitney U-tests and multiple logistic regression applied to sleep-time weight-averaged spindle-durations.

Results: The night-to-night spindle-duration ICC was 0.95 (P<0.0001), with a Bland-Altman bias of 0.05+/-2.83 minutes. Spindle-duration was independently associated with PSD versus non-PSD groups (P=0.017, OR 1.08, 95%-CI 1.01-1.15), but not significantly associated with age (P=0.12, OR 1.03, 95%-CI 0.99-1.07) or sex (P=0.54). When stratified by subtype, age was associated with spindle-duration when NC were compared to AD and MCI (P=0.0003, OR 1.10, 95%-CI 1.04-1.16) and when iRBD were compared to DLB/PDD, PD and PSP (P<0.05, OR 1.00, 95%-CI 0.89-1.13)Spindle-durations were reduced in PSP (0.9+/-2.1) and DLB/PDD (2.0+/-5.1) when individually compared to AD (3.2+/-7.1), iRBD (3.3+/-3.4), PD (5.3+/-6.6), MCI (5.3+/-9.7), and NC (8.0+/-11.1) subtypes (all P<0.05). AD patients also exhibited lower spindle-durations than NC (P=0.03).

Conclusion: Auto-detected sleep spindle-durations exhibited excellent night-to-night reliability in both NC and patients with neurologic disorders. Decreased sleep spindle-duration was independently associated with PSP and DLB/PDD, and in AD. Reduced sleep spindle duration may be a distinct sleep biomarker for those disorders likely indicating thalamocortical dysfunction.

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0267

THE INFLUENCE OF ANTIDEPRESSANTS ON NON-REM HYPERTONIA

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Introduction: The severity of REM sleep without atonia, a prodromal biomarker for synucleinopathy-related neurodegenerative disorders, is influenced by selective serotonin reuptake inhibitor (SSRI) or serotonin-norepinephrine retake inhibitor (SNRI) use. This study investigates whether SSRI/SNRIs similarly impacts the severity of Non-REM hypertonia (NRH), a biomarker independently associated with patients broadly characterized with presumed Parkinsonian-spectrum disorders (PSD).

Methods: In this multi-center study, the relationship between NRH and SSRI/SNRIs was evaluated in PSD patients [Lewy Body/Parkinson Disease Dementia (DLB/PDD=16), Parkinson Disease (PD=16), isolated REM sleep behavior disorder (iRBD=19), and progressive supranuclear palsy (PSP=12)], and non-PSD subjects [Alzheimer Disease (AD=22), mild cognitive impairment (MCI=35), and normal cognition (NC=61)]. Studies were conducted with the Sleep Profiler in all participants. NRH was auto-detected based on persistently elevated electromyographic (EMG) power relative to delta, theta, and sigma bands. Abnormal-NRH was based on a threshold of >5% of sleep time, and weight-averaged by sleep time, in the 75% of studies with two-nights of data. Statistical analyses included multiple logistic regression, Fisher Exact, and Mann-Whitney U tests.

Results: Across all 181 records, 38% had abnormal-NRH and 24% used SSRI/SNRIs (P<0.005). No differences were observed in the distributions of NRH for those with NRH-only vs. those with combined NRH and SSRI/SNRI use (n=45, 14.5+/-7.7% versus n=24, 18.6+/-11.6%, respectively; P=0.19). Abnormal-NRH was associated with the PSD versus non-PSD groups (P<0.0001, odds-ratio=14.0) and SSRI/SNRI use (P<0.05, odds-ratio=2.4), but not age and sex. Within the PSD and non-PSD groups, the frequency of abnormal-NRH was 75% vs. 19% (P<0.0001), and SSRI/SNRI use was 32% vs. 19% (P=0.07), respectively. The distributions of abnormal-NRH in the PSD and non-PSD subgroups ranged from PSP=92%, DLB/PDD=81%, PD=56% ,and RBD=74% versus MCI=26%, and NC=16%, AD=14%, respectively. By comparison, distributions of SSRI/SNRI use were DLB/PDD=50%, RBD=42%, PSP=33%, and PD=0% in the PSD subgroups, compared to MCI=34%, AD=23%, and NC=10% in the non-PSD subgroups.

Conclusion: Abnormal non-REM hypertonia exhibited a very strong association with Parkinsonian-spectrum disorder diagnoses (odds-ratio=14.0) and a relatively weaker association with selective serotonin reuptake inhibitor or serotonin-norepinephrine retake inhibitor use (odds-ratio=2.4), suggesting a finding that reflects an interactive, rather than causal inference.

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0268

CHARACTERIZATION OF NEURODEGENERATIVE DISORDER SUBTYPES BASED ON NON-REM HYPERTONIA AND SLEEP SPINDLE DURATION

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Introduction: Increased non-REM hypertonia (NRH) and decreased sleep spindle-durations were found to be independently associated with patients broadly characterized as presumed Parkinsonian-spectrum disorder [i.e., dementia with Lewy Bodies/Parkinson Disease Dementia (DLB/PDD), Parkinson Disease (PD), progressive supranuclear palsy (PSP), or isolated REM sleep behavior disorder (iRBD)] when compared to subjects with Alzheimer Disease dementia (AD), mild cognitive impairment (MCI) and normal cognition (NC). In this investigation, the NRH and spindle-duration features were combined to determine whether these biomarkers could distinguish neurodegenerative disorder subtypes.

Methods: This multicenter investigation included analysis of several neurodegenerative disorder patient subtypes including: DLB/PDD (n=16), PD (n=16), iRBD (n=19), PSP (n=13), AD (n=22), MCI (n=35), and NC (n=61). Sleep Profiler (SP) studies were conducted in all participants. NRH was auto-detected based on persistently elevated electromyographic (EMG) power relative to delta, theta, and sigma bands, while spindles were recognized by temporal excursions in alpha and sigma power > 250-milliseconds. With NRH >5% of sleep-time and spindle-duration <1-minute considered abnormal, tallies were compared across neurodegenerative disorder subtypes with Fisher Exact tests.

Results: Combined SP features of Normal-NRH/normal-SpD were greater in the NC (56%), AD (46%), and MCI (43%) subtypes versus PSP (8%) and DLB/PDD (6%), and when iRBD (21%) was compared to NC (all P<0.05). Abnormal-NRH/abnormal-SpD were more frequent in PSP (85%) and DLB/PDD (75%) subtypes versus iRBD (26%), PD (25%), MCI (11%), AD (9%), and NC (8%)(all P<0.02). Abnormal-NRH/normal-SpD were greater in iRBD (47%) compared to MCI (14%), NC (8%), PSP (8%), DLB/PDD (6%), and AD (5%) subtypes, and in PD (31%) versus NC (all P<0.05). Normal-NRH/abnormal-SpD occurred more often in AD (41%) than iRBD (5%) and PSP (0%)(both P<0.05).

Conclusion: The combination of NRH and spindle-duration abnormality occurred more frequently in DLB/PDD and PSP subtypes. Abnormal NRH with normal sleep-duration was more frequent in iRBD and PD subtypes. Normal NRH and spindle-duration occurred most often in NC and MCI types. AD exhibited normal NRH with isolated cases of either normal or abnormal spindle-duration. Our preliminary findings suggest that auto-detected sleep biomarkers may aid in the characterization of neurodegenerative disorder subtypes. Larger prospective cohort studies are needed.

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0269

NON-REM SLEEP HYPERTONIA IN PARKINSONIAN-SPECTRUM DISORDERS

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Introduction: Non-REM hypertonia (NRH) was recently reported to be independently associated with the synucleinopathy-mediated neurodegenerative disorders: dementia with Lewy Bodies/Parkinson Disease Dementia (DLB/PDD), Parkinson Disease (PD), and isolated REM sleep behavior disorder (iRBD). In this NRH investigation, we included progressive supranuclear palsy (PSP), a Parkinsonian-spectrum disorder caused by tau pathology.

Methods: In this multicenter study, patients broadly characterized as presumed Parkinsonian-spectrum disorders (PSD) included DLB/PDD (n=16), PD (n=16), iRBD (n=19), and PSP (n=13). Presumed non-PSD subjects included Alzheimer's Disease dementia (AD=22), mild cognitive impairment (MCI=35), and normal cognition (NC=61). Sleep Profiler studies were acquired in all participants. NRH, auto-detected based on persistently elevated electromyographic (EMG) power relative to delta, theta, and sigma bands in the differential Af7-Af8 signal, was measured as a percentage of sleep time and then weight-averaged in the 75% of in-home studies with two-nights of data. A >5% threshold characterized abnormal-NRH. Twenty-nine NC were longitudinally retested after 364- to 563-days. Statistical analyses included inter-class correlations (ICC), Bland-Altman plots, multiple logistic regression, and receiver-operating-characteristic curves (ROC).

Results: In the PSD=41 and non-PSD=95 records with two-nights of data, NRH-severity demonstrated moderate consistency (ICC=0.78, bias=0.6+/-6.2%, P<0.0001). Across the two-nights, NRH was classified consistently as normal or abnormal in 59.6% and 27.2% of the records, vs. normal/abnormal=4.4% or abnormal/normal=8.8%. The test-retest reliability of NRH-severity was good (ICC=0.84, bias=0.06+/-3.8%, P<0.0001), with all retest comparisons repeating as normal (73%) or abnormal (27%). The frequency of abnormal-NRH in PSP=92% was significantly greater than MCI=26%, AD=14%, and NC=16% (all P<0.0001) and PD=56% (P<0.05), but not DLB/PDD=81% and iRBD=74%. Abnormal-NRH was significantly associated with the PSD group (P<0.0001) and it differentiated PSD versus non-PSD group with an area under the curve of 0.78 (95%CI: 0.72-0.85) based on a sensitivity of 0.75 (95%CI: 0.63-0.84) and a specificity of 0.81 (85%CI: 0.73-0.87).

Conclusion: NRH independently discriminated PSD patients from age-sex similar non-PSD subjects, suggesting that NRH

is a common sleep motor signature across clinical PSD phenotypes. We speculate that NRH could be related to pathological changes within the key non-REM sleep motor modulating center in synucleinopathies and PSP.

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0270

EEG SLOW WAVE COHERENCE IS RELATED TO PSG-DERIVED MEASURES OF SLEEP FRAGMENTATION AND COGNITION IN THE WASHU BASE COHORT

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Introduction: There exists a bidirectional relationship between sleep disruption and neuropathology in Alzheimer's disease (AD). Electroencephalogram (EEG) during polysomnography (PSG) provides an opportunity to examine stereotyped, coordinated brain activity. Specifically, slow wave activity (SWA), a defining feature of non-REM sleep, is aberrant in AD, and disruption of SWA in healthy adults is related to increased amyloid-beta levels. Coherence of slow waves across different cortical regions may serve as a metric of brain network coordination, sensitive to earliest AD pathology. We explored slow wave coherence during sleep in relation to sleep macrostructure and cognitive performance in the Biomarkers of Alzheimer's Disease in Sleep and EEG(BASE) cohort.

Methods: EEG was collected during an attended overnight PSG from the BASE cohort (n=79, average age = 70.8 ± 4.4 years), approximately 20% of whom had Clinical Dementia Rating (CDR) of 0.5-1. A custom slow wave peak detector was implemented in MATLAB to across 6 EEG leads (C3, C4, F3, F4, O1, and O2), and slow wavecoherence was calculated as the proportion of sleep with slow waves occurring within 100ms in all 6 leads.

Results: EEG slow wave coherence was reliably quantified during wake, non-REM stages N1, N2, N3, and REM. Slow wave coherence in N2/N3 was negatively correlated with measures of sleep fragmentation (wake after sleep onset Spearman r = -0.3, p 0.008; number of awakenings r = -0.39, p 0.0004), and positively correlated with sleep efficiency (r = 0.28, p = 0.013). Slow wave coherence in N2/N3 was correlated with overall cognition as measured by MoCA adjusted z-score (r = 0.2, p 0.087) and executive function as measured by Trailmaking B adjusted z-score (r = 0.25, p 0.038).

Conclusion: Slow wave coherence was strongly correlated with measures of sleep quality. Reduced slow wave coherence was associated with poorer cognitive executive function. EEG slow wave coherence is a novel, promising approach to measure coordinated brain network function that is sensitive to early cognitive dysfunction in AD.

Support (If Any): NIH R01 AG059507, ARCS Foundation Scholar

0271

ACTIGRAPHY BASED MEASURES OF SLEEP DISRUPTION AND CIRCADIAN RHYTHMS IN THE WASHU BIOMARKERS OF ALZHEIMER'S DISEASE IN SLEEP AND EEG (BASE) COHORT

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Introduction: Prospective studies of Alzheimer's disease (AD) demonstrate sleep-wake disturbances may precede and accelerate with cognitive decline. Use of wrist-actigraphy in conjunction with overnight polysomnography (PSG) enables researchers to evaluate diverse characteristics of sleep and circadian rhythms. Though outcome measures from these devices have been implicated in the progression of AD, because of great individual differences, it is valuable to internally replicate within cohort. Here we demonstrate application of actigraphy in the context of healthy aging to identify patterns of activity that predict cognitive decline.

Methods: Participants were prospectively recruited at Washington University as part of the BASE study and wore an Actiwatch2 (Philips-Respironics) and cross-validated for sleep and wake using polysomnography. The watch was worn continuously for at least 5 consecutive nights to be included in the analysis (n = 68, age = 71.1 ± 4.5 years). Rest-activity rhythms were computed using compiled code from National Sleep Research Resource (actiCircadian) pipeline implemented in MATLAB R2021a (Mathworks). Clinical Dementia Rating (CDR) scales and cognitive tests were conducted on the first day of actigraphy recording.

Results: Individuals with cognitive impairment (CDR Global Score > 0) had increased wake after sleep onset (WASO) and reduced sleep efficiency compared with individuals with no impairment (CDR = 0). (unpaired ttest: p = 0.02 and p = 0.02). Participants with cognitive impairment had a trend toward reduced relative amplitude (RA) (p = 0.06). Reduced (worse) RA was correlated with worse performance on the Trail Making Task A (Pearson r: -0.37, p = 0.002). Higher (better) interdaily Stability (IS) was associated with better responses on subjective questionnaires including Epworth Sleepiness Scale and Pittsburgh Sleep Quality Index (Pearson r: -0.24 p = 0.051; r: 0.242, p = 0.047, respectively).

Conclusion: Actigraphically-derived rest-activity metrics are correlated with cognitive status, cognitive test performance, and subjective sleep questionnaires.

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0272

DECREASED RISK OF 2-YEAR INCIDENCE OF ALZHEIMER'S DISEASE AMONG OLDER ADULTS WHO REPORT SLEEP SYMPTOMS

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Introduction: Those with dementia or Alzheimer's Disease report an elevated amount of sleep difficulties compared to age-matched controls. Sleep-based interventions may be especially useful for

this group, such as cognitive behavioral therapy for insomnia or pharmacological interventions. Therefore, it is important to expand the current understanding of the nature of sleep difficulties in those with Alzheimer's Disease.
Methods: Data from the 2018 Health and Retirement Survey was collected from 17,146 older adults. Poisson regression analyses were used to explore the relationship between Alzheimer's Disease as diagnosed by a doctor and sleep difficulties. Individuals who reported no Alzheimer's Disease in the previous wave (N=16,751) were asked if they had since become diagnosed. N=101 individuals reported incident Alzheimer's Disease in the 2-year gap between assessments. Sleep difficulties were assessed by asking participants if they had difficulties initiating or maintaining sleep, waking up too early, and how rested they felt upon awakening. All 4 of these symptoms were coded as "never," "sometimes," or "often."
Results: Unexpectedly, there was a significant decreased risk of developing Alzheimer's Disease among those who reported difficulties maintaining sleep (IRR=0.9962; 95%CI[0.9936,0.9988]; p=0.004), and early morning awakenings (IRR=0.9961; 95%CI[0.9938,0.9984]; p=0.001) "sometimes". When the model was adjusted for sex, race, ethnicity, age, and depression, a similar finding of decreased risk for Alzheimer's Disease for those who reported difficulties maintaining sleep (IRR=0.9953; 95%CI[0.9927,0.9980]; p<0.001), and early morning awakenings (IRR=0.9954; 95%CI[0.9930,0.9978]; p=0.001), "sometimes" were maintained.
Conclusion: Although previous studies have shown that poor sleep may lead to increased risk of Alzheimer's and related dementias, the present study, which examined longitudinal data from a large, national sample of older adults, found that there was no association between frequent sleep disturbances and 2-year incidence of Alzheimer's Disease, and a small association between more mild symptoms and decreased risk. It is possible that the 2-year observation window was insufficient to detect effects. Also, there is a risk of measurement error in collecting self-reported data on sleep and Alzheimer's diagnoses.
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0273

SLEEP DISORDERS AS A POTENTIAL RISK FACTOR FOR DEMENTIA IN ELDERLY ADULTS

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Introduction: Sleep disorders such as insomnia are seen in the early onset of Alzheimer's disease, the most common form of dementia. Simultaneously, sleep disorders may indicate increased risk for the development of dementia. Due to the rate of comorbidity of these two conditions seen in the elderly population, the relationship between dementia and sleep disorders is a topic of interest for researchers. A bidirectional correlation between the two could have important implications in the clinical field exploring factors that lead to dementia
Methods: Data was assessed from 17,146 older adults from the 2018 Health and Retirement Survey. Participants were surveyed using questionnaires regarding both incident dementia or serious memory impairment in the past 2 years and the presence of a sleep disorder, as diagnosed by a doctor or health professional. Those who reported no dementia in the previous wave (N=16,547) were asked if they had been diagnosed since they were last asked. N=185 individuals reported incident dementia in the 2-years between assessments. Responses were coded to either "Yes" or "No". A Poisson regression analysis was conducted to explore the relationship between incident dementia and sleep disorders.
Results: In a sample of older adults, unadjusted results indicate that having a sleep disorder was associated with a 0.6% increased risk of new onset dementia (PRR=1.006; 95%CI[1.001,1.012]; p=0.026). These results were sustained when adjusted for sex, age, race, ethnicity, and depression (PRR=1.006; 95%CI[1.001,1.012]; p=0.013).
Conclusion: Chronic sleep disturbances may be a factor used to indicate increased risk for dementia and help with early detection of the disease. These results demonstrate the value of sleep disorders screening among those at risk for dementia. Further research is needed to clarify these findings (e.g., explore specific sleep disorders) and expand the follow-up window (i.e., beyond 2 years).
Support (If Any): The HRS (Health and Retirement Study) is sponsored by the National Institute on Aging (grant number NIA U01AG009740) and is conducted by the University of Michigan.

0274

EFFECT OF AGING ON SLEEP ARCHITECTURE INCLUDING A NOVEL REM BEHAVIOR DISORDER PHENOTYPE IN THE PS19 MOUSE MODEL OF TAUOPATHY AND EFFECT OF A DUAL OREXIN RECEPTOR ANTAGONIST

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Introduction: This project examines changes to sleep microarchitecture with aging in the PS19 (MAPT P301S) model of tauopathy and response to a dual orexin receptor antagonist (DORA-12) in aged PS19 mice.
Methods: 24-hour video PSG recordings occurred in 28 PS19 mice and 22 littermate controls at 2-3 months (young) and 10-14 months (old).
Results: Spindle density significantly deceased as a function of both advanced age and PS19 genotype without interaction. We observed a significant interaction between age and genotype on slow oscillation (SO) density such that SO density was higher in young PS19 lower in old PS19 mice vs controls without main effects of age or genotype. Phase amplitude coupling of spindles to detected SO events was significantly decreased as a function of age with a trend toward an age/genotype interaction such that the reduction in coupling was greater with aging in PS19 mice vs controls. We observed unexpected dream enactment during REM in 3 of 11 old PS19 but not in young PS19 mice or control mice at any age. Normalized cumulative EMG area during REM sleep, cumulative duration of elevated EMG in REM, and %REM w/o atonia were all significantly increased in mice displaying dream enactment.Old PS19 mice were also video-PSG recorded for 24 hours while receiving 100 mg/kg DORA-12 vs vehicle control orally twice daily. DORA-12 resulted in significant reduction in latency to persistent NREM and REM sleep, and significant increases in spindle density and SO density, without significant difference in spindle-SO coupling. While we did not observe significant differences in dream enactment measures with DORA-12 due to low sample size, all 3 mice with dream enactment displayed decreases in normalized EMG amplitude in REM and %REM with EMG bursts with DORA-12 ranging from 10 to 60%.
Conclusion: Given the importance of spindles, SO's, and their coupling on cognitive processes, these observations can motivate further evaluation of DORA's toward such cognitive processes in

neurodegenerative models as well as effect of DORA's on RBD phenotypes.
Support (If Any):

0275

EFFECT OF ACUTELY INDUCED SEVERE OSA ON AD PLASMA BIOMARKERS

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Introduction: Obstructive sleep apnea (OSA) has been associated with Alzheimer's disease (AD) progression but a causal relationship is unclear. We hypothesized that OSA can influence (AD) biomarkers including beta-amyloid (Aβ) and tau, as well as neural filament light chain (NfL).
Methods: To test this hypothesis, we examined plasma tau, NfL, Aβ42, and Aβ40 in a randomized crossover study of OSA vs. 3-night CPAP withdrawal in 30 subjects with severe OSA adherent to CPAP. We compared the overnight change in evening to morning plasma samples across the untreated night (off) versus CPAP treated night (on). Paired t-tests were used to compare measures across sleep conditions while hierarchical linear regression with difference in the overnight change of each biomarker between conditions were set as dependent variables with age and sex as covariates.
Results: Of the 30 subjects, mean age was 52 years and 27% were women. As expected, CPAP withdrawal caused sleep disruption and recurrence of underlying OSA. Sleep architecture measures including %N3 (Off: 6.1% [3.7-8.5], On: 15.1% [10.6-19.6], p<0.001), %REM (Off: 11.8% [8.8-14.7], On: 20.6% [18.3-22.9], p<0.001), and measures of breathing such as AHI4% (Off: 63/hr [54-72], On: 3/hr [2-4], p<0.001), SpO2 below 90% (Off: 20 min [14-26], On: 1 min [0-3], p<0.001), and SpO2 min (Off: 77% [74-80], On: 88% [86-90], p<0.001) were all significantly different in the untreated versus CPAP treated nights. Compared to CPAP treatment, the overnight change in NfL was increased relative to CPAP withdrawal while the overnight change in Aβ40 was decreased relative to CPAP withdrawal. No change was observed with tau or Aβ42. We found that difference in %N3 between the on- and off-CPAP conditions significantly explained an additional 15.7% of the variance beyond a base model including age and sex alone. No other difference in sleep architecture or apnea severity/hypoxemic burden metric significantly contributed to the variance in overnight change in Aβ40 between conditions, and we identified no significant predictors for variance in overnight change in NfL.
Conclusion: This study presents some of the first evidence for an effect of acute CPAP withdrawal on neurodegenerative and amyloid plasma biomarkers and implicates a role for N3 sleep in this effect.
Support (If Any): AASMF Focus award, NIDDK P30DK072488, R01AG066870, K24HL109156

0276

SLEEP EEG CHANGES IN A TRANSGENIC MOUSE MODEL OF SPINOCEREBELLAR ATAXIA TYPE 3

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Introduction: Spinocerebellar ataxia type 3 (SCA3) or Machado-Joseph disease is a fatal, incurable, dominantly inherited ataxia, typically of adult-onset, and the most frequent type of SCA worldwide. SCA3 patients show progressive neuronal loss in several brain areas reflecting a broad spectrum of motor and non-motor symptoms, including ataxia, parkinsonism, and sleep disorders. In other neurodegenerative diseases, sleep disturbances alter brain homeostatic mechanisms, including DNA repair, synaptic function, and network activity, leading to deterioration of neurologic function. Sleep research has provided insights into their pathophysiology, disease prediction, and symptom management. Such studies have not been performed in SCA3. The aim of this study is to characterize sleep EEG in an SCA3 transgenic mouse model.
Methods: We used homozygous, hemizygous, and wild-type YACMJD84.2 littermate mice. To confirm the expected disease phenotype, we assessed for locomotor and exploratory activity in the morning and evening when the mice were 22 to 31 weeks old. We then implanted 6 electrodes in the frontal, parietal, and cerebellar areas. About two weeks after, we recorded their sleep activity for 15 hours (ZT0-15) per day for three consecutive days. We analyzed the data from the open-field testing and the EEG from the third day of recordings using SPSS and Matlab and a $p<0.05$ was considered for statistical significance.
Results: As expected, homozygous SCA3 mice showed statistically significant decreased locomotor and exploratory activities compared with wild-type littermates. In terms of sleep architecture we did not observe any significant differences between the different genotypes. Moreover, compared with wild-type, homozygous SCA3 mice displayed increased β spectral power band activity during REM. They also had decreased θ band activity, β band activity, spindle activity, and γ band acitivity during wake.
Conclusion: Our data suggest that EEG spectral power is dysregulated in homozygous SCA3 mice. Changes in β band have been observed in SCA3 patients during wake, and in patients with REM sleep behavior disorder. Therefore, future studies analyzing the sleep EEG of SCA3 patients are needed to confirm whether our findings are translatable. Further studies should also investigate the causal relationship between the observed differences in sleep and disease progression. Gaining greater insight into the role of sleep in SCA3 could provide translatable biomarkers and lead to improved assessment of the disease progression and therapeutic interventions.
Support (If Any): NHLBI 5T32HL110952

0277

DEEP LEARNING REVEALED ASSOCIATIONS BETWEEN ALTERED TEMPORAL CORRELATIONS IN MOTOR ACTIVITY AND PARKINSON'S RISK

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Introduction: Motor activity in healthy young adults displays fractal patterns with similar temporal correlations at different timescales. Altered fractal patterns were observed in patients with Parkinson's disease. This study aimed to determine whether altered fractal patterns also predict the risk of Parkinsonism.
Methods: We studied 982 participants (age: 80.12±7.27 [SD]; 750 females) from the Rush Memory and Aging Project, who had at least one actigraphy assessment, had no symptoms of Parkinsonism at actigraphy baseline, and had follow-up clinical assessments. Detrended fluctuation analysis was performed on baseline actigraphy

to determine the fractal patterns. Specifically, the activity fluctuation (around the trend) was computed at multiple timescales (n) ranging from 3-600 min. An exponential function with a variable scaling factor α was used to fit the local fluctuation function with respect to n. The α(n) that represented the temporal correlations was fed into a convolutional neural network (CNN) model whose output was further used as the input of a Cox proportional hazards model to predict the time to incident Parkinsonism. Covariates at baseline considered include age, sex, education, cognition, motor function, chronic health assessment, and actigraphy-derived measures including physical activity level, rest-activity/activity-rest transition probabilities, interdaily stability, and intradaily variability.

Results: There were 412 subjects who developed parkinsonism (in 4.75±3.13 [SD] years from baseline). Based on the gradient of hazard function (with respect to α) from the CNN model (estimated feature importance), the α in three timescale regions (i.e., 3-5 min, 12-20 min, and 270-600 min) contributed significantly to the prediction. Consistently, in separate Cox models with adjustment of age, sex, and education, the mean α at timescales 3-5 min was inversely associated with incident parkinsonism (for 1-SD increase, hazard ratio [HR]=0.82, 95% CI: 0.78-0.92, p<0.0001); The mean α at timescales 270-600 min was also inversely associated with incident Parkinsonism (HR=0.87, 95% CI: 0.78-0.96, p=0.008); And the mean α at timescales 10-25 min was marginally, positively associated with incident Parkinsonism (HR=1.10, 95% CI: 0.99-1.22, p=0.08).

Conclusion: Altered temporal correlations at specific timescales in motor activity predicted the risk of Parkinsonism.

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0278

ISOLATED REM SLEEP BEHAVIOR DISORDER IS ASSOCIATED WITH 24-HOUR RHYTHM DISRUPTION

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Introduction: Isolated REM sleep behavior disorder (iRBD), the loss of motor inhibition during REM sleep, is a symptom of prodromal Lewy body disease, with over 80% of iRBD patients eventually phenoconverting to Parkinson's disease or Dementia with Lewy bodies. Rest-activity rhythm disruption, also an established predictor of Parkinson's disease, has not been well characterized in patients with iRBD. Here, we tested the hypothesis that accelerometer-based measures of 24-hour rhythms would indicate greater fragmentation and variability in patients with iRBD relative to matched healthy controls.

Methods: N=36 patients with iRBD recruited from the Stanford Sleep Clinic had 24-hour activity continuously monitored for (mean ± SD) 25.3 ± 8.4 days using an Axivity wristworn device. A control dataset of age, sex, and body mass index matched healthy older adults (N=126) was selected from the UK Biobank accelerometer dataset. Raw accelerometer data were processed using the GGIR, nparACT, and ActCR software packages in R, with a focus on nonparametric and 5-parameter cosinor measures of 24-hour rhythms. Functional PCA analyses (fPCA) were applied to detect overall differences in 24-hour rhythms and during sleep.

Results: Patients with iRBD had lower interdaily stability and higher intradaily variability than controls (IS, Cohen's d=-1.15, Mann-Whitney test p<0.001; IV, d=0.46, p=0.04). Cosine amplitude was lower in iRBD patients (d=-0.22, p=0.001), but mean activity (mesor) did not differ (d=0.03, p=0.31), suggesting differences in rest-activity patterns rather than overall activity levels. A shape naïve approach utilizing fPCA indicated that increased activity during the night may explain overall rhythm differences observed in iRBD.

Conclusion: Multiple metrics of rest-activity rhythms support the hypothesis that 24-hour rhythms are disrupted in iRBD. It remains to be determined whether rhythm fragmentation in iRBD reflects higher activity levels during REM sleep, or if dysfunctional rhythms represent the direct effects of degenerating sleep-wake regulating circuits, indicating the early stages of Lewy body disease.

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0279

THERMONEUTRAL TEMPERATURE EXPOSURE INCREASES SLOW-WAVE SLEEP IN THE 3XTG-AD MOUSE MODEL OF ALZHEIMER'S DISEASE.

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Introduction: There is growing evidence that disordered sleep, which is known to be associated with Alzheimer's disease (AD), may accelerate neuropathology, thus promoting a vicious cycle. Strategies for improving sleep quality may slow disease progression. Here we investigate the feasibility of sleep enhancement through ambient temperature regulation and examine the effect on amyloid pathology.

Methods: Female 3xTg-AD mice (~12 m.o.) were instrumented for EEG/EMG monitoring. After a week-long baseline, one half of the mice (n=8, EXPT) were exposed to stepwise diurnal increases in ambient temperature (Ta) to reach 30oC (thermoneutral for mice) during the light phase while the rest (n=8, CTRL) remained at room temperature (22oC). Vigilance state – i.e., Wake, REM, NREM, and slow wave sleep (SWS) within NREM – was scored in 4-second epochs and sleep metrics were computed.

Results: SWS percentage became significantly greater (p<0.05) in the light phase for EXPT mice over the course of treatment. These effects suggest better sleep consolidation and greater sleep depth with thermoneutral warming. After four weeks of treatment, the animals were euthanized, and the brains removed to assay amyloid pathology by ELISA. We found that thermoneutral warming caused a significant reduction in both Aβ40 and Aβ42 in the hippocampus, but not in the cortex.

Conclusion: These data imply that thermoneutral warming might have some regional specificity in its effects. The effects appear to be specific to some brain areas more than others, with implications for the cognitive and neuropathologic changes found in AD. Furthermore, since SWS and REM support memory, future studies should investigate the effects of thermoneutral enhancement of SWS and REM on cognition.

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0280

OREXINS PLAY A DUAL ROLE IN IMMOBILITY EPISODES ON TAIEP RATS A MODEL OF H-ABC

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Introduction: Leukodystrophies are a heterogenous group of congenital myelin alterations with more than 30 classified diseases was described until now. Among them there are several mutations in the a and b tubulins the so called tubulinophaties, that affect the central nervous system. The hypomyelination with atrophy of the basal ganglia and cerebellum (H-ABC) is due to a mutation in the tubulin b 4a (TUBB4A) and the taiep rats is the only available model of this human disease with similar magnetic resonance changes and a punctual mutation in the TUBB4A. Taiep rats had immobility episodes (IEs) with a peak between at 9 months of age. Importantly, electroencephalographic recordings shown that IEs had a rapid eye movement (REM) sleep characteristic pattern supporting that are equal to human cataplexy episodes that are key sign of narcolepsy. It is possible to induced IEs when taiep rats are manipulated from the tail or the thorax. Narcolepsy in humans and narcoleptic dogs had a significant decreased in orexin levels in the cerebrospinal fluid (CSF) and a concomitantly decreased of orexin neurons in the lateral hypothalamus.
Methods: We used 21 male rats from taiep at 9 months of age. All rats were kept in standard conditions and were implanted for EEG, EMG and EOG recordings to characterize IEs. We administered orexin A and B agonists and characterized the sleep-wake cycle and frequency of IEs, the peptides were administered by a intracerebroventricular (i.c.v.) injections diluted in artificial CSF. We also measured the number or positive orexin neurons in the lateral hypothalamus through immunohistochemistry.
Results: The i.c.v. administration of [Ala11, D-Leu 15] orexin B agonist significantly decrease the frequency of IEs with 3 and 10 nM doses ($P \leq 0.05$ and $P \leq 0.03$, respectively), without affecting the sleep-wake pattern. However, the i.c.v. administration of Orexin A (17-33) an agonist did not affect the sleep-wake pattern or the frequency of IEs. It is relevant that the number of orexins neurons did not differ between taiep and control Sprague-Dawley (SD) male rats.
Conclusion: Our results showed that IEs had a REM sleep EEG characteristic pattern with cataplexic-like atonia, there are sensible to orexin B agonist, but the number of orexin positive neurons do not differ with respect to SD male rats. In conclusion taiep rats a model of H-ABC is an adequate model of cataplexy-like episodes due to myelin disease.
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0281

IMPACT OF CHRONIC SLEEP DISRUPTION ON GLYMPHATIC FUNCTION, COGNITIVE PERFORMANCE, AND NEUROPATHOLOGY IN THE 5XFAD MOUSE MODEL

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Introduction: Recent studies suggest a bidirectional relationship between sleep disruption and Alzheimer's disease, with mid-life sleep disruption associated with the development of Alzheimer's-related amyloid and tau pathology. Yet, the mechanistic link between sleep disruption, particularly over chronic time scales, and the development of Alzheimer's pathology remains unclear.
Methods: In this study, we evaluated the impact chronic sleep disruption has on the onset of cognitive impairment and neuropathologic disease progression using the 5xFAD amyloidosis mouse model. Chronic sleep disruption in male and female C57BL/6 and 5xFAD+ mice was performed in Lafayette sleep fragmentation cages from 10-18 weeks of age. Cognitive impairment was evaluated through behavioral tasks indicative of spatial memory, short-term memory, locomotion, anxiety, and activities of daily living. Upon completion of behavioral experiments, glymphatic function was assessed by measuring the influx of fluorescent cerebrospinal fluid tracers into brain tissue. Aquaporin-4 localization, amyloid plaque deposition, and markers of astroglial and microglial activation were assessed by immunofluorescence.
Results: We observed that chronic sleep disruption impaired cognitive performance and increased neuropathological outcomes in 5xFAD+ and littermate controls. The impact on glymphatic function was assessed in parallel and correlated with neuropathological and behavioral outcomes.
Conclusion: These findings highlight the critical association between dysfunctional sleep and the development of cognitive impairment and neuropathologic disease progression. They indicate that there is a potential interaction between inflammatory expression after chronic sleep disruption and neuropathologic disease progression.
Support (If Any):

0282

ELEVATED LEVELS OF EXTRACELLULAR VESICLE CYTOKINES ARE ASSOCIATED WITH POOR SLEEP QUALITY IN WARFIGHTERS WITH CHRONIC MILD TBI

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Introduction: Sleep disorders are common in military populations and frequently occur comorbidly with mild traumatic brain injury (mTBI), resulting in substantial health risks. Although inflammation and cytokine elevations have independently been reported both after traumatic brain injury (mTBI) and in association with sleep dysfunction, the impact of these factors on inflammatory processes in a combined context (i.e. post-mTBI sleep dysfunction) has yet to be explored. Extracellular vesicles (EVs) are a particularly promising source of these cytokines; EVs are lipid bilayer-enclosed

particles released by cells to the extracellular environment, constituting a newly discovered form of cell-to-cell communication that may afford improved signal-to-noise ratio and more functionally specific protein biomarkers than free (soluble) sources. To determine whether mTBI and sleep dysfunction may bidirectionally regulate inflammatory processes, the present study examined associations between plasma and EV levels of cytokines and sleep quality in a cohort of warfighters with and without chronic mTBI.

Methods: Participants (n=182) were enrolled in the Chronic Effects of Neurotrauma Consortium (CENC) Multicenter Prospective Longitudinal Study/ Long-Term Impact of Military Brain Injury Consortium (LIMBIC). They were divided into control (no TBI history) or mTBI groups (positive history of mTBI). EV and plasma levels of interleukin (IL)-10, IL-6, and tumor necrosis factor-alpha (TNFα) were analyzed using a Simoa HD-1 analyzer. Sleep quality was evaluated using Pittsburgh Sleep Quality Index (PSQI).

Results: Within the mTBI group, patients reporting poor sleep quality (PSQI ≥10) had elevated EV levels of IL-10 (ß(SE) = 0.12(0.04), $p<0.01$) when compared to those reporting good sleep (PSQI<10). Sleep quality was associated with EV levels of IL-10 (ß(SE)=0.11(0.04), p=0.01) and TNFα (ß(SE)=0.07(0.03), $p< 0.01$) in mTBI patients. Plasma levels of cytokines were not significantly associated with sleep quality.

Conclusion: Our findings suggest that EV levels of IL-10 and TNFα, but not their plasma levels, are associated with self-reported sleep quality warfighters with history of mTBI. Our results suggest that EVs are relevant signaling mechanisms in sleep-related inflammatory responses following mTBI. Larger prospective studies are needed to further investigate the links between EV cytokines and sleep quality in participants with mTBI.

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0283

NEUROBEHAVIORAL RESILIENCE AND VULNERABILITY TO SLEEP LOSS DIFFERS BETWEEN OBJECTIVE AND SELF-RATED METRICS REGARDLESS OF CATEGORIZATION METHOD UTILIZED

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Introduction: Trait-like individual differences in neurobehavioral responses to sleep restriction (SR) and total sleep deprivation (TSD) are robust and phenotypic. We investigated whether the concordance between multiple approaches for defining differential vulnerability depends on the methods and metrics utilized for categorization, including comparisons between objective and self-rated metrics. Trait-like individual differences in neurobehavioral responses to sleep restriction (SR) and total sleep deprivation (TSD) are robust and phenotypic. We investigated whether the concordance between multiple approaches for defining differential vulnerability depends on the methods and metrics utilized for categorization, including comparisons between objective and self-rated metrics.

Methods: Forty-one adults (33.9±8.9y; 18 females) participated in a 13-day experiment (two baseline nights [10h-12h time-in-bed, TIB], 5 SR nights [4h TIB], 4 recovery nights [12h TIB], and 36h TSD). The 10-minute Psychomotor Vigilance Test (PVT), Digit Symbol Substitution Test (DSST), Digit Span Task (DS), Karolinska Sleepiness Scale (KSS), Profile of Mood States Fatigue (POMS-F) and Vigor (POMS-V) were administered every 2h during wakefulness. Three approaches (Raw Score [average SR score], Change from Baseline [average SR minus average baseline score], and Variance [intraindividual SR score variance]), and six thresholds (±1 standard deviation, and the best and worst performing 12.5%, 20%, 25%, 33%, and 50%) categorized Resilient and Vulnerable groups. Kendall's tau-b correlations assessed the group categorization's concordance between pairings of PVT lapses (reaction time [RT]>500ms), PVT mean response speed (1/RT), DSST number correct, DS total number correct, KSS score, POMS-F score, and POMS-V score (tau-b=0.0: zero; 0.1: weak; 0.4: moderate; 0.70: strong; 1.0: perfect).

Results: Generally, tau-b correlations comparing Resilient and Vulnerable categorizations between two objective metrics (i.e., PVT, DSST, DS) revealed weak to moderate significant relationships (tau-b=0.29-0.53, p<0.001-0.049) between at least two of the approaches at most thresholds. However, comparisons between one objective (i.e., PVT, DSST, DS) and one self-rated metric (i.e., KSS, POMS) revealed a general lack of significant relationships (tau-b=-0.25-0.28, p=0.052-1.00), regardless of approach or threshold.

Conclusion: Comparisons between two objective metrics revealed significantly concordant Resilient and Vulnerable categorizations, whereas categorizations were generally not significantly correlated between one objective and one subjective metric, regardless of the method utilized. Our findings support and extend previous assertions that SR differentially impacts objective and subjective neurobehavioral domains and have important implications when assessing resilience and vulnerability to sleep loss in both laboratory and applied settings.

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0284

REPETITIVE WEEKLY REM SLEEP DEPRIVATION-RECOVERY CYCLE OBTAINED FROM A LARGE U.S. SAMPLE BY HOME-BASED UNDER-MATTRESS MONITORING DEVICES

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Introduction: American adults are typically sleep deprived during weekdays and attempt to recover sleep on the weekends. Technological advances in home sleep monitoring have provided the opportunity to analyze sleep patterns on a scale much larger than previously imaginable. This study explores the weekly REM sleep deprivation–recovery cycle in a large U.S. sample.

Methods: Estimated total sleep time (TST) and REM/TST (R%) were analyzed by a commercially-available home-sleep-monitoring device (Sleeptracker-AI Monitor, Fullpower Technologies, California, USA). The device passively monitors sleep using piezoelectric sensors that register the forces exerted through the mattress. The de-identified data from the devices were analyzed following review and exemption of the study (#57681) from the Stanford University IRB. Data from 07/2020–06/2021, from 101,442 individuals with 14,277,964 recorded nights, were available. The analytic dataset included individuals with at least 300 nights of sleep per year and 26 of 52 nights per each day of the week (excluding nights abutting federal holidays).

Results: A total of 21,543 individuals (11,095 men, 51±14 years; 9,821 women, 50±15 years; 627 unspecified genders) and 6,850,717 recorded nights met the inclusion criteria. There is a stepwise increase in R% from Sunday night to Friday night and a decrease back to Sunday night, following a cycle of weekday sleep deprivation and weekend recovery. The means and standard deviations (across individuals' averages) of TST in hours and R% for each night were: Sunday (TST*:7.21±0.885, R%*:24.20±3.09), Monday (TST*:7.18±0.853, R%*:24.56±3.10), Tuesday (TST*:7.16±0.847, R%*:24.67±3.13), Wednesday (TST*:7.16±0.845, R%*:24.80±3.15), Thursday (TST*:7.18±0.845, R%*:24.87±3.15), Friday (TST*:7.51±0.904, R%*:25.05±3.15), and Saturday (TST*:7.59±0.897, R%*:24.83±3.12). Each statistic, when compared with the previous night of the week, was significant ($p < 0.05/7$, Bonferroni corrected) by paired t-test (denoted by an asterisk).

Conclusion: The use of advanced technology to estimate sleep-wake patterns in a large sample permits the validation of a repetitive REM sleep deprivation–recovery cycle. Individuals are, on average, partially sleep deprived starting Sunday night, which leads to a progressive REM sleep rebound that transitions into a REM recovery cycle on Friday and Saturday nights. Further work will focus on studying this cycle within different groups (e.g., age, gender), across seasons, and including other sleep parameters.

Support (If Any):

0285

EXCESSIVE DAYTIME SLEEPINESS WITH LONG SLEEP DURATION INCREASES MYOCARDIAL INFARCTION RISK

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Introduction: Excessive daytime sleepiness (EDS) affects 10-20% of the population and is associated with cardiovascular diseases (CVD) and mortality. However, EDS is heterogeneous, associated with both short and long sleep duration. It is unclear whether each subtype is related to CVD.
Methods: To understand the association of EDS subtypes (stratified by sleep duration) with incident myocardial infarction (MI), we perform multivariable Cox proportional hazards regression on MI using longitudinal medical record data of 471,991 individuals free of CVD at baseline from the UK Biobank. Baseline EDS and sleep duration were assessed by self-reported questionnaires.
Results: After adjusting for multiple social-demographic and behavioral factors, EDS with long sleep (≥9 hours) was associated with a 91% increased incidence of MI (HR=1.91, 95% CI 1.34-2.71) compared to healthy sleep pattern (sleeping 6-9 hours without sleepiness), while EDS with normal (6-9 hours) or short sleep (≤6 hours) was not associated with incident MI. Long sleep without sleepiness was associated with a 39% increase in incident MI (HR=1.39, 95% CI 1.14-1.71). The association of EDS with long sleep was not explained by chronotype, insomnia, sleep apnea, depression, hypertension, or type 2 diabetes, but was confounded with self-reported overall health conditions (HR=1.46, 95% CI 1.02-2.08 after adjustment).
Conclusion: Our study suggests the previous association evidence of EDS increasing risk of MI may be primarily driven by its long sleep subtype (high "sleep propensity"), but the underlying mechanisms are unclear. Future work is needed to understand whether there are targetable interventions for this novel sleep phenotype that may improve cardiovascular health.
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0286

PRESENCE AND POTENTIAL IMPACT OF DEMOGRAPHICALLY BASED ATTRITION IN PEDIATRIC SLEEP MANIPULATION RESEARCH

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Introduction: Pediatric sleep manipulation studies have mostly enrolled youth from dominant-culture, higher-income families. Studies with more diverse samples have been underpowered to detect differential attrition and demographic effect moderators. Here we pool data from two adolescent sleep manipulation protocols in a Midwest US city to better examine demographic differences in attrition rates and effect sizes.
Methods: Samples were pooled from studies detailed in Beebe et al. (2017; SLEEP, zsw035) and Duraccio et al. (2021; JSR, e13054). Both involved a sleep stabilization week, followed by 5-night periods of sleep restriction (6.5 hours/night in bed) and healthy sleep (9.5-10 hours/night in bed) in randomized counterbalanced order. Primary caregivers and 14-17 year-old adolescents each completed attention and sleepiness questionnaires for both conditions. Here we compare adolescents who were caregiver-identified as Black vs. White, the two largest local racial groups. Caregivers also reported their own education, family income, and household structure (single- vs. two-parent). Non-parametric tests looked for differential attrition and MANCOVA tested for racial differences in effects.
Results: Of the 257 initially enrolled, Black adolescents and those from households with one parent, lower income, or lower caregiver education were differentially lost to attrition (all $p<.001$), even though the racial makeup of the final sample approximated the regional population (36% Black, 64% White). In the final sample, Black and White youth were equally able to change their sleep ($p>.90$). Manipulation effects were significantly smaller for Black than White adolescents for inattention (self-report $p=.026$; parent-report $p=.017$) and sleepiness (self-report $p=.002$, parent-report $p<.001$), but these differential effects were non-significant after controlling for family income, household structure, and caregiver education ($p>.05$).
Conclusion: Even when a final study sample seemingly approximates the diversity of the local population, differential attrition may affect results. In this case, it superficially appeared that being in a non-dominant group (self-identified Black) was protective against the impact of short sleep. However, this effect disappeared after controlling for demographic risk factors. Participation in sleep manipulation studies can be challenging, so families facing higher burdens may need more support; otherwise, only the most resilient of those families may succeed, which could distort findings.
Support (If Any): NIH (R01HL120879, R01HL092149)

0287

EFFECTS OF SLEEP RESTRICTION AND RECOVERY ON THE CAPACITY OF GLUCOCORTICOIDS TO INHIBIT INFLAMMATORY MARKER EXPRESSION IN HUMAN MONOCYTES

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Introduction: Chronic low-grade systemic inflammation is involved in the pathogenesis of many human diseases. Common sleep patterns of restricting sleep during weekdays and catching up on sleep over the weekend induce inflammatory upregulation that may not resolve following weekend recovery sleep. We hypothesize that this sleep pattern leads to an inflammatory imbalance of markers regulating inflammatory homeostasis, including inflammatory markers (eg, interleukin-6 (IL-6) and cyclooxygenase 2 (COX-2)) and markers of counter-inflammation (eg, glucocorticoids (GCs)). The enzyme COX-2 is involved in prostaglandin synthesis and is the target of pain-relieving nonsteroidal anti-inflammatory drugs (NSAIDs). GCs are used in the treatment of many inflammatory diseases, including severe acute infection with SARS-CoV-2. We investigated if sleep restriction impairs the capacity of GCs to inhibit inflammatory COX-2 expression in a preliminary dataset.
Methods: The present preliminary dataset (N=6, 2F/4M) derives from an ongoing randomized controlled within-subjects trial consisting of three 11-day in-hospital protocols (2 restricted sleep arms, 1 control sleep arm). The ongoing study is blinded for administration of placebo or aspirin under sleep restriction. Under restricted sleep conditions, 2 nights of baseline sleep (8h/night) were followed by 5 nights of restricted sleep (4h/night), concluding with 3 nights of recovery sleep (8h/night).

In the control condition, participants could sleep 8h/night throughout the entire protocol. Blood samples were taken after baseline sleep, after 5 nights of restricted or control sleep, and after 2 nights of recovery sleep. Data were analyzed using generalized linear mixed models.
Results: Sleep restriction was associated with decreased capacity of GCs to inhibit COX-2 expression in monocytes ($p<.01$) and has the expected inflammatory effect on IL-6 production in monocytes ($p<.01$). Moreover, sleep restriction has lasting inflammatory effects as shown in increased inflammation following 2 nights of recovery sleep ($p<.01$).
Conclusion: In conclusion, the present preliminary analysis suggests that in patients treated with GCs, sleep restriction potentially reduces their effectiveness in controlling inflammation, thus contributing to increased inflammation-related morbidity. Sample collection and data analysis is ongoing.
Support (If Any): NIH/NHLBI R01-HL136310; NIH/NCRR UL1-RR02758, M01-RR01032; German Research Foundation (DFG) EN1291/1-1.

0288

ROLE OF COFILIN AND CALCIUM SIGNALING IN SLEEP-LOSS NEURAL INJURY

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Introduction: Chronic sleep disruption (CSD) in young adult mice leads to phenotypes consistent with early (pre-plaque) Alzheimer's Disease (AD), including increased Aβ and hippocampal neuron loss. Mechanisms underlying this injury are not known. Both acute sleep loss and AD activate cofilin, a regulator of actin dynamics. Activated cofilin (AC) in AD mouse models can impart neural injury, increase Aβ, and cofilin translocation to the mitochondria delays cytosolic Ca2+ clearance. We are critically testing the role of AC in chronic short sleep (CSS) and sleep fragmentation (SF) neural injury.
Methods: Synapse loss was studied using STED confocal microscopy and Imaris in CSS (n=9) and rested (n=10) mice. Synapses were identified as overlaps of pre- and postsynaptic densities. Percent area of cofilin was measured with FIJI. To further understand if and how wake-induced cofilin activation induces sleep-loss synapse and neural injury, we implanted AAV9CAMKII-GCaMP6f and then GRIN lenses, and later studied CAMKII calcium transients in CA1 of WT controls (n=4) and SF mice (n=4) by measuring GCaMP6f calcium transients. We developed a Shiny R application to analyze the frequency of Ca2+ spikes, ΔF/F0, and the rising and clearance patterns of spikes. To directly test cofilin's role in delayed calcium clearance, we studied the calcium transients in hAPP mice (n=2) after injection of AAV-CAMKII-CofilinS3A to express AC and GCaMP6f. All data were analyzed with two-way ANOVA or unpaired t-tests.
Results: Results reveal significant synapse loss in CA1 of CSS mice (CSS=48.8±10.3; Rested=83.4±8.4), $t(16)=2.63$, $p<0.02$, and increased cofilin activation (AC=19.8±3.41; Rested=8.76±1.95), $t(16)=8.43$, $p<0.0001$. SF mice reveal an increase in NREM sleep firing rates, $F(1,1)=22.0$, $p<0.001$. In contrast, hAPP-AC mice show significantly increased ΔF/F0, $F(1,1)=356$, $p<0.0001$, prolonged calcium influx, $F(1,1)=18.6$, $p<0.02$, and prolonged calcium clearance duration, $F(1,1)=23.9$, $p<0.01$, but not increased firing frequencies.
Conclusion: CSS induces CA1 synapse loss and cofilin activation in WT mice. Increased CAMKII calcium ΔF/F0 occurs through different pathways in SF and AC, suggesting additional factors in CSD neural injury.
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0289

AFFECT AND AFFECTIVE PERSONALITY DURING A SIMULATED FIRST NIGHT SHIFT

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Introduction: Shiftwork contributes to work-related stress and chronic partial sleep deprivation. A first night shift can be particularly problematical for many workers since they are required to adjust to working at night following a period of sleeping at night. Part of this adjustment involves emotional stability and reactivity including affect. The purpose of this study is to examine how affect and a related construct, affective personality, changes during a simulated first night shift.
Methods: Ninety undergraduate students, 60 males and 30 females (22.1 ± 3.0 years), participated in a simulated first night shift. As part of the night shift, the participants completed the PANAS test (using the cue: how they felt lately) assessing positive and negative affect four times during the simulated shift (6:30 pm, 10:30 pm, 3 am, 7:30 am). The PANAS data were grouped using median split values from the 6:30 pm survey into high and low positive and negative affect groups to represent four categories of affective personality (Self-Actualizing: high positive, low negative; High Affective: high positive, high negative; Self-Destructive: low positive, high negative; Low Affective: low positive, low negative).
Results: A 2x4 ANOVA found significant changes across the night for affect ($p<.0001$), a significant difference between positive and negative affect ($p<.0001$), and a significant interaction ($p<.0001$) with positive affect decreasing during the night but negative affect remaining stable. A Friedman Test found significant changes in affective personality across the night ($p<.0001$) with decreasing occurrences of Self-Actualizing and High Affective but increasing occurrences of Self-Destructive and Low Affective personality types.
Conclusion: These findings suggest that positive affect decreases during a first night shift which could reduce workers' competence resulting in more performance errors and potential safety hazards. The change in affective personality suggests that these groupings are not personality traits but instead could be considered affective personality states. Managers and organizations should anticipate decreases in the positive affective personality states during a first night shift and may find that workers will be less adaptive and efficient.
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0290

ASSOCIATIONS BETWEEN SLEEP DURATION AND SEDENTARY BEHAVIOR IN HEALTHY, YOUNG ADULTS

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Introduction: Chronic diseases are more prevalent among populations with greater daily sedentary time and among populations with insufficient sleep duration. Yet, little is known about the potential links between insufficient sleep and sedentary behavior. Early findings from recent studies show variable and bidirectional associations between sleep duration and sedentary behavior, based on the population studied. The purpose of this investigation was to measure associations between: (1) sleep duration and sedentary time the next day; and (2) sedentary time and sleep duration the same study day/night, during a sleep extension intervention.
Methods: Data collection are ongoing. To date, three participants (2 female; aged 24.7±4.04yr; BMI 21.73±2.38kg/m2) with self-reported habitual insufficient sleep (<6.5h per night) completed the study protocol in its entirety. Sedentary behavior (<1.5 METs, in seated or lying posture) and sleep duration were measured via activPALTM and wrist-actigraphy, respectively, at baseline for days 1-13. After baseline, participants completed a sleep extension intervention for study days 15-41, with sedentary behavior and sleep duration measured during study days 28-41. Only study days with full 24h activPAL™ wear time were included in statistical analyses. Associations between sedentary behavior and nightly sleep duration were analyzed by linear mixed-model regression. We focused this preliminary analysis of 3 participants on R2.
Results: Sleep duration was significantly increased ($p<0.05$) during sleep extension (7.6±1.5h) versus baseline (7.0±1.4h). Sedentary behavior was not significantly different ($p=0.869$) during sleep extension (8.4±1.6h) versus baseline (8.3±2.0h). The association between sleep duration to sedentary time the following day had $p=0.683$, $R2=0.51$, and =2.5±6.2h. The association between daily sedentary time to sleep duration the same study day/night had $p=0.72$, $R2=0.12$, and =2.3±6.2h.
Conclusion: Preliminary findings from 3 participants in this ongoing study suggest that sleep extension is not associated with changes in sedentary behavior.
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0291

SOCIAL DESIRABILITY MEDIATES SELF-REPORTED SLEEPINESS DURING A LABORATORY TOTAL SLEEP DEPRIVATION STUDY

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Introduction: Total sleep deprivation (TSD) increases sleepiness and impairs vigilant attention. There are large individual differences in vulnerability to sleep loss, but individuals' self-ratings of sleepiness often do not align with their objective performance impairment. Here we investigated whether the trait of social desirability – the desire to conform to social standards – plays a role.
Methods: N=39 healthy adults (ages 27.6±4.6y; 22 men) completed a 3-night/4-day in-laboratory study with 10h baseline and recovery sleep opportunities (22:00–08:00) preceding and following a 38h period of TSD. Every 2–4h during TSD, subjects completed the Karolinska Sleepiness Scale (KSS) and a 10min Psychomotor Vigilance Test (PVT) to assess subjective sleepiness and vigilant attention, respectively. Throughout the study, subjects were behaviorally monitored by the researchers. Prior to the study, subjects completed the Marlow-Crowne Social Desirability (MCSD) scale. Based on standard criteria, subjects were categorized post hoc into average (n=13) and high (n=26) social desirability groups (no subjects in the sample scored low on social desirability). Self-reported sleepiness scored on the KSS and lapses (reaction times ≥500ms) on the PVT were analyzed using mixed-effects ANOVA with fixed effects for time awake and MCSD group and their interaction.
Results: As expected, there was a main effect of time awake for KSS score ($F[12,441]=31.48$, $p<0.001$) and PVT lapses ($F[12,441]=16.27$, $p<0.001$), with sleepiness and lapses increasing during TSD. We found a main effect of MCSD group for KSS score ($F[1,441]=4.56$, $p=0.033$), with the high MCSD group reporting lower levels of sleepiness than the average MCSD group. However, there was no effect of MCSD group for PVT lapses ($p=0.93$) and no time awake by MCSD interaction for either KSS ($p=0.86$) or PVT ($p=0.99$).
Conclusion: Subjects high in social desirability reported less sleepiness during TSD than those with average social desirability yet their objective performance was equally degraded. This finding has implications for fatigue risk management because individuals with high social desirability may underreport their sleepiness. This may undermine the reliability of self-report assessments of sleepiness and ability to work safely. [1] Whether there is bias in self-reported sleepiness for individuals low in social desirability as well remains to be investigated.
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0292

DIFFERENTIAL UTILITY OF PSYCHOMOTOR VIGILANCE TEST VS. SLEEP LATENCY TESTS IN HEALTHY HUMANS

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Introduction: The Psychomotor Vigilance Test (PVT), the Multiple Sleep Latency Test (MSLT), and the Maintenance of Wakefulness Test (MWT) are widely used in both sleep research and clinical settings. The PVT measures reaction time to a visual stimulus, whereas time to sleep onset is measured in both the MSLT and MWT, which differ primarily with respect to the instructions (i.e., whether to try to fall asleep vs. stay awake). Compared to sleep latency tests, the PVT is relatively inexpensive and easy to administer, so it is advisable to delimit the conditions under which its administration is most appropriate.
Methods: A comprehensive search of sleep studies on healthy adults revealed 30 studies in which both PVTs and sleep latency tests were administered – usually to assess the effects of various interventions on sleepiness and vigilance. Two reviewers compiled findings from each study and graded the levels of outcome

agreement based on whether a test intervention produced similar effects on vigilance across tests.
Results: Of the 13 studies that included both PVT and MWT of studies, a high level of agreement (based on the presence and direction significant effect on vigilance) between test outcomes was evident in 8 (61.5%) of the studies. In contrast, a considerably lower percentage of studies in which both the PVT and MSLT were performed (6 of 17 studies; 35.3%) had high agreement between test outcomes. It was also found that the MSLT was more sensitive to interventions (e.g., caffeine, sleep loss, and cognitive workload) than the PVT in the majority of studies in which there was low agreement (5 of 6 studies; 83.3%).
Conclusion: There is generally more agreement between PVT and MWT measures than between PVT and MSLT measures in studies involving sleep loss. This is most likely because the PVT and MWT both require application of effort to resist sleepiness, whereas the MSLT involves the withdrawal of resistance to sleepiness. This suggests that the PVT is potentially more useful in operational environments (where ability to sustain performance is the primary concern) than in clinical settings (where the focus is on determining the severity of sleepiness).
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0293

THE EFFECT OF SLEEP LOSS ON DIVERGENT THINKING USING A REMOTE ASSOCIATES TASK

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Introduction: Sleep loss-induced neurobehavioral deficits are a recognized threat to health, safety, and performance. Sleep loss has previously been shown to differentially impact distinct types of cognitive function, although less is known about the higher-order cognitive function, divergent thinking. Understanding the influence of sleep on divergent thinking can assist in developing targeted strategies to mitigate specific cognitive function impairments.
Methods: Eight participants (3M/5F), mean age 27.875y (± 5.5y SD) were studied over the course of 40 days in a crossover design. Participants were randomly assigned to one of two study schedules, with 4 participants in each that alternated the order of sleep restriction and total sleep deprivation. The schedules consisted of a baseline assessment and 6 study phases [sleep extension prior to sleep restriction (10h Time in Bed (TIB)), sleep restriction (6h TIB), recovery following sleep restriction, sleep extension prior to total sleep deprivation (10h TIB), total sleep deprivation (62h), and recovery following sleep restriction. The Remote Associates Task (RAT), a task to assess divergent thinking by presenting a triad of apparently unrelated words with the goal of identifying a unifying 4th word, was administered the evening of the last day of every phase. RAT performance metrics included number of triads attempted, correct responses, repeated trials, and mean correct and incorrect reaction times.
Results: No differences were found in total number of word triads attempted by participants (p=0.18). The number of correct responses during baseline was lower than during sleep restriction, recovery from sleep restriction, and total sleep restriction (p=0.00691), most likely reflecting a steep learning curve. No significant main effect of phase was found for any RAT metric.
Conclusion: These preliminary findings suggest divergent thought as measured by the RAT is conserved across a differential amounts of sleep. More studies are needed to better characterize the impact of sleep loss on divergent thinking as well as possible mediating effects of other higher-order cognitive functions.
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0294

VOLUNTARY ALCOHOL CONSUMPTION AND SLEEP DEPRIVATION IN RATS

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Introduction: Alcohol is one of the most common psychoactive drugs that has depressant effects on the central nervous system. The vast majority of research on alcohol and sleep indicates chronic alcohol consumption has a detrimental impact on sleep architecture and homeostasis. However, less research has explored the effects of sleep deprivation on alcohol consumption; that is, the relationship in the opposite direction. Previous animal studies have explored a potential bi-directional relationship between sleep and alcohol with promising results. However, there was concern that the potential relationship may be a result of stress as a by-product of the sleep deprivation method. The present study examines the effect of sleep deprivation on voluntary alcohol consumption using two sleep deprivation methods in the rat, forced exercise wheels and the automated sleep deprivation system.
Methods: Twelve male Sprague-Dawley rats had ad libitum access to a 7% alcohol solution and water. Alcohol and water consumption was measured daily at 0900. Baseline consumption levels were recorded in the home cage prior to introduction to the sleep deprivation equipment. Following baseline, rats were placed in the stationary equipment for the first sleep deprivation environment control. Rats were then subjected to 6hr/day of sleep deprivation for five consecutive days in either the forced exercise wheel (n=6) or the automated sleep deprivation system (n=6). After sleep deprivation, rats were placed back in the stationary equipment as a second control measure. In total, there were four conditions, home cage baseline, first sleep deprivation environment control, sleep deprivation, second environment control.
Results: Data indicates that rats consumed significantly more alcohol in the sleep deprivation condition and the second sleep deprivation control. There was no difference between the two sleep deprivation methods. The mean alcohol consumption (g/kg) significantly increased from the sleep deprivation condition to the second environment control indicating a cumulative effect.
Conclusion: The increase in alcohol consumption in the final condition rejects the hypothesis of a bi-directional relationship. Instead, the data suggests potential receptor downregulation due to alcohol exposure over time and a conditioned compensatory effect of the sleep deprivation environment. Research methodology issues also may have confounded results.
Support (If Any):

0295

SUBJECTIVE ALERTNESS, BEHAVIORAL ALERTNESS, AND PERCEPTION-ACTION COUPLING REFLECT DISTINCT ASPECTS OF NEUROBEHAVIORAL RESILIENCE DURING SIMULATED MILITARY OPERATIONAL STRESS

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Introduction: Despite exposure to operational stressors (e.g., sleep loss, caloric restriction), military personnel must maintain different aspects of neurobehavioral function (i.e., subjective alertness, behavioral alertness, perception-action coupling) to operate safely within military environments. It is unclear whether perception-action coupling, which refers to the ability to 'read and react' to ever-changing circumstances, reflects a distinct aspect of neurobehavioral resilience from subjective and behavioral alertness. Further, prior sleep may enhance resilience during subsequent exposure to operational stressors. Therefore, we examined resilience across different neurobehavioral tasks during exposure to simulated military operational stress (SMOS) and examined differences in baseline sleep between resilient and vulnerable participants.
Methods: Forty-nine military personnel (11 females, 26.6 ± 5.8 years) completed a 5-day SMOS protocol that included two days of sleep restriction and disruption (sleep opportunities: 01:00-03:00 and 05:00-07:00) accompanied by caloric restriction (50% caloric need). Participants completed tasks of subjective alertness (Profile of Mood States Vigor subscale, POMS), behavioral alertness (Psychomotor Vigilance Task) and perception-action coupling (Perception-Action Coupling Task) at baseline and at 04:00 across the two nights of sleep disruption. For each neurobehavioral outcome, a two-step decision-making process defined resilient and vulnerable participants: resilient participants demonstrated high alertness/performance during sleep disruption and minimal change from baseline during sleep disruption. Kappa coefficients were calculated to determine agreement in resilience classification across different neurobehavioral outcomes. Further, differences between resilient and vulnerable participants in baseline sleep questionnaires (Pittsburgh Sleep Quality Index; Epworth Sleepiness Scale) and polysomnography (sleep efficiency; sleep fragmentation; and slow wave activity, SWA) were examined with independent t-tests.
Results: Classification of participants as resilient or vulnerable differed across neurobehavioral outcomes, as indicated by kappa values <0.60. Resilient participants, defined by POMS, had lower baseline SWA than vulnerable participants ($t = 2.06$, $p = .04$). No other differences in sleep were observed between groups.
Conclusion: Subjective alertness, behavioral alertness, and perception-action coupling reflect distinct aspects of neurobehavioral resilience, highlighting the importance of understanding the operational relevance of different neurobehavioral measures when assessing fatigue risk. Further, more baseline SWA, indicating higher baseline sleep need, may reflect vulnerability to SMOS and subsequent sleep loss.
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0296

VIGILANT ATTENTION PERFORMANCE ADVANTAGE CONFERRED BY TNFA G308A POLYMORPHISM IS ASSOCIATED WITH DIMINISHED DELTA AND THETA POWER IN THE NON-REM SLEEP EEG

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Introduction: Carriers of the A allele of a single nucleotide polymorphism of the TNFα gene (G308A, rs1800629) are relatively resilient to vigilant attention performance impairment from total sleep deprivation (TSD), as compared to G/G homozygotes, and even exhibit a small performance advantage at baseline. The mechanism underlying this effect remains unclear. As TNFα is a sleep regulatory substance, we investigated whether TNFα G308A genotype is associated with systematic differences in markers of sleep homeostasis.
Methods: N=168 healthy young adults (ages 27.4±5.4y; 86 women) participated in one of seven in-laboratory TSD studies. During TSD, performance was assessed every 2–3h using a psychomotor vigilance test (PVT). The TSD period was preceded and followed by nocturnal sleep opportunities (baseline and recovery, respectively), which were recorded polysomnographically and scored according to AASM criteria. The EEG (C3-M2 derivation) of stages N2 and N3 non-REM sleep was investigated using spectral analysis.
Results: The genotype distribution of the sample was 0.6% A/A, 26.8% A/G, 72.6% G/G, in Hardy-Weinberg equilibrium (P=0.14). As documented previously, A allele carriers, compared to G/G homozygotes, had fewer PVT lapses (RTs>500ms) at baseline and during TSD, indicating greater resilience to sleep deprivation. During both baseline and recovery sleep, A allele carriers, compared to G/G homozygotes, displayed reduced power in the delta (0.8–4.0Hz; P=0.017) and theta (4.2–8.0Hz; P=0.004) bands of the non-REM sleep EEG.
Conclusion: The performance advantage of the A allele carriers brings to mind the "banking sleep" phenomenon previously observed in sleep deprivation studies with prior sleep extension, suggesting that the A allele carriers gained this advantage by essentially being able to bank sleep. If this interpretation is correct, then the diminished power in the delta and theta bands of the non-REM sleep EEG in the A allele carriers, which suggests reduced homeostatic sleep pressure during both baseline and recovery sleep, may imply that the A allele carriers operate at a lower homeostatic setpoint due to an underlying advantage in the recuperative efficiency of sleep.
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0297

EXPLORING SEX AND STRAIN DIFFERENCES IN MOUSE MODELS OF SLEEP DISRUPTION

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Introduction: Sleep abnormalities are a common feature of neurodevelopmental disorders (NDDs), and can have

severe consequences for the affected individual and their families. Although mouse models can be used to investigate the mechanistic basis for social deficits and other symptoms of NDDs, recapitulating sleep phenotypes in mice has proven to be difficult. In this study, we determined whether a sleep-disruption challenge could reveal or exacerbate sex and strain differences in sleep patterns, using two well-validated mouse models of autism-like behavior; the BALB/cByJ and C58/J inbred strains.

Methods: Mice were placed in a piezoelectric sleep system for 3 days to evaluate baseline sleep rhythms. Mice were then exposed to a series of novel environments, including open field boxes and activity wheel cages, for 3 hours during the morning period of the light cycle. Sleep rebound was determined by comparing percent time spent sleeping and average sleep bout length in the three 6-hr intervals before and after the sleep disruption. Subjects were males and females of the C57BL/6J, BALB/cByJ and C58/J strains.

Results: At baseline, the C57BL/6J and BALB/cByJ females showed significantly reduced percent sleep, in comparison to males. During rebound from sleep disruption, BALB/cByJ mice had higher percent time and longer sleep bouts than C57BL/6J, suggesting a greater vulnerability to the effects of sleep disruption. Additionally, female C58/J mice lacked the highly robust increase in percent sleep seen in C57BL/6J in the early night interval after sleep disruption.

Conclusion: Overall, the data provide evidence that this sleep disturbance procedure can induce a sleep rebound effect, which could be helpful in revealing strain and sex differences in NDD mouse models.

Support (If Any):

0298

KYNURENIC ACID SYNTHESIS INHIBITOR PROMOTES ENHANCED SLEEP RECOVERY FOLLOWING ACUTE SLEEP DEPRIVATION IN ADULT WISTAR RATS

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Introduction: Sleep disorders and cognitive dysfunction often afflict the general population and are common amongst patients with neuropsychiatric disorders like schizophrenia. Sleep deprivation (SD) disrupts cognitive function, yet little is known about underlying mechanisms. The tryptophan metabolite kynurenic acid (KYNA), an endogenous a7nACh and NMDA receptor antagonist, is synthesized by kynurenine aminotransferase II (KAT II). KYNA is increased in the brain of patients with schizophrenia and our translational studies demonstrate that elevated KYNA disrupts hippocampal learning and sleep architecture in rodents (Pocivavsek et al. 2017 Sleep). We hypothesize a mechanistic link between KYNA, sleep, and cognitive dysfunction.

Methods: In vivo microdialysis in the dorsal hippocampus and simultaneous EEG/EMG telemetry was conducted in adult male Wistar rats (N=3-5 per group). Using a within-subjects experimental design, rats underwent a control and SD day. Animals received either vehicle or KAT II inhibitor PF-04859989 (PF), 30mg/kg s.c., on both days at zeitgeber time (ZT) 0 or ZT6. SD occurred from ZT0-6 by gentle handling. KYNA levels were evaluated in the microdialysate.

Results: SD effectively eliminated REM sleep (100%) and significantly reduced NREM (94%) during ZT0-6. Extracellular KYNA levels in the hippocampus significantly increased with SD (2-way ANOVA, time x SD: **P<0.0001) and PF readily prevented this accumulation. Initial sleep recovery (ZT6-12) did not significantly differ between treatment groups. During the dark phase (ZT12-24), PF treatment of SD animals promoted REM sleep parameters, including total REM duration (2-way ANOVA, SD x treatment ZT: P<0.05). PF treatment enhanced theta spectral power determined by Discrete Fourier transform during REM sleep recovery (ZT12-24). PF alone during the control day enhanced NREM delta power (P<0.05) during the late light phase (ZT6-12).

Conclusion: Importantly, the KAT II inhibitor PF promoted sleep recovery following acute SD, supporting our hypothesis that the accumulation of KYNA may exacerbate sleep disruptions. Changes in sleep parameters elicited by PF, a potential therapeutic avenue, may be indicative of mild somnolence. The present and future complementary experiments with cognitive behavioral tasks in rodents support our understanding of the role of KYNA in modulating sleep and cognition.

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0299

THE EFFECTS OF CHRONIC SLEEP RESTRICTION ON CALORIE AND MACRONUTRIENT INTAKE

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Introduction: Chronic sleep restriction (CSR) has been associated with increased calorie intake and increased consumption of fats and carbohydrates, with inconsistent changes in protein. However, the majority of studies have either been observational field studies with no sleep intervention, or laboratory-based studies where food availability may not have reflected participants' real-world choices. We hypothesized that calorie, fat, and carbohydrate intake would increase during a week of imposed CSR compared to a week of sleep satiation (SS) among individuals living in their home environment.

Methods: Twelve healthy participants (6 females) kept a fixed sleep-wake schedule, with a constant waketime, at home for four weeks (actigraphy confirmed compliance). During weeks one and three, participants maintained 9 hours in bed. During weeks two and four, participants were randomly assigned to experimental weeks of 5 and 9 hours of time-in-bed in a crossover design. Participants documented their food consumption during both experimental weeks using a picture-based meal logging application (MealLogger). Intake of calories and macronutrients were classified by two blinded evaluators. Descriptive statistics were calculated in SAS (Cary, NC).

Results: Participants averaged 4.43 ± 0.33 (SD) hours of sleep per night during CSR compared to 7.42 ± 0.42 hours during SS. Participants consumed a daily average of 1812 ± 672 kilocalories, 71 ± 31 grams of total fat, 217 ± 69 grams of carbohydrates, and 84 ± 40 grams of protein during CSR, compared to 1682 ± 514 kilocalories, 68 ± 23 grams of total fat, 198 ± 61 grams of carbohydrates, and 77 ± 32 grams of protein during SS.

Conclusion: Preliminary descriptive findings suggest that, on average, participants consumed more calories, from an increase in consumption of each macronutrient group, during a week of sleep restriction compared to a week of sleep satiation. Further analysis is needed to determine whether these differences are statistically different and to identify when calories were consumed in each of the experimental conditions.

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0300

EARLY LIFE SLEEP FRAGMENTATION IMPAIRS HIPPOCAMPAL-DEPENDENT LEARNING AND SLEEP-DEPENDENCY IN HIPPOCAMPAL CALCIUM TRANSIENTS

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Introduction: Sleep deprivation impairs hippocampal-dependent memory, and hippocampal-dependent memory impairments occur in some dementias, including Alzheimer's disease. As our population continues to age, understanding the molecular basis for memory impairments is increasingly important. We hypothesized that early life sleep fragmentation would result in lasting increases in hippocampal calcium transient activity.
Methods: B6 mice were randomized to 12wk of sleep fragmentation or rested control conditions at age 8wk. Mice were microinjected with AAV9-CamKII-GCamp6F into the hippocampus and later implanted with a GRIN Lens into CA1 secured to a baseplate along with chronic EEG/EMG electrodes and recording connector. Calcium recordings were obtained two to three months after injection and recordings were obtained across sleep-wake cycles>4mins of wake and NREM sleep. Individual cells across animal were combined into sleep fragmented (n = 521 cells) or rested (n = 443 cells) groups during wake or sleep. Average FFx was analyzed by group and condition by T-tests, paired for within and unpaired across groups. A spatial object recognition assay was also performed on all mice (n=16 for both groups) and performance across group was analyzed by paired T-tests.
Results: Rested mice showed normal spatial object recognition (n = 16, $p<0.05$). In contrast, SF mice showed impaired spatial object recognition (n = 16, N.S.). There were no differences across sleep conditions in calcium transient FFx for waking ($p>0.05$). However, in sleep, cells in SF mice had significantly higher average FFx values than cells in rested mice ($p<0.0001$).
Conclusion: Early-life sleep fragmentation has long-lasting impacts on memory. Since spatial memory is dependent on hippocampal function, the calcium transient FFx data suggests that a driver of this hippocampal memory impairment may be higher firing rates in sleep and/or greater calcium exposure in hippocampal CamKII neurons in sleep, both of which may perturb microglial maintenance of synapses. Understanding the molecular drivers behind this calcium dysfunction will be essential in our understanding of neurodegeneration, dementia, and Alzheimer's disease.
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0301

DOES OREXIN INFLUENCE SLEEP FRAGMENTED BRAIN INFLAMMATION? A PILOT STUDY

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Introduction: Fragmented sleep occurs when there are repetitive, short interruptions of sleep, resulting in less than six hours of sleep per day. Overall, however, in the United States, sleep fragmentation is reported by 30% of employed adults. Sleep fragmentation may be a risk factor for Alzheimer's disease, and orexin reduction appears effective in reducing amyloid plaque formation in mice with transgenic Alzheimer's disease. Orexin is a neuropeptide that regulates arousal, wakefulness, and appetite. Thus we hypothesized that loss of orexin might also be protective against sleep disruption injury in non-Alzheimer's mice. This study aims to combine sleep fragmentation with orexin loss to see if brain health is severely reduced.
Methods: The 24 mice in this study were split into four groups: B6 rested, B6 sleep fragmented, orexin knockout rested, orexin knockout sleep fragmented. The sleep fragmented mice were placed on a shaker table for 10½ weeks to initiate chronic sleep loss. The mice were all perfused within five to eight months of birth, and then the brains were cryopreserved and sliced. These sections were immunolabeled with different protein antibodies using immunohistochemistry techniques. The stained brains were either analyzed through microscope stereology counts or computer image analysis.
Results: Two-way ANOVA analysis for tyrosine hydroxylase, ionized calcium binding adaptor, and vesicular acetylcholine transporter had $p<0.05$ for the sleep fragmentation variable, showing differences in these antibodies for rested and sleep loss mice. ANOVA for cluster of differentiation 68, cofilin, postsynaptic density protein, and RanBP had $p<0.05$ for the genotype variable, showing differences in these antibodies for knockout and normal orexin mice. ANOVA for glial fibrillary acidic protein and amyloid-beta had $p<0.05$ for both variables, showing differences for sleep and orexin levels. There was no ANOVA significance for synapsin.
Conclusion: Our results show that knocking out orexinergic neurons causes hippocampal tissue damage, dampens the functioning of synapses, and diminishes the ability of the brain to adapt through plasticity and memory. Sleep fragmentation, however, increases phagocytic activity, and harms the acetylcholine and norepinepherine neurotransmitter pathways. When combined, cell communication worsens and the blood brain barrier loses function, resemblant of neurodegenerative diseases.
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0302

RECOVERY SLEEP IN UNIVERSITY STUDENTS

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Introduction: Poor sleep hygiene is common in American college students, with the majority reporting insufficient sleep. Previous studies suggest that many students extend sleep during the weekend to recover sleep debt accrued during the week. In the current study we objectively measured sleep to determine if weekend catch-up sleep was practiced. We also provided students with a 9h sleep opportunity in order to observe how an extended sleep period affected sleep architecture.
Methods: Students (N=36, 20 women, 19.9±1.7 years) participated in the study from September 2019-March 2020. Sleep-wake behavior was assessed for two weeks using wrist actigraphy and a twice-daily diary. During this two-week period, participants wore at-home polysomnography (PSG) on two non-consecutive nights. For these two nights, in counterbalanced order, participants were instructed to follow their typical sleep pattern or to extend their sleep opportunity to 9h. Within-subjects ANOVA were used to compare sleep between week (Sunday-Thursday) and weekend (Friday and Saturday) nights as well as between typical and 9h PSG nights.

Results: Compared to week nights, participants went to bed 35 minutes later and woke up 58 minutes later on weekend nights (ps<0.01). Measures of sleep duration and sleep continuity were comparable (ps>0.10) between week and weekend nights and indicated that students averaged less than 7h of sleep per night (6.3±1.0h on week nights and 6.7±1.1h on weekend nights). Self-report measures of sleep quality and daytime sleepiness were also comparable between week and weekend nights (ps>0.05). When instructed to extend their sleep opportunity to 9h, participants exhibited high adherence and increased total sleep time by 88 minutes compared to the typical night (p<0.05). This increase in sleep was due to significant increases in time spent in all four stages of sleep (NREM S1-3 and REM sleep, ps<0.05).
Conclusion: In this study, students did not utilize weekend nights to extend sleep in order to recover accumulated sleep debt from the week. When provided with a 9h sleep opportunity, participants were physically able to extend sleep and exhibited high quality sleep, suggesting that the primary driver of insufficient sleep in this population is a lack of sleep opportunity rather than impaired sleep ability.
Support (If Any):

0303

THE EFFECTS OF LATITUDE ON SLEEP AT 4300M

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Introduction: Worldwide, 140-million people live above 2400m and even more visit high altitudes (HA) annually. Exposure to HA is associated with hypoxia-related cognitive impairments and sleep disruptions. Additionally, both planetary axial tilt, solar gravity, and planetary spin distort the earth's atmosphere pulling the equator's atmosphere further from the earth's surface when compared to the poles. These forces may have additional impacts on physiology at HA. There has yet to be a study to determine these effects of latitude on physiology at HA. Therefore, the aim of the current study was to determine if latitude exacerbates the effects of HA on sleep.
Methods: Similar testing protocols were utilized at 4,300m at Camp-14 on Denali at a latitude of ~63° and in the village of Dingboche on the route to Mount Everest at a latitude of ~28°. Exclusion criteria included 18-65 years, self-reported drug use, cigarette-smoking, sleep disorders, abnormal body mass index (BMI), falling asleep more than one hour or awakened more than an hour during the night. Wireless sleep recording devices recorded the sleep architecture of qualified participants. Twenty-two climbers (3 females) participated in the Denali study (age 34.0±9.7 mean±SD) and twenty-five climbers (6 females) participated in the Everest study (age 28.0±9.7 mean±SD). Participants were instructed to go to bed and wake up at their habitual bedtimes and wake times.
Results: Independent t-tests revealed a statistically significant decrease in total sleep (p<0.05) on Denali when compared to Mt. Everest. There were nonsignificant trends for a decrease in rapid eye movement (REM) and sleep onset latency on Denali. Other sleep stages appear relatively unaffected by latitude.
Conclusion: Our findings indicate that a decrease in total sleep time occurs at higher latitude with comparable altitude. Prior research has linked a decrease in total sleep time to decreased cognitive impairments and physiologic disruptions. Our findings suggest that latitude should be considered when venturing into HA environments, designing research protocols, analyzing results, and clinical applications or military operations.
Support (If Any):

0304

CHARACTERIZING AGE AND SEX-RELATED CHANGES IN SLEEP EEG K-COMPLEX MORPHOLOGY IN 3,909 INDIVIDUALS

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Introduction: K-complexes are hallmarks of sleep stage N2 and are thought to be associated with two distinct roles that serve as either or both, a sleep protective mechanism or a cortical arousal response. K-complexes and their morphological features (number, delta surrounding K complexes, etc.) have been implicated in sustained attention as well as in Alzheimer's disease wherein a decline in the number of K-complexes appeared to discriminate diseased individuals from healthy controls. Yet, age and sex-related changes in K-complex morphology are not well-known.

Methods: We analyzed data from the Sleep Heart Health Study (SHHS) to understand age- and sex-related changes in K-complex morphology. The SHHS is a cohort study comprised of 5,804 men and women aged 40 and older aimed at investigating the cardiovascular consequences of sleep-disordered breathing. K-complex (on C3/A2) features were quantified using previously published and validated open-source algorithm (DETOKS; Parekh et. al. J. Neurosci Meth. 2015). Three features of K-complexes were studied: number of K-complexes (density), delta (ΔSWAK) and alpha (ΔalphaK) surrounding K-complexes.

Results: Of the 5,804 studies available, 3,909 that had at least 6h of usable EEG were analyzed (mean = 62±11 yrs., range [40-90 yrs.], 53%female). With aging, K-complex density and (rho=-0.1, $p<0.0001$), ΔSWAK (rho=-0.2, $p<0.0001$) were inversely associated with age, while ΔalphaK (rho=0.1, $p<0.01$) was significantly positively associated with age. The inverse association of K-complex density with age was greater in men compared to women (rhomen=-0.3, $p<0.0001$, rhowomen=-0.1, $p<0.01$). Women had greater K-complex density compared to men (1.8[1.3-2.4] vs. 1.3[0.9-1.8], median[IQR]; std. mean diff =0.4). The changes in K-complex morphology with age remained significant after controlling for OSA severity.

Conclusion: Age is associated with decline in K-complex morphology such that K-complex density and delta activity surrounding K-complexes declines whereas alpha activity surrounding K-complexes increases. An age-related decline in delta activity surrounding K-complexes and an increase in alpha activity surrounding K-complexes is consistent with the potential role for these features in either sleep-state maintenance or arousal responsiveness. Whether the decline in K-complex morphology seen here with aging, and its interaction with sex-related differences, is accelerated in neurodegenerative disorders such as AD remains to be tested.

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0305

IRREGULARITIES IN SLEEP DURATION AND BIOMARKERS OF CARDIOVASCULAR DISEASE ACROSS THE MENSTRUAL CYCLE

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Introduction: Irregular sleep duration may disrupt circadian rhythms necessary for optimal cardiovascular function. Yet, few studies have examined irregular sleep duration in relation to cardiovascular health, particularly among diverse cohorts of reproductive-age women. This study examined associations between sleep duration irregularities across the menstrual cycle and cardiovascular disease biomarkers in a cohort of healthy, premenopausal women.

Methods: We utilized the BioCycle micro-longitudinal cohort study of 259 regularly menstruating women aged 18–44 years. This measurement-intense study collected cardiovascular disease biomarkers at key reproductive time-points along the menstrual cycle (approximately days 2,7,12,13,14,18,22,27 of a 28-day cycle) across two cycles. Specifically, we assessed serum high-density lipoprotein (HDL), low-density lipoprotein (LDL), total cholesterol, triglycerides, and C-reactive protein (CRP). Women recorded sleep duration in daily diaries concurrently. We computed a system of four mathematical measures, the L-moments, robust versions of location, dispersion, skewness, and kurtosis for series of recorded sleep durations. Using linear mixed models with random intercepts and inverse probability weighting we estimated associations between irregular sleep duration and cardiovascular disease biomarkers in all women and within a subset of non-white women. Adjusted analysis accounted for baseline characteristics and time-varying hormonal changes across the menstrual cycle.

Results: Woman-specific mean sleep duration ranged from 4.4 to 10.6 hours. A one-hour increase in dispersion of sleep duration was associated with a lower mean LDL and higher mean HDL for non-white women (-19.4%, 95%CI -30.9,-6.0% and 24.7%, 95%CI 8.2,43.0, respectively). Unbalanced (skewed) sleep duration, frequent short or long hours, was associated with higher mean CRP for all women and non-white women (99.3%, 95%CI 17.2,238.9 and 126.7%, 95%CI 3.1,398.2, respectively), but lower total cholesterol (-10.9%, 95%CI -19.9,-1.0). Finally, irregular sleep durations, extreme short and long sleep bouts (kurtosis), were associated with reduced mean HDL for all women, and non-white women (-17.1%, 95%CI -31.1,-0.2 and -25.4%, 95%CI -39.5,-8.0, respectively).

Conclusion: This micro-longitudinal study of premenopausal women found associations between irregularities in sleep duration and differences in CRP, LDL, HDL and total cholesterol, but not with triglycerides. These data suggest that even in young and healthy women, irregularities in sleep duration could have a potential impact on cardiometabolic health.

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0306

NORMATIVE DATA OF CYCLIC ALTERNATING PATTERN ACROSS THE LIFESPAN

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Introduction: Cyclic alternating pattern (CAP) is a marker of sleep instability, and neuroplasticity. Slow wave sleep has been described as a stable period, and CAP can be a marker of funcional delta sleep. The aim of this review was to evaluate the normative data of CAP parameters according to the aging process in healthy subjects.
Methods: Two authors independently searched databases using PRISMA guidelines through a systematic review and meta-analysis. Subgroup analysis and tests for heterogeneity were conducted. Descriptive statistics were used for the analysis of CAP variables. Meta-analyses were performed by using Comprehensive Meta- Analysis software. Data extracted from tables provide
Results: We found the evolution of CAP rate across the lifespan. Squares and diamond represent the CAP mean while bars represent the CAP range between 95% CI values according to each age range. We analysed 168 healthy individuals by CAP analyses. Scoring of CAP can begin at 3 months of life, when K-complexes, delta bursts, or spindles can be recognized. Rate of CAP increased with age, mainly during the first 2 years of life, then decreased in adolescence, and increased in the elderly. The A1 CAP subtype and CAP rate were high in school-aged children during slow-wave sleep (SWS). Our meta-analysis registered the lowest CAP rate in infants younger than 2 years old and the highest in the elderly.
Conclusion: The normative data of CAP in NREM sleep can be connected with brain maturation.The CAP rate increased with age and sleep depth, especially during SWS. These data in sleep disorders can be a treatment goal. CAP may reflect neurodiversity of endophenotype and human cronobiotypes. Further studies about CAP subtypes are needed.
Support (If Any):

0307

IS POOR SLEEP ASSOCIATED WITH USE OF MULTIPLE BENZODIAZEPINE RECEPTOR AGONISTS IN OLDER VETERANS?

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Introduction: Benzodiazepine receptor agonists (BZAs) are often prescribed for insomnia in older adults. Polypharmacy increases risk of adverse events in this population in general, particularly when medications within the same class are prescribed. During an ongoing hypnotic deprescribing trial, we explored use of more than one BZA (multi-BZA use) and self-reported sleep quality among older adults.
Methods: Telephone surveys were performed for recruitment to an ongoing BZA deprescribing trial. Participants aged ≥ 55 years who were prescribed at least one BZA (i.e., alprazolam, clonazepam, lorazepam, temazepam, or zolpidem) from a Department of Veterans Affairs pharmacy in Southern California were asked about their use of each BZA over the past 3 months for sleep (yes/no). Multi-BZA use was defined as using > 1 different BZA over the past 3 months. Self-reported sleep items included duration of sleep problems (<3, 3-12, or >12 months), sleep quality (very or fairly good, fairly or very bad), and sleep efficiency (mean total sleep time over time in bed). Analyses compared sleep variables between multi-BZA and non-multi-BZA users (Fisher's Exact or t-tests).
Results: Among participants (N=359), 152 (42.3%) reported using zolpidem, 41 (11.4%) lorazepam, 39 (10.9%) alprazolam, 31 (8.6%) clonazepam, and 29 (8.1%) temazepam during the past 3 months. 35 (9.8%) participants reported taking more than one of these drugs. 93.9% reported their sleep problems were present for ≥3 months. 68.3% of participants reported their sleep was fairly/very bad, and mean sleep efficiency was 67.9 (SD 18.5). There were no significant differences between multi-BZA versus non-multi-BZA users in duration of sleep complaints (Fisher's Exact=1.0; p=.842), sleep quality (Fisher's Exact=0.70; p=0.56) or sleep efficiency (p=0.91).
Conclusion: We found 1 in 10 older adults prescribed a BZA for sleep reported multi-BZA use over the past 3 months. Multi-BZA use was unrelated to duration of sleep complaints, sleep quality or sleep efficiency. Whether the use was simultaneous or staggered, these findings are concerning, given the elimination half-life of most of the BZAs and that polypharmacy, especially within medication class, may increase risk of adverse events (e.g., falls). Further research is needed to explore factors contributing to multi-BZA use.
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0308

THE STABILITY OF SLOW WAVE SLEEP AND EEG MICROSTRUCTURE MEASURES ACROSS TWO CONSECUTIVE NIGHTS OF LABORATORY POLYSOMNOGRAPHY IN COGNITIVELY NORMAL OLDER ADULTS

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Introduction: Healthy and sleep disordered populations show high night-to-night variability of polysomnographic (PSG) macrostructure metrics, however there is evidence of stability in EEG microstructure. In-laboratory PSG is critical to gold standard measures of sleep physiology but multi-night investigations are resource heavy and burdensome to participants. Given the theoretical link between sleep and Alzheimer's disease (AD) pathology (tau and β-amyloid burden), we assessed the night-to-night reliability of sleep macrostructure and EEG microstructure in a group of cognitively normal elderly participating in aging and memory studies.
Methods: 107 participants (mean = 67±8 yrs., range [54-84 yrs.], 72% female) attended 2 consecutive nights PSG scored according to AASM guidelines for sleep staging, respiratory and leg movement events. Midline EEG (Fz, Cz and Pz referenced to average mastoid signals) were analyzed in 98 participants using an automatic algorithm (DETOKS) for detection of relative slow wave

(0.5-4Hz) activity (SWA), NREM2 spindle and K-complexes (KC) densities. Differences between night 1 and 2 for total sleep time (TST), slow wave sleep (SWS), rapid eye movement (REM), stage 2 (%NREM 2), sleep efficiency (SE), apnea hypopnea (AHI) and periodic limb movement (PLM) indices, and EEG microstructure were assessed using t-tests and Wilcoxon rank sum tests where appropriate. Two-way intraclass correlations (ICC) for single unit and absolute agreement were used to determine variability between nights for all measures.

Results: Night 2 PSGs showed significantly greater TST (6.3 vs 6.8 hours, $p<0.001$), %REM (17.5 vs 19.7, $p<0.001$), SE (84.9 vs 87.4%, $p<0.02$) and SWA (Fz:76.8 vs 78.0%, $p<0.01$). There were no significant differences between nights for %SWS, %NREM2, AHI, PLMs, spindle and KC densities. ICC and 95% confidence interval estimates were low for TST(0.28), %REM(0.32) and SE(0.32), moderate for %SWS(0.67) and %NREM2(0.59), good for AHI(0.78), SWA(Fz:0.86) and KCs(Fz:0.85), and excellent for PLMs(0.91) and spindles (Pz:0.97).

Conclusion: SWS, SWA, spindles, KC's, AHI and PLM indices show good to excellent intra-individual stability across two consecutive nights of PSG. Although there were differences in %REM, SE and SWA, these were numerically small and perhaps functionally or clinically less significant. One night of in-lab PSG is enough to provide reliable estimates of individuals' SWS, SWA, spindles, KC's and sleep disorders.

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0309

A MULTIDISCIPLINARY INITIATIVE FOR SCREENING AND TREATING SLEEP DISORDERS IN MENOPAUSE: EXPERIENCE IN A TERTIARY CENTER

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Introduction: Menopause is a time of adaptation and transition to a new biological situation that implies the loss of reproductive function. The onset of menopause coincides with the onset of other symptoms related to hypertension, weight gain, hormonal changes, osteoporosis, and vascular disease. These hormonal changes could be responsible for some sleep disorders. It is well documented that the prevalence of sleep disorders is higher in post-menopause, regardless of other factors such as aging.

Methods: As part of routine care for patients in a gynecology outpatient clinic, all patients with menopause were screened for sleep disorders using the following clinical tools: the Pittsburgh Sleep Quality Index (PSQI), the Patient Health Questionnaire (PHQ-9), the STOP-BANG Questionnaire, and the Epworth Scale.A full clinical history was also taken, focusing on sleep habits and risk factors that could contribute to sleep difficulties.Patients that presented with any sleep disorders were assessed and continued their treatment depending on these results.

Results: Between August 2021 and December 2021, a total of 60 patients going through menopause that attended the gynecology outpatient clinic for other reasons were screened for sleep disorders.Using the PSQI we identified 51 patients with low quality sleep (defined as a score of 5 or higher using this tool).Depression was also identified in a total of 43 patients, none of which were receiving treatment. All these patients also reported low-quality sleep and other problems such as hypersomnia, which in turn was identified in 15 patients using the Epworth Scale.Thirty-five patients were identified as having at least 3 risks factors for obstructive sleep apnea with the STOP-BANG questionnaire and were ordered a polysomnography.

Conclusion: Sleep disorders are highly prevalent in menopause. With this initiative, we present our experience and results incorporating routine screening for these disorders in a clinical setting outside of a sleep clinic.Integrating this information can be helpful for working in multidisciplinary teams aimed at reducing chronic diseases and mortality in these patients. This is a multidisciplinary approach that will continue in our institution.

Support (If Any):

0310

SLEEP HEALTH CHARACTERISTICS IN SEDENTARY DESK-BASED WORKERS

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Introduction: Many occupations consist of predominantly desk-based work, which leads to prolonged periods of sitting during the workday. Excessive periods of sedentary behavior could have a negative impact on health outcomes, including sleep. The purpose of this study was to characterize sleep health in a sample of sedentary desk-based workers.

Methods: This secondary analysis of baseline data from an ongoing clinical trial included 125 inactive adults with elevated, nonmedicated blood pressure and desk-based occupations (49.6% female, age=43.9±10.6 y, 85.6% White race, body mass index [BMI]=30.9±6.4 kg/m^2). Sleep was assessed using validated questionnaires (e.g., Pittsburgh Sleep Quality Index [PSQI], Insomnia Severity Index [ISI]) and 7 nights of actigraphy. Six dimensions of sleep health (regularity, satisfaction, alertness, timing, efficiency, and duration) were categorized as "good" or "poor"; a composite score summed good sleep health dimensions on a scale of 0-6.

Results: The mean sleep health score was 4.7±1.1; 24.8% of participants met "good" criteria for all 6 sleep health dimensions. The most common "good" sleep health dimensions were efficiency (89.0%) and alertness (87.2%); the least common was regularity (60%). The mean PSQI score was 5.5±3.0, and 41.6% had poor sleep quality (PSQI >5); a trend was observed in adults with poor sleep quality to have lower sleep health ($p=0.055$). The mean ISI score was 7.1±4.7, and 40% had at least mild-severity insomnia symptoms (ISI ≥8); those with insomnia symptoms had significantly lower sleep health compared to those without insomnia symptoms ($p=0.04$). Sleep health was not significantly correlated with age, BMI, systolic blood pressure, diastolic blood pressure, mean arterial pressure, or mean daily sedentary behavior (each $r\leq .08$, $p\geq 0.38$) and did not differ between males and females ($p=0.26$). However, White adults had significantly better sleep health compared to their non-White counterparts (6.4% Black, 5.6% Asian, 2.4% other) ($p<0.001$).

Conclusion: This sample of sedentary desk-based workers presented generally good sleep health. This warrants future investigations comparing adults with different levels of occupational

activity and non-desk-based occupations to understand why highly sedentary behavior is associated with negative health outcomes.
Support (If Any): This study was funded by National Institutes of Health (NIH) grants R01HL134809 and R01HL147610.

0311

THE DAY AFTER: HOW DOES A POOR SLEEP PERCEPTION AFFECT PAIN DURING THE NIGHT?

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Introduction: Senescence generates repercussions on sleep, including increased difficulty to initiate and maintain sleep, more awakenings, diurnal naps, and a propensity to polyphasic sleep. These disorders might be more common in older individuals with musculoskeletal pain. In this sense, the relationship between sleep and pain is considered to be bidirectional. However, it is unclear in the literature whether feeling pain during the night could be associated with poor subjective sleep quality. Our objective was to describe a measurement model that appropriately conveys the link between sleep and feeling pain at night.
Methods: A cross-sectional analysis was conducted, using a dataset from the 2015 São Paulo Epidemiological Sleep Study (EPISONO), including only individuals aged 60 years or more. Two constructs were formulated: an objective sleep quality construct, based on the polysomnography (PSG) performed on all EPISONO volunteers and a subjective sleep quality construct, formed by the self-reported answers in the Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI). Musculoskeletal pain was assessed by 1. Did you feel any pain during the night? 2. Did you wake up feeling pain? (Possible answers: "Yes" or "No"). We used exploratory factor analysis and structural equation modelling to identify the significant variables.
Results: A total of 152 older adults was analyzed in this study. The PSQI and ISI indicate poor perception of sleep or a high frequency of sleep complaints in proportion to their score, the resulting latent factor was labelled poor sleep perception. The exploratory factor analysis assessed the measurement models of the latent factors and resulted in the inclusion of sleep-related variables: wake after sleep onset, sleep efficiency, total sleep time, latency to sleep onset and amount of N1 stage in the objective sleep quality factor. However, this factor was not associated with felling pain during the night and woke up with pain.
Conclusion: Our findings suggest that poor sleep perception was associated with feeling pain at night in older adults. These results contribute for the improvement of future clinical evaluations of patients presenting musculoskeletal pain and sleep complaints and highlight the importance of considering both factors simultaneously during treatment.
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0312

SLEEP AND FEAR OF FALLING, IS THERE A RELATIONSHIP? A CROSS-SECTIONAL STUDY IN OLDER ADULTS

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Introduction: Excessive daytime sleepiness is a common problem in older people. This population is at higher risk of falls that lead to injuries, which explains the high prevalence of fear of falling among them. The relationship between sleep disturbances and concern about falling is unclear. The aim of this study was to identify whether poor sleep quality and excessive daytime sleepiness are associated with fear of falling in older adults.
Methods: This is a cross-sectional study. Data on age, sex, body mass index, alcohol consumption, mental status, depression, single-leg stance, excessive daytime sleepiness (Epworth Sleepiness Scale), sleep quality, comorbidities, and fear of falling (assessed through the Falls Efficacy Scale), were collected from participants aged 60 years and over. Univariable and multivariable linear regression were performed. Logistic regression evaluated the association between excessive daytime sleepiness and high fear of falling.
Results: 504 participants were analyzed. The chance of an older person having high concern of falling was 3 times bigger among those with excessive daytime sleepiness when compared to those without excessive daytime sleepiness. The final model, multivariable linear regression showed that excessive daytime sleepiness score was able to predict fall efficacy scale scores (Beta coefficient=0.26; 95%CI: 0.07 to 0.45) adjusted by the following variables: age, single-leg stance, comorbidities, and depression. Our results showed that for each point increase on the Epworth Sleepiness Scale there was an average increase of 0.26 points in the Falls Efficacy Scale, indicating that sleepiness was related to fear of falling.
Conclusion: Having excessive daytime sleepiness increased the chance of older adults showing a high fear of falling. Healthcare workers should be aware that drowsiness can increase the fear of falling among older patients, and this may influence treatment.
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0313

THE ROLE OF OBJECTIVE SLEEP ON SUBJECTIVE AND OBJECTIVE COGNITION IN OLDER ADULTS WITH INSOMNIA: A PILOT STUDY

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Introduction: Cognitive complaints and objective cognitive dysfunction are common in aging populations, but findings regarding associations between them are inconclusive. Given age-related sleep changes [more lighter-staged sleep, reduced sleep efficiency

(SE)], and known relationships between insomnia complaints and cognitive dysfunction, this pilot tested whether polysomnographic sleep moderates associations between subjective and objective cognition in older adults with insomnia complaints.
Methods: Older adults with insomnia complaints (N=37, Mage=68.9, SD=6.23, 20 women) completed one night of polysomnography (Sleep Profiler-PSG2TM) and the NIH Toolbox [Pattern Comparison (processing speed), Dimensional Change Card Sort (cognitive flexibility), Stroop (attention and inhibition), and Sternberg (working memory). Additionally, participants completed the Cognitive Failures Questionnaire (subscores CFQ-memory, CFQ-distractibility CFQ-blunders computed). Multiple regressions examined if polysomnographic sleep (SE, %N1, %N3) moderated associations between subjective/objective cognition, controlling for apnea-hypopnea index and depression.
Results: %N1 moderated associations between Sternberg performance and CFQ-memory (R2=.13, p=.03), CFQ-distractibility (R2=.20 p=.01) and CFQ-blunders (R2=.19 p=.02). At highest %N1, worse working memory was associated with less complaints in memory (β=16.4, p=.03), distractibility (β=12.4, p=.009) and blunders (β=15.3, p=.02). Additionally, %N1 (R2=.14, p=.02) and SE (R2=.17, p=.02) moderated the association between dimensional change performance and CFQ-distractibility. At lowest %N1, worse cognitive flexibility was associated with more distractibility complaints (β=-988.8, p=.02), while at highest %N1, worse cognitive flexibility was associated with less distractibility complaints (β=3881.4, p=.02). At lowest SE, worse cognitive flexibility was associated with less distractibility complaints (β=2354.0 p=.02), while at highest SE, worse cognitive flexibility was associated with more distractibility complaints (β=-1414.1 p=.03).
Conclusion: Preliminary findings suggest in older adults with insomnia complaints, greater time spent in lighter-staged sleep and more sleep fragmentation may exacerbate discrepancies in the objective/subjective cognition relationship, while less time spent in lighter-staged sleep and less sleep fragmentation may converge the objective/subjective relationship. Objective sleep should be considered when understanding discrepancies between subjective reports versus neuropsychological/objective cognition profiles. Prospective studies with larger samples examining how sleep impacts the trajectory of subjective/objective cognition in aging are warranted.
Support (If Any): This research was made possible by an award (PI:Curtis) from the American Academy of Sleep Medicine Foundation, a foundation of the American Academy of Sleep Medicine.

0314

ORAL CONTRACEPTIVES AND SLEEP DURATION AND TIMING, DAYTIME SLEEPINESS, AND SNORING IN NHANES 2015-2018

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Introduction: Oral contraceptives have been associated with psychiatric disorders including depression and anxiety, but few studies have looked at the relationships with sleep health.
Methods: Data from the National Health and Nutrition Examination Survey (NHANES) 2015-2016 and 2017-2018 waves were examined. Of 6,335 females aged 44 and under, 308 had used hormonal contraceptives within 30 days of survey completion. These women also self-reported sleep and wake times and usual sleep duration on weekdays. They also reported snoring frequency, with answer choices ranging from "never" to "1-2 nights per week", "3-4 nights/week", or ">5 nights/week". Lastly, they reported how often they felt overly sleepy during the day, with answer choices ranging from "never", to "once/month", "2-4 times/month", "5-15 times a month", or "16-30 times/month". Linear and logistic regression analyses were adjusted for age, race/ethnicity, education, employment status, marital status, and income.
Results: Contraceptive users were more likely to be white, more highly educated, with higher income, employed, and never married. There were no differences by severity of depression symptoms between users and non-users according to PHQ-9 score. Contraceptive use was not associated with self-reported sleep duration in unadjusted or adjusted linear models (p=0.502 and p=0.146, respectively). Contraceptive use was also not a significant correlate of time to bed, time out of bed, time in bed, or midpoint of sleep in either unadjusted and adjusted linear models. In unadjusted logistic regression models, individuals who reported sleepiness "sometimes" or "often" were about twice as likely to be contraceptive users (OR=1.98, p=0.0023; and OR=1.87, p=0.0084, respectively). These associations were no longer significant after adjusting for covariates. In unadjusted logistic regression models, individuals with frequent snoring had 50% lower odds of contraceptive use (OR=0.50, p=0.0023), but similarly, there were no associations after adjusting for covariates.
Conclusion: Oral contraceptive use did not appear to be related to habitual sleep parameters, after adjusting for sociodemographic covariates in these analyses. However, further investigation must look at both objective measures and larger samples.
Support (If Any):

0315

QUANTIFYING THE TEMPORAL RELATIONSHIP BETWEEN SELF-REPORT SLEEP QUALITY AND COGNITION IN OLDER ADULTS

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Introduction: Poor sleep is a promising modifiable risk factor for impaired cognition in older adults. However, the relationship between sleep and cognition is likely bi-directional, and few studies have examined these temporal associations. We seek to investigate the temporal relationships between self-report sleep quality and global cognition.
Methods: Our analytic sample includes 1,610 participants from the Memory and Aging Project and Minority Aging Research Study without cognitive impairment at the initial visit (41% black, 77% female, mean[min,max] age = 77[54,100] years). Participants have cognition and sleep quality measured at an initial visit and up to 14 years of annual follow-up (median 6 years). Sleep quality was measured using a modified 10-item Pittsburgh Sleep Quality Index score (higher scores indicating worse quality) and standardized; global cognition was a composite z-score computed from an average of 19 cognitive tests. We used linear mixed effects models to quantify the concurrent and prospective (1-year) relationships of sleep quality and global cognition. Quadratic terms were also tested to allow for a potentially U-shaped relationship.
Results: When examining same-year associations with cognition as the outcome, sleep quality and cognition exhibit a negative

quadratic association (linear term BL[p] = 0.01[0.021]; quadratic term BQ[p] = -0.01[0.051]), indicating that both better- and worse-than-average sleep quality are associated with lower cognition. Regarding 1-year associations, both better- and worse-than average sleep quality predict worse next-year global cognition (BL[p] = 0.01[0.008], BQ[p] = -0.01[0.033]). In contrast, better-than-average cognition predicts worse next-year sleep quality (B L[p] = 0.05[p=0.005]; BQ[p] = -0.01[0.650]) with a stronger association in this direction.

Conclusion: Understanding the temporal association between sleep and cognition has important implications for screening and development of novel treatments and interventions. The finding that both better and worse sleep quality are associated with worse cognition may reflect an underreporting of poor sleep symptoms in older adults with worsened cognition. Future work will examine these associations considering specific domains of self-report sleep (e.g., timing, efficiency, duration) and cognitive function (memory and perception), consider mechanisms relating sleep and cognition, and use objective measures of sleep (e.g., actigraphy).

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0316

ACTIGRAPHY-DERIVED SLEEP HEALTH PROFILES AND MORTALITY IN OLDER MEN AND WOMEN

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Introduction: To identify actigraphy sleep health profiles in older men (Osteoporotic Fractures in Men Study; N=2,640) and women (Study of Osteoporotic Fractures; N=2.430), and to determine whether the identified profiles predict mortality.

Methods: We applied a novel and flexible clustering approach (Multiple Coalesced Generalized Hyperbolic mixture modeling) to identify sleep health profiles based on actigraphy midpoint timing, midpoint variability, sleep interval length, continuity, and napping/inactivity. Adjusted Cox models were used to determine whether profile membership predicts time to all-cause mortality.

Results: We identified similar profiles with different prevalences in men and women: High Sleep Propensity [HSP] (20% of women; 39% of men; high napping and high continuity); Adequate Sleep [AS] (74% of women; 31% of men; average actigraphy levels); and Abnormal Continuity/Timing [ACT] (6% of women; 30% of men; low continuity and late/variable midpoint). In women, ACT was associated with increased mortality risk (Hazard Ratio [HR]=1.59 for ACT vs. AS; 1.75 for IS vs. HSP). In men, ACT and AS were associated with increased mortality risk relative to HSP (1.19 for IS vs. HSP; 1.22 for AS vs. HSP).

Conclusion: These findings suggest several considerations for sleep-related interventions in older adults. For instance, interventions may be developed to target the combination of low continuity with late/variable midpoint. Findings also indicate that high napping/inactivity co-occurs with high sleep continuity in some older adults. Although high napping/inactivity is typically considered a risk factor for deleterious health outcomes, our findings suggest that it may not be inherently problematic when occurring in combination with high sleep continuity.

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0317

INTERACTION OF SLEEP AND EMOTION ACROSS THE MENSTRUAL CYCLE

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Introduction: Women experience increased risk for sleep and affective disorders compared to men, attributed in part to monthly oscillations in sex hormones. Emotional functioning worsens during the perimenstrual phase. There is increasing evidence that sleep continuity also decreases during this phase. Thus, this study examined the interactive effects of sleep and menstrual phase on emotion across two menstrual cycles in healthy women.

Methods: Participants (N=51, 43% Caucasian) aged 18-35 (m=23.67) completed actigraphy and daily sleep/emotion diaries over two menstrual cycles (m days=51.29). Cycles were identified via date of menses and urinary ovulation detection, and coded into four phases: perimenstrual, mid-follicular, periovulatory, and mid-luteal. The perimenstrual phase was defined the 3 days prior to and the 3 days following menses onset. Variables included diary and actigraphic total wake time (TWT), daily ratings of positive (happy, calm, enthusiastic) and negative (angry, afraid, sad) affect using a 9-point scale. Relationships between phase, sleep, and emotion were estimated using multistep hierarchical linear modeling. Pandemic-related stress and daily US and region-specific COVID-19 case counts were included as covariates in adjusted models.

Results: Mean menstrual cycle length was 28.61±2.69 days. Menstrual phase was first entered into models as predictors for sleep and emotion variables independently. The perimenstrual phase positively predicted anger ($p<.001$) but no other emotions. Additionally, the perimenstrual phase predicted higher rates of TWT, such that diary-reported TWT was 8-16 minutes longer during the perimenstrual (m=67.54, SE=3.37) compared to other phases ($p<.001$). Actigraphic TWT was also increased by 4-7 minutes (m=61.54, SE=3.37) in the perimenstrual phase ($p<.001$). A second model included the interaction term, TWT*phase to the original model. Positive emotions were .05-.10 points lower (p's=.006-.02) when TWT was greater in the perimenstrual phase.

Conclusion: Menstruating women experienced greater rates of anger and sleep disruption during the perimenstrual phase compared to other phases. When poor sleep occurred during the perimenstrual phase, however, women reported reduced positive

emotions. Sleep disruptions, particularly occurring during the perimenstrual phase, may be an important intervention target for women at risk for affective disorders. Future studies should be mindful to assess menstrual phases when assessing sleep and circadian rhythm.

Support (If Any):

0318

SUBJECTIVE SLEEP AND COGNITION IN MIDDLE-AGED AND OLDER ADULTS: CHRONOTYPE AND SEX AS MODERATORS

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Introduction: Associations between sleep and cognition are well studied in aging populations. However, less is known regarding the moderating impact of chronotype (morningness vs. eveningness) and sex on these relationships. We aimed to determine the sex-specific moderating impact of subjective chronotype on the association between subjective sleep and subjective cognition in middle-aged and older adults.

Methods: Participants (N=260, 142 men/118 women) aged 50+ completed surveys measuring subjective sleep [Pittsburgh Sleep Quality Scale (PSQI)], chronotype [Morning-Evening Questionnaire (MEQ)], and everyday subjective cognition [Cognitive Failures Questionnaire (CFQ)]. Moderated regressions determined independent and interactive roles of subjective sleep (PSQI-total, sleep disturbances, sleep efficiency), chronotype (MEQ total), and sex on everyday subjective cognition (CFQ scores: total, memory, distractibility, and blunders). Analyses controlled for age, education, depressive/anxiety symptoms, and sleep medication use.

Results: Sex moderated the interactive associations of chronotype and PSQI-total on CFQ-total (p=.005) and CFQ-memory (p<.001). Specifically, higher PSQI-total was associated with higher CFQ-total (B=0.87, SE=0.38, p=.02) and CFQ-memory scores (B=0.33, SE=0.13, p=.009) in men with a tendency for eveningness. Sex also moderated the interactive associations of chronotype and PSQI-sleep disturbances on CFQ-memory (p=.04) and CFQ-blunders (p=.02). In men with a tendency for eveningness, greater PSQI-sleep disturbances were associated with worse CFQ-memory (B=2.65, SE=.84, p=.002) and CFQ-blunders scores (B=1.85, SE=0.83, p=.03). In women with a tendency for morningness, greater PSQI-sleep disturbances were associated with worse CFQ-memory (B=2.65, SE=.81, p= .001) and CFQ-blunders scores (B=2.37, SE=0.81, p=.004).

Conclusion: There are sex-specific patterns regarding the moderating impact of chronotype on associations between sleep and everyday cognition in middle aged and older adults. In men prone to eveningness, worse overall sleep quality and sleep disturbances may exacerbate negative perceptions of overall and memory specific cognitive function. However, in women prone to morningness, greater sleep disturbances may exacerbate negative perceptions of memory and task execution. Further investigating chronotype on objective sleep and cognition in prospective studies may help further explain underlying mechanisms of the impact of sleep on cognition, in addition to sex-specific sleep interventions to mitigate cognitive decline in aging populations.

Support (If Any):

0319

AGE ESTIMATION FROM SLEEP USING DEEP LEARNING PREDICTS LIFE EXPECTANCY

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Introduction: Sleep disturbances increase with age and are predictors of mortality. However, summary metrics typically derived in sleep clinics from gold standard clinical analysis of polysomnograms (PSGs) only represent a very small fraction of data collected. In this study, we designed deep neural networks that estimate age as a proxy for overall health using full PSG signals. Age estimation was next used to evaluate association to mortality risk.

Methods: Aging was modeled using 2,500 PSGs and tested in 10,808 PSGs from men and women in 7 different cohorts aged between 20 and 90. The deep neural network was trained using as a regression model of age in the 2,500 PSGs roughly uniformly distributed across 6 to 90 years. The estimates of the network were interpreted using Gradient SHAP, which attributes relevance scores to the input in terms of the age estimate. The association between age estimate error (AEE), which is the residual of the estimate, and mortality risk was investigated with Cox proportional hazards models that adjusted for demographics, sleep, and health covariates.

Results: Ages were estimated with a mean absolute error of 5.81 ± 1.18 years, while a linear regression model using basic sleep scoring measures had an error of 15.10 ± 6.48 years. Interpretation of the network revealed that patterns such as arousal, sleep apnea, and sleep stage transitions contribute to the age estimate. Each 10-year increment in AEE was associated with increased all-cause mortality rate of 28 % (95% confidence interval: 19–38 %) and cardiovascular mortality rate of 38 % (95% confidence interval: 19 – 59 %). An increase from -10 to +10 years in AEE translates to an estimated decreased life expectancy of 6.21 years (95% confidence interval: 4.31–8.21 years).

Conclusion: Greater AEE was mostly reflected in increased sleep fragmentation, suggesting this is an important biomarker of future health independent of sleep apnea.

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0320

SEX DIFFERENCES IN SLEEP QUALITY AND BIOMARKER LEVELS IN SERVICE MEMBERS AND VETERANS WITH CHRONIC MILD TRAUMATIC BRAIN INJURY

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Introduction: Sleep disorders are highly prevalent in military populations and are frequently associated with a history of traumatic brain injury (TBI). Despite the recent increase in female representation in the military, few studies have focused on sex differences in sleep quality in military populations. In this study, we examined biological sex differences in self-reported sleep quality and blood levels of protein biomarkers of TBI in a cohort of service members and veterans with chronic mild TBI (mTBI).

Methods: Participants (n=1,121) were enrolled in the Chronic Effects of Neurotrauma Consortium (CENC)/Long Term Impact of Military Brain Injury Consortium (LIMBIC) study. Females (n=147) and males (n=974) were classified into control (n=192, no TBI history) or mTBI (n=929, positive history of mTBI) groups. Self-reported sleep quality was assessed using PSQI (Pittsburgh Sleep Quality Index). Plasma levels of glial fibrillary acidic protein (GFAP), neurofilament light chain (NfL), Tau, interleukin (IL)-10, IL-6, and tumor necrosis factor-alpha (TNFα) were analyzed using a Simoa HD-X analyzer.

Results: Regression models revealed higher PSQI scores in females than males (ß(SE)=1.36(0.40), p =0.001) and in the TBI group (ß(SE)=1.97(0.36), p<0.001) in comparison to controls. TBI x sex interaction was not statistically significant. Within the mTBI group, females had higher PSQI scores (p=0.031) and GFAP levels (p<0.001) than males, which remained significant when controlling for demographics, number of mTBIs, and time since last mTBI. No other significant differences in biomarker levels were observed. In men, but not women, higher levels of GFAP were associated with lower PSQI scores (ß(SE)=-1.38(0.43), p=0.001).

Conclusion: Our findings suggest sex differences in sleep quality after mTBI, providing insights into possible mechanisms underlying the development of chronic symptoms in military populations. Our results support the need for considering biological sex in the development of personalized therapeutic strategies for chronic TBI-related sleep disorders.

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0321

POOR AGREEMENT AMONG SELF-REPORTED AND OBJECTIVE SLEEP DEFICIENCY ASSESSMENTS IN OLDER PERSONS

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Introduction: Many traditional sleep questionnaires were developed in younger populations and may have poor sensitivity to detect objective sleep deficiency in older persons due to atypical presentations, aging-related decreases in symptom awareness, and different expectations about health.

Methods: In a secondary analysis of data from the Osteoporotic Fractures in Men (MrOS; Sleep Visit 1) and the Study of Osteoporotic Fractures (SOF Visit 9), we evaluated the prevalence of objective sleep deficiency among persons with scores in the normal range on traditional sleep questionnaires (Pittsburgh Sleep Quality Index [PSQI] <6 and Epworth Sleepiness Scale [ESS] <11). Objective sleep deficiency was established based on presence of sleep-disordered breathing (SDB; apnea hypopnea index [at >4% desaturation] per hour of sleep ≥15 on polysomnography), insufficient sleep duration (average sleep duration <6 hours on actigraphy), or impairment in daytime sustained attention/alertness (falling in the worst quartile of Digit Vigilance Test scores for the sex-specific cohort).

Results: Average ages were 76±6 and 84±4 years in men and women, respectively. Among men with normal scores on the PSQI and ESS, 359/1527 (25%) had SDB, 428/1519 (28%) had insufficient sleep duration, and 346/1527 (23%) had impaired daytime attention/alertness. Among women with normal scores on both the PSQI and ESS, 72/185 (40%) had SDB, 318/1332 (24%) had insufficient sleep duration, and 140/546 (26%) had impaired daytime attention/alertness.

Conclusion: A substantial proportion of older men and women with normal scores on traditional sleep questionnaires have objective sleep deficits, suggesting a need to develop instruments to improve detection of sleep deficiency in this population.

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0322

SLEEP DISORDERED BREATHING AND MRI MAKERS OF BRAIN AGING IN THE HISPANIC COMMUNITY HEALTH STUDY/STUDY OF LATINOS

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Introduction: We aim to determine if white matter hyperintensities and decreased brain volumes are associated with sleep-disordered breathing (SDB), in a diverse sample of middle-aged and older Hispanic/Latino adults.

Methods: Our sample of 1,119 Hispanics/Latinos (ages older than 50-years; 70% female) from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) underwent brain magnetic resonance imaging (MRI) as part of the Study of Latinos - Investigation of Neurocognitive Aging MRI (SOL-INCA MRI) ancillary study. MRI outcomes of interest included global (gray matter, total brain) and regional (lobar cortices, hippocampus) brain volumes, lateral ventricle volume, and total white matter hyperintensity (WMH) volume. All MRI measures were residualized for total cranial volume. Our main exposure was visit-1 sleep data (2008-2011), which includes information about SDB defined with the respiratory event index 3% (REI), ≥5 and ≥15 (moderate-severe SDB) identified by home-sleep apnea test. Survey linear regression models to assess the association between sleep measures and MRI outcomes adjusted for age, sex, education, Hispanic/Latino background, body mass index, tobacco use, alcohol consumption, and physical activity factors and accounted for HCHS/SOL complex study design. We tested for effect modifications by age, sex and Hispanic/Latino background.

Results: Mean age was 63.9±7.0 years. Adjusting for age, sex, and education, individuals with a REI ≥15 (vs. <5) had decrements in total brain volume (Btotal=-6.115[-10.19 ; -2.04]; $p<0.01$), total gray matter volume(B= -3.702 [-6.7 ; -0.7]; $p<0.05$), and frontal cortical gray matter volume (B= -1.844[-3.48; -0.21]; $p<0.05$), and increments in hippocampal volume β= 0.138[0.04; 0.23]; $p<0.01$). The associations persisted after adjustment for Hispanic/Latino background and behavioral risk factors. Older age modified associations between the REI and age and total brain volumes (Bage*REI=-0.019[-0.04 ;~0.00]; $p<0.05$). There was no consistent evidence for effect moderation by sex or Hispanic/Latino background.

Conclusion: In a diverse sample of Hispanic/Latinos, moderate-severe SDB was associated with decreased total brain volumes and increments in hippocampal volumes. Our findings suggest that SDB related neuroimaging markers of brain health could serve to identify Hispanic/Latino participants with sleep related Alzheimer's disease and related dementia risk.

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0323

GENDER-SPECIFIC DIFFERENCES IN SELF-REPORTED FACTORS ATTRIBUTED TO SLEEP DISRUPTION

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Introduction: Women are more likely to report sleep difficulties. There are many ways for sleep to be disrupted (social influences, external sensory stimuli, somatic cues) but limited data exists on the relative burden of these disruptors. The purpose of the present analysis was to compare the occurrence of disruptors between males and females of equal ages.

Methods: We used self-reported data from the PSG-validated SleepScore mobile app to analyze the relative occurrence of a variety of sleep disruptors in an age- and gender-balanced sample of users (39,560 male and 39,560 female, median age=41, SD=15). Fisher's exact test was used to examine whether gender was a significant factor in the likelihood of reporting each disruptor. Disruptors were categorized as follows: somatic cues included hot flashes/thermal discomfort, chronic pain, bathroom visits, and heartburn; external sensory stimuli included temperature, light, and noise; social influences included: bed partner, pet, and children. All $p < 0.00001$ results are reported.

Results: Women were significantly more likely than males to report at least one sleep disruptor (Odds ratio (OR): 2.29, prevalence: 90% vs 80%) and were more likely to report sleep disruption attributed to external stimuli (OR: 1.61, prevalence: 54% vs 42%), somatic cues (OR: 1.66, prevalence: 68% vs 56%), and social influences (OR: 1.95, prevalence: 50% vs 34%). Among somatic cues, women were more likely than males to report hot flashes/thermal discomfort (OR: 3.42), chronic pain (OR: 2.32), bathroom visits (OR: 1.24), and heartburn (OR: 1.14). Among external sensory stimuli, women were more likely than males to report sleep disruption attributed to sound (OR: 1.58), light (OR: 1.54), and temperature (OR: 1.54). Among social influences related disruptive factors, women were more likely than males to report sleep disruption attributed to pets (OR: 2.31), bed partners (OR: 1.65), and children (OR: 1.62).

Conclusion: The present analysis found that women reported higher rates of regular disruption for every cause. These findings highlight the role of gender in sleep-health reporting behavior and mirror other findings showing lower symptom reporting and healthcare utilization among males.

Support (If Any):

0324

SLEEP DURATION AND BRAIN MRI BIOMARKERS: RESULTS FROM SOL-INCA MRI STUDY

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Introduction: Long and short sleep have been associated with stroke and dementia. Sleep patterns may differ by sex and Hispanic/Latino background. Within Hispanics/Latinos heterogeneity in sleep outcomes exists and is understudied. The purpose of this study was to examine associations between sleep duration and MRI biomarkers of brain health.
Methods: SOL-Investigation of Neurocognitive Aging (SOL-INCA) MRI study is an ongoing ancillary study of the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). Our analytic sample consisted of 1,103 adults 50-years and older from diverse Hispanics/Latino backgrounds that completed baseline sleep assessments (2008-2011) and underwent neuroimaging (2018-ongoing; Mean age 64 ±6.9 years). The main exposures were baseline self-reported average nightly sleep duration. Outcomes included brain volume measures residualized for cranial volume (e.g. total brain, hippocampal, and white matter hyperintensities). Brain outcomes were modeled, using regression techniques, as a function of sleep duration and adjusting for age, sex, education, Hispanic/Latino background, language use, self-reported cardiovascular events, BMI, depressive symptoms, Apena/Hypopena index and self-reported sleep quality.
Results: Mean sleep duration was 7.7 ± 1.36 hours, and 13.2% reported sleeping >9 hours. Increasing sleep duration was associated with smaller total brain (Btotal_brain -1.32 [-2.33 ; -0.32], $p<0.05$) per hour increment and larger lateral ventricle volumes (Blateral_ventricle=0.02 [~0.00; 0.04], $p<0.05$) after adjusting for sociodemographic, behavioral, cardio-vascular and sleep quality characteristics. The associations were not modified by sex or Hispanic/Latino background.
Conclusion: We found that increments in sleep duration was associated with lower total brain volume and larger ventricle size, MRI measures that could associate with increased dementia-risk in diverse Hispanic/Latino adults.
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0325

A COMPREHENSIVE EVALUATION OF SLEEP DISORDERS IN MALE AND FEMALE U.S. MILITARY PERSONNEL

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Introduction: Sleep disorders are increasingly recognized in military personnel. However, no study has comprehensively evaluated male and female service members with clinically significant sleep disturbances. While, insomnia and obstructive sleep apnea (OSA) are the two most recognized sleep disorders, some studies have suggested that comorbid insomnia and OSA, also known as COMISA, potentially is the most frequent sleep disorder. Further little is known regarding the co-occurrence of nightmares, shift work disorder, depression, anxiety, and posttraumatic stress disorder (PTSD) in this population.
Methods: Participants were 309 active duty service members (females n = 113, male n = 196) in all branches of the military who underwent a clinically indicated sleep evaluation in a military sleep disorders center. All underwent an attended in-lab polysomnogram, were diagnosed with insomnia, OSA, or COMISA and completed self-report measures. Participants completed the Nightmare Disorder Index and Shift Work Disorder Index, and non-sleep questionnaires using the PCL-5 for post-traumatic stress disorder (PTSD), the PHQ-9 for depression, the GAD-7 for anxiety, and History of Head Injuries for traumatic brain injury (TBI).
Results: COMISA was diagnosed in 36.8% of the sample, insomnia in 32.7%, and OSA in 30.4%. Males were significantly more likely to have COMISA or OSA and females were more likely to have insomnia. Polysomnographic variables were consistent with the respective sleep diagnoses. Forty service members (12.9%) met criteria for nightmare disorder; those with OSA were significantly less likely to have nightmares. Shift work disorder was present in 49 (15.9%) and did not differ between sleep diagnoses. PTSD was present in 57 (18%) and those with COMISA were significantly more likely to have PTSD. A history of head injuries was reported by 38.2% and there was no difference in rates between the sleep disorder groups.
Conclusion: The most frequent sleep disorder profile in service members with sleep disturbances was COMISA, which was associated with significantly higher rates of PTSD and anxiety. Conversely, OSA alone was not associated with higher rates of any comorbid disorders. Nightmare disorder and shift work are relatively prevalent in military personnel with sleep disorders.
Support (If Any): This work was supported by the Defense Health Agency, Defense Medical Research and Development Program, Clinical Research Intramural Initiative for Military Women's Health (DM170708; Mysliwiec), and the Air Force Research Laboratory, Wright Patterson Air Force Base, Ohio (FA8650-18-2-6953; Peterson). The views expressed herein are solely those of the authors and do not represent an endorsement by or the official policy or position of the U.S. Air Force, the U.S. Army, the Defense Health Agency, the Department of Defense, the Department of Veterans Affairs, or the U.S. Government.

0326

INFLUENCE OF SLEEP AND CARDIOVASCULAR HEALTH ON COGNITIVE OUTCOMES IN OLDER ADULTS

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Introduction: High and low sleep duration have been associated with reduced executive function (EF) and episodic memory (EM). However, causal pathways have not been identified. Cardiovascular health may contribute to the relationship between sleep and cognitive aging. Sleep disturbance has been associated with increased hypertension and heart disease in older adults, and cerebrovascular insufficiency has been consistently linked with cognitive decline. Therefore, the mediating and moderating effects of cardiovascular disease risk (CVD) on the relationship between sleep duration and longitudinal change in EF and EM were examined.
Methods: Statistical analyses were preregistered (osf.io/6yw7g). Average total sleep time (TST) over 2-6 nights was estimated using single-channel EEG at baseline (N=332). CVD was estimated using the abbreviated Framingham Heart Score approximately one year post-baseline. Outcome variables were linear change in EF and EM composite scores [BL1] per year up to 7 years after baseline. EF subtests measured semantic fluency, working memory, and task switching. EM subtests measured verbal associative memory, narrative episodic memory, and list learning. Covariates included age, gender, Alzheimer disease (AD) biomarkers (ratio of phosphorylated tau181 to amyloid-ß42), global cognition, and apnea-hypopnea index.
Results: Greater TST was linearly associated with reduced CVD (ß=-.157, p=.006). Quadratic effects of TST on EF and EM were observed (EF: ß=-.105, p=.002; EM: ß=-.203, p=.007). Lowest TST was related to greater reduction in EF; highest TST was related to greater reduction in EF and EM. Mediating effects of CVD for EF and EM were observed (ps<.05) but were non-significant when age and AD biomarkers were included (p=.10, p=.08, respectively). A non-significant trend indicated CVD moderated effects of TST on EF (ß=.10, p=.055), controlling for age and AD biomarkers. Less sleep combined with higher CVD tended to be associated with greater decline in EF. CVD did not moderate effects of TST on EM (ß=.07, p=.254).
Conclusion: Consistent with prior literature, CVD and TST were independently associated with cognitive decline. Although findings suggest that CVD may influence effects of TST on cognitive decline, more evidence is needed. Future analyses will examine alternative sleep measures (e.g., sleep efficiency, slow wave spectral density).
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0327

AGE-RELATED ASSOCIATIONS BETWEEN CHRONOTYPE AND SLEEP-WAKE CYCLES: A BIG DATA ANALYSIS

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Introduction: Circadian rhythms progressively delay throughout adolescence until older adulthood when they advance to become early as children. Chronotype represents a subjective assessment of when one feels their performance is optimal. Evidence suggests evening chronotype is associated with adverse health effects. Presently, it is unclear whether sleep-wake cycles and chronotype diverge across ages. Here, we examined whether self-reported chronotype was associated with the daily start of the sleep-wake cycle (indicated through objectively measured bedtime) across the lifespan using a large, ecologically-valid dataset.
Methods: Data from 11,026 users (mean age: 45.3, 54.3% female) across 1,167,489 nights were included in the analysis from the PSG-validated SleepScore Mobile Application, which uses a non-contact, sonar-based method to objectively capture sleep-related metrics, and questionnaires to assess self-reported lifestyle factors. Chronotype was subjectively assessed with a 5-item question ranging from definitely morning-type to definitely evening-type. Bedtime, a proxy for the daily start of the sleep-wake cycle, was captured as the time at which users started a sleep recording in the Application. Linear regressions were used for the analysis.
Results: Overall, chronotypes showed a near-normal distribution with a skew toward definite evening types (n=2147) compared to definite morning (n=1560) types (21.70% versus 15.70%). As expected, average bedtime was earliest for definite morning types (mean=23:02 ± 86.4 mins) and latest for definite evening types (mean=01:10 ± 102 mins). Across all chronotypes, linear regressions revealed a significant negative association between overall age and bedtime (p<0.0001). Among definitive evening types, younger ages had later bedtimes and older ages had earlier bedtimes (ß=-0.014, SE=0.002, p<0.00001). Further, the degree of change in bedtimes across age was largest for definite morning types, whereby average bedtime decreased from 23:38 (SD=86.3 mins) at age 20 to 22:29 (SD=88.2mins) at age 80 (ß=-0.019, SE = 0.002, p<0.00001).
Conclusion: The present analysis showed that, across chronotypes, younger ages had later bedtimes and older ages had earlier bedtimes, presumably driven by age-related changes in circadian rhythmicity. This association was also exemplified by morning-types showing the greatest change in bedtimes across the lifespan. Future prospective studies are warranted to examine the relationship between longitudinal changes to chronotype and endogenous circadian rhythmicity across the lifespan.
Support (If Any):

0328

SOCIAL JETLAG DECREASES ACROSS THE LIFESPAN: A LONGITUDINAL BIG DATA ANALYSIS OF OBJECTIVE SLEEP

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Introduction: Changes in social zeitgebers across the lifespan likely impact the interplay between biological and social clocks that fosters the circadian misalignment seen in social jetlag. Extant literature is limited to self-reported methods and cross-sectional designs and suggests older adulthood may be associated with a reduction in social jetlag given declining social obligations occurring after retirement. Using longitudinal ecologically-valid data, we examined the association between age as a continuous measure and social jetlag. We also examined whether work cessation is associated with a reduction in social jetlag.

Methods: Data from 2,446 users (mean age: 52.2 +/- 15.8, 51.8% female) across 473,113 nights were included in the analysis from the PSG-validated SleepScore Mobile Application, which uses a non-contact sonar-based method to objectively capture sleep-related metrics and self-reported lifestyle. Social jetlag (expressed in minutes) was defined as the difference between midsleep times on week and weekend days from a user's total recording period. Linear regressions were used for the analysis. Age was examined as a both continuous variable, and as a dummy variable in a subsequent analyses in a subgroup of older adults, serving as a proxy for pre– (n = 604, age: 54-64, mean age: 60.5 +/- 2.8) and post-retirement (n = 428, age: 65-75, mean age: 69.9 +/- 2.8).
Results: Linear regressions revealed a significant negative association between overall age and social jetlag, whereby older age was associated with a reduction in social jetlag (ß=-0.64, SE=0.082, p<0.0001). In agreement with this finding, post-retirement age was associated with a significant reduction in social jetlag (ß=-15.31, SE=3.78, p<0.0001) as compared to pre-retirement.
Conclusion: The present analysis showed that social jetlag decreases across the lifespan, and its reduction appears to be amplified following retirement. Our findings are in-line with prior work demonstrating the reduction, but not extinction, of social jetlag in older adulthood.
Support (If Any):

0329

SOCIAL JETLAG AND INCREASED BMI: A POPULATION-BASED STUDY USING A CONTACTLESS SLEEP MEASUREMENT APPLICATION

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Introduction: Social jetlag involves delayed bed and wake times on weekends relative to weekdays. Resulting circadian rhythm disruption, sleep disturbance, and shortened sleep have untoward consequences for human health and performance. Elevated BMI is associated with habitual short sleep and circadian disruption, as seen in shift workers. Studies assessing the relationship between social jetlag and BMI often rely on self-reported sleep patterns, or measure sleep objectively with a worn device for short periods of time. We assessed the relationship between social jetlag and BMI in a novel manner using longitudinal, ecologically valid assessments (measured in subjects typical home environment) using the PSG-validated contactless, sonar-based SleepScore mobile application.
Methods: A total of 357 individuals across 130,120 nights monitored their sleep with the contactless SleepScore mobile application (ages 18-87, mean age, 46.7% females). Social jetlag was determined in a well-established manner by subtracting the mean objective sleep midpoint on weekdays from the mean objective sleep midpoint on weekends. Body mass index (BMI) was self-reported and defined as kg/m2. Chronotype was subjectively assessed with a 5-item question ranging from definitely morning-type to definitely evening-type. Chronotype, age and gender were included in the analysis as confounds.
Results: Mean social jetlag was 26.6 min (95% CI 22.2 – 31.0). Linear regression revealed a significant association between social jetlag and BMI (ß=0.025, SE=0.012, p<0.05) after adjustment for age, gender and chronotype. Thus, for every one-minute increase in social jetlag, there was a 0.025 kg/m2 increase in BMI. For expository purposes, a social jetlag of 60 minutes would increase BMI by 1.5 kg/m2.
Conclusion: In our population-based sample of individuals using a sonar-based contactless consumer sleep technology to objectively measure sleep we found a positive association between a well-validated measure of social jetlag and BMI, such that increased social jetlag portended increased BMI. This is consistent with previous reports demonstrating the untoward effect of social jetlag on human health and metabolism. The longitudinal and ecologically valid nature of our sleep measurement adds to the veracity of our growing understanding of the problem with social jetlag.
Support (If Any): SleepScore Labs

0330

SELF-REPORTED EXERCISE AND OBJECTIVELY MEASURED SLEEP: A BIG DATA ANALYSIS USING CONSUMER SLEEP TECHNOLOGY

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Introduction: Exercise is bidirectionally associated with sleep, whereby exercise can be an efficacious element of behavioural therapy for sleep, and longer sleep duration has been associated with increased physical activity. Given poor sleep and physical inactivity are each widely recognized as critical public health priorities, further research into the relationship between objective sleep and indices of exercise using ecologically-valid sleep measurement tools is warranted. Here, we examined the association between self-reported exercise intensity and duration, and objectively measured sleep using consumer sleep technology.
Methods: Data from 2,662 users (mean age: 47.4, 36.5% female) across 343,308 nights were included in the analysis from the PSG-validated SleepScore Mobile Application, which uses a non-contact, sonar-based method to objectively capture sleep-related metrics, and questionnaires to capture self-reported data. Exercise intensity ("At what level of intensity do you work out?", 3 point scale) and exercise frequency ("How many times a week do you exercise for at least 20 mins?", 5 point scale) were gathered used self-report questionnaires. Linear regression modelling was used for analysis, with age and gender used as confounding variables.
Results: Greater reported exercise frequency was associated with an increase in TST (ß=3.3 mins, SE=0.838, p<0.001) and sleep efficiency (ß=0.5%, SE=0.116, p<0.001). Exercise frequency was also associated with reductions in WASO (ß=-1.153mins, SE=0.429, p<0.01) and SOL (ß=-0.425mins, SE=0.163, p<0.01). Greater reported exercise intensity was associated with an increase in TST (ß=4.908 mins, SE=1.886, p<0.01) and sleep efficiency (ß=1.16%, SE=0.255, p<0.001). Exercise intensity was also associated with reductions in WASO (ß=-3.282mins, SE=0.965, p<0.01) and SOL (ß=-0.852mins, SE=0.272, p<0.01).
Conclusion: Self-reported exercise frequency and intensity were associated with improved objective sleep metrics across the board. This big data finding using ecologically-valid consumer sleep technology can further contribute to public health recommendations regarding the positive impact of exercise on sleep.
Support (If Any):

0331

INTERSECTIONAL DISCRIMINATION AND SLEEP HEALTH AMONG WOMEN VETERANS: A PILOT STUDY

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Introduction: Structural inequalities perpetuate poor health outcomes. Sleep inequality, which is the disproportionate burden of sleep problems among marginalized groups compared to historically advantaged groups, is poorly understood. While racial discrimination is associated with chronic health outcomes, few studies have examined the health impact of discrimination stemming from multiple social vulnerabilities. The current study assessed women veterans' experiences of intersectional discrimination, specifically the combined impact of gender and racial/ethnic discrimination on sleep health.

Methods: Data were from the WISE (Women Improving Sleep through Education) study. Participants were women veterans with a previous diagnosis of sleep apnea or 1 or more risk factors for sleep disordered breathing (n=39). Data collection was from 3/2021–11/2021. The 9-item Major Discrimination Scale (MDS) and 10-item Everyday Discrimination Scale (EDS) were employed. The MDS included items such as "have you ever been unfairly stopped, searched, questioned, physically threatened or abused by police?" and the EDS, "how often on a day-to-day basis are you treated with less courtesy than other people?". Items were adapted to assess discrimination related to respondents' gender and race/ethnicity separately. Major intersectional discrimination (MDS-gender + MDS-race/ethnicity) and everyday intersectional discrimination (EDS-gender + EDS-race/ethnicity) were computed. Sleep health was assessed by the Pittsburgh Sleep Quality Index (PSQI) and Insomnia Severity Index (ISI). Descriptive statistics and correlational analyses were performed.

Results: Racial/ethnic minority women veterans comprised 54% of the study sample. Prevalence of major intersectional discrimination was 67% and everyday intersectional discrimination, 92%. Compared to other racial/ethnic groups, the proportion of Black women veterans reporting major intersectional discrimination was highest (78%). Major intersectional discrimination was positively correlated with ISI ($p=0.04$) and PSQI ($p=0.01$). Everyday intersectional discrimination was not correlated with sleep health ($p>0.05$).

Conclusion: Pilot study findings highlight the potential role of discrimination on sleep health, particularly multiple forms of discrimination. High prevelence of intersectional discrimination related to women veterans' gender and racial/ethnic identities was observed. Major intersectional discrimination, not everyday intersectional discrimination, was associated with higher insomnia severity and poorer sleep quality.

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0332

OBJECTIVE AND SUBJECTIVE SLEEP QUALITY IN MEXICAN AMERICANS AND NON-HISPANIC WHITES: THE HABLE-DORMIR STUDY

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Introduction: The ongoing prospective Health & Aging Brain among Latino Elders (HABLE)-Dormir Study is designed to investigate the association between objective and subjective sleep quality and cognitive impairment among Mexican Americans and non-Hispanic Whites (NHWs).

Methods: We plan to recruit 1000 community-dwelling Mexican Americans and NHWs and elders (age 50 and above). Objective sleep duration and fragmentation were assessed by 7-day wrist actigraphy; presence of sleep disordered breathing (SDB) was determined using WatchPAT; and subjective sleep quality and excessive daytime sleepiness (EDS) were examined by Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS), respectively.

Results: To date, 367 participants have been enrolled (62% women, 45% Mexican Americans, mean age 67.3±8.4 years); 296 (81%) of the participants had normal cognition, 56 (15%) had mild cognitive impairment (MCI), and 15 (4%) had dementia. On average, participants had a mean sleep duration of 7.3±1.1 hours, sleep efficiency of 88.3±5.3%, and wake after sleep onset (WASO) of 55.2±29.3 minutes. Almost half (51%) of the participants had moderate to severe SDB defined by WatchPAT-derived respiratory event index (REI) >=15, 54% had self-reported poor sleep quality (PSQI>5), and 10% reported EDS (ESS>=11). After adjustment for age, Mexican Americans had lower sleep efficiency (86.5% vs. 89.5%, $p<0.001$) and greater WASO (63.6 vs. 48.9 minutes, $p<0.001$), compared to NHWs. Sleep duration did not differ significantly among NHWs (7.2 hours) and Mexican Americans (7.4 hours); $p=0.20$. The prevalence of moderate to severe SDB was similar in NHWs (51.2%) and Mexican Americans (50.0%); $p=0.84$. Besides, NHWs and Mexican Americans had similar PSQI and prevalence of EDS.

Conclusion: In this initial analysis, Mexican Americans have worse objective sleep quality, but similar sleep duration, prevalence of SDB and subjective sleep quality as compared to NHWs. Continued investigations are needed to explore potential racial/ethnic disparities in sleep health and how differences in objective and subjective measurements vary by race and ethnicity.

Support (If Any):

0333

GENDER AND MENOPAUSAL STATUS CORRELATE WITH SLEEP SURGERY OUTCOME

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Introduction: With recognized anatomic and physiological differences between males and females, it is critical to describe outcomes of sleep surgery with respect to gender. The objective of this study is to compare the subjective and objective outcomes of phase I sleep surgery with respect to gender and age.
Methods: This was a retrospective review of adult subjects who presented to a single center for surgical evaluation of OSA from January 2019 to June 2021. Only subjects undergoing phase I surgery (turbinate reduction, septoplasty, nasal valve surgery, DOME, tonsillectomy, preservation palatopharyngoplasty, tongue base reduction, genioglossus advancement, and upper airway stimulation), who also had complete pre and post-operative PSG data were included. Objective measures were post operative apnea hypopnea index (AHI), oxygen desaturation index (ODI), and lowest oxygen saturations (LOS). Subjective outcomes include Epworth Sleepiness Scale (ESS), and Nasal Obstruction and Septoplasty Effectiveness (NOSE) questionnaires. The groups were matched for age and pre-operative BMI.
Results: Twenty-six subjects met inclusion criteria, of which 12 were female and 13 were males. Of the females 5 were post-menopausal. The average male pre-operative AHI, ODI, lowest SpO2, and ESS were 34.4± 28.7, 30.2±28.3, 80.7±6.6, and 10.3±5.6 respectively. Pre-operative values for females were, 31.9±19.2, 18.47±20.4, 82.8±8.4, and 12.5±4.8 respectively. The average AHI reduction in males was 25.5± 29.1, and for females it was 8.3±21.0 (p=0.042). Specific to post-menopausal females, Average AHI reduction was 8.3± 21.0 and 20.2±16.6 for pre-menopausal females (p=0.01). The average ESS reduction in males was 3.1±3.2 (p=0.22) and for females 5.5±5.4 (p=0.001).
Conclusion: In this cohort, pre-menopausal women have higher objective surgical success rate (Sher's criteria) after phase I surgery as compared to post-menopausal women. Men respond more favorably than women to phase I surgery based on AHI reduction, but not with ESS. Gender and menopause status are important factors in evaluating efficacy of sleep surgery.
Support (If Any):

0334

THE ROLE OF RACE-GENDER INTERSECTIONALITY IN ASSOCIATIONS BETWEEN INSOMNIA PATTERNS AND LATE-LIFE MEMORY TRAJECTORIES

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Introduction: Difficulty initiating sleep (DIS) may be a stronger predictor of neurodegenerative risk than other insomnia symptoms. This study examined whether longitudinal patterns of DIS are associated with subsequent memory trajectories, and whether associations differ across non-Hispanic Black and White men and women.
Methods: 12,565 participants in the Health and Retirement Study (Mage=67.8±9.1, 59.1% women) who self-identified as non-Hispanic Black (14.5%) or non-Hispanic White were included. DIS ("How often do you have trouble falling asleep?") at three biennial waves (2002-2006) was dichotomized ("never/rarely/sometimes"=0, "often"=1). Participants were categorized into three mutually exclusive groups: low (reference group), persistent, and variable DIS. Episodic memory was assessed using a 10-item word list recall test at five biennial waves (2008-2016). Latent growth curves modeled associations between DIS patterns and subsequent memory level and change, adjusting for sociodemographics (model 1), health conditions (model 2), and depressive symptoms (model 3) in 2002. Stratified models compared associations across White men, Black men, White women, and Black women.
Results: Compared to low DIS, persistent (β=-0.03, p<.001) or variable (β=-0.07, p<.001) DIS was associated with worse subsequent memory in models 1 and 2. The effect of variable (β=-0.05, p<.001), but not persistent (β=-0.01, p=.271), DIS remained in model 3. Persistent DIS was most prevalent among White women (5.4% vs. 2.4-4%), and variable DIS was most prevalent among Black women (24.1% vs. 14-22.2%). Persistent DIS was only significantly associated with memory among White women (β=-0.04, p=.003 vs. β=-0.04, p=.324 for Black Men; β=-0.03, p=.087 for White men; and β=0.01, p=.859 for Black women). Variable DIS was most strongly associated with memory among Black men (β=-0.141, p=.003), followed by White men (β=-0.09, p<.001), White women (β=-0.06, p<.001) and Black women (β=-0.06, p=.064). There were no associations between DIS patterns and memory change.
Conclusion: While links between persistent DIS and subsequent memory may reflect negative cognitive effects of depression, variable DIS may presage worse memory above and beyond depression. Race/gender differences in the prevalence and predictive value of DIS patterns for subsequent cognitive function highlight the value of an intersectional lens. Gender disparities in DIS may be more prominent than racial disparities.
Support (If Any): NIA F31AG067717 (PI: Zaheed)

0335

SLEEP PATTERNS AND EXPERIENCES IN OLDER NIGHT SHIFT NURSES

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Introduction: Working at night can lead to misalignment between the timing of the biological clock and the work/sleep schedule, resulting in sleepiness, inattention, and impaired performance during the night shift and poor quality, shortened sleep during the day. These adverse effects are reported to be worse in older workers due to their decreased ability to sleep during the daytime. Although numerous quantitative studies have examined these associations, there are few qualitative studies to describe the sleep patterns and experiences from older night workers' perspectives.

Methods: Four virtual focus groups were conducted with 12 nurses aged 50-65, working regular 8-hr night shifts, to learn about their sleep patterns and experiences, and factors affecting their sleep and non-sleep activities before, between, and after consecutive night shifts. Two facilitators and two research assistants reviewed and coded the focus group transcripts for consistent themes among participants.

Results: Eight common themes were identified: (1) sleep patterns are self-selected based on family and childcare responsibilities; (2) sleep timing switches between nights and days from before- to between- to after-consecutive night shifts; (3) frequent extended (24+ h) wake before and after consecutive night shifts; (4) difficulty maintaining long and sound sleep during daytime; (5) family, social, health, and environmental disturbances interrupt daytime sleep; (6) more satisfaction with sleep quantity and quality in participants with split sleep than those with one episode; (7) sleep is considered less important compared to childcare, family, and social activities; (8) better on-shift alertness and performance when the main sleep episode or a nap immediately precedes night shift.

Conclusion: Sleep patterns and experiences reported by older night shift nurses are helpful in understanding their priorities and challenges to obtaining adequate sleep. This information is critical for the future design and implementation of feasible and acceptable interventions to improve sleep in this occupational group.

Support (If Any): This study was supported by NIH grant R01 AG044416.

0336

SLEEP TIME AND RISK TAKING BEHAVIOUR IN NIGHT SHIFT-WORKERS

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Introduction: Night shift-workers are integral in a multitude of industries. Many night shift-workers experience sleep loss, which may impact their risk taking behaviour.This study aimed to identify the correlation between total sleep time (TST) and shift-workers' engagement in risk-taking behavior.

Methods: 53 night shift-workers participated in the experiment. Polysomnography was conducted to determine the TST of shift-workers prior to completing a task that measured risk taking behaviour. This task simulated a driving scenario in which participants must decide whether or not to proceed at a yellow traffic light. Participants were not informed of the duration of the yellow light, which varied unpredictably in duration. The task consisted of 16 trials, and participants earned points that translated to a cash incentive (25 points = 25 cents). Participants either earned or lost 25 points depending on the success of each trial. Failure was defined as running a red light. Those who proceeded at every trial were categorized as insensitive to risk.

Results: The data revealed that those insensitive to risk had a significantly lower TST value.Those insensitive to risk had a lower mean sleep time (374 minutes, SD=75) compared to those sensitive to risk (415 minutes, SD= 42), p =.01 (Cohen's d=0.67).

Conclusion: Sleep time is associated with risk-taking behavior in night shift-workers. This study offers insight into the amplification of risk taking behaviours within night shift-workers posed by sleep loss, possibly leading to errors and injuries in the workplace. This association may also suggest that implementation of measures to increase sleep for night shift-workers could decrease risk-taking behaviours.

Support (If Any): K23HL133186

0337

WITHDRAWN

0338

ASSOCIATION OF EVENING CIRCADIAN PREFERENCE AND LANGUID/FLEXIBLE CIRCADIAN TYPE WITH PREDISPOSING, PERPETUATING FACTORS, AND TREATMENT ACCEPTABILITY IN PATIENTS WITH CHRONIC INSOMNIA DISORDER

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Introduction: Circadian factors may contribute to sleep difficulties among chronic insomnia disorder (CID) patients who do not otherwise meet full criteria for a circadian rhythm sleep-wake disorder, particularly delayed and advanced sleep-wake phase disorders. Current nosology suggests that using circadian preference measures can provide important diagnostic information and aid in differential diagnosis. However, there is a lack of research identifying clinical factors associated with circadian dimensions in patients with CID.

Methods: 195 patients (45.50±15.99 years old, 66.2% female, 15.9% minority) with a diagnosis of CID and absent of any other sleep disorder were evaluated at the Behavioral Sleep Medicine (BSM) program of Penn State Health Sleep Research & Treatment Center. All patients completed measures of circadian preference and type, insomnia severity, arousability, sleep reactivity, pre-sleep arousal, sleep-wake schedule and incompatible behaviors, dysfunctional beliefs and attitudes, mood and stress, and insomnia treatment acceptability. Multivariable linear regression examined which predisposing, perpetuating and treatment acceptability factors were associated with each circadian dimension, while adjusting for age, sex, race/ethnicity and insomnia severity.

Results: About 30% of the sample was classified as evening, 29% as morning, 74% as languid, and 43% as flexible types. Sleep-wake irregularity was associated with eveningness (β=-0.276, $p<0.01$), languidity (β=0.280, $p<0.01$) and flexibility (β=0.184, $p<0.01$). Pre-sleep cognitive arousal (β=-0.182, $p<0.01$) and sleep expectations (β=-0.127, $p<0.05$) were associated with eveningness. Negative

cognitions about the consequences of insomnia (β=0.230, p<0.01) and sleep expectations (β=0.268, p<0.01) were associated with languidity. Sleep-incompatible behaviors (β=0.165, p<0.05) and perceived stress (β=0.267, p<0.01) were associated with flexibility, while trait anxiety (β=-0.137, p=0.058) and negative cognitions about the consequences of insomnia (β=-0.318, p<0.01) were associated with rigidity. Less agreeability to pharmacotherapy over behavioral therapy was associated with morningness (β=0.129, p<0.05), while greater agreeability to behavioral therapy over pharmacotherapy (β=-0.158, p<0.05) was associated with rigidity.
Conclusion: Sleep-wake irregularity in patients with CID is a perpetuating factor strongly associated with evening and languid/flexible circadian types, while other predisposing and perpetuating factors can be also determined by circadian preference and/or type. Circadian measures in the evaluation of CID patients may help clinicians individualize BSM treatments, including patients' acceptability.
Support (If Any):

0339

A POSSIBLE ROLE FOR THE CIRCADIAN SYSTEM IN AGGRESSION IN DEMENTIA

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Introduction: Growing evidence suggest a bidirectional relationship between circadian and sleep regulation, and the pathology and progression of dementia. Behavioral and psychological symptoms of dementia (BPSD) are very prevalent, and lead to an enormous disease burden in patients, families and caregivers. Indications for a possible disruption of circadian regulation of emotions and behavior in dementia, can be found in the phenomenon known as 'sundowning', exacerbation of neuropsychiatric symptoms during the late afternoon and early evening. Aggression in particular can be a very debilitating symptom of dementia, and previous animal and human studies point to a possible role of the circadian rhythm in the propensity for aggressive behavior. Therefore, we examine here the timing of aggression in a dementia cohort.
Methods: We studied the timing of aggression incidents on a university psychiatric hospital unit treating patients with dementia and additional behavioral problems. During a 6-month period (November 2020 - April 2021) 84 patients were admitted to the ward. Data of these patients were retrospectively analyzed. During this period 335 individual incidents of aggression (verbal and/or physical) were reported by the nursing staff.
Results: Among the 84 subjects, 42 (50%) had at least one aggression incident during hospital admission. 41% of all incidents occurred between 4-10pm. (5-9pm (36.4%), 9pm-1am (11.6%), 1-5am (5.7%), 5-9am (22.7%), 9am-1pm (10.7%), 1-5pm (12.8%)). In every investigated month, a peak in number of incidents could be seen between 7 and 8pm. Aggression incidents were most likely to occur in Alzheimer's dementia (OR: 3.75). Patients who exhibited aggression had worse cognitive impairment (difference in mean MMSE: 4.57 ± 2.1 , p=0.034).
Conclusion: Aggression incidents were most prevalent during the late afternoon and evening. Furthermore, the severity of cognitive impairment and type of dementia negatively impacted the prevalence of aggression.Our study thus confirms a possible role of the circadian rhythm in aggression. The role of the circadian rhythm in the pathophysiology of neurodegenerative disorders, and specifically in their neuropsychiatric symptoms, warrants further research.
Support (If Any): Supported by the Funds Malou Malou, Perano, Georgette Paulus, JMJS Breugelmans and Gabrielle, François and Christian De Mesmaeker, Managed by the King Baudouin Foundation of Belgium, No. 2021-J1990130-222081.

0340

NON-SURGICAL MAXILLARY EXPANSION USING A NOVEL ORAL APPLIANCE SYSTEM

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Introduction: Complete Airway Repositioning and Expansion (CARE; Vivos Therapeutics, USA) consists of a series of dental devices that cause gradual expansion of the airway over an 18-month course used to treat mild-to-moderate obstructive sleep apnea. In this retrospective database review we sought to determine whether airway and obstructive sleep apnea (OSA) parameters changed via treatment as measured without the appliance in their mouths.
Methods: After IRB exemption by the Mount Sinai Health System IRB (STUDY-21-01561) we conducted a retrospective review of the Vivos database. Demographics, pre-, mid-, or post-treatment maxillary dimensions, and pre-, mid-, or post- treatment sleep study parameters were reviewed. CBCT parameters for trans-palatal width (TPW) and total three dimensional (3D) airway volume were analyzed along with available AHI data.
Results: There were 786 patients with complete radiographic datasets. The median (interquartile range) age was 49 (36-59) years, and half were female. Both the median TPW of 33.5 (31.0-35.3) mm and median 3D volume of 19,752 (15965-25042) mm3 increased, to 35.0(33.0-37.5) mm and 21919 (17484-27711) mm3, respectively. These increases were significantly different ($p<0.001$ in both measures by related-samples Wilcoxon signed rank test). A subset of patients had complete sleep study data (N=139). For those patients with pre- and post-treatment studies who had also completed at least 18 months of therapy (N=37), the TPW increased by a median of 2.50 (1.00-3.50) mm and the 3D volume by a median of 3092 (1006-6480) mm3. Overall, the number of patients with no OSA went from 4 to 13 and the number of patients with severe OSA went from 10 to 3. Twenty-five patients (65%) had improved AHI, and 15 (41%) had their AHI improve by 50% or more (all of these were decreased to an AHI <20).
Conclusion: This retrospective database review showed that OSA patients treated with BOAT improved their OSA with concomitant increases in maxillary dimensions. Further analyses of these data, and future prospective clinical trials are warranted to better understand this novel OSA treatment.
Support (If Any): Support from Vivos Therapeutics in the form of granting access to their database and compensated clinical advisors.

0341

DIGITAL HEALTH TECHNOLOGY TO SUPPORT AUTONOMOUS SLEEP MONITORING AND MANAGEMENT IN MULTI-DOMAIN OPERATIONAL (MDO) ENVIRONMENTS

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Introduction: Sleep and fatigue management strategies can substantially impact the Armed Forces' readiness and fitness. These strategies can be implemented with behavioral health personnel and Wi-Fi connectivity to support real-time assessment, monitoring, and intervention. However, these resources are not readily available in multi-domain operational (MDO) environments. An autonomous Wi-Fi-independent digital sleep and fatigue management tool (DSFMT) could offer a critical advantage in detecting, monitoring, and providing just-in-time sleep and fatigue recommendations for Soldiers and support unit performance. We describe how we adapted a validated sleep-focused clinical decision support platform into a DSFMT for use in MDO environments.
Methods: Semi-structured interviews were conducted with 6 Army Key Opinion Leaders (KOLs) to assess perceived utility of a DSFMT and identify key requirements. We also conducted a literature review to identify evidence-based sleep optimization and fatigue mitigation strategies in real or simulated military environments, or occupations with high sleep disruption. Directives for sleep and fatigue management from all branches of the U.S. Armed Forces were reviewed.
Results: KOLs were enthusiastic about the proposed DSFMT and emphasized three requirements: (1) brief and actionable content; (2) tap into Soldiers' competitive nature; (3) provide unit level metrics to the medic. Five sleep education topics (e.g., consequences of insufficient sleep) and eight evidence-based sleep self-optimization strategies (e.g., sleep banking) were identified and included in the digital content. The resulting DSFMT consists of a smartphone-based Soldier App that captures self-reported sleep and fatigue data and offers individualized feedback and self-management strategies, and a Medic App that displays aggregate unit-level sleep and fatigue status. The apps operate when connected to Wi-Fi and have capabilities for offline data collection and transfer via Bluetooth.
Conclusion: We created an initial prototype of an autonomous Wi-Fi-independent DSFMT that can be used in MDO environments and meets KOL requirements. 246 Soldiers have field tested this prototype. Findings from ongoing acceptability and feasibility analyses will inform the next iteration.
Support (If Any): This project is partially funded by MTEC-19-02-TeleSleep-001-2019-406. The opinions and assertions contained herein are those of the authors and do not necessarily reflect the views of the U.S. Army or the U.S. Department of Defense.

0342

USE OF A DIFFUSED FRAGRANCE BEFORE BED MAY CONTRIBUTE TO IMPROVED OBJECTIVE AND PERCEIVED SLEEP

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SleepScore Labs [1] Reckitts Ltd (Science Platform) [2]

Introduction: This study examined if a diffused fragrance used at home before bedtime would contribute to sleep improvement in a sample of healthy females. Existing evidence regarding the sleep-promoting properties of fragrances often has been anecdotal or based on clinical research, thereby limiting the generalizability and ecological validity of results.
Methods: 26 women with self-reported interest in air care to support healthy sleep participated in a 9-week field study. A within-subjects, counterbalanced intervention design was implemented, comparing 3 weeks of nightly product use to 3 weeks without using the product after a baseline period. Intervention consisted of the use of a fragrance diffuser and fragrance by Reckitt's Scientific Platform Fragrance Research for at least an hour at the participants' preferred settings in the room where they spent the most time before going to bed. Sleep was measured objectively with SleepScore Max every night. Self-report data were collected at bedtime, in the morning, and after each measurement period. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: Across all participants there were 835 nights of tracked sleep. Participants (100% female, age 21 to 55, average 36 years old) showed improvement in both objective and perceived sleep during the intervention. Participants got more deep sleep, spent a greater proportion of the night in deep sleep, and had an improved BodyScore, a measure of deep sleep (ps<.05). Additional objective improvements were related to sleep consistency: fewer awakenings during the night, less time awake during the night, and better sleep maintenance (ps<.05). Self-report results complemented the objective findings. Participants felt sleepier at bedtime, felt they woke up less often and spent less time awake after initially falling asleep, reported better sleep quality, and experienced better mood both at bedtime and in the morning (ps<.05). No significant negative impacts were seen on sleep in the objective and self-report measures.
Conclusion: Using the fragrance diffuser before bed may contribute to improvement of many aspects of sleep within this study population of females without underlying sleep conditions. Objectively improved sleep outcomes were supported by self-report, showing multifaceted benefits of the diffused fragrance on sleep.
Support (If Any): Reckitt

0343

IN-PERSON EXPERT PILLOW FITTING PROCESS IMPROVES SLEEP QUALITY AND DURATION

Holly Rus[1], Sharon Danoff-Burg[1], Morgan Weaver[1], Rodolfo Rodriguez[1], Larisa Gavrilova[1], Colin Burke[1], Kiara Carmon[1], Duvia Lara Ledesma[1], Elie Gottlieb[1]
SleepScore Labs [1]

Introduction: The myriad of anecdotal claims about the benefits of different pillow types may complicate consumers' ability to find a pillow that can support better sleep. Services that provide consumers with personalized recommendations may address this problem. This study examined the sleep of research participants using pillows selected during an in-store pillow fitting process compared to using their original pillows.
Methods: Healthy adults (71% female, ages 21-59) who reported interest in a new pillow participated in a 9-week field study using a pre-post intervention design. The intervention consisted of being guided through the Mattress Firm in-store pillow fitting process to be paired with a pillow that provided the best fit and support based on body type and sleeping position preferences. During the 4-week baseline period, participants used their regular pillow. Once they were fit for their new pillow, participants slept with that pillow for 5 weeks, including a 1-week adjustment period. Sleep was measured objectively using SleepScore Max every night and by daily and pre-post self-report. Multilevel regression and paired t-tests and were used to test for statistical significance.
Results: There were 722 nights of tracked sleep across participants (n=17). Objective sleep measurements showed nightly improvement in SleepScore, a measure of objective sleep quality (p=.003), longer time in bed (+13 minutes, p=.034),longer sleep duration (+16 minutes, p=.010), a lower proportion of the night awake after falling asleep (p=.009), and better sleep maintenance (p=.009). In addition, participants got more deep sleep (+5.6 minutes, p=.017) and showed improved BodyScore, a measure of deep sleep (p=.031). Self-reported measures showed improvements in pillow comfort and overall comfort in bed; perceived ability to sleep through the night; perceived reduction in number of awakenings and amount of time awake at night; better overall sleep quality; and feeling more well-rested in the morning when using the fitted pillows compared to baseline (all ps <.05).
Conclusion: Objective and self-reported sleep improved among healthy adults using a pillow selected by an expert, in-person pillow fitting process. The results suggest that a pillow fitting process can improve sleep by helping individuals find a pillow that provides a personalized fit and optimal comfort.
Support (If Any): Mattress Firm INC

0344

USE OF AN ADJUSTABLE BED BASE IMPROVES SLEEP QUALITY AND DURATION

Sharon Danoff-Burg[1], Holly Rus[1], Colin Burke[1], Morgan Weaver[1], Rodolfo Rodriguez[1], Kiara Carmon[1], Duvia Lara Ledesma[1], Elie Gottlieb[1]
SleepScore Labs [1]

Introduction: The positional adjustment of a bed can potentially contribute to better sleep and alleviation of discomfort associated with a variety of medical conditions. As most studies in this area have focused on inclined sleeping for therapeutic purposes, understanding the impact of postural change on improving sleep among healthy individuals requires further research. This study compared sleep in an inclined position on an adjustable bed base to participants' prior sleep on their original bed bases.
Methods: Healthy adults (61% female, ages 23-60) willing to sleep at an incline participated in an 8-week field study, using a pre-post intervention design. During the 4-week baseline period, participants used their regular bed base at home. During the 4-week intervention period, they used the Mattress Firm 600 Adjustable Base at home with head and/or feet raised (not flat). Sleep was measured objectively using SleepScore Max every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.

Results: There were over 1,100 nights of tracked sleep across 26 participants. Objective sleep measurements showed many nightly improvements during the intervention compared to baseline: increased time in bed (+21 minutes, p=.003), total sleep time (+21 minutes, p=.001), and REM (+5 minutes, p=.009); less WASO, both in duration (-3 minutes, p=.046) and proportion of the night (p=.015); fewer awakenings (p=.034); and better sleep maintenance (p=.014). Improvements also were observed in 3 objective sleep quality measures: SleepScore, BodyScore, and MindScore (ps<.05).Self-report measures revealed greater comfort and enjoyment when using the adjustable base, as well as perceived improvement in a variety of outcomes, including time to fall asleep and falling asleep within a preferred amount of time, ability to sleep through the night, sleep duration, sleep quality and satisfaction, and feeling more rested in the morning (ps<.05).
Conclusion: Objectively-measured sleep and self-reported sleep improved in duration and quality when using the adjustable base compared to healthy adults' original bed bases. Furthermore, qualitative and quantitative self-report results suggested that the intervention was perceived as a comfortable and enjoyable experience.
Support (If Any): Mattress Firm INC

0345

COMFORTER DESIGNED FOR WARM SLEEPERS IMPROVES OBJECTIVELY-MEASURED SLEEP FOR ADULTS IN MIDLIFE AND OLDER

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SleepScore Labs [1]

Introduction: Bedding can aid in maintaining a comfortable thermal state in the sleep environment. Research is needed to bring scientific rigor to document these benefits and their potential for promoting better sleep. This study examined effects of a comforter designed for warm sleepers used at home.
Methods: Healthy adults (96% female, ages 23-74) who reported sleeping hot, experiencing night sweats, or having hot flashes during the night participated in a 6-week field study, using a pre-post intervention design. Intervention consisted of using a comforter designed for warm sleepers, made of 300 thread count viscose from bamboo fiber with Tencel/polyester fill. During the 3-week baseline period, participants used their regular bedding. During the 3-week intervention period, they used the comforter without a top sheet to have direct contact with the comforter. Sleep was measured objectively using SleepScore Max every night and by daily and pre-post self-report. Multilevel regression and paired t-tests were used to test for statistical significance.
Results: There were over 1,000 nights of tracked sleep across all participants. In the full sample (n=31), self-reported sleep (e.g., perceived sleep quality, feeling well-rested) but not objectively-measured sleep showed improvements. Therefore, and given that this type of product may provide the most benefit for sleepers in midlife or older, additional analyses were conducted for the subgroup of participants who were 45 years old and above (n=15). Results indicated increased time in bed (+11 minutes, p=.017), total sleep time (+12 minutes, p=.010), and deep sleep (+6 minutes, p=.005) during the intervention compared to baseline. Improvements also were observed in SleepScore, a measure of overall sleep quality (p=.002), and BodyScore, a measure of deep sleep (p=.002).
Conclusion: Self-reported but not objectively-measured sleep improved among healthy adults using a comforter designed for warm sleepers. However, looking specifically at those aged 45 and older, objectively-measured time in bed, total sleep time, deep sleep, and overall sleep quality all increased significantly when using the comforter compared to baseline.
Support (If Any): Blue Ridge Home Fashions

0346

DIFFERENTIATION OF NATURALISTIC SLEEP IN CHRONIC INSOMNIA VS. HEALTHY CONTROLS USING A NON-CONTACT MEASUREMENT DEVICE

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Introduction: Individuals with insomnia report poor sleep quality and non-restorative sleep, and often exhibit irregular sleep patterns over time. First night effects and logistical challenges make it difficult to accurately measure these sleep characteristics in the laboratory. Also, sensitivity to sleep disruption from obtrusive devices confounds sleep measurements in people with insomnia in their naturalistic setting. Non-contact devices (NCDs) may address these issues and enable ecologically valid, longitudinal and unobtrusive characterization of sleep in individuals with insomnia. We present results from a NCD, previously validated against polysomnography, – SleepScore Max (SleepScore Labs) – assessing the sleep of individuals with chronic insomnia, compared to healthy sleeper controls, in their home setting.
Methods: A total of 112 individuals participated in an at-home sleep monitoring study including 83 with chronic insomnia (ages 19-65, 58 females) and 29 healthy sleeper controls (ages 19-54, 21 females). Enrollment criteria included being 18-65 years of age and, for the insomnia group, meeting International Classification of Sleep Disorders (3rd edition; ICSD-3) criteria for chronic insomnia with no other clinically relevant condition contributing to sleep disturbance. Participants used the NCD to record their sleep periods each night for 8 weeks. Sleep measurements were analyzed for group differences in both means (characterizing sleep overall) and within-subject standard deviations (characterizing night-to-night sleep variability), using mixed-effects regression controlling for systematic between-subject differences.
Results: On average, individuals with chronic insomnia exhibited increased total wake time, wake after sleep onset, and decreased sleep efficiency relative to healthy sleeper controls ($F>6.8$, $p<0.01$). Additionally, they demonstrated greater night-to-night variability in time in bed, total sleep time, sleep latency, total wake time, wakefulness after sleep onset, sleep interruptions, sleep efficiency, and light and deep sleep ($F>4.4$, $p<0.05$).
Conclusion: In our sample of individuals with chronic insomnia, a NCD naturalistically detected differences from healthy sleeper controls in multiple sleep parameters, both on average and in terms of night-to-night variability. Capturing night-to-night variability in the home setting adds an important dimension to our understanding of poor sleep and provides a more comprehensive, ecologically valid characterization of chronic insomnia as experienced in daily life.
Support (If Any): NIH grant KL2TR002317; research devices provided by SleepScore Labs

0347

SLEEP HEALTH EDUCATION AND A PERSONALIZED SMARTPHONE APPLICATION IMPROVE SLEEP AND PRODUCTIVITY AND REDUCE HEALTHCARE UTILIZATION AMONG EMPLOYEES: RESULTS OF A RANDOMIZED CLINICAL TRIAL

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Brigham & Women's Hospital [1] dayzz Live Well Ltd. [2]

Introduction: Sleep deficiency and undiagnosed or untreated sleep disorders are pervasive among employed adults, yet are often ignored in the context of workplace health promotion. Smartphone applications (apps) are a promising, scalable approach to improving sleep among employees. We evaluated an online sleep education program followed by access to a mobile sleep training program, the dayzz app, that promotes healthy sleep, sleep disorders awareness and intervention.

Methods: In a sample of daytime employees affiliated with a large healthcare organization, we evaluated the intervention (sleep education at baseline plus access to the personalized app for up to 9 months) in a parallel group, randomized controlled trial. Participants were randomly assigned to either the experimental condition that received the intervention in months 1 through 9 or the control group that was assigned to receive the intervention in month 10. In a prespecified data analysis plan, the experimental and control groups were compared in months 1 through 9; no outcome data was collected thereafter. We collected data on employee sleep, workplace outcomes, and healthcare utilization, monthly throughout the study.

Results: The final cohort was comprised of 794 participants assigned to the experimental and 561 to the control condition. Those assigned to the experimental condition were more likely to maintain consistent sleep schedules (OR:1.40;95%CI:1.12-1.75) and less likely to experience fatigue and sleepiness (OR:1.30;95%CI:1.08-1.57). At the 9-month follow-up assessment, the experimental group reported significantly longer sleep duration than the control group on work (experimental: 7.20hrs; control: 6.99hrs, p=0.01) and free (experimental: 8.26hrs; control: 8.04hrs, p=0.03) nights. The odds of poor sleep quality at follow-up were lower in the experimental condition (OR:0.79,95%CI:0.63-0.98) as compared to control. Mean total dollars lost due to presenteeism was less among experimental compared to control participants (p=0.0001), corresponding to an average of $274 saved per person per month. Finally, participants in the experimental group were less likely to report mental health visits (p=0.01) and had a lower rate of overall healthcare utilization (p=0.03), compared to the control group.

Conclusion: Results from this randomized clinical trial demonstrate that a digital workplace sleep wellness program can be beneficial to both employees and employers, by improving employee sleep and fatigue, increasing work productivity, and reducing direct healthcare costs.

Support (If Any): This study was funded by dayzz Live Well Ltd.

0348

SLEEP STAGING USING END-TO-END DEEP LEARNING MODEL BASED ON NOCTURNAL SOUND FOR SMARTPHONES

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Introduction: Convenient sleep tracking with mobile devices such as smartphones is desirable for people who want to easily objectify their sleep. The objective of this study was to introduce a deep learning model for sound-based sleep staging using audio data recorded with smartphones during sleep.

Methods: Two different audio datasets were used. One (N = 1,154) was extracted from polysomnography (PSG) data and the other (N = 327) was recorded using a smartphone during PSG from independent subjects. The performance of sound-based sleep staging would always depend on the quality of the audio. In practical conditions (non-contact and smartphone microphones), breathing and body movement sounds during night are so weak that the energy of such signals is sometimes smaller than that of ambient noise. The audio was converted into Mel spectrogram to detect latent temporal frequency patterns of breathing and body movement sound from ambient noise. The proposed neural network model consisted of two sub-models. The first sub-model extracted features from each 30-second epoch Mel spectrogram and the second one classified sleep stages through inter-epoch analysis of extracted features.

Results: Our model achieved 70 % epoch-by-epoch agreement for 4-class (wake, light, deep, rapid eye movement) stage classification and robust performance across various signal-to-noise conditions. More precisely, the model was correct in 77% of wake, 73% of light, 46% of deep, and 66% of REM. The model performance was not considerably affected by existence of sleep apnea but degradation observed with severe periodic limb movement. External validation with smartphone dataset also showed 68 % epoch-by-epoch agreement. Compared with some commercially available sleep trackers such as Fitbit Alta HR (0.6325 in mean per-class sensitivity) and SleepScore Max (0.565 in mean per-class sensitivity), our model showed superior performance in both PSG audio (0.655 in mean per-class sensitivity) and smartphone audio (0.6525 in mean per-class sensitivity).

Conclusion: To the best of our knowledge, this is the first end (Mel spectrogram-based feature extraction)-to-end (sleep staging) deep learning model that can work with audio data in practical conditions. Our proposed deep learning model of sound-based sleep staging has potential to be integrated in smartphone application for reliable at-home sleep tracking.

Support (If Any):

0349

ROBUST INTER-BEAT INTERVAL ESTIMATION ALGORITHM USING CLUSTERING METHOD

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HoneyNaps [1]

Introduction: The heart rate is a basic indicator of the state of the human body and therefore it is important to measure the heart rate continuously, reliably, and accurately. However, it is difficult to measure the heart rate in various environments due to the limitations of Contact sensors, such as ECG. Therefore, heart rate measurement using non-contact sensors such as PVDF, Radar, and cameras has been widely studied. Among these non-contact sensors to measure the heart rate, the PVDF sensor, installed under a bed or chair, can measure the heart rate from the J-peak of Ballistocardiograph (BCG). However, it is challenging to accurately measure the heart rate due to noise-induced by the external environment. To overcome these challenges in this study, we have proposed a new algorithm for accurate heart rate measurement using PVDF sensor. The proposed algorithm includes estimators and clustering techniques to estimate the beat-to-beat of BCG signals.
Methods: In order to continuously estimate inter-beat interval, basic, auto-correlation, average magnitude difference function, maximum amplitude pairs, and a Bayesian approach are used to obtain basic information to calculate inter-beat interval. Auto-correlation is an estimator that estimates heart rate intervals by calculating for all discrete lags. The average magnitude difference function (AMDF), which is often used for pitch tracking, also calculates for discrete lags like auto-correlation. If the waveforms of BCG are similar, the calculated value with AMDF is small. Therefore, the reciprocal of the ADMF output is used to take the larger value for the most likely interval. This is a complementary relationship from auto-correlation because the noise characteristics are different. Maximum amplitude pairs is an estimator used for indirect peak detectors with the amplitude information of the signal. The estimated IBI was determined by combining the estimation results of three estimators with a Bayesian approach. After the estimated IBI was obtained, continuously estimated inter-beat intervals were clustered into locally similar values. The inter-beat interval values were determined by voting for the most estimated interval value in the clustered sets.All inter-beat intervals estimated by the Bayesian method have their own probability density function and the confidence value was calculated using the difference between the largest peak and the second largest peak of the probability density function. By excluding inter-beat intervals with low confidence values, the accuracy of the estimation was improved. After, the final continuous inter-beat intervals were calculated by performing the ectopic beats removal algorithm and interpolation.
Results: To evaluate the performance, BCG data from PVDF sensor was simultaneously measured with PSG. The PSG datasets consisted of three male patients with moderate sleep apnea, a patient with snoring problems, and a normal person. Because of the difference in timing between the peak signal of ECG and that of BCG, less than 1 HR count was allowed when the inter-beat intervals were converted to HR. When the 21-hour inter-beat intervals were compared, the difference in HR was less than 1 in 91.4%. The rest 8.6% had a difference of 1 HR or more, and it was confirmed that 6.9% of them were caused by movement, and the remaining 1.7% were caused by a temporary failure of the sensor.
Conclusion: The proposed algorithm showed better coverage by 18.71% compared to the coverage of 72.69% from the previous study. It was confirmed that the proposed algorithm provides a more accurate heart rate than previous studies, and the measured inter-beat intervals will be used to estimate, not only the heart rate but also the sleep stage in the future.
Support (If Any):

0350

AT-HOME SAMPLE COLLECTION FOR MEASUREMENT OF DIURNAL RHYTHMS OF URINARY CORTISOL AND MELATONIN

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Introduction: Sleep- and stress-related hormones (e.g., melatonin, cortisol) can be measured from dried urine samples collected at-home and sent for laboratory testing. These measures may be used to identify patterns of circadian alignment, peak nocturnal melatonin levels as well as a cortisol awakening response. The purpose of this analysis was to describe diurnal patterns and reference ranges from a 4-timepoint serial assessment of urinary cortisol and melatonin in a large cohort of at-home self collected samples.
Methods: This retrospective analysis evaluated data from 3,966 individuals who used an at-home Sleep and Stress Test (Everlywell, Inc.) between September 28, 2017 and July 14, 2021. Individuals provided four urine samples according to habitual sleep patterns: upon waking (T1), two hours after waking (T2), prior to the evening meal (T3), and at bedtime (T4). Melatonin and cortisol distributions were normalized to creatinine and log transformed to approximate normal distributions to define respective reference ranges (two standard deviations above and below the log transformed mean) and reverted to original units for reporting.
Results: 71% (n=2,832) of users were female and mean age was 42.8 (sd=12.0) years. Mean (sd) urinary values were as follows: Cortisol: T1, 29.3 (37.9) ug/g Cr; T2, 47.2 (49.8); T3, 14.9 (36.3); T4. 8.38 (26.9). Melatonin: T1, 745 (3208) ug/g Cr; T2, 169 (1189); T3, 45 (620); T4, 155 (1701). For cortisol, only 4-5% of samples fell outside the defined reference ranges across time points. Melatonin was more variable with 23% and 15% falling outside the reference range at time points T3 and T4, respectively. A majority of individuals' peak cortisol occurred at T2 (67.4%), and melatonin at T1 (85.2%).
Conclusion: This analysis demonstrates measurable physiological diurnal patterns for cortisol and melatonin using at-home self-collection for dried urine tests. This provides evidence that at-home sample collection kits using dried urine spots are a viable tool for assessing diurnal patterns of sleep and stress. Future controlled studies are needed to evaluate the utility in identifying abnormal patterns associated with shiftwork or sleep disorders.
Support (If Any):

0351

TOWARDS INTERPRETING CONSUMER SLEEP DATA: DISTRIBUTIONS OF SLEEP SCORES

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Introduction: With the rise of sleep measurement technology becoming widely available to the public, it has become apparent that traditional sleep metrics might not be best suited for a lay audience. Most consumer industry has started including a metric that would capture sleep quality, although the exact calculations of these scores remain proprietary. These novel outcome metrics require a set of reference values in order to become interpretable. Here, we provide reference values for the parameters SleepScore, BodyScore and MindScore as included in the SleepScore Labs non-contact radiofrequency sleep measurement devices.

Methods: SleepScore is a sleep quality metric that includes objectively measured total sleep time (TST), sleep onset latency (SOL) and sleep stage durations, normalized for aged and sex, using reference values of Ohayon et al (2004), ranging from 0-100. BodyScore reflects the normalized amount of deep sleep, whereas MindScore reflects the normalized amount of REM, ranging from 0-100. Data from 40,862 S+ and Max users between 18 and 98 years old were used to calculate distribution statistics.

Results: The average age of users was 53±15 years old. Individual scores of SleepScore, BodyScore and MindScore ranged from 0-100 and their distribution was left-skewed. SleepScore averaged 81±11, with the first quartile (Q1) at 73, median at 81 and third quartile (Q3) at 88, and a mode of 89. BodyScore averaged 81±10 with Q1 at 73, median at 80 and Q3 at 86, and a mode of 84. MindScore averaged 78±10 with Q1 at 72, median at 79 and Q3 at 84, and a mode of 83. Despite being algorithmically normalized for age, average SleepScore increased from 70 to 88 across the age range, BodyScore increased from 71 to 89, and MindScore increased from 75 to 81.

Conclusion: SleepScores, BodyScores and MindScores presented to the average consumer will mostly show them a number in the low 70 to high 80 range. This distribution was intentionally created as being left-skewed to prevent triggering anxiety that may contribute to orthosomnia. Despite the intent to create a normalized score that would not be impacted by age, the data show an increase of scores by age.

Support (If Any):

0352

COMPLIANCE TO SLEEP RECOMMENDATIONS: A BIG DATA ANALYSIS IN USERS OF A CONSUMER SLEEP TECHNOLOGY

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SleepScore Labs [1] Department of Neurology, University of Washington School of Medicine [2]

Introduction: The National Sleep Foundation has published sleep time duration (Hirshkowitz et al., 2015) and sleep quality (Ohayon et al., 2017) recommendations across the lifespan based on expert panel input. These recommendations offer sleep guidance to millions of individuals. Many individuals are using commercially available sleep tracking devices to measure their sleep. We analyzed the data of two non-contact radiofrequency sleep measurement devices (SleepScore Max (SleepScore Labs) and S+ (ResMed), both validated against PSG) to determine how well the users of these devices are sleeping.

Methods: Total Sleep Time (TST), sleep latency (SL) and sleep efficiency (SE) data of 40,892 users between 15 and 98 years old were used in this analysis, covering 5,513,369 nights of data, and averages per user were calculated. In alignment with the aforementioned papers, the data were split in 3 age groups; Young Adults (18-25), Adults (26-64) and Older Adults (>=65), and the criteria as listed were used, classifying the sleep indicators in 3 bins; Appropriate/Recommended, Uncertain/ May be Recommended, and Inappropriate/Not Recommended. Proportion of users meeting the Appropriate/Recommended, Uncertain/May be Appropriate and Inappropriate/Unlikely were calculated for each age group.

Results: In the Young Adults group most users had an Appropriate SL (SL<= 30 min; 79.7 %), an Appropriate SE (SE>=85%; 53.6 %), but only 30.0% had a Recommended TST (7 to 9 h.). In the Adult group, larger proportions of users met on average the Appropriate measures for SL (SL<= 30 min; 84.8%), SE (SE>= 85%; 58.4%), but only 27.3% slept on average the Recommended hours (TST 7 to 9 h). In the Older Adults group, the average SL and SE was considered Appropriate for most elderly users (SL<30min; 84.3: SE>=85%; 59.6%), but only 28.2% slept the Recommended amount (TST 7 to 8 h).

Conclusion: 30% or less users slept on average the recommended amount, whereas slightly over half of the users showed the recommended sleep efficiency, and at least 79.7% fell on average asleep within 30 minutes. These results show that sleep improvement campaigns need to focus on extending the sleep duration and sleep hygiene to improve SE.

Support (If Any):

0353

ESTIMATED SLEEP-WAKE PATTERNS OBTAINED FROM A LARGE U.S. SAMPLE BY HOME-BASED UNDER-MATTRESS MONITORING DEVICES

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Introduction: Sharing the bed with a partner is common among adults and is likely to impact sleep in multiple ways. However, polysomnograms are performed without a bed partner and objective data on co-sleeping couples are extremely rare. This study aimed to investigate the effects of a bed partner's presence on objective sleep parameters.
Methods: Sleep data from 5190 users (43% female, 14% unspecified gender, mean age 47) and their bed partners were collected through a commercially-available home sleep monitoring device (Sleeptracker-AI Monitor, Fullpower Technologies, California, USA). The device passively monitors sleep using piezo-electric sensors that register the forces exerted through the mattress. Subjects with at least 10 weekday sleep recordings with a bed partner present for at least an hour, and at least 10 weekday sleep recordings without a bed partner present at all during the period from 08/2021 to 11/2021 were included. Estimated total sleep time (TST), wake after sleep onset (WASO), sleep efficiency (SE), and light, deep, and REM sleep were analyzed comparing between the nights with and without a bed partner.
Results: The mean (standard deviation) across subject averages of estimated TST (min), WASO (min), SE (%), and light, deep and REM sleep (min) with a bed partner were: TST 417.2(44.5), WASO 47.2(24.9), SE 89.5(6.4), light sleep 255.4(34.2), deep sleep 56.7(11.9) and REM sleep 105.2(17.5) and without a bed partner were: TST 414.7(49.2)-*, WASO 40.7(20.5)-*, SE 90.7(5.8)+*, light sleep 243.6(38.0)-*, deep sleep 62.9(12.9)+* and REM sleep 108.2(19.0)+*; a (+) indicates an increase and (-) a decrease in the sleep parameter between nights with and without a bed partner, and (*) signifies $p < 0.05$ by paired t-test.
Conclusion: When the bed partner is absent, an individual's sleep architecture shows on average a higher sleep efficiency, with less awake time but also less total sleep; more minutes spent in deep and REM sleep, and less in light sleep. This suggests a less interrupted night, perhaps due to fewer disruptions from the partner, where the individual has enough continuity in his/her sleep to transition to deeper stages. Further work will add the effect of a bedpartner in AHI and snoring.
Support (If Any):

0354

THE FEASIBILITY OF RESEARCH USING IN-HOME POLYSOMNOGRAPHY FOR 20 NIGHTS ACROSS 25 DAYS

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Introduction: Several studies have studied sleep with polysomnography (PSG) in the laboratory across multiple days but there is a paucity of research using lab-quality PSG in the home where the sleep environment is much different. In this study, we assessed the feasibility of conducting research while recording PSG in the home across multiple nights under real-world conditions.
Methods: Twenty-one participants volunteered to participate in the study and wore in-home PSG using the Cerebra Sleep System which used gel electrodes to record EEG, EOG, EMG, ECG, and a chest effort belt for 20 nights across 25 days. Participants completed baseline questionnaires (pre – and post-study), daily activities, sleep disturbances, and any skin sensitivities via online morning and evening questionnaires.
Results: Eighteen participants (age 40.2±10.5; 9 females) completed at least 18 nights of recordings and were included in the final analysis. PSG was recorded for 375 nights with an average of 20.1 nights (±3.5) recorded per participant across 24.3 days (± 2.9). Three participants withdrew from the study due to a change in work schedule (3 nights), skin sensitivity issues (5 nights), and lack of motivation (10 nights). There were 100% completion rates for questionnaires at baseline, 98% completion rates for morning questionnaires, and 93% completion rates for evening questionnaires. Participants reported skin sensitivities on 36.4% of the nights but were typically not reported again at the evening session. When there was a complaint, most of the irritations were minor with 27.1% having residual stickiness from the electrodes, 26.1% redness, and 17.5% imprints. For more of the major complaints, they were less common with 5% reporting soreness or irritation and 3.3% swelling.
Conclusion: We found that data collection from electronic questionnaires was good. Skin irritations were reported about a third of the time but typically went away across the day. These results highlight the feasibility of doing research using in-home PSG for multiple nights and the utility of collecting electronic questionnaire data for in-home research.
Support (If Any):

0355

WHICH HOSPITALS ARE THE QUIETEST AT NIGHT? IT'S NOT THE US NEWS TOP 20 INSTITUTIONS

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Introduction: The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey distributed by The Center for Medicare and Medicaid (CMS) services measures patient perceptions of hospital experience and impacts annual CMS reimbursement. This study focuses on the "Quiet at Night" variable, to identify the top box institutions and identify the key characteristics that enable their success.
Methods: Using the Linear Mean Scores and the Star Ratings' inherent clustering algorithm and RStudio™, the top box scorers amongst the 5 Star Rated hospitals were isolated and grouped together as CMS Top Rated "Quiet at Night" Hospitals. These Star Ratings and the key characteristics of these institutions were compiled and compared to the US News Honor Roll Hospitals (2019-2020) to ascertain trends and determine the predictive value of the HCAHPS "Quiet at Night"' hospitals' characteristics.
Results: The mean Star Rating for CMS Top Rated "Quiet at Night" Hospitals was 5.00 compared to that of the US News Honor Roll Hospitals which was 2.67. An unpaired t-test of this data found a two-tailed P value of less than 0.0001, which is considered statistically significant under all conventional significance levels (Table 1). In comparing the key characteristics for these two lists documented by the American Hospital Directory a stark difference emerged between these groups with those that scored well on the "Quiet at Night" question identifying as predominantly privately controlled, specialized, surgical facilities with very few total hospital beds.
Conclusion: This study was the first of its kind to critically analyze hospitals that score well on the CMS "Quiet at Night" and compare them to the US News Honor Roll Best Hospitals. With the knowledge that these scores impact CMS reimbursement, it is important to determine the cultural and organizational shifts that enable hospitals to be top performers on the "Quiet at Night" metric. A greater understanding of how top CMS hospitals so efficiently provide care in a sleep protective way may help inform larger institutions about Best Practices.
Support (If Any):

0356

DOES UNCONSCIOUS SOCIOECONOMIC BIAS INFLUENCE TELE-EVALUATION OF OBSTRUCTIVE SLEEP APNEA? A TELE-EQUITY EXPLORATORY ANALYSIS

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Introduction: Telemedicine, once of limited scope, has become common and widespread due to the present and ongoing SARS-CoV-2 pandemic. Center to home delivery, the most common model, allows for convenient and efficient care. Concurrent with this groundshift, there is increasing attention to disparities in medical services, and how these disparities may impact patient outcomes. Telemedicine could be used to help bridge barriers to timely quality care, however, patient access and longstanding institutional biases may limit the potential. Healthcare providers must actively develop systems to ensure that telemedicine is optimized for people across the income spectrum. This exploratory analysis examined how economic disparities in patients being evaluated for obstructive sleep apnea may be associated with providers' clinical impressions. The objective was to study the inter-method reliability of pre-test probability of obstructive sleep apnea assessed via telemedicine and in-person evaluations, and to compare that reliability between income classes.
Methods: This is a secondary analysis of a pre-pandemic interrater reliability study, conducted between March 2017 and January 2019. Our researchers completed a randomized, blinded study comparing the pre-test probability of obstructive sleep apnea between an in-person physician and a separate physician seeing the same patient via televideo conferencing. Patients referred to the University

of Rochester (UR) Sleep Center were eligible for the study. Women and men 30-70 years old were invited to participate. The patients were not necessarily referred to the center for evaluation of sleep disordered breathing. Patients with dementia, hearing or visual loss, severe psychiatric or developmental illness, or not fluent in English were excluded. Patients had adequate computer literacy, access to high speed internet, and a computing device with appropriate video camera and microphone.The primary objective of the original study was to assess the interrater reliability between the in-person and telemedicine raters for pre-test probability of sleep apnea (high, moderate, or low). Providers used clinical judgement from the history and examination to determine pre-test probabilityFor this present analysis, we assessed the inter-method reliability separately for strata defined by reported annual income level: low income (< $50,000), middle income ($50,000-$100,000), and high income (> $100,000). Reliability was quantified for each stratum using weighted kappa statistics given the ordinal nature of the outcome variable, pre-test probability of obstructive sleep apnea (high, moderate, or low). Weighted kappa statistics were compared between the income strata (high vs. middle, high vs. low, middle vs. low). The operant statistic assumed an approximate standard normal distribution under the null hypothesis of equal kappa values in the two income strata. The Bonferroni method was used to adjust the p-values for the three pairwise comparisons performed among the three income strata.

Results: Data from 53 patients were avaiable for this analysis. 11 of these patients were in the low income group, 22 in the middle income, and 16 were in the high income group. 9 patients did not include their income bracket, and were not included in the analysis. Inter-method reliabilities, assessed using weighted kappa, were 0.83 (low income), 0.24 (middle income), and 0.66 (high income). When comparing between the strata, the kappa statistics were significantly different (p=0.005) between the low and moderate income groups. There was a trend between the high and moderate income groups that did not meet statistical significance (p=0.07).

Conclusion: The intermethod reliability was substantial in the low income stratum, moderate in the high income stratum, and slight in the middle income group based on the kappa statistic. There was a significant difference in the reliability values of telemedicine versus in-person assessments between the low and middle income brackets, and there was a trend between the high and moderate groups. Since the raters were unaware of the patients' income levels, this association might suggest possible unconscious bias in evaluating for OSA. It may also suggest that beyond access to telemedicine technology, the quality of the care may also be influenced by socioeconomic factors. With telemedicine in its early stages, it is important to develop this technology that will minimize biases that could result from patients' economic fortunes.

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0357

INTERDISCIPLINARY TRAINING IN PEDIATRIC SLEEP

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Introduction: Sleep is a critical domain of child functioning. However, clinical psychology programs lack formal sleep education while behavioral sleep instruction is deficient in sleep and pulmonary fellowships. Cross-disciplinary training in pediatric sleep is ideal. This study examined medical and psychology trainee satisfaction with two interdisciplinary experiences: a 1-2 semester clinical rotation for medical fellows and psychology doctoral students and a concentrated annual elective for medical students. The rotation includes 1-2 half-day clinics per week wherein medical sleep fellows and behavioral sleep medicine trainees conduct a sleep interview together and ask specific questions within their discipline. With an attending psychologist and physician, they discuss case conceptualization, differential diagnoses, and possible interventions. The team reviews pertinent findings and collaboratively provides recommendations to the patient. Trainees also participate in weekly didactics presented by psychologists and physicians.The second interdisciplinary training experience, Frontiers, is designed to impact physician learners earlier in their careers. Sleep physicians and psychologists teach an annual week-long sleep elective for medical students.

Methods: Evaluations from fellows, psychology trainees, and medical students from the most recent 3 years were analyzed to determine trainee satisfaction with the interdisciplinary rotation and the medical student course.

Results: Results of sleep fellow evaluations rated the program as having effective teachers`X=4.67 (0.62) and high educational value `X=4.6 (0.83) on a 5-point Likert scale with 5 being the highest. Similarly, psychology trainees rated the overall rotation experience over the past 3 years on a 4-point Likert scale with 4 being the highest as`X=3.74 (0.43).Medical students who took the Frontiers course also rated the training highly on a 4-point Likert scale with 4 being the highest:`X=3.79 (0.43) in 2021,`X=3.76 (0.75) in 2019, and,`X= 3.73 (0.47) in 2018. The course was not offered in 2020 due to the pandemic.

Conclusion: Comprehensive pediatric sleep education and training (both clinical and didactic) is feasible within a single interdisciplinary rotation provided simultaneously to both psychology and medical trainees with high trainee satisfaction. Sleep-related in vivo training and didactics are relevant to physician and psychology training programs and prepare trainees for future work in interdisciplinary care.

Support (If Any):

0358

DEFINING EXISTING PRACTICES TO SUPPORT THE SLEEP OF HOSPITALIZED PATIENTS: A MIXED-METHODS STUDY OF TOP-RANKED HOSPITALS

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Introduction: While sleep is critical for health, the hospital is not conducive to patient sleep and few efforts have been made to improve. The current practices to promote hospitalized inpatient sleep at highly-ranked hospitals are unknown.

Methods: A mixed-methods study of Hospital Medicine Section Chiefs at the 2020 US News and World Report Honor Roll pediatric and adult hospitals was conducted to understand the current practices and attitudes towards inpatient sleep between June and August 2021. An anonymous, quantitative survey was disseminated to quantify current practices and satisfaction with sleep-friendly institutional efforts. Survey participants were invited to share their institutions' progress and potential ways to further improve inpatient sleep during structured, qualitative interviews.

Results: Pediatric (n=10) and adult (n=20) section chiefs were queried. Survey response rate was 77% (n=23/30; pediatric n=8/10; adult n=15/20). While 96% (n=22) of hospitalist leaders rated sleep as important, only 43% (n=10) were satisfied with their institution's efforts to improve patient sleep. Although 91% (n=21) of hospitalist leaders rated sleep equity as important, one institution (4%) had practices in place to address the issue. Less than half (n=11) of institutions reported having sleep-friendly practices. Among these institutions, the most common practices included: reducing overnight vital sign monitoring (91%, n=10), decreasing ambient light in the wards (91%, n=10), adjusting lab and medication schedules (73%, n=8), and implementing quiet hours (64%, n=7). Twenty-seven percent of hospitalist leaders (n=8/30; pediatric interviews=3/10; adult interviews=5/20) participated in interviews. Themes included: the importance of having a sleep-friendly culture, environmental changes, modified hospital practices, and external incentives to improve patient sleep.
Conclusion: Hospitalists recognize the importance of improving patient sleep, but few institutions have sleep-friendly practices in place. Most institutions have no sleep health equity practices in place in their hospital. Building sleep-friendly hospital cultures and establishing best practices should be a priority for clinicians.
Support (If Any): The authors thank the Society of Hospital Medicine and the Pritzker School of Medicine for funding support.

0359

CLINICAL PERFORMANCE QUALITY OF A PRECISION ORAL APPLIANCE MADE FROM NOVEL MEDICAL GRADE CLASS VI MATERIAL

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ProSomnus Sleep Technologies [1] ProSomnus SleepTechnolgies [2]

Introduction: Oral appliance therapy device quality is an important factor for successful, efficient treatment of Obstructive Sleep Apnea. Poor device quality, defined in this investigation as the remake rate, is costly. A previous investigation reports that 13% of oral appliance therapy devices required remakes, each costing an estimated $300 in lost productivity, fees for remakes, and three weeks of lost therapy. Other investigations associate poor quality with even higher costs and an increased propensity for the patient to discontinue treatment.
Methods: In this retrospective study design, quality data for 34,261 consecutively manufactured oral appliance therapy devices made from a novel medical grade class VI material was collected. Quality data was analyzed in total, and with 30-day and 60-day lag periods. The purpose of the lag periods was to account for the time between manufacture and delivery.
Results: Total remake rates were 1.2% (416/34,261). Total remake rates with a 30-day lag period were 1.3% (416/30,946). Total remakes with a 60-day lag period were 1.5% (416/26,964).
Conclusion: The clinical performance quality for a new precision oral appliance made from a novel medical grade class VI material is encouraging. Remake rates were between 1.2% and 1.5% depending on the lag period, which is directionally favorable in comparison with previously reported remake data.
Support (If Any): Data provided by ProSomnus Sleep Technologies.

0360

PAP ADHERENCE, FOLLOW-UP, AND TELEHEALTH DURING THE COVID-19 PANDEMIC

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Introduction: Positive airway pressure (PAP) is the gold standard therapy for OSA. However, patient follow-up and adherence to PAP therapy remains variable. With the onset of the COVID-19 pandemic, many sleep centers shifted towards telemedicine. In order to evaluate the impact of telehealth, we assessed the rates of follow-up and PAP adherence among patients newly diagnosed with OSA prior to and after the onset of the COVID-19 pandemic.
Methods: Patients aged 18-75 years enrolled in our military sleep center who met eligibility criteria were divided into a pre-pandemic group and a pandemic group. For the pre-pandemic group, initial and follow-up clinic appointments occurred via face-to-face encounters. For the pandemic group, these clinic appointments occurred via telephone encounters. PAP follow-up was defined as a clinic appointment occurring within 6 months of the initial OSA diagnosis and the onset of PAP therapy. Adequate PAP adherence was defined as usage of the device ≥ 4 hours per night on ≥ 70% of nights during a consecutive 30-day period. Differences among the two groups regarding PAP follow-up, PAP adherence, and demographic data were analyzed.
Results: Eligible patients (n=234) were divided into a pre-pandemic group (n=117) and a pandemic group (n=117). Demographic data for the pre-pandemic group vs. pandemic group included the following: mean age 42.2 vs. 40.3 years; 78.6% vs. 88.0% male; 60.7% vs. 76.9% active duty military, mean BMI 30.1 vs. 30.1; mean AHI 28.5/hr vs. 27.7/hr; mean Epworth Sleepiness Scale score 11.7 vs. 12.0; mean Insomnia Severity Index 16.9 vs. 16.8. The rates of PAP follow-up were 59.0% (pre-pandemic group) vs. 41.0% (pandemic group). The rates of adequate PAP adherence were 34.8% (pre-pandemic group) vs. 25.0% (pandemic group).
Conclusion: There were higher rates of PAP follow-up and PAP adherence among patients seen via face-to-face encounters occurring prior to the onset of the COVID-19 pandemic. While utilization of telehealth in our center did not result in improved outcomes, there may still be utility in offering telehealth to the sleep patient population. Additional studies are needed to identify effective interventions that can be implemented to improve rates of PAP follow-up and PAP adherence.
Support (If Any): There were higher rates of PAP follow-up and PAP adherence among patients seen via face-to-face encounters occurring prior to the onset of the COVID-19 pandemic. While utilization of telehealth in our center did not result in improved outcomes, there may still be utility in offering telehealth to the sleep patient population. Additional studies are needed to identify effective interventions that can be implemented to improve rates of PAP follow-up and PAP adherence.

0361

PENNPALS: AN INNOVATIVE, BIDIRECTIONAL TEXT MESSAGING SYSTEM USING PAP USAGE DATA TO INCREASE PATIENT ADHERENCE WITH PAP THERAPY

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Introduction: Cloud-based systems that collect PAP data provide patients and providers with near real-time usage information, but a system that identifies/intervenes with patients at risk of PAP non-adherence has not been available to date. The Penn PAP Automated Learning System (PennPALS) is an automated, bidirectional text messaging system that uses PAP data to initiate text messaging conversations to patients in a timely manner.
Methods: PennPALS was created using Way to Health, an evidence-based patient engagement platform, to leverage PAP data, such as daily average hours of use and time spent with a large mask leak, to identify and initiate automated text messages to help patients troubleshoot issues. Depending on their responses, patients were given a pre-defined recommendation via text or escalated to a

clinical provider contacting them via phone-call. Two 30-day pilots were conducted, which collectively enrolled 33 patients who were prescribed PAP for the first time.
Results: Most patients were White, Non-Hispanic (54.8%, n=17), males (64.5%, n=20), with a mean age of 52 years. Two patients did not receive a PAP machine by the end of the pilot. PennPALS engaged patients via text message 115 times. Of the 31 patients who started PAP, 7 (22.6%) were adherent from the start of enrollment and only received positive enforcement text messaging. Across the 24 (77.4%) patients that experienced issues, there were 58 text message conversations, which resulted in 32 clinical escalations. Twenty-one (67.7%) patients triggered text messaging interventions for using PAP for < 4 hours/night on average over a 7-day period or experiencing a large mask leak, n=10 (32.3%) and n=11 (35.5%) respectively. At 30-days, 17 (70.8%) of the 24 patients were adherent (i.e. using their PAP at least 4 hours/night on average over the last 7-days). Patient feedback was generally favorable with a Net promoter score (likelihood to recommend) of 68.4 (n=19).
Conclusion: PennPALS effectively identified/intervened with patients at risk of non-adherence to PAP therapy, and the bidirectional text messaging system helped patients become adherent in the first 30 days of treatment. Further testing and longer-term monitoring is needed to examine the effectiveness of PennPALS on long-term PAP adherence.
Support (If Any):

0362

THE COST OF IN-PERSON VERSUS TELEHEALTH PAP INITIATION FOR PATIENTS WITH SLEEP APNEA

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Introduction: Telehealth has been widely integrated into healthcare systems during the COVID-19 pandemic and is likely to remain a part of routine clinical care. At the VA Greater Los Angeles Healthcare System (VAGLAHS), positive airway pressure (PAP) set-up visits transitioned from in person to telehealth for newly diagnosed sleep apnea patients during the pandemic. The telehealth pathway included mailing of PAP machines to patients with follow-up video/phone education by respiratory therapists (RTs). As part of a larger study examining the clinical outcomes resulting from telehealth versus in-person PAP initiation, we performed a cost analysis of these two treatment pathways within VAGLAHS.
Methods: We examined the total variable direct cost of telehealth versus in-person PAP initiation for patients newly diagnosed with sleep apnea at VAGLAHS between March and October 2021 (n = 2,662 PAP set-ups) using a bottom-up analysis. There was an average of 16 PAP set-ups per day with 11 set-ups (68.7%) via telehealth and 5 set-ups (31.3%) in person.
Results: The total variable direct cost of telehealth PAP initiation was $98.87 per patient. The total variable direct cost of in-person PAP initiation was $50.58 per patient. For telehealth, there was an additional cost of mailing the PAP machine and 31.2% more RT time spent on educating patients compared to the in-person pathway. After the initial PAP set-up visit, a larger subset of patients required additional troubleshooting help from RTs about proper PAP use after telehealth compared to in-person set-ups (5% versus 1%).
Conclusion: The telehealth PAP initiation pathway was nearly two times the cost of in-person PAP initiation. This resulted from the additional cost of mailing the PAP machine, more RT time spent on education, and a greater need for troubleshooting after the visit. Telehealth visits may need to be supplemented by written educational materials or web-based resources to reduce the need for additional support after the initial visit.
Support (If Any): OCC study funding, VAGLAHS GRECC

0363

PERCEPTIONS OF THE NEED FOR PERIOPERATIVE OSA EDUCATION: AN INTERDISCIPLINARY AND MULTI-INSTITUTIONAL SURVEY

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Introduction: Advanced Practice Providers (APPs; Advanced practice registered nurses, physician assistants) and physicians-in-training (residents, fellows) receive inadequate education on obstructive sleep apnea (OSA)/perioperative OSA risks. However, they are front-line providers assessing these patients. Failure to mitigate this risk has led to significant postoperative morbidity/mortality. We assessed these providers' perceptions to OSA/perioperative OSA training.
Methods: Surveys were sent to three provider roles, APPs, residents, and fellows, in four categories of practice at nine academic institutions between May 9-June 30, 2021. Chi-square and Fisher's exact tests assessed association between survey responses and participant characteristics. False discovery rate adjustment accounted for multiple comparisons, threshold of $q<0.05$ for statistical significance. Cochran-Mantel-Haenzsel tests evaluated associations stratified by institution.
Results: 2236 of 6724 (33.3%) participants responded: 48.4% APPs, 11% Fellows and 40.6% Residents. Primary category of practice included: 20.3% Anesthesiology, 8.9% Family Medicine, 34.1%, Internal Medicine (IM)/IM subspecialties, 6.7% Obstetrics/ Gynecology/Gynecologic Oncology, 25.9% Surgery/Surgery subspecialties, 4.1% Other.While 93.2% of respondents believed OSA is a risk factor for perioperative complications, fewer respondents reported that they felt adequately trained to assess for OSA (50.9%) in general, with significant differences noted by provider role (range 42-70%, $q=0.001$) and across the categories of practice (range 12-82%, $q=0.001$). Even fewer felt adequately trained

to assess for OSA in perioperative patients (38.2%) with significant differences noted by provider role (range 31-52%, q=0.001) and across the categories of practice (range 15-84%, q=0.001).Across all categories of practice, respondents indicated that they would like additional educational training about OSA (76.7%). This varied by clinical role (range 64-82%, q=0.003), but not categories of practice (range 73-84%, q=0.13). Furthermore, respondents indicated they also desired additional education about OSA in the perioperative patient (75.5%). This extended across all clinical roles (range 68-77%, q=0.09) and categories of practice (range 72-80%, q=0.09).

Conclusion: We found significant differences in APP and physician-in-training perceptions of the adequacy of their current training and desire for further OSA/perioperative OSA education. Our study identifies a critical gap and opportunity to improve provider understanding and patient care.

Support (If Any): American Academy of Sleep Medicine Foundation (AASMF) award.

0364

GOOD SLEEP CARE: GEOSPATIAL OPTIMIZATION OF DISTANT SLEEP CARE IN THE VA

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Introduction: Obstructive Sleep Apnea (OSA) is very prevalent in the Veterans Administrations (VA) clinical population, affecting about 24% of Veterans. Sleep medicine services in VA suffers from uneven distribution, which especially affects Veterans in rural populations, where care is often not available except by long distance travel. Travel burden is increasingly recognized as a burden on Veteran care that can be ameliorated by telemedicine. Little is known about travel burden and few attempts have been made to quantify it. We have attempted to quantify travel burden for rural Veterans using data from VA's Office of Rural Health supported Enterprise Wide Initiative for Telesleep Medicine. In this project we focus on travel from a Veteran's home to a facility-based sleep clinic visit (traditional face-face visit) vs. how much travel would be avoided if visits were performed using video-based telemedicine with the Veteran at his/her residence.

Methods: Purpose built geocoding software (validated in prior studies) was used to quantify the driving distance from the Veterans home zipcode to the zipcode of the facility where the visits would were performed. The data were taken from the VA's national corporate data warehouse (CDW). Over 4 million sleep encounters were coded. CPT4 codes were used to define the clinic visit encounters from 2016 through 2020. We set the travel range where telemedicine is reasonable based on distance at greater than 40 miles from the VA medical center which is how VA currently defines "distant travel".

Results: No. of Encounters (thous) 2016, 557; 2017, 623; 2018, 678; 2019, 667; 2020, 420Miles ObsTravel (mil) 2016, 38; 2017, 42; 2018, 45; 2019, 43; 2020, 27 Miles Travel if telemed used (mil) 2016, 25; 2017, 27; 2018, 29; 2019, 27: 2020, 17Difference (mil miles) 2016, 13; 2017, 15; 2018, 16; 2019, 16 2020, 10Between 10 and 16 million miles could be saved each year for sleep medicine visits if all travel > 40 miles was converted to video home visits.

Conclusion: Travel burden in this analysis, defined by miles driven to and from a sleep medicine encounter, could be dramatically reduced if telemedicine visits were used for sleep apnea evaluation and management. This reduction in travel equates to a reduction in automobile related use-costs, lower carbon footprint, fewer automobile crashes with injury and death. Assuming that clinical effectiveness of home telemedicine is comparable to traditional visits, these data support the vigorous adoption of telemedicine for sleep medicine services.

Support (If Any): VA Office of Rural Health; Measurement QUERI, San Francisco VA Medical

0365

EVALUATION OF SLEEP MEDICINE FELLOWSHIP PROGRAM WEBSITES

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Introduction: Fellowship program websites often serve as the initial resource applicants use to learn about programs. Websites have likely become even more important due to social distancing mandates related to the on-going Covid-19 pandemic. In this study, we evaluated the websites of sleep medicine fellowship programs and analyzed the comprehensiveness of their content.

Methods: Sleep medicine fellowship programs in the United States (US) for the 2021 match cycle were identified using the Electronic Residency Application Service (ERAS) directory and the Fellowship and Residency Electronic Interactive database (FREIDA). Twenty-two prespecified website content criteria related to education, recruitment, and compensation were evaluated. Programs' website comprehensiveness was compared based on geographic location (Northeast/Midwest/South/West); type of programs (Community/University); programs matching status (Complete/Partial or No matching status); core specialty (Internal medicine/Other specialties); and program size (based on number of sleep fellows).

Results: A total of 78 US sleep fellowship program' websites were evaluated. Most (80.8%) had a direct functional link to ERAS or FREIDA websites. The percentage of sleep medicine fellowship program' websites reporting each of the twenty-two-criterion was highly variable (range: 2.6%-98.7%). The percentage of overall website comprehensiveness among sleep medicine fellowship programs was 56.8%±16.5% (range:13.6%-90.9%). There was a significantly higher educational website content comprehensiveness for the Internal medicine compared to other specialties-based sleep programs ($p = 0.002$). There were no significant association between the overall, educational, recruitment, and compensation website content comprehensiveness of sleep programs and their US region location, type of affiliation, matching status, or program size.

Conclusion: Website content comprehensiveness amongst sleep fellowship programs in the US is variable with a lower educational content on website pages of non-internal medicine-based sleep programs. Improvement in website content of sleep medicine programs is a potentially easy way for programs to improve fellow recruitment, and more importantly, allow prospective sleep fellow applicants to make a more informed decision with regards to program selection.

Support (If Any): This study was not funded.

0366

INVESTIGATING THE USE OF STOP-BANG QUESTIONNAIRE IN INPATIENT AND OUTPATIENT SETTINGS IN A RURAL HEALTHCARE SYSTEM

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Introduction: Obstructive Sleep Apnea (OSA) is one of the strongest modifiable risk factors for Atrial Fibrillation (AF). Although, STOP-BANG questionnaire is a well-validated screening tool for OSA, its adoption and utility to screen newly diagnosed AF has not been reported in a large rural healthcare system. Our aim was to identify the characteristics in patients with AF, which led to screening and referral for a sleep study by providers. In addition, we identified the provider specialty types that had the highest rate of screening for OSA and sleep study referral.
Methods: We conducted a retrospective multicenter study that identified newly diagnosed patients with AF from January 2018-January 2020. STOP-BANG questionnaire, patient demographics, electrocardiogram, and sleep study data were collected. A logistic regression model was used to identify patient characteristics that were associated with increased screening. Using a chi-squared test, we compared differences in provider specialty that screened for OSA and referred patients for a sleep study.
Results: Among the study cohort (N=845), 136 (16.1 %) were female and 709 (83.9 %) were male. Only 82 patients (9.7%) had confirmed OSA screening by STOP-BANG questionnaire. Among higher risk patients for OSA (at least 3 of the following: age>50, male, hypertension, BMI>35), the screened patients were 5.8 years younger (95% CI: 3.7-7.9, p<0.001) compared to patients that were not screened. Patients who were screened for OSA had significantly higher BMI (p<0.001), hypertension (p<0.001), and diabetes mellitus (p<0.001). Our findings revealed that OSA screening providers, were most commonly Primary Care Providers (PCP) (47.5%) followed by cardiologists (31.7). Furthermore, PCPs (48.5 %) and cardiologists (14.1%) were most likely to provide referrals for a sleep study. All of the patients, who were screened using STOP-BANG questionnaire and referred for a sleep study, were diagnosed with OSA.
Conclusion: Our findings revealed underutilization of STOP-BANG to screen for OSA in newly diagnosed AF patients. Screening pattern may be tilted towards patients with obvious and severe forms of OSA therefore missing on milder cases. This study could prompt systemic adoption of STOP-BANG questionnaire, education, and periodic evaluation of healthcare providers in a large rural healthcare system to improve outcomes in AF patients.
Support (If Any):

0367

NOVEL 3D-PRINTED CUSTOM ORAL APPLIANCE THERAPY: A PILOT STUDY

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Introduction: Oral appliance (OA) therapy protrudes the jaw in a more anterior position during sleep to treat obstructive sleep apnea. OA therapy can be used in combination or as an alternative to positive airway pressure (PAP) therapy. Most custom oral devices are fabricated with expensive manufacturing equipment or individually hand-made increasing treatment costs that prevent access to care for patients. Previous studies report concerns of cost-effectiveness of OA therapy and surveys of sleep physicians with cost concerns leading to barriers in prescribing OA therapy. More recent technological advancements in additive technology have allowed low-cost, custom fabrication of digitally designed OA. To date there have been no clinical studies that the authors are aware of that have investigated the feasibility of offering 3D printed custom OA therapy.
Methods: A novel OA was designed specifically for 3D-printing with additional features to improve clinician efficiency, patient comfort, and patient safety. A review of 3D-printed materials was completed to ensure biocompatibility requirements prior to clinical testing. Approval from the Committee for Protection of Human Subjects of University of Texas Health Science Center at Houston was obtained. Five participants had novel OA digitally designed based on scans of upper and lower teeth in addition to a bite registration recorded using a George Gauge. Participants were surveyed based on comfort of device and safety monitoring.
Results: Participants found the novel OA generally comfortable. Comfort questions were presented on a scale of 1 – 10, where ten is the highest level of comfort. On average participants found that the novel OA had comfort levels of 9.0 ± 0.77 on gums, 8.2 ± 0.92 on teeth, and 9.8 ± 0.20 of the jaw joints. No major adverse events were reported and the most common minor adverse event reported was increased salivation.
Conclusion: This pilot study illustrates the clinical feasibility of a novel 3D printed OA. Future studies will further investigate patient outcomes and clinician efficiency during clinical implementation of this novel OA. Though the use of 3D-printing technologies OA therapy has the potential to be offered at lower cost and delivered to the patient in one visit representing a paradigm shift.
Support (If Any):

0368

LEVERAGING THE ELECTRONIC HEALTH RECORD TO FACILITATE SHARED-MEDICAL DECISION MAKING IN A LARGE HEALTH SYSTEM: RESPONSE TO THE PAP RECALL

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Introduction: The positive airway pressure (PAP) device manufacturer recall afflicting ~4 million users has posed a major challenge for the care of patients with sleep disordered breathing. We report on the Cleveland Clinic enterprise-wide response efforts and relevant predictors of medical decision-making surrounding this recall.
Methods: A taskforce developed a strategic response to the recall with the goal of distributing enterprise-wide communications; providing key guidance to providers and patients. For patients, a multipronged, tiered approach of MyChart messaging, phone and mailings instructing device registration and continuing use of PAP until discussed with the provider was implemented. For providers, an Epic smartphrase, embedded with a tracker, was developed as a resource including details of a decision-making algorithm while awaiting remediation. A team of mid-level providers was trained in the use of the algorithm; and the smartphrase was utilized for targeted virtual visits and communications. Presented is a retrospective cohort analysis of demographics and comorbid predictors between the group of patients advised to continue therapy, versus those advised to discontinue. Wilcoxon rank sum test or t-test was used for comparisons.
Results: 15,759 patients were contacted; message confirmed read/heard for 99.3%. Analysis of smartphrase use yielded 1135 instances (median,IQR): age:61.0 [51,70];48.5% female, 13.6% African American, body mass index(BMI) 33.5[29,38.9] kg/m2, apnea hypopnea index(AHI)=22.8[11.7,46.1] of whom n=770(67.8%) were advised to continued therapy. Predictors of provider guidance to

continue versus temporarily hold PAP therapy respectively include: age:63[53,71] vs. 58[47,67] p<0.001, female:44% vs. 57%,p<0.001, BMI:33.9[29.5, 39.7] vs. 32.0[28.0,37.5],p<0.001, AHI:31.9[15.5, 58.0] vs.15.7[9.1,21.2],p<0.001 and the following comorbidities: hypertension:61.0% vs. 46.3%,p<0.001, coronary artery disease,11.3% vs. 3.6%,p<0.001,heart failure:2.6% vs. 0.6%,p<0.001, atrial fibrillation:9.5% vs. 2.5%,p<0.001 and chronic obstructive pulmonary disease:5.8% vs. 1.6%,p<0.001,but not diabetes.
Conclusion: We conclude that EHR tools can be used to coordinate device recall response efforts and guide both providers and patients. The use of a system smartphrase facilitated provider-patient shared medical decision-making to continue versus temporarily discontinue use of PAP therapy efficiently. Those advised to continue PAP therapy had higher burden of sleep apnea and cardiopulmonary comorbidity.
Support (If Any):

0369

SLEEP EDUCATION FOR THE NURSE PRACTITIONER: NURSE PRACTITIONER STUDENT FOCUS GROUP FINDINGS

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Introduction: Primary care nurse practitioners (NPs) receive little to no sleep education in graduate programs despite being first-line providers for patients presenting with sleep-related symptoms. Sleep curriculum has been consistently identified as a gap in nursing education and confirmed in recent survey studies of nurses and NPs.
Methods: Qualitative descriptive study to explore NP students' reactions to an asynchronous, case-based sleep e-learning program. Data were collected as part of a larger pre-/post-study assessing the program. Six asynchronous online modules were offered to a cohort of primary care NP students in a single academic institution's master's degree in primary care nursing program. At the end of the course, students were invited to participate in one-hour, online, focus group sessions. Directed content analysis, guided by the Kirkpatrick training evaluation model, was used to analyze the qualitative data to understand NP students' experience with the program and elicit their perspectives about sleep education.
Results: Participants in the course (N=67) were predominantly female (88%) and ≤35 years old (81%). Twenty-four students participated in the focus group sessions. Two overarching themes emerged, including positive reactions to (1) course design and (2) course content. Students reported the case-based scenarios and quizzes enhanced their learning and kept them engaged, noted the user-friendly format, and appreciated that the course was asynchronous. After completing the modules, students recognized they had a previous knowledge gap related to sleep and perceived the information they received to be relevant to their practice/patient population and to their own personal health/wellbeing. Students also discussed their intentions to incorporate sleep assessments into practice.
Conclusion: Given the increasing sleep health needs of the population and the growing shortages of sleep providers, there is a critical need to ensure NP's have the proper education to recognize and identify implications of poor and disordered sleep in their patients. In this study, NP students enthusiastically embraced sleep education, identified knowledge gain, and had intentions to apply their learned skills in practice highlighting the feasibility of increasing curricular exposure to sleep medicine.
Support (If Any): The work reported herein was supported by National Institutes of Health (R25HL120874 Rosen, PI).

0370

POLYSOMNOGRAPHY FOLLOWING AN INDETERMINATE HSAT: LOW COMPLIANCE WITH AASM GUIDELINES

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Introduction: Home sleep apnea test (HSAT) provides a low risk, cost-effective, and convenient diagnostic test for obstructive sleep apnea (OSA) in adult patients. However, in situations where HSAT are inconclusive, technically inadequate, or produce a negative result, the American Academy of Sleep Medicine (AASM) strongly recommends that a polysomnography (PSG) be performed. In this study, we evaluate whether patients are likely to comply with receiving a follow-up PSG following an indeterminate HSAT to rule out any presence of OSA and assess the demographic characteristics of individuals who are more likely to follow the AASM guidelines.
Methods: In order to assess routine compliance with the AASM follow-up guidelines, we have conducted an observational study with N=3,049 patients that received a HSAT in 2019 from 6 independent AASM accredited sleep centers across the U.S. The patient sample included 39.8% female and 60.2% male. 30.34% from the 19-44 age group, 47.2% from the 45-64 age group, and 21.2% from the 65-84 age group. Furthermore, 33% of the patients received a negative HSAT and were advised for a follow-up PSG.
Results: 14.8% of patients who received a negative HSAT in 2019 underwent a follow-up PSG by the end of 2021. Male patients and patients who are younger in age were more likely to follow the AASM guidelines. 16.4% of male patients and 9% of female patients who received a negative HSAT underwent a follow-up PSG. 17.7% of patients aged 19-44 who received a negative HSAT received a follow-up PSG, while only 11.1% of patients aged 45-64, and 7.6% of patients aged 65-84 conformed with the AASM guidelines and followed-up with a PSG.
Conclusion: The overall percentage of patients who comply with the AASM guidelines is relatively low at 14.8%. Emphasis should be put on patient outreach and education to improve this statistic. Such endeavors may try to target female and older patients who appear to be slightly less compliant with AASM guidelines. Simultaneously, more attempts should be made to improve HSAT to increase OSA specificity and decrease the necessity for a follow-up PSG, as this AASM guideline is often overlooked by patients.
Support (If Any):

0371

SLEEP MEDICINE CARE THROUGH THE COVID-19 PANDEMIC

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Introduction: The COVID-19 pandemic accelerated use of telehealth, an expansion of services that required the appropriate

technological infrastructure for health care facilities and in patient homes. Telehealth on the one hand has held promise for addressing health disparities perpetuated by inadequate rural access, but delivery requires extensive broadband and technologic access. That creates the possibility for new kinds of healthcare disparities. In addition, COVID-19 forced marked reduction in in-lab polysomnography (PSG), and concurrent expansion of home sleep apnea testing (HSAT). We hypothesized that the pandemic led to an increase in the overall frequency of telehealth and HSAT utilization, particularly in those who were younger, White, more educated, and from a non-local area.

Methods: We completed a retrospective chart review of all adult patients seen by all provider types across the Sleep Medicine practices in Mayo Clinic Rochester, Arizona, Florida, and the Mayo Clinic Health System between 1) 6/1/18—3/8/20 (Pre-COVID-19), 2) 3/9/20—4/19/20 (Early COVID-19), and 3) 4/20/20—present (Late COVID-19). We recorded the total number of PSGs and HSATs and total number of face-to-face and telehealth visits, along with the age, gender, race, educational level, and locality by zip code for patients served. These data were compared across the 3 timeframes.

Results: Average monthly visits changed from Pre-COVID-19, Early COVID-19, to Late COVID-19 [2194.7/m, 1416.5/m, 2690.6/m (P<0.001)]. Average monthly sleep test volumes also changed [1004.1/m, 530.5/m, 1123.4/m (P<0.001)], with a proportionate increase in HSATs across the 3 periods [34.71%, 65.37%, 53.59% (P<0.005)]. The increase in Late COVID-19 in telehealth visits occurred proportionately more in those who were younger, female, non-White, college and post-graduate educated, and from a non-local area. The increase in use of HSATs occurred proportionately more in patients who were younger, female, non-White, college and post-graduate educated, and from a local area.

Conclusion: The COVID-19 pandemic increased the use of telehealth visits and HSATs in Sleep Medicine practices across our enterprise, particularly in those who are younger and more educated, which may be due to ease of use with and access to technology. The reasons for the presence of additional disparities based upon gender, race, and locality needs further exploration.

Support (If Any):

0372

PATIENT PERSPECTIVES OF SLEEP DISTURBANCES ON A NEUROLOGY INPATIENT UNIT

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University of Rochester Medical Center [1]

Introduction: Sleep is a process critical to our daily physical revitalization, but sleep in the hospital is often very disruptive and is associated with poorer health outcomes during recovery. We aimed to assess patient and staff perceptions on sleep disturbances on a neurology inpatient unit in order to minimize sleep disturbances during hospitalization.

Methods: From April 2021 to November 2021, patients on a neurology inpatient unit completed Karolinska Sleep logs, Berlin questionnaires, and the Potential Hospital Sleep Disruptions and Noises Questionnaire (PHSDNQ). Surveys were administered three times a week to patients oriented, available to participate, and slept on the unit for at least one whole night. Responses were dichotomized and compared to previously-surveyed dichotomized disturbance perceptions by the unit staff. We used chi-square tests to analyze disturbances across both groups for statistical significance.

Results: One hundred twenty-nine patient surveys were collected, and of the disturbances listed, bed comfort, general noise, vital signs, and toileting were the most significant disruptors to sleep. Staff agreed that noise was a top disruptor but ranked testing, pain, and medications higher than patients.High-risk patients for sleep apnea were more likely to be disturbed by medication administration than low-risk patients (19% vs. 7%, p=0.0288), with trends also nearing significance in neuro checks (17% vs. 7%, p=0.059) and light (17% vs. 7%, p=0.059).Overall, there were significant differences across almost all sleep disturbances when comparing the groups, with staff ranking noise, medications, testing, vital sign checks, neuro checks, anxiety, pain, light, and bed comfort significantly higher than patients (p<0.0001). Temperature was not statistically significant. While survey collecting, we found that patients reported specific interventions disrupted their sleep but later ranked them lower than we expected on PHSDNQ. Upon further questioning, patients thought those interventions were required by inpatient teams.

Conclusion: There is undoubtedly room to minimize the top-ranked disruptors and identify discrepancies between high and low-risk sleep apnea patients. We found that patients typically expect certain sleep disturbances during hospitalization, and are generally unaware that we can modify them. Future studies should involve empowering patients to minimize sleep disruptions.

Support (If Any):

0373

DEVELOPING AN ONLINE SLEEP EDUCATION TRAINING-LESSONS LEARNED & FUTURE DIRECTIONS

Danielle Groton[1], Christine Spadola[1], Nicole Alford[1]
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Introduction: Systems of higher education are increasingly offering online education, with the most recent expansion of e-learning surrounding the COVID-19 pandemic. As the e-learning industry grows, it provides the opporunity to expand a burgeoning body of research focusing on the development of online training to promote health across disciplines. This presentation describes the development of an interdisciplinary online training to educate social work students on sleep health and shares feedback recieved from the student experience. We describe the steps taken to develop the instructional method, content management, and the delivery of the training.

Methods: This training involved 25 collaborators across seven universities. The Center for Online and Continuing Education (COCE) at the 'home' institution partnered with faculty to recommend best practices in online learning and provide technical assistance. Based on formative research conducted with the target population, the training included 5 'modules': introduction to sleep health, sleep hygiene, fatigue and fatigue countermeasures, sleep disorders, and sleep health among special populations. The content included mixed media, humor, and props to bolster student engagement. The COCE team created a digital 'Sleep Health Badge' and certificate of completion that students would earn after completing the training. The training was offered to social work students at a public university in the southeastern United States.

Results: 90 students participated in the training. Students increased their sleep health knowledge, and reported being very satisfied with the structure and curriculum of the training(96.7%). Of note, while the training was only 2 hours long and asynchronous, the the most frequent recommended change given by participants was to shorten the length of the videos (20.8% of responses).

Conclusion: Overall, the training was well-received and is in the process of being adapted for professional social workers. For future

development of online trainings, we will share reflections and recommendations as they relate to each of the major components of e-learning: content development, instructional method, content management, and content delivery/presentation. We center these reflections around both student feedback on the online training, and our own experiences in developing this training.
Support (If Any): American Academy of Sleep Medicine Foundation

0374

A SLEEP HEALTH EDUCATIONAL MODULE FOR SOCIAL WORK STUDENTS IS ASSOCIATED WITH IMPROVEMENTS IN SLEEP KNOWLEDGE AND SLEEP QUALITY

Christine Spadola[1], Danielle Groton[2], Katherine Freeman[2], Shanna Burke[3], Cassie Hilditch[4], Abhishek Pandey[5], Kerry Littlewood[5], Eric Zhou[6], Suzanne Bertisch[7]
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Introduction: Insufficient sleep is highly prevalent, particularly among underserved groups. Social workers often work with underserved populations who are at risk for sleep deprivation and are well-positioned to promote healthy sleep behaviors. However, sleep health training is rarely integrated into social work curriculums. To address this gap, we developed and tested a 2-hour online sleep health educational intervention, designed to improve sleep-related knowledge among social work students.
Methods: We recruited 106 social work students via a departmental listserve to participate in a 1-hour sleep education module. Pre-post module changes in knowledge and beliefs were assessed using the Sleep Beliefs Scale (SBS) and the Sleep Practices and Attitudes Questionnaire (SPAQ). We also assessed changes in self-reported sleep quality using the Pittsburgh Sleep Quality Index (PQSI). Wilcoxon Signed-Rank tests were used to assess pre- to post-module scores. We conducted qualitative research (open-ended questions and focus groups) to assess acceptability and to inform future module refinement.
Results: Of the 106 students participating in the module, mean age was 28.3±8.8 yrs, 92.5% were female, 4.7% male, and 2.8% other. The sample was racially/ethnically diverse with 37.7% identifying as non-Hispanic White, 34.0% African American/Black, 22.6% Hispanic/Latino, 0.9% Asian, and 4.7% other. Ninety (84.9%) participants completed the questionnaires. Demographics did not differ between students who completed the training and those who did not. Students participating in the module reported improvements in the Sleep Beliefs Scale (Median=2.0, range: -4, 10 [positive change=increased knowledge]), the SPAQ (Median=-10, range: -37, 95 [negative change=increased importance of sleep]), and the Global PQSI Score (Median=-1, range: -7, 4 [negative change = improved sleep quality]). Qualitative data supported the module's acceptability and utility (e.g., "Not only will I adapt these healthy sleep habits, I will always ask my clients how they are sleeping!"). Suggestions for improvement included adding additional topics (e.g., over-the-counter sleep aids) and shortening the training duration.
Conclusion: Participation in an online educational module was associated with not only improvements in sleep knowledge but also self-reported sleep among social work students, suggesting feasible ways to expand providers promoting sleep health.
Support (If Any): American Academy of Sleep Medicine Foundation

0375

EFFECTIVENESS OF AN INTELLIGENT SLEEP MANAGEMENT SYSTEM IN THE US MILITARY: PRELIMINARY RESULTS

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Introduction: There are well-recognized barriers limiting access to evidence-based sleep interventions in the military. Given the large number of patients seeking treatment and the shortage of trained specialist providers, demand greatly exceeds available supply. As part of a larger implementation effort, the purpose of this study was to evaluate health provider ratings of the effectiveness and usability of a novel sleep telehealth assessment at a busy military treatment facility.
Methods: Health providers were recruited from the Internal Medicine and Sleep Medicine clinics at Walter Reed National Military Medical Center. Effectiveness was defined a priori based on the established Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) implementation science framework. Providers from participating clinics completed a questionnaire that measured specific aspects of effectiveness: perceived satisfaction, usability, improvement, credibility, risks, benefits, acceptability and overall satisfaction with a sleep assessment report.
Results: Providers (n=16) were surveyed regarding perceived satisfaction, usability, improvement, credibility, risks, benefits, and acceptability of the sleep assessment report were rated favorably, with each domain being rated with a positive or very positive response by more than 75% of providers. All providers viewed the usability of the report favorably and all but one provider had a positive view on the report improving their documentation of sleep problems.
Conclusion: Health care providers at our hospital rated a novel sleep telehealth assessment as highly effective across established key domains of implementation science. Providers were highly satisfied with the content, usability, and credibility of the report, and felt this intervention would improve their documentation. Research is ongoing to further evaluate the implementation of the system.
Support (If Any): This research was supported by an investigator-initiated research award from the Department of Defense (via the Medical Technology Enterprise Consortium) to the University of Maryland, Baltimore (PI: EMW).

0376

EVALUATION OF HEALTHCARE DELIVERY DISPARITIES AMONG THE NATIVE AMERICAN POPULATION: KNOWLEDGE AND ATTITUDES OF OBSTRUCTIVE SLEEP APNEA AMONG THE INDIAN HEALTH SERVICES PRIMARY CARE PHYSICIANS

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Introduction: The burden of racial disparities in diagnosis and treatment of Obstructive sleep apnea (OSA) remains underrecognized among the Native American population. This study intends to assess the knowledge and attitudes towards diagnosis and

management of obstructive sleep apnea among the primary care physicians caring for the Native American population.
Methods: A cross-sectional survey was conducted at an Indian Health Services (IHS) primary care clinic. A validated OSA Knowledge (18 questions) and Attitudes (5 questions) (OSAKA) questionnaire was used, in addition to one question to address referrals to a sleep specialist.
Results: A total of 20 primary care providers were invited to participate in the survey with a response rate of 45% (9 participants, 2 males and 7 females). The median (IQR) knowledge score was 14 (13-16). The mean (±SD) percentage of correct response (proportion of correctly answered questions) was 79% (±9.5), which was similar to previously reported scores among primary care physicians in other studies. There was no significant knowledge difference between males and females and no difference based on age. All participants felt it was very or extremely important to identify patients with OSA and that OSA is important as a clinical disorder. There was a significant positive correlation between knowledge and recognizing the importance of OSA as clinical disorder, and between knowledge and confidence in identification of OSA. There was a negative correlation between confidence in OSA identification and referral to a sleep specialist but was not statistically significant. Only one participant (11%) felt comfortable managing patients on CPAP therapy, but there was no significant correlation with referrals to a sleep specialist.
Conclusion: Obstructive sleep apnea knowledge in IHS primary care providers is comparable to their peers. However, the lack of comfort in managing patients with OSA on CPAP did not increase referrals to a sleep specialist. This highlights a possible disparity and resource gap in treating Native Americans within the IHS health system with sleep apnea and further studies are needed.
Support (If Any):

0377

SUCCESS RATES OF SELF-APPLIED TYPE 2 STUDIES IN 191 PARTICIPANTS

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Cerebra Heatlh [1] Cerebra Health [2] Cerebra [3]

Introduction: Wait times for the gold standard Type 1 polysomnograms are lengthy, and the pandemic has only increased the backlog. The need for having home sleep testing has grown yet Type 3 home sleep apnea tests (HSAT) can be inaccurate despite their popularity. In this study, we assessed the reliability of a self-applied in-home Type 2 sleep test using the Cerebra Sleep System.
Methods: 213 sleep files were collected from 191 participants that had their Type 2 device shipped to their home with no prior training. Participants watched videos and read written instructions to self-apply the full Type 2 system. The lab-quality in-home PSG included a recording of EEG (Fp1,Fp2), EOG (E1, E2), EMG (chin), EMG (legs), respiratory channels (one effort or two RIP belts), nasal flow, and pulse oximetry. The study was considered successful if the head unit (EEG/EOG/EMG), leg EMG, nasal flow, and oximetry were present for recordings of 3 and 4 hours in duration.
Results: Based on a 4-hour success criterion, 82.6% of studies were considered successful. This percentage increased with 3 hours (85.4%). When studies did fail at the 4-hour criterion, 10.8% had failures of all signals, 5.4% had failures of 4/5 signals, 10.8% had failures of 3/5 signals, 16.2% had failures of 2/5 signals, and 56.8% had failures of 1/5 signals. The head unit failed on 15 records (7%), the right leg on 9 records (4.2%), the left leg on 6 records (2.8%), the cannula on 12 records (5.6%), and the oximeter on 7 records (3.3%). For 13 participants who had a failed study, the issues were resolved in 6 cases (46%) with a second night of recording.
Conclusion: We found that the Cerebra Sleep System Type 2 in-ho me test showed reliable performance with a high success rate. When studies did fail, in most cases, a single signal was the source of the problem. For patients suspected of having sleep disordered breathing or other sleep disorders, Type 2 testing is a reliable, convenient, and safe alternative to in-lab polysomnography and performs similar success rates to Type 3 HSATs.
Support (If Any):

0378

DAYTIME PAP ACCOMMODATION: A BREATH OF FRESH AIR

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Introduction: Rising healthcare costs and resource utilization represents a growing problem in the United States, especially for individuals with progressive neuromuscular disorders. Diagnosis and treatment of obstructive sleep apnea has been demonstrated to decrease healthcare resources in the general population; however, there is no well-defined approach to diagnosis and management of sleep-disordered breathing (SDB) in patients with neuromuscular disease (NMD). Many providers believe it best to diagnose and introduce positive airway pressure (PAP) support during a single overnight in-laboratory sleep study. Patients with NMD require a team with understanding of sleep physiology, complex pulmonary pathophysiology, disease process and progression, and advanced PAP therapy modes and indications. Optimal treatment requires patient and caregiver education, frequent monitoring of PAP data, ongoing evaluation of oxygenation and ventilation parameters, as well as assistance with device issues. We hypothesized a focused, personalized approach to managing patients with NMD will improve patient adherence to PAP therapy, nocturnal oxygenation, and ventilation, as well as limit hospital admissions.
Methods: 10 patients diagnosed with NMD (including muscular dystrophy, diaphragm paralysis, and scoliosis) presented to UPMC Montefiore sleep lab for daytime accommodation study with a pulmonary-sleep physician and dual-trained respiratory therapist-sleep technician. The visit included mask fitting, patient education, and initiation of PAP therapy with titration of bilevel pressure settings. Data collected included: pre- and 3-month-post nocturnal oxygen saturation and serum bicarbonate level; data download at 3 months including device usage, leak, average PAP pressures; and number of hospital admissions.
Results: All 10 patients demonstrated initiation of PAP therapy with usage on 100% of days for minimum of 6 hours per night. There was improvement in average nocturnal oxygen saturation and serum bicarbonate level after visit compared to prior. 3 patients were hospitalized in 6-12 months following, none for respiratory related reasons.
Conclusion: In this pilot study, an innovative daytime PAP accommodation study for patients with sleep-disordered breathing due to NMD results in excellent initiation and adherence to PAP therapy, as well as improvement in oxygenation and ventilation and minimal hospitalizations. Future studies are necessary including a larger randomized trial to demonstrate the safety and efficacy of home based NIV initiation.
Support (If Any): NIH T32 HL082610-15, American Thoracic Society ASPIRE fellowship

0379

AT-HOME SAMPLE COLLECTION FOR IDENTIFICATION OF ALTERATIONS IN HPA-AXIS ACTIVITY AND CORTISOL AREA UNDER THE CURVE

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Introduction: Sleep problems are associated with alterations in diurnal cortisol patterns, reflective of altered hypothalamic-pituitary-axis (HPA) activity. At-home collection of dried samples for measurement of urinary free cortisol are useful for assessment of diurnal rhythms because they do not impose the stress or sleep disruption associated with inpatient studies. The purpose of this analysis was to assess urinary cortisol responses among a large real-world dataset of at-home collection kit users and the potential for utility in identifying alterations in HPA-axis activity.
Methods: This retrospective analysis evaluated data from 3,966 individuals who used a Sleep and Stress Test (Everlywell, Inc.) between September 2017 and July 2021. Four dried urine spot samples were collected according to habitual sleep patterns: upon waking (T1), two hours after waking (T2), prior to the evening meal (T3), and at bedtime (T4). Urinary free cortisol normalized to creatinine, indicative of HPA-axis activity was assessed (area under the curve (AUC), wake to bedtime diurnal cortisol slope (DCS), mid-morning (T2) and bedtime (T4) cortisol levels). Sample reference ranges were established from two standard deviations above and below the log-transformed mean at each time point, values were reverted to original units for reporting.
Results: The sample was predominantly female (n=2,832, 71%). Mean age was 42.8 (sd=12.0) years. Seventy-eight individuals had mid-morning (T2) cortisol levels that were higher than the sample reference range (7.0-170.7 ug/g Cr), and 88 individuals below. Bedtime (T4) cortisol levels were elevated in 145 individuals (reference range 1.1-25.0 ug/g Cr). Total AUC for cortisol was high in 93 and low in 81 of individuals. The slope of the diurnal cortisol response was flattened in 20.6% (n=816) of the sample.
Conclusion: This real-world study demonstrates that at-home dried urine sample collection can be used to characterize normal and atypical HPA-axis activity. Convenient assessment of alterations in diurnal cortisol patterns are critical in identifying and understanding the mechanisms of HPA-axis activity common in sleep disruptions/disorders. Future studies utilizing this methodology may prove useful in identifying subpopulations with altered HPA-axis activity, sleep issues, and potential relationships to cardiometabolic health.
Support (If Any):

0380

A PILOT STUDY TO TEST PATIENT-REPORTED OUTCOMES VISUALIZATION METHODS IN THE EHR NOTE TEMPLATE FOR SLEEP MEDICINE CLINICIANS

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Cleveland Clinic [1]

Introduction: Patient-Reported Outcomes (PROs) are standardized assessments of patient-specific health measures for physical, mental, and social well-being reported directly by patients without provider interpretations. Providers use PROs to efficiently improve the quality of care and empower patients through structured communication. Patient factors are widely acknowledged to affect PROs; however, there is very little data on the effect of provider PRO visualization methods on patient outcomes. This pilot study compares PRO visualization methods to improve readability, provider satisfaction, and patient outcomes in a comprehensive sleep center. We hypothesize that detailed PRO with color-based formatting will improve the clinical diagnoses and provider satisfaction with PRO metrics.
Methods: Twenty-four sleep providers from the Sleep Disorders Center at Cleveland Clinic, consisting of physicians (n=14), fellows (n=3), and nurse practitioners (n=7), were randomly assigned to two equal groups. All sleep providers completed the online pre-intervention survey (71% female), and 23 providers (96%) completed the post-intervention survey four weeks after randomization. Survey questions utilizing 5-point Likert scales inquired about current use and perceived benefit of 3 PROs accompanying new visits: International Restless Leg Syndrome Scale (IRLS), Insomnia Severity Index (ISI), and Epworth Sleepiness Scale (ESS). The standard presented only total scores, while the intervention group received detailed tables of IRLS, ISI, and ESS components with color-stratified total scores. ANCOVA statistical analysis was performed to compare satisfaction, usage, and clinical utility between groups over time.
Results: Current PRO templates were used by 79% of providers. PROs were reported as helpful or extremely helpful by 87% of providers, while only 38% were satisfied or extremely satisfied by the presentation. Compared to controls, the enhanced-visualization group scores improved but did not display significant differences in the likelihood of use (p=0.8), helpfulness (p=0.7), or overall satisfaction (p=0.9); utility in reaching diagnosis demonstrated a trend towards improvement (p=0.051).
Conclusion: PRO enhanced visualization did not demonstrate improvements in provider utility or satisfaction in this study. However, effects are likely limited by small sample sizes. Direct measurement of effects on test ordering and clinical diagnoses may provide further clarity. Future research is needed to enhance the usage of PROs to assess the decision-making process during clinical practice.
Support (If Any):

0381

HIGH LEVELS OF PATIENT ENGAGEMENT WITH A NOVEL SLEEP TELEHEALTH PLATFORM IN THE US MILITARY

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National Capital Consortium Combined Internal Medicine and Psychiatry Program [1]

Introduction: Despite very high prevalence and documented adverse consequences of insufficient and disturbed sleep in the US military, there are well-recognized barriers limiting access to evidence-based sleep interventions within the military health system (MHS). Chief among these is an insufficient number of trained sleep specialists and sleep centers. As part of a larger implementation effort, the purpose of this pilot study was to evaluate patient engagement with a novel sleep telehealth platform at a busy military treatment facility.
Methods: The sleep telehealth platform consists of an online web portal for patients and providers, a secure mobile app, and integrated wearable sensors using an off the shelf commercial

solution (COTS; in this study, Fitbit). The purposes of this platform are to 1) help primary care managers (PCMs) assess sleep complaints, 2) empower patients and PCMs to make evidence-based sleep treatment decisions, 3) deliver evidence-based behavioral sleep treatments via mobile devices, and 4) connect patients with sleep specialists in virtual or physical sleep centers. Participants were recruited from the Internal Medicine clinic and the Sleep Disorders Center at Walter Reed National Military Medical Center (WRNMMC). Inclusion criteria included ages of 18-75 years and self or provider referral for sleep problems, including insufficient sleep duration. In addition to wearing the COTS sleep tracker, participants completed a baseline assessment and 2x/daily diaries for ten days, and a brief satisfaction survey.

Results: Participants included 35 patients (57% female, mean age=44.7 years). One hundred percent of participants wore the COTS sleep tracker and completed the post-monitoring assessment. Satisfaction survey results indicated that 96.7% of participants found completing the 10-day continuous sleep monitoring assessments to be "easy" or "very easy," and 96.7% of those who completed the monitoring expressed a preference for app-based sleep treatment either alone or in conjunction with virtual or in person care. Finally, participants offered suggestions to optimize the app and platform for pending clinical implementation.

Conclusion: Results of this pilot study demonstrate high levels of patient engagement with the sleep telehealth platform. Given the large number of patients seeking treatment and the shortage of trained specialist providers, sleep telehealth is a promising pathway to increase access to evidence-based care.

Support (If Any): This research was supported by an investigator-initiated research award from the Department of Defense (via the Medical Technology Enterprise Consortium) to the University of Maryland, Baltimore (PI: EMW).

0382

OPTIMIZING OBSTRUCTIVE SLEEP APNEA SCREENING AND EDUCATION IN UNDERSERVED COMMUNITY

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McLeod Regional Medical Center Family Medicine Residency Program [1]

Introduction: Obstructive sleep apnea (OSA) is the most common sleep-related breathing disorder. There are many conditions associated with OSA, including obesity hypoventilation syndrome, congestive heart failure, atrial fibrillation, pulmonary hypertension and pulmonary diseases. Majority of patients endorse daytime sleepiness, but family often report snoring and apneas. There are multiple screening tools, including the STOP-BANG. Scores 5 or above are high risk for OSA. Untreated OSA worsens comorbidities and increases risk of myocardial infarction and stroke. We provided physicians with this screening tool to help risk stratify, thus providing better patient education and treatment.

Methods: Physicians educated on OSA, STOP-BANG and documentation in didactic sessions. Patients ages 18 and older provided with questionnaire. Physicians measured neck circumference and BMI. Questionnaire reviewed with patient and education given. If high risk, sleep medicine referral recommended. Physicians documented in charts about discussion, risk category and referral status.

Results: Total of 407 patients completed the questionnaire, but 67 patients were excluded for no neck circumference. Remaining 340 patients stratified by STOP-BANG scores: 128 Low, 142 Intermediate, 70 High Risk. From High Risk category, 20 patients referred to Sleep Medicine. Only 18 charts from the 50 not referred explained why, which included patient declining, already on CPAP, referral already in, and because outpatient sleep study was ordered instead. Data stratified for age, gender, BMI and neck circumference. Age range from the 340 total was 19-87-years-old. From High Risk, 39 were male and 31 female. BMI range for total was 17-61, while High Risk was 22-61. Neck circumference range for total was 12-21 inches, while High Risk was 12.5-17.5 inches.

Conclusion: The goal was not only to provide a validated screening tool, but also provide better OSA education for physicians and patients. Results indicate many patients were intermediate or high risk. Majority of patients had multiple comorbidities, including obesity, hypertension and diabetes. This study highlights the prevalence of OSA in an inner-city primary care clinic and challenges involved in screening all at risk patients. Further investigations could include the effect of more education, continued screening and effect of lifestyle changes in this vulnerable population.

Support (If Any):

0383

CLINICAL IMPACT OF PITOLISANT ON EXCESSIVE DAYTIME SLEEPINESS AND CATAPLEXY IN ADULTS WITH HIGH BURDEN OF NARCOLEPSY SYMPTOMS

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Tricoastal Narcolepsy and Sleep Disorders Center [1] Harmony Biosciences, LLC [2] Bioprojet Pharma [3]

Introduction: This post hoc analysis evaluated the clinical impact of pitolisant for the reduction of excessive daytime sleepiness (EDS) and cataplexy in adults with a high burden of narcolepsy symptoms. When evaluating results of randomized, placebo-controlled trials, the clinical impact of a treatment can be assessed using effect size metrics that include Cohen's d (the standardized mean difference of an effect) and number needed to treat (NNT; number of patients that need to be treated to achieve a specific outcome for one person).
Methods: Data were pooled from 2 randomized, placebo-controlled, 7- and 8-week studies of pitolisant (individually titrated; potential maximum dose, 35.6 mg/day) in adults with narcolepsy. Analyses included 3 independent patient subgroups with high symptom burden: (1) baseline score of ≥16 on the Epworth Sleepiness Scale (ESS), (2) sleep latency of ≤8 minutes on the Maintenance of Wakefulness Test (MWT), and (3) ≥15 cataplexy attacks per week. Efficacy measures included the ESS, MWT, weekly rate of cataplexy (WRC), and Clinical Global Impression of Change (CGI-C). Cohen's d was derived from the least-squares mean difference between treatment groups (pitolisant vs placebo), and NNTs were calculated from response rates. Missing values were imputed using a last observation carried forward approach.
Results: The high-burden populations included 118 patients for the ESS subgroup (pitolisant, n=60; placebo, n=58), 105 for MWT (pitolisant, n=59; placebo, n=46), and 31 for cataplexy (pitolisant, n=20; placebo, n=11). Cohen's d effect size values for pitolisant versus placebo were 0.80 for ESS, 0.31 for MWT, and 1.31 for WRC. NNTs for pitolisant were 3 for ESS score reduction (≥3-point decrease from baseline or final score ≤10) in the ESS subgroup and 2 for WRC reduction (≥50% decrease from baseline) in the cataplexy subgroup. For the CGI-C for EDS ("much" or "very much" improved), NNT was 5 in the ESS subgroup and 4 in the MWT subgroup; for the CGI-C for cataplexy, NNT was 3 in the cataplexy subgroup.
Conclusion: The results of this analysis demonstrate the robust efficacy of pitolisant for the reduction of both EDS and cataplexy in patients with severe narcolepsy symptom burden.
Support (If Any): Bioprojet Pharma and Harmony Biosciences, LLC.

0384

CLINICAL UTILIZATION OF A CSF OREXIN TEST: FIRST TWO YEARS OF DATA FROM MAYO CLINIC

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Mayo Clinic In Arizona [1] Mayo Clinic in Rochester [2] Mayo Clinic in Florida [3]

Introduction: Orexin deficiency in cerebrospinal fluid (CSF) was first reported in human narcolepsy in 2001, included in diagnostic criteria for narcolepsy in 2014, and made clinically available at the Mayo Clinic in 2019. The purpose of this publication is to report orexin test utilization and results, and other clinically relevant findings from patients evaluated at Mayo Clinic.
Methods: We retrospectively reviewed CSF orexin samples and clinical records from patients evaluated at Mayo Clinic from 2019 to 2021.
Results: A total of 98 internal samples (Rochester, n=56; Arizona, n=25, and Florida, n=17) from 95 patients (mean age 32.4 +/- 16.6 years with 20 %, 52 %, and 28 % of patients < 18, 18 – 40, and > 40 years, respectively, at time of CSF collection; 62 % female) have been submitted for CSF orexin measurement (mean CSF orexin 335.17 +/- 158.3 pg/ml; deficient < 110 pg/ml, n=11, 64 % <=40 years with mean age 32.9 +/- 17.0 years; intermediate 110 – 200 pg/ml, n=8, 100 % <= 40 years with mean age 21.1 +/- 12.8 years; normal > 200 pg/ml, n=79, 57 % <=40 years with mean age 33.5 +/- 16.7). No significant correlation was found between orexin levels, and time of collection (i.e., diurnal variation), gender, or age. Repeat testing was performed on three individuals (ages 10, 14, and 19 years) with a change in category of orexin level found in one patient from an intermediate to a normal level.
Conclusion: Orexin deficiency was found in 12 % of the patients (64 % of the deficient samples were found at ages <= 40 years). This result may reflect the fact that this test is frequently pursued in clinical patients presenting with inconclusive findings and/or comorbidities. Intermediate orexin levels found in 8 % of the samples (100 % <= 40 years). Although most of the patients tested were female (62.2%) and most were 40 years or younger (72%), no significant correlation was found between orexin levels, and time of collection (i.e., diurnal variation), gender, or age.
Support (If Any): none

0385

CHILDREN, ADOLESCENTS, AND THEIR PROVIDERS: THE NARCOLEPSY ASSESSMENT PARTNERSHIP (CATNAP™) PEDIATRIC NARCOLEPSY REGISTRY: BASELINE DEMOGRAPHICS

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Introduction: Limited information is available on the natural history, presentation, and management of pediatric narcolepsy. CATNAP™ is a retrospective/prospective, longitudinal, multicenter, web-based pediatric narcolepsy registry (NCT04899947). The primary objectives are to improve understanding of the natural history of pediatric narcolepsy, characterize symptom presentation and diagnosis, and understand treatment practices and outcomes.
Methods: Eligible children/adolescents (<18 years) had confirmed narcolepsy. Using web-based portals, patients, caregivers, and clinicians completed an initial survey on sociodemographic characteristics; diagnostic, medical, and treatment history; comorbidities; and disease progression.
Results: Patient/caregiver-reported interim baseline data are included (N=25 patients; mean±SD age: 15.6±2.9 years; 52.0% female; 60.0% White; 64.0% narcolepsy type 1 [NT1]; 28.0% narcolepsy type 2; mean±SD age at narcolepsy diagnosis: 11.0±4.0 years). At narcolepsy diagnosis, the percentages of participants who were <10, 10 to 15, and ≥16 years of age were 36.0%, 52.0%, and 12.0%, respectively. Symptoms at first diagnosis included excessive daytime sleepiness (EDS; 96.0%), cataplexy (64.0%), disrupted sleep (64.0%), vivid dreams (52.0%), and nightmares (40.0%). Comorbid psychiatric disorders were present in 36.0% of participants and included anxiety

disorder (20.0%), depression (16.0%), attention-deficit/hyperactivity disorder (ADHD; 12.0%), and panic attacks (8.0%). Misdiagnosis of narcolepsy was reported in 32.0% of participants; alternative diagnoses included anxiety disorder, ADHD, sleep apnea (all 8.0%), and obsessive-compulsive disorder (4.0%). Physician specialties that confirmed narcolepsy diagnosis included neurologists and pediatricians (each 24.0%), pulmonologists (16.0%), pediatric neurologists (12.0%), general practitioners/internists (8.0%), and endocrinologists (4.0%). In participants with NT1 (n=16), warning symptoms for cataplexy were reported by 43.8% and included a sense that cataplexy was imminent without physical symptoms, a sense that time had somewhat suspended, fear/fright, and a feeling of warmness (all 6.3%). At diagnosis, the number of cataplexy episodes per day in order of frequency was 2 (37.5%), 3 (25.0%), 4 (18.8%), and 1 (12.5%). Current medications for narcolepsy included stimulants (60.0%), wake-promoting agents (40.0%), sodium oxybate (32.0%), serotonin-norepinephrine reuptake inhibitors (16.0%), and selective serotonin reuptake inhibitors (8.0%).

Conclusion: Interim baseline data from CATNAP provide valuable information on the experience and management of pediatric narcolepsy that will facilitate education of patients and caregivers, inform clinical decision-making, and potentially improve treatment strategies.

Support (If Any): Jazz Pharmaceuticals.

0386

LONG-TERM SAFETY DURING A CLINICAL TRIAL OF LOWER-SODIUM OXYBATE IN PARTICIPANTS WITH NARCOLEPSY WITH CATAPLEXY

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Introduction: Treatment-emergent adverse events (TEAEs) were analyzed during a 6-month open-label extension (OLE) of a double-blind, placebo-controlled, randomized withdrawal trial (NCT03030599) of lower-sodium oxybate (LXB; Xywav™). LXB is FDA approved for treating cataplexy or excessive daytime sleepiness in patients with narcolepsy aged ≥7 years and for treating idiopathic hypersomnia in adults.

Methods: Participants entered the OLE following rescreening (re-entry) after discontinuing LXB treatment or directly after completing the main study (rollover). Re-entry participants initiated LXB (4.5 g/night) or, if taking sodium oxybate (SXB) during rescreening, transitioned to identical LXB doses (gram-for-gram). Participants titrated (1–1.5 g/night/week) to a maximum of 9 g/night. TEAEs were assessed in all participants receiving ≥1 LXB dose. TEAE duration represents time from TEAE start to end date (or end of OLE, if TEAE end date unrecorded).

Results: In the analysis population (N=74, mean±SD age=37.6±12.6 years, 66.2% female, 91.9% White), 27 (36.5%) re-entered (after a median [range] of 15.0 [4.0–33.0] days), and 47 (63.5%) rolled over. Most reported ≥1 TEAE (overall, 58.1%; re-entry, 59.3%; rollover, 57.4%). Overall, the most commonly reported TEAEs were headache (n=7, 9.5%; peak incidence was month 3 [n=5/72]; median [range] duration=1.0 [1–25] day), nasopharyngitis (n=6, 8.1%; peak incidence was month 6 [n=2/69]; median [range] duration=9.0 [1–24] days), and dizziness (n=5, 6.8%; peak incidence was month 1 [n=3/74]; median [range] duration=26.0 [1–181] days). TEAEs were most prevalent in month 3 (n=11/72 [15.3%] reporting a TEAE). No participant reported fall or enuresis; 1 reported nausea (rollover). Most TEAEs were mild or moderate; 2 participants had severe TEAEs (invasive ductal carcinoma [IDC], n=1; dizziness, n=1). Few participants (14.9%) had LXB-related TEAEs, most frequently dizziness (overall, 5.4%; re-entry, 7.4%; rollover, 4.3%). LXB-related TEAEs were more common in participants who re-entered (re-entry, 22.2%; rollover, 10.6%). Seven participants discontinued (re-entry, n=2; rollover, n=5), 3 due to TEAEs (IDC, n=1; apathy, n=1; sleep apnea syndrome, n=1); only apathy was treatment related.

Conclusion: In this long-term study of LXB, safety and tolerability profiles were generally consistent with the known safety profile of SXB. The most common TEAEs were headache, nasopharyngitis, and dizziness.

Support (If Any): Jazz Pharmaceuticals.

0387

WEIGHT CHANGES DURING TREATMENT WITH LOWER-SODIUM OXYBATE IN A PHASE 3 CLINICAL STUDY IN PATIENTS WITH IDIOPATHIC HYPERSOMNIA

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Introduction: Treatment with sodium oxybate (SXB) has been associated with weight loss in patients with narcolepsy. Lower-sodium oxybate (LXB) contains the same active moiety as SXB, with 92% less sodium, and is approved in the United States for the treatment of idiopathic hypersomnia in adults. This analysis assessed weight changes during LXB treatment in a phase 3 clinical study (NCT03533114).

Methods: Participants 18–75 years of age with idiopathic hypersomnia (treatment naive or taking an alerting agent [with or without SXB] at study entry) began LXB treatment in a 10- to 14-week, open-label, optimized treatment and titration period. After a 2-week stable-dose period (SDP) on their optimized dose of LXB, participants were randomized (1:1) to LXB or placebo for a 2-week, double-blind, randomized withdrawal period, followed by a 24-week open-label extension (OLE).

Results: Study participants (N=154) had a mean (SD) age of 40.3 (13.7) years; baseline mean (SD) weight was 76.9 (18.6) kg, and baseline mean (SD) body mass index (BMI) was 27.1 (5.9) kg/m2. At baseline, 1.3% (2/154) of participants were underweight (BMI <18.5 kg/m2), 40.3% (62/154) of participants had a normal weight (BMI 18.5 to <25 kg/m2), 33.8% (52/154) were overweight (BMI 25 to <30 kg/m2), and 24.7% (38/154) were obese (BMI ≥30 kg/m2). At the end of the SDP, 28.7% (31/108) of participants had weight loss ≥5%. Mean (SD) change in weight at the end of the SDP (n=108) was −2.5 (4.1) kg. Mean (SD) decreases in weight at the end of SDP were numerically greater in participants with higher baseline BMI (normal baseline BMI, −1.8 [3.0] kg; overweight baseline BMI, −2.8 [3.1] kg; obese baseline BMI, −3.2 [5.9] kg).

Conclusion: In this phase 3 clinical trial, adults with idiopathic hypersomnia treated with LXB experienced weight loss, including weight loss ≥5% in 28.7% of participants. Mean weight loss was greater in participants with a higher baseline BMI.

Support (If Any): Jazz Pharmaceuticals.

0388

DOSING AND REASONS FOR TRANSITIONING FROM SODIUM OXYBATE TO LOWER-SODIUM OXYBATE IN PEOPLE WITH NARCOLEPSY: DATA FROM THE REAL-WORLD TENOR STUDY

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Introduction: Lower-sodium oxybate (LXB) contains 92% less sodium than sodium oxybate (SXB) and is approved for treating cataplexy or excessive daytime sleepiness in patients with narcolepsy (aged ≥7 years) and for treating idiopathic hypersomnia in adults. The Transition Experience of persons with Narcolepsy taking Oxybate in the Real-world (TENOR) study examines the impact of transitioning from SXB to LXB in a real-world setting.

Methods: TENOR is a patient-centric, prospective, observational, noninterventional, virtual-format study (NCT04803786). Eligible participants include US adults with narcolepsy (type 1 or 2) transitioning from SXB to LXB within the previous/upcoming 7 days. Longitudinal data are collected for 21 weeks post-transition. These analyses include data collected at initiation of LXB treatment from all qualifying participants.

Results: The analyses included 85 participants with confirmed narcolepsy (type 1, n=45; type 2, n=40). Mean (SD) age was 40.3 (13.0) years; most participants were female (73%) and White (87%) and took ≥1 concomitant medication for narcolepsy at baseline in addition to SXB (79%, with 38% taking 1 concomitant medication, 33% taking 2, and 8% taking ≥3). Mean (SD) time on current SXB regimen was 57.8 (52.1) months. Almost all (96%) participants took SXB twice nightly. After transitioning, 98% of participants took LXB twice nightly. Mean (SD) total nightly SXB (n=85) and starting LXB (n=84) doses at baseline were 7.7 (1.5) g and 7.7 (1.5) g, respectively; SXB-LXB dose conversions at baseline were gram-for-gram in 87% of participants. The most common total nightly LXB dose was >7.5 g (56%), followed by >6.0 to ≤7.5 g (21%), >4.5 to ≤6.0 g (15%), and ≤4.5 g (7%). Participant-reported reasons for transitioning to LXB (multiple selections allowed) included lower sodium content for long-term health (93%), physician recommendation (47%), to avoid cardiovascular issues (39%), to avoid side effects (31%), to improve control of narcolepsy symptoms (18%), and other (14%).

Conclusion: The majority of participants transitioned from SXB to LXB using a gram-for-gram dose conversion. The most common reason cited for switching was for long-term health due to the lower sodium content of LXB.

Support (If Any): Jazz Pharmaceuticals.

0389

EFFICACY OF LOWER-SODIUM OXYBATE IN THE TREATMENT OF IDIOPATHIC HYPERSOMNIA: EVALUATION OF RESPONSE BASED ON THE EPWORTH SLEEPINESS SCALE SCORE

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Introduction: Idiopathic hypersomnia is a debilitating neurologic sleep disorder characterized by excessive daytime sleepiness (EDS), with sleep inertia and prolonged nighttime sleep as key symptoms in many patients. The Epworth Sleepiness Scale (ESS) is an 8-item self-report questionnaire (0–24 score range; higher scores indicate greater EDS). An ESS total score ≤10 is considered normal. The minimum clinically important difference (MCID) for narcolepsy is considered to be a decrease of ≥2 points; the MCID in idiopathic hypersomnia has not been established. This post hoc analysis evaluated response to lower-sodium oxybate (LXB; Xywav®) treatment on ESS scores in a phase 3 clinical trial (NCT03533114).

Methods: Eligible participants with idiopathic hypersomnia began LXB treatment with an open-label titration and optimization period (OLT; 10–14 weeks), followed by a 2-week, open-label, stable-dose period (SDP). The ESS was completed at baseline, during OLT (week [W]1, W4, W8, and end of OLT), and end of SDP. Response was defined as ESS total score ≤10 or decrease in total ESS score of ≥4 points after open-label LXB treatment.

Results: Participants were treatment naive (n=47) or taking alerting agents other than sodium oxybate at study entry (stable doses ≥2 months; n=62). At W1, W4, W8, end of OLT, and end of SDP, the percentage of participants achieving a response of total ESS score ≤10 was 13.0%, 55.3%, 70.2%, 85.1%, and 87.2% (treatment-naive participants), respectively, and 21.0%, 56.5%, 65.6%, 74.2%, and 83.9% (participants taking alerting agents), respectively. At W1, W4, W8, end of OLT, and end of SDP, the percentage of participants achieving a response of total ESS score decrease of ≥4 points was 26.1%, 68.1%, 76.6%, 87.2%, and 87.2% (treatment-naive participants), respectively, and 33.9%, 64.5%, 78.7%, 88.7%, and 95.2% (participants taking alerting agents), respectively. Treatment-emergent adverse events (≥10%) included nausea, headache, dizziness, anxiety, and vomiting.

Conclusion: Over 80% of participants achieved a clinically meaningful response based upon ESS total score ≤10, and up to 95% demonstrated a decrease in total ESS score of ≥4 points at end of SDP. The response rate increased over the study period. The safety profile of LXB was consistent with that observed in narcolepsy.

Support (If Any): Jazz Pharmaceuticals.

0390

EFFICACY OF LOWER-SODIUM OXYBATE IN THE TREATMENT OF IDIOPATHIC HYPERSOMNIA: EVALUATION OF RESPONSE BASED ON THE IDIOPATHIC HYPERSOMNIA SEVERITY SCALE SCORE

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Introduction: Idiopathic hypersomnia is a debilitating neurologic sleep disorder characterized by excessive daytime sleepiness (EDS), with sleep inertia and prolonged nighttime sleep as key symptoms in many patients. The Idiopathic Hypersomnia Severity Scale (IHSS) is a 14-item self-reported questionnaire (0–50 score range; higher scores indicate greater severity). The IHSS assesses key symptoms (EDS, sleep inertia, prolonged sleep). An IHSS total score ≤22 is considered normal; the established minimum clinically important difference (MCID) is 4 points. This post hoc analysis evaluated response to lower-sodium oxybate (LXB; Xywav®) treatment on IHSS scores in a phase 3 clinical trial (NCT03533114).

Methods: Eligible participants with idiopathic hypersomnia began LXB treatment with an open-label treatment titration and optimization period (OLT; 10–14 weeks), followed by a 2-week, open-label, stable-dose period (SDP). The IHSS was completed at baseline, during OLT (week [W]1, W4, W8, and end of OLT), and end of SDP. Response was defined as IHSS total score ≤22 or decrease in IHSS total score of ≥4 points after open-label LXB treatment.

Results: Participants were treatment naive (n=47) or taking alerting agents other than sodium oxybate at study entry (stable doses ≥2 months; n=62). At W1, W4, W8, end of OLT, and end of SDP, the percentage of participants achieving a response of total IHSS score ≤22 was 26.1%, 55.3%, 68.1%, 76.6%, and 80.9% (treatment-naive participants), respectively, and 24.2%, 53.2%, 60.7%, 71.0%, and 82.3% (participants taking alerting agents), respectively. At W1, W4, W8, end of OLT, and end of SDP, the percentage of participants achieving a response of total IHSS score decrease of ≥4 points was 45.7%, 80.9%, 83.0%, 97.9%, and 93.6% (treatment-naive participants), respectively, and 46.8%, 79.0%, 83.6%, 90.3%, and 98.4% (participants taking alerting agents), respectively. Treatment-emergent adverse events (≥10%) included nausea, headache, dizziness, anxiety, and vomiting.

Conclusion: Over 80% of participants achieved a clinically meaningful response based upon IHSS total score ≤22, and up to 98% demonstrated a decrease in total IHSS score of ≥4 points at end of SDP. The response rate defined by either parameter increased over the study period. The safety profile of LXB was consistent with that observed in narcolepsy.

Support (If Any): Jazz Pharmaceuticals.

0391

PHYSICIAN PERSPECTIVE ON IDIOPATHIC HYPERSOMNIA: AWARENESS, DIAGNOSIS, AND IMPACT ON PATIENTS

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Introduction: Idiopathic hypersomnia is a debilitating central disorder of hypersomnolence characterized by excessive daytime sleepiness, severe sleep inertia, and prolonged nighttime sleep. Awareness of idiopathic hypersomnia among physicians and the general public is believed to be low, and diagnosis may be delayed by years.

Methods: US physicians completed an online survey (February 5–12, 2021) assessing familiarity with idiopathic hypersomnia and understanding of the diagnostic process and impact on patients' lives. Eligible physicians had been in practice for ≥2 years and had treated ≥2 patients for idiopathic hypersomnia and ≥2 patients for narcolepsy.

Results: There were 305 respondents, including 62 primary care physicians (PCPs), 67 neurologists, 82 psychiatrists, 90 pulmonologists, and 4 sleep specialists. Most were male (73%), White (58%), and 35–54 years of age (62%); mean years in practice was 16.6, and median number of patients with idiopathic hypersomnia was 30. Overall, 48% of physicians reported being extremely familiar with idiopathic hypersomnia (PCPs, 29%; neurologists, 60%; psychiatrists, 34%; pulmonologists, 62%), and 64% agreed that most healthcare providers have an insufficient understanding of idiopathic hypersomnia. Fewer than half (46%) considered the diagnostic process for idiopathic hypersomnia to be clear (strongly/somewhat agree), a lower proportion compared with other sleep disorders (93% for obstructive sleep apnea, 76% for restless legs syndrome, 72% for narcolepsy type 1, and 67% for narcolepsy type 2). Most considered the diagnostic process to be challenging (strongly agree, 40%; somewhat agree, 47%; neither agree nor disagree, 9%; somewhat disagree, 4%; strongly disagree, 1%) and agreed that patients with idiopathic hypersomnia are often misdiagnosed (strongly/somewhat agree, 90%) and that the negative impact of idiopathic hypersomnia is underestimated (strongly/somewhat agree, 92%). Estimated years to diagnosis of idiopathic hypersomnia were 0–1 (11%), 1–2 (32%), 2–5 (39%), 5–10 (15%), and 10+ (2%). Most considered idiopathic hypersomnia to be both a daytime wakefulness disorder and a nighttime sleep disorder (64%).

Conclusion: The survey findings highlight the need for more healthcare provider education and increased understanding of idiopathic hypersomnia, its diagnosis, and its impact on patients' lives.

Support (If Any): Jazz Pharmaceuticals, with participation of the Hypersomnia Foundation.

0392

PATIENT PERSPECTIVE ON IDIOPATHIC HYPERSOMNIA: IMPACT ON QUALITY OF LIFE AND SATISFACTION WITH THE DIAGNOSTIC PROCESS AND MANAGEMENT

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Introduction: Idiopathic hypersomnia is a debilitating central disorder of hypersomnolence characterized by excessive daytime sleepiness (EDS), severe sleep inertia, and prolonged nighttime sleep. The impact of idiopathic hypersomnia on quality of life (QoL) and patient satisfaction with the diagnostic process and management have not been well established.

Methods: US patients with idiopathic hypersomnia completed an online survey (June 10 to July 2, 2021) assessing symptoms, impact, diagnosis, and management.
Results: Respondents (N=290) were mostly female (88%), White (88%), and 25–44 years of age (mean, 38 years), had postsecondary education (88%), and were employed at least part time (63%). Self-reported years to idiopathic hypersomnia diagnosis were 0–1 (31%), 1–2 (16%), 2–5 (21%), 5–10 (13%), and 10+ (19%). Overall, 67% reported unreasonable delays to diagnosis (strongly/somewhat agree); 61% reported being misdiagnosed prior to their idiopathic hypersomnia diagnosis. Diagnoses of depression/anxiety, sleep apnea, or narcolepsy type 2 were reported by 72%, 25%, and 10% of respondents, respectively; these diagnoses were later removed and changed to idiopathic hypersomnia in 26%, 30%, and 57%, respectively. Symptoms of IH endorsed (strongly/somewhat agree) by ≥95% of patients were EDS (99%), reduced mental energy level and motivation to carry out daily activities (99%), and feeling as if they could never get enough sleep (98%). The following statements were endorsed by ≥90% of patients: idiopathic hypersomnia has had a significant negative effect on my QoL (79% strongly agree, 19% somewhat agree), has prevented me from being who I want to be (66% strongly agree, 26% somewhat agree), and is often unrecognized and underdiagnosed (67% strongly agree, 24% somewhat agree), and the idiopathic hypersomnia community is underserved (67% strongly agree, 24% somewhat agree). Specific QoL impacts (strongly agree) included constantly struggled with maintaining relationships (65%), had suicidal thoughts (34%), and chose not to have children (25%). Nearly half (49%) of patients reported dissatisfaction with the management of their idiopathic hypersomnia (not very/not at all satisfied).
Conclusion: The survey findings indicate that patients with idiopathic hypersomnia experience a profound negative impact on QoL and dissatisfaction with their diagnostic journey and management.
Support (If Any): Jazz Pharmaceuticals, with participation of the Hypersomnia Foundation.

0393

WEIGHT CHANGES DURING TREATMENT WITH LOWER-SODIUM OXYBATE IN A PHASE 3 CLINICAL STUDY IN PATIENTS WITH NARCOLEPSY

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Introduction: Treatment with sodium oxybate (SXB) has been associated with weight loss in patients with narcolepsy. Lower-sodium oxybate (LXB) contains the same active moiety as SXB, with 92% less sodium, and is approved in the US for treatment of cataplexy or excessive daytime sleepiness in patients ≥7 years of age with narcolepsy and for treatment of adults with idiopathic hypersomnia. This analysis assessed weight changes after 14 weeks of open-label LXB treatment in a phase 3 clinical study in patients with narcolepsy (NCT03030599).
Methods: Participants 18–70 years of age with narcolepsy with cataplexy (taking SXB only, SXB+other anticataplectics, or other anticataplectics, or who were anticataplectic-naive at study entry) began LXB treatment in a 12-week, open-label, optimized treatment and titration period, followed by a 2-week stable-dose period (SDP) on LXB.
Results: Study participants (N=201) had a mean (SD) age of 37.2 (12.2) years. At baseline, mean (SD) weight and body mass index (BMI) were 83.7 (19.2) kg and 28.8 (6.1) kg/m2, respectively; 31.8% of participants (64/201) were normal weight (BMI 18.5 to <25 kg/m2), 31.8% (64/201) were overweight (BMI 25 to <30 kg/m2), and 35.3% (71/201) were obese (BMI ≥30 kg/m2). At the end of SDP, mean (SD) weight and BMI changes in SXB-only (n=45 weight; n=44 BMI), SXB+anticataplectics (n=14), other-anticataplectics (n=23), and anticataplectic-naive (n=65) participants were, respectively, −0.2 (2.5) kg and 0.0 (0.9) kg/m2, −1.0 (1.9) kg and −0.3 (0.6) kg/m2, −2.3 (4.0) kg and −0.8 (1.4) kg/m2, and −2.5 (3.8) kg and −0.9 (1.3) kg/m2. Weight loss ≥5% at the end of SDP occurred in 6.7% of SXB-only, 0.0% of SXB+anticataplectics, 21.7% of other-anticataplectics, and 27.7% of anticataplectic-naive participants. In normal weight, overweight, and obese participants at baseline, mean (SD) decreases in weight at the end of SDP were −1.5 (3.1) kg, −3.3 (3.5) kg, and −2.6 (4.7) kg, respectively (participants who were oxybate-naive at study entry), and −0.1 (1.8) kg, −1.0 (2.4) kg, and 0.2 (2.8) kg, respectively (participants taking SXB at study entry).
Conclusion: In this study, adults with narcolepsy who were oxybate-naive at study entry experienced greater weight loss during LXB treatment compared with adults previously taking SXB.
Support (If Any): Jazz Pharmaceuticals.

0394

EFFICACY AND SAFETY IN PEOPLE WITH NARCOLEPSY TRANSITIONING FROM SODIUM OXYBATE TO LOWER-SODIUM OXYBATE: DATA FROM THE REAL-WORLD TENOR STUDY

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Introduction: Lower-sodium oxybate (LXB) contains 92% less sodium than sodium oxybate (SXB) and is approved for treating cataplexy or excessive daytime sleepiness in patients with narcolepsy (aged ≥7 years) and idiopathic hypersomnia in adults. The Transition Experience of persons with Narcolepsy taking Oxybate in the Real-world (TENOR) study collects data from patients transitioning from SXB to LXB in a real-world setting.
Methods: TENOR is a patient-centric, prospective, observational, noninterventional, virtual-format study (NCT04803786). Eligible participants include US adults with confirmed narcolepsy (type 1 or 2) transitioning from SXB to LXB within the previous/upcoming 7 days. Longitudinal data are collected for 21 weeks post-transition. Efficacy measures (Epworth Sleepiness Scale [ESS]; Functional Outcomes of Sleep Questionnaire, Short Version [FOSQ-10]; and British Columbia Cognitive Complaint Inventory [BC-CCI]) are collected at baseline (taking SXB) and weekly beginning at week 1 (taking LXB). Participants were prospectively queried about changes in tolerability. These analyses include data collected during the first week of LXB from all qualifying participants.
Results: The analyses include 85 participants (type 1, n=45; type 2, n=40) at baseline and 79 participants at week 1. At baseline, mean (SD) age was 40.3 (13.0) years; most participants were female (73%) and White (87%), and 79% took ≥1 concomitant medication for narcolepsy at baseline in addition to SXB. Patient-reported comorbidities included depression (54%),

anxiety (46%), obstructive sleep apnea (27%), and hypertension (24%). At baseline (taking SXB) and week 1 (taking LXB), mean (SD) ESS scores were 9.9 (5.2) and 9.7 (5.2), respectively (mean [SD] change: −0.3 [2.7]); mean (SD) FOSQ-10 scores were 28.7 (7.1) and 28.8 (7.5), respectively (mean [SD] change: 0.2 [3.9]); and mean (SD) BC-CCI scores were 6.1 (4.4) and 6.1 (4.7), respectively (mean [SD] change: 0.0 [2.3]). Tolerability associated with LXB treatment was consistent with the known safety profile of SXB.
Conclusion: In this real-world study in people with narcolepsy who are transitioning from SXB to LXB, efficacy of oxybate treatment on measures of excessive daytime sleepiness, quality of life, and cognition as well as safety were maintained after 1 week. Longer-term maintenance of efficacy and safety will be reported at study completion.
Support (If Any): Jazz Pharmaceuticals.

0395

EFFECTIVENESS AND TREATMENT OPTIMIZATION AMONG PARTICIPANTS WITH NARCOLEPSY SWITCHING FROM SODIUM OXYBATE TO LOWER-SODIUM OXYBATE: INTERIM DATA FROM THE SEGUE STUDY

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Introduction: Lower-sodium oxybate (LXB) contains 92% less sodium than sodium oxybate (SXB) and is approved for treating cataplexy or excessive daytime sleepiness in patients with narcolepsy (≥7 years of age) and for treating idiopathic hypersomnia in adults. The SEGUE study examines safety, tolerability, effectiveness, and treatment optimization in participants with narcolepsy transitioning from SXB to LXB.
Methods: Eligible participants in this ongoing, multicenter, open-label study are adults with narcolepsy type 1 or 2 who are on a stable dose (maximum 9 g/night; no single dose >6 g) and regimen (once, twice, or thrice nightly) of SXB. After 2 weeks on a stable SXB dose/regimen (baseline period), participants switch to the same dose/regimen of LXB (intervention period; 6 weeks). If needed, LXB dose/regimen is titrated to optimize efficacy/tolerability. Assessments include the Patient Global Impression of Change (PGIc), a forced preference questionnaire (FPQ), and an ease of switching medication scale (EOSMS; all collected at end of treatment/early discontinuation). An interim analysis (first 24 participants to complete the study) is reported.
Results: A majority of participants were female (54%) and White (92%); mean (SD) age was 45.5 (16.20) years. Starting and ending (end of treatment/early discontinuation) median total nightly doses of LXB were both 9.0 g. Most participants took LXB twice nightly (88% at both time points). Twenty-two participants completed the transition period; mean (SD) time to optimized dose was 1.4 (1.56) days, and median (range) number of changes in dose/regimen was 0.0 (0, 1). At end of treatment/early discontinuation, most participants reported improvement (very much/much/minimal; 57%) or no change (43%) in narcolepsy symptoms on the PGIc, preferred LXB over SXB on the FPQ (86%), and reported that the transition to LXB was easy (easy/extremely easy/not difficult at all) on the EOSMS (91%).
Conclusion: Participants with narcolepsy switched from SXB to LXB with minimal modifications of dose/regimen and reported that the transition process was easy. Efficacy of oxybate treatment was maintained or improved, and most participants preferred LXB over SXB.
Support (If Any): Jazz Pharmaceuticals.

0396

CHARACTERISTICS AND DISEASE BURDEN OF PATIENTS WITH IDIOPATHIC HYPERSOMNIA WITH AND WITHOUT LONG SLEEP TIME: THE REAL-WORLD IDIOPATHIC HYPERSOMNIA OUTCOMES STUDY (ARISE)

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Introduction: Idiopathic hypersomnia is a debilitating central disorder of hypersomnolence. The Real World Idiopathic Hypersomnia Outcomes Study (ARISE) assessed the symptoms and impact of idiopathic hypersomnia.
Methods: US-based adults with idiopathic hypersomnia with or without long sleep time (LST; ≥11 hours of sleep in a 24-hour period [self-reported]) completed an online survey assessing symptom severity (Epworth Sleepiness Scale [ESS]; Idiopathic Hypersomnia Severity Scale [IHSS]), daily functioning (Functional Outcomes of Sleep Questionnaire [FOSQ-10]), quality of life (Neuro-QoL), cognition (British Columbia Cognitive Complaints Inventory [BC-CCI]), depression (Patient Health Questionnaire-9 [PHQ-9]), work/activity impairment (Work Productivity and Activity Impairment Questionnaire: Specific Health Problem v2.0 [WPAI:SHP]), and treatment satisfaction (Treatment Satisfaction Questionnaire for Medication vII [TSQM]).
Results: Of 75 participants enrolled, 37 were with LST and 38 were without long sleep (non-LST). Most were female (LST, 73.0%; non-LST, 89.5%) and took medication for idiopathic hypersomnia (LST, 97.3%; non-LST, 81.6%); mean age was 33.7 years (LST) and 34.4 years (non-LST). In LST and non-LST participants, respectively, mean (SD) ESS scores were 15.4 (3.8) and 13.6 (3.0), mean (SD) IHSS scores were 38.2 (7.1) and 32.2 (7.0), and mean (SD) FOSQ-10 scores were 9.6 (2.3) and 11.9 (2.8); mean (SD) Neuro-QoL scores were 22.9 (6.1) and 26.8 (5.7) for ability to participate in social roles/activities and 22.5 (6.6) and 17.4 (5.0) for stigma. Severe cognitive complaints (BC-CCI score 15–18) were reported by 35.1% and 18.4% of LST and non-LST participants, respectively, and severe depression (PHQ-9 score ≥20) was reported by 13.5% and 5.3%. Mean (SD) WPAI:SHP scores in LST and non-LST participants were 57.1 (21.9) and 41.5 (21.4) for presenteeism, 60.1 (24.1) and 45.8 (23.8) for absenteeism+presenteeism, and 72.2 (17.3) and 56.1 (23.2) for activity impairment. Mean (SD) TSQM scores in LST and non-LST participants were 57.9 (21.4) and 66.7 (20.3) for global satisfaction and 49.1 (16.6) and 56.2 (19.7) for effectiveness.
Conclusion: People with idiopathic hypersomnia with long sleep time report greater sleepiness; poorer quality of life, cognition, daily functioning, and work performance; a higher rate of severe depression; and less satisfaction with treatment, compared with those without long sleep time.
Support (If Any): Jazz Pharmaceuticals.

0397

AUTONOMIC REFLEX TESTING CONFIRMS AUTONOMIC DISTURBANCES IN A COHORT OF PATIENTS WITH IDIOPATHIC HYPERSOMNIA

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Introduction: Symptoms suggestive of autonomic nervous system (ANS) dysfunction have been previously described in patients with idiopathic hypersomnia (IH), however, objective ANS reflex testing data has not been reported. We aimed to better quantify symptoms of ANS dysfunction in a cohort of patients with IH through the use of standardized ANS reflex testing.

Methods: Patients diagnosed with IH based on ICSD-3 criteria using overnight video polysomnography and multiple sleep latency testing (MSLT) were consecutively enrolled in our study, regardless of ANS symptoms. All patients underwent ANS reflex testing, including measures of parasympathetic (heart rate variability with deep breathing and Valsalva ratio) and sympathetic adrenergic function (Valsalva blood pressure response and 10-minute head-up tilt at an angle of 70 degrees) with continuous blood pressure and heart rate monitoring. Eleven patients also underwent measures of sympathetic cholinergic function (quantitative sudomotor axon reflex testing). All medications that affect ANS function were held prior to ANS testing, including wake-promoting medications and sodium oxybate.

Results: Twenty patients with IH were enrolled. Fifty percent (10/20) were long sleepers (>11hrs). Mean sleep onset latency and number of sleep onset REM periods (SOREMs) on MSLT were 6.9 (± 3.1) mins and 0.2 (± 0.4), respectively. Mean duration of IH symptoms prior to the date of ANS testing was 6.3 (± 8.1) yrs. Eighty-five percent (17/20) of patients had abnormal ANS testing. Of these, 75% (15/20) had sympathetic adrenergic impairment, 64% (7/11) had sympathetic cholinergic impairment, and 5% (1/20) had parasympathetic impairment. Fifty-five percent (11/20) of patients were diagnosed with postural tachycardia syndrome (POTS), 45% (5/11) with small fiber neuropathy, 5% (1/20) with inappropriate sinus tachycardia and 15% (3/20) with neurally-mediated syncope. Seventy percent (14/20) of patients reported orthostatic intolerance regardless of autonomic diagnosis.

Conclusion: ANS dysfunction was common and severe in our cohort of IH patients, affecting all domains of ANS reflex testing, with more prominent impairment in sympathetic domains. POTS was the most common comorbid diagnosis, and most patients reported orthostatic intolerance. There was no association with IH disease duration, though our sample size was limited. Future studies will focus on ANS testing in larger cohorts of IH patients, specifically on shared pathophysiological mechanisms of hypersomnia and ANS dysfunction.

Support (If Any):

0398

IS INCREASED SERUM PROLACTIN ASSOCIATED WITH EXCESSIVE DAYTIME SLEEPINESS? A PROOF-OF-CONCEPT ANALYSIS

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Introduction: With this study we aimed to: 1) identify subjects with hyperprolactinemia in a clinical sample of patients; 2) compare the neurologic, psychiatric, and sleep conditions found in patients subgrouped by excessive daytime sleepiness (EDS) and hyperprolactinemia; 3) identify patients with hyperprolactinemia and EDS not supported by the presence of any other neurologic, psychiatric, or sleep disorder, or substance/medication use.

Methods: A retrospective chart review of inpatients was carried out in order to identify all patients in whom the prolactin (PRL) serum levels were determined. A total of 130 subjects were retrieved: 55 had increased levels of PRL while the remaining 75 participants had normal PRL levels.

Results: EDS was reported by 32 (58.2%) participants with increased PRL and 34 (45.3%) with normal PRL. Obstructive sleep apnea or other sleep or neurologic/psychiatric conditions could explain EDS in all participants with normal PRL. Among subjects with increased PRL, eight had no other neurologic/psychiatric or sleep disorder (or drug) potentially causing EDS; these participants, at polysomnography, had time in bed, sleep period time, and total sleep time longer than those with EDS associated to another condition.

Conclusion: These findings can be considered as a preliminary indication of a role of hyperprolactinemia in EDS and represent a basis for future controlled studies able to test in a reliable, objective, and methodologically more appropriate way this hypothesis.

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0399

PATIENT PREFERENCE AND NOCTURNAL EXPERIENCE WITH SODIUM OXYBATE TREATMENT FOR NARCOLEPSY: INTERIM DATA FROM RESTORE

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Introduction: Available, immediate-release oxybate products for narcolepsy require patients to awaken for a second dose 2.5-4 h after the first to cover a full night of sleep. The investigational, extended-release once-nightly sodium oxybate (ON-SXB; FT218) eliminates this middle-of-the-night dosing. This interim analysis from the ongoing RESTORE study (NCT04451668) assessed patient preferences for ON-SXB versus twice-nightly sodium oxybate

(SXB) and experiences with the second nightly SXB dose in patients who switched from twice-nightly SXB to ON-SXB.
Methods: Participants enrolled in the open-label extension/switch study (RESTORE) were aged ≥16 y with a confirmed diagnosis of narcolepsy type 1 or 2 from the phase 3 REST-ON trial or receiving stable doses of twice-nightly SXB for ≥1 month. Initial ON-SXB doses for switch patients were equivalent/closest to their previous total nightly SXB dose. Patient preference questionnaires were completed by switch patients 3 months after switching and nocturnal adverse event (AE) questionnaires at baseline.
Results: At an interim data cutoff date of November 22, 2021, 46 participants completed patient preference questionnaires; 93.5% (43/46) preferred ON-SXB to twice-nightly SXB. Nocturnal AE questionnaires were completed by 76 switch participants. In the 3 months before switching to ON-SXB, 62% (47/76) had unintentionally missed their second twice-nightly SXB dose, with 86% experiencing worse narcolepsy symptoms the next day. Forty percent (30/76) reported taking their second twice-nightly SXB dose >4 h after the first dose, with 47% reporting being somewhat, quite a bit, or extremely groggy/unsteady the next morning. For 76% (58/76), taking a second nighttime dose was somewhat, quite a bit, or extremely inconvenient. Additionally, 91% (69/76) reported that they had arisen from bed after the second dose; of these, 5 reported associated falls, and 3 had injuries. Anxiety (25%) and the need for someone else to wake them (21%) were also reported. One participant reported that the medication was missing when they awoke for the second dose.
Conclusion: These interim data indicate that individuals with narcolepsy and prior experience taking SXB prefer ON-SXB to twice-nightly SXB. Treatment burden from the second nightly SXB dose may be alleviated with ON-SXB.
Support (If Any): Avadel Pharmaceuticals

0400

SLEEP ONSET REM PERIOD (SOREMP); BEYOND THE DIAGNOSTIC MARKER

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Introduction: Shortened mean sleep latency and multiple Sleep Onset REM Period (SOREMP) on MSLT has been used as a characteristic marker for narcolepsy and incorporated in all editions of International Classification of Sleep Disorders. Epidemiologic studies have shown that SOREMP could occur in general population especially those with sleep insufficiency and shift work. However the physiological meaning of SOREMP besides the diagnostic marker is not well clarified. We searched for subjective and objective sleep variables independently associated with the number of SOREMPs.
Methods: Participants were 769 consecutive sleepy patients or controls who gave written informed consent and underwent PSG followed by MSLT in Seiwa Hosiptal or Koishikawa Tokyo Hospital from October 2014 to November 2021. We excluded those with obvious nocturnal sleep disturbances (AHI≥10, PLMI≥15), with medication affecting sleep and with severe first-night effect at the time of PSG. We analyzed data from resultant 580 participants (male/female=312/268, age 25.3±8.4 years old, BMI 21.6±3.3). They were subdivided into 4 groups according to the number of SOREMPs on MSLT (used as ordinal scale). Subjects with 3 or more SOREMPs were merged into one group to increase number enough for statistical analyses. We dichotomized participants into narcolepsy type 1 (NT1) (n=50) and others (n=530) to adjust the effect of NT1 diagnosis. Epworth Sleepiness Scale (ESS) as well as conventional sleep variables on PSG and MSLT were compared by ANOVA and variables associated with the number of SOREMPs were further analyzed by regression analyses to determine the independent association after adjustment of covariates (age, sex, BMI and dichotomized diagnosis).
Results: Number of SOREMPs on MSLT was positively associated with ESS score (p=0.010), Total Sleep Time (TST) (p=0.03), REM %TST(p<0.001), and negatively associated with Sleep Latency (p<0.01), REM Latency (p<0.001), MSLT mean Sleep Latency (p<0.001) and MSLT REM Latency (p<0.001) and subjective sleep latency on PSG night.
Conclusion: Our data indicate that the number of SOREMPs have physiological significance besides narcolepsy diagnosis. More SOREMPs reflects higher sleep propensity and REM propensity as well as subjective sleepiness. The number of SOREMPs can be a marker reflecting one aspect of sleepiness. Our study will also contribute to better understand the meaning of SOREMP in diagnostic criteria of central disorders of hypersomnolence.
Support (If Any): This study was partly supported by JSPS KAKENHI Grant Number JP21H02856.

0401

EFFICACY OF ONCE-NIGHTLY SODIUM OXYBATE (ON-SXB; FT218) BY NARCOLEPSY TYPE: POST-HOC ANALYSES FROM THE REST-ON TRIAL

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Introduction: Once-nightly sodium oxybate (ON-SXB; FT218) was evaluated for treatment of narcolepsy in the phase 3 REST-ON trial (NCT02720744). Significant improvement was shown for the three coprimary endpoints mean sleep latency on the Maintenance of Wakefulness test (MWT), Clinical Global Impression of Improvement (CGI-I) rating, and weekly number of cataplexy attacks overall (all P<0.001 vs placebo) and in post-hoc analyses by narcolepsy type (NT1/NT2) for MWT and CGI-I (all P<0.05). Post-hoc efficacy analyses of objective and subjective measures of disrupted nighttime sleep and daytime sleepiness by narcolepsy type were conducted.
Methods: Participants aged ≥16 years were randomized 1:1 to receive ON-SXB (1 week, 4.5 g; 2 weeks, 6 g; 5 weeks, 7.5 g; 5 weeks, 9 g) or placebo. Mixed-effects models for repeated measures were used to calculate P values for change from baseline vs placebo at weeks 3 (6 g), 8 (7.5 g), and 13 (9 g) for secondary REST-ON endpoints of Epworth sleepiness scale (ESS) score, sleep shifts (ie, the number of shifts from stages N1, N2, N3 and rapid eye movement [REM] sleep to Wake and from N2, N3 and REM sleep to N1), nocturnal arousals (NA), and patient-reported sleep quality and refreshing nature of sleep (100-point visual analog scale).
Results: Of 190 participants, 145 had NT1 (ON-SXB, n=73; placebo, n=72) and 45 had NT2 (ON-SXB, n=24; placebo, n=21).

Improvements with ON-SXB vs placebo were reported for shifts to a lighter stage of sleep (NT1: 6, 7.5, 9 g, all P<0.001; NT2: 6 and 7.5 g, P<0.05; 9 g, P<0.001), NA (NT1: 6 g, P<0.05; 7.5 and 9 g, P<0.01; NT2: 6 g, directional improvement; 7.5 and 9 g, P<0.05), and sleep quality (NT1: 6, 7.5, 9 g, all P<0.001; NT2: 6, 7.5, 9 g, all P<0.05). Significant improvements in ESS and refreshing nature of sleep for ON-SXB vs placebo were reported for NT1 (6, 7.5, 9 g, P≤0.001) with directional improvements observed for the NT2 subgroup.
Conclusion: Results of these subgroup efficacy analyses are generally consistent with previously reported REST-ON endpoints and support ON-SXB treatment efficacy in adults with NT1 or NT2.
Support (If Any): Avadel Pharmaceuticals

0402

EFFICACY OF FT218, A ONCE-NIGHTLY SODIUM OXYBATE FORMULATION, IN PATIENTS WITH NARCOLEPSY: POST-HOC SENSITIVITY ANALYSES FROM THE REST-ON TRIAL

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Introduction: In REST-ON, once-nightly sodium oxybate (ON-SXB; FT218) achieved significant improvement (P<0.001) vs placebo for all coprimary endpoints: Maintenance of Wakefulness test (MWT) mean sleep latency, Clinical Global Impression of Improvement (CGI-I) rating, and weekly number of cataplexy attacks (NCA).
Methods: Individuals aged ≥16 years were randomized 1:1 to receive ON-SXB (1 week, 4.5 g; 2 weeks, 6 g; 5 weeks, 7.5 g; 5 weeks, 9 g) or placebo. Post-hoc sensitivity analyses were conducted with methods to handle missing data: completer population; placebo-based multiple imputation (MI) with missing not at random assumption; analysis of covariance (ANCOVA); and tipping point-based MI of worsening values until P>0.05.
Results: Completers (ON-SXB, n=69; placebo, n=79) showed significant improvement (P<0.001) with 6, 7.5, and 9 g ON-SXB vs placebo on all coprimary endpoints; with 9-g dose, mean (95% CI) differences vs placebo were 6.0 min (3.3–8.7) on MWT and –6.6 (–9.6 to –3.6) in NCA; 72.3% and 31.6%, respectively (odds ratio [OR], 5.7 [95% CI: 2.8–11.6]), were CGI-I responders. All ON-SXB doses achieved significant improvement (P<0.001) vs placebo on all coprimary endpoints with placebo-based MI and ANCOVA. With placebo-based MI, mean (95% CI) differences vs placebo (9-g dose) were 5.4 min (2.8–8.0) on MWT and –6.4 (–11.3 to –3.7) in NCA; 63.0% and 28.5%, respectively (OR, 4.3 [95% CI: 2.3–8.0]), were CGI-I responders. With ANCOVA, mean (95% CI) differences vs placebo (9-g dose) were 6.0 min (3.6–8.5) on MWT and –6.4 (–9.0 to –3.8) in NCA; CGI-I rating difference was –1.0 (–1.3 to –0.7). With MWT tipping point MI, between-treatment differences lost significance with worsening of 7.0, 5.2, and 4.3 min from baseline for 6, 7.5, and 9 g, respectively (implausible for 7.5- and 9-g doses). When withdrawals from ON-SXB were imputed as "not improved," CGI-I remained significant (all 3 doses, P<0.001). Mean NCA remained significant for all 3 doses vs placebo with worsening trajectories imputed; positive results were not tipped over with plausible values.
Conclusion: These results support the robustness of the primary efficacy data for ON-SXB for narcolepsy treatment.
Support (If Any): Avadel Pharmaceuticals

0403

EFFICACY OF ONCE-NIGHTLY SODIUM OXYBATE (ON-SXB; FT218) FOR EXCESSIVE DAYTIME SLEEPINESS AND CATAPLEXY: POST-HOC NUMBER NEEDED TO TREAT AND EFFECT SIZE ANALYSES FROM REST-ON

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Introduction: FT218 is an investigational, extended-release, once-nightly formulation of sodium oxybate (ON-SXB) for adults with narcolepsy. ON-SXB treatment achieved significant improvement vs placebo (6 g, 7.5 g, and 9 g, all P<0.001) for the coprimary endpoints of mean sleep latency on the Maintenance of Wakefulness test (MWT), Clinical Global Impression of Improvement rating, and number of weekly cataplexy episodes (NCA), and the secondary endpoint Epworth sleepiness scale (ESS) score, in the phase 3 REST-ON trial (NCT02720744). Post-hoc analyses of numbers needed to treat (NNT) and effect sizes were performed to further contextualize the effectiveness of ON-SXB.
Methods: Participants in REST-ON (aged ≥16 years with narcolepsy type 1 or 2) were randomized 1:1 to receive ON-SXB (1 week, 4.5 g; 2 weeks, 6 g; 5 weeks, 7.5 g; 5 weeks, 9 g) or placebo. MWT response was defined as ≥5-min increase from baseline in mean sleep latency, ESS response as a score ≤10, and cataplexy response as ≥50% reduction from baseline in mean NCA. Effect sizes were calculated using Cohen's d; NNTs were the inverse of the absolute risk reduction.
Results: The modified intent-to-treat population included 190 participants (ON-SXB, n=97 [NT1, n=73]; placebo, n=93 [NT1, n= 72]). For MWT response, all ON-SXB doses (6 g at week 3, 7.5 g at week 8, and 9 g at week 13) had NNTs of 3 and effect sizes of 0.7–0.9. A dose-response effect was seen for ESS response with NNTs ranging from 3 to 6. Effect sizes were between –0.5 to –0.7 for the 3 doses (decreases signifying response). The NNT for cataplexy response was 6 for ON-SXB 6 g and 3 for ON-SXB 7.5 and 9 g; effect sizes were between –0.7 to –0.8.
Conclusion: NNT calculations show that 3–6 patients need to be treated with ON-SXB to achieve ≥5 minutes increased sleep latency on the MWT, ESS score ≤10, or a ≥50% reduction in cataplexy. Considering these post-hoc analyses may be useful to clinicians in discussing treatment expectations and provide support for the efficacy of ON-SXB for excessive daytime sleepiness and cataplexy in adults with narcolepsy.NNT calculations show that 3–6 patients need to be treated with ON-SXB to achieve ≥5 minutes increased sleep latency on the MWT, ESS score ≤10, or a ≥50% reduction in cataplexy. Considering these post-hoc analyses may be useful to clinicians in discussing treatment expectations and provide support for the efficacy of ON-SXB for excessive daytime sleepiness and cataplexy in adults with narcolepsy.
Support (If Any): Avadel Pharmaceuticals

0404

PATIENT AND PROVIDER PREFERENCES FOR OXYBATE TREATMENT FOR NARCOLEPSY: A DISCRETE CHOICE EXPERIMENT

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Introduction: Currently available immediate-release sodium oxybate (SXB) and mixed-salt oxybates are dosed twice nightly (second 2.5–4 hours after first). Extended-release, once-nightly SXB (ON-SXB; FT218) is in development. To characterize drivers of oxybate treatment attribute preferences, discrete choice experiments (DCEs) were conducted for both patients and healthcare providers (HCPs).
Methods: Thirty-minute web-based surveys were fielded to 1) adults with self-reported physician-diagnosed narcolepsy with/without prior/current use of oxybate, and 2) board-certified/board-eligible HCPs treating ≥5 narcolepsy patients in the last month. Choice sets of 2 hypothetical treatment profiles were generated combining attributes of twice-nightly SXB, mixed-salts oxybate, and ON-SXB. While viewing 12 choice sets, each participant indicated (1) their preferred product overall, (2) the product that would improve quality of life (QoL), and (3) the product that would result in less patient stress/anxiety. Results were analyzed using a mixed logit model.
Results: For patients (n=120) and HCPs (n=100), the most important attribute driving overall product choice was dosing frequency (relative attribute importance, 26.0 and 46.1, respectively), with once-nightly preferred over twice-nightly dosing (relative preference weight, ±25.6 and ±43.6); QoL (relative attribute importance, 28.7 and 41.7), with once-nightly preferred over twice-nightly dosing (relative preference weight, ±25.7 and ±38.5); and reducing patient anxiety/stress (relative attribute importance, 26.7 and 44.0), with once-nightly preferred over twice-nightly dosing (relative preference weight, ±23.9 and ±41.6). Other drivers of overall product choice were as follows: patients, clinical efficacy and sodium content (relative attribute importance, 23.5 and 20.8); HCPs, adverse reactions and sodium content (relative attribute importance, 19.7 and 18.6). Drivers of QoL preference were as follows: patients, clinical efficacy and sodium content (relative attribute importance, 28.3 and 20.9); HCPs, adverse reactions and clinical efficacy (relative attribute importance, 21.5 and 18.6). Drivers of reducing patient anxiety/stress were as follows: patients, clinical efficacy and sodium content (relative attribute importance, 17.4 and 17.3); HCPs, adverse reactions and sodium content (relative attribute importance, 18.2 and 14.2).
Conclusion: Dosing frequency was identified as the most important attribute driving preference for overall product choice, QoL, and reducing patient anxiety/stress for both patients and HCPs with once-nightly preferred over twice-nightly dosing.
Support (If Any): Avadel Pharmaceuticals

0405

PATIENT AND HEALTHCARE PROVIDER SURVEYS OF NARCOLEPSY DISEASE BURDEN AND OXYBATE TREATMENT EXPERIENCE

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Introduction: Immediate-release sodium oxybate (SXB) and mixed-salt oxybates require patients with narcolepsy to take a second nightly dose 2.5–4 h after the first. Extended-release, once-nightly SXB (ON-SXB; FT218) is an investigational treatment for adults with narcolepsy. Surveys evaluated patient and healthcare provider (HCP) perspectives on narcolepsy disease burden and satisfaction with current narcolepsy treatment options.
Methods: Individuals with narcolepsy and HCPs participated in 30-minute, web-based surveys. Participants were 1) adults with self-reported, physician-diagnosed narcolepsy for ≥1 year, and prior/current/no use immediate-release oxybates; and 2) board-certified/board-eligible HCPs (pulmonology, sleep medicine, neurology, psychiatry specialties); nurse practitioners; or physician assistants. Participants responded using 9-point scales; higher scores indicated greater severity/agreement/satisfaction/importance/preference.
Results: Mean patient participant (n=120) age was 40 years; most were white (81%), female (79%), and current/past users of twice-nightly SXB (n=86) or mixed-salt oxybates (n=56). Twenty-six were oxybate naive. Most HCPs (n=100; 68% male) had sleep medicine (37%) or neurology (30%) specialties; 91% and 83% had experience with twice-nightly SXB and mixed-salt oxybates, respectively. Patients and HCPs agreed that patients preferred narcolepsy treatments dosed fewer times (rated 6.7 and 7.7, respectively). Common symptoms patients experienced daily/almost daily at narcolepsy diagnosis were tiredness/fatigue (64%) and excessive daytime sleepiness (EDS; 68%). HCPs and patients expressed moderate-to-high satisfaction with mixed-salt oxybates (both 7.1) and twice-nightly SXB (6.8 and 6.6, respectively). Compared to HCPs, patients were less satisfied with modafinil (6.9 vs 4.5), armodafinil (6.9 vs 4.8), solriamfetol (6.8 vs 5.4), and pitolisant (6.6 vs 5.2). Twice-nightly SXB and mixed-salt oxybates received high ratings from patients and HCPs for reduction of cataplexy (patients: 7.3 and 7.4; HCPs, 6.7 and 6.8) and EDS (patients: both 7.0; HCPs, both 6.9). Lower satisfaction was reported for twice-nightly SXB and mixed-salt oxybates with dosing frequency (patients, 5.4 and 6.0; HCPs, 5.9 and 6.3) and medication taste (patients, 5.3 and 5.7; HCPs, 5.9 and 6.2).
Conclusion: While both individuals with narcolepsy and HCPs are relatively satisfied with current narcolepsy treatments, both groups are less satisfied with the dosing frequency of currently approved oxybate formulations. ON-SXB will be an additional treatment option that can address this unmet need.
Support (If Any): Avadel Pharmaceuticals

0406

EFFICACY OF ONCE-NIGHTLY SODIUM OXYBATE (ON-SXB; FT218) ACROSS STIMULANT USE SUBGROUPS: POST-HOC ANALYSES FROM THE REST-ON TRIAL

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Introduction: In the REST-ON trial (NCT02720744), once-nightly sodium oxybate (ON-SXB; FT218) was associated with significant improvement vs placebo for mean sleep latency on the Maintenance of Wakefulness test (MWT) and Clinical Global Impression of Improvement (CGI-I) rating in the overall population (both P<0.001) and in subgroups of participants taking concomitant stimulants (both P<0.05). Post-hoc analyses of ON-SXB efficacy on disturbed nocturnal sleep (DNS) and Epworth Sleepiness Scale (ESS) score were conducted.

Methods: Participants (≥16 years of age) with narcolepsy type 1 or 2 were randomized 1:1 to ON-SXB (1 week, 4.5 g; 2 weeks, 6 g; 5 weeks, 7.5 g; 5 weeks, 9 g) or placebo. Mixed-effects models for repeated measures calculated P values for change from baseline vs placebo at weeks 3 (6 g), 8 (7.5 g), and 13 (9 g) in ESS score, sleep shifts (ie, number of shifts from N1, N2, N3, and rapid eye movement [REM] sleep to Wake and from N2, N3, and REM sleep to N1), nocturnal arousals (NA), and patient-reported outcomes of sleep quality and refreshing nature of sleep on a 100-point visual analog scale.

Results: In the modified intent-to-treat population (n=190), 119 participants took concomitant stimulants (ON-SXB, n=66; placebo, n=53); 71 did not take stimulants (ON-SXB, n=31; placebo, n=40). Improvements with ON-SXB vs placebo were reported: ESS (stimulants: all doses, P≤0.01; no stimulants: 6 g, directional improvement; 7.5 g, P<0.01; 9 g, P<0.001), sleep shifts (stimulants: 6 g, P<0.01; 7.5 and 9 g, P<0.001; no stimulants: all doses P<0.001), NA (stimulants: 6 g, directional improvement; 7.5 g, P<0.01; 9 g, P=0.001; no stimulants: 6 and 7.5 g, P<0.05; 9 g, P=0.01), sleep quality (stimulants: 6 and 7.5 g, P<0.01; 9 g, P<0.05; no stimulants: all doses P<0.001), refreshing nature of sleep (stimulants: 6 and 9 g, P<0.05; 7.5 g, P<0.001; no stimulants: 6 and 7.5 g, P<0.01; 9 g, P=0.001).

Conclusion: Data from these post-hoc analyses were consistent with the previously reported results from REST-ON and support the efficacy of ON-SXB for EDS and DNS, as measured by objective and subjective endpoints whether or not stimulants were concurrently used.

Support (If Any): Avadel Pharmaceuticals

0407

EARLY EFFICACY WITH ONCE-NIGHTLY SODIUM OXYBATE (ON-SXB; FT218): POST-HOC ANALYSES FROM REST-ON

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Introduction: Extended-release once-nightly sodium oxybate (ON-SXB; FT218) is in development for adults with narcolepsy. In REST-ON, significant improvements on the Maintenance of Wakefulness test, Clinical Global Impression of Improvement rating, and number of weekly cataplexy episodes occurred with all analyzed ON-SXB doses vs placebo (week 3, 6-g dose; week 8, 7.5-g dose; week 13, 9-g dose; all P<0.001). ON-SXB was superior to placebo on Epworth Sleepiness Scale (ESS) score and sleep quality and refreshing nature of sleep using visual analog scales (VAS; all P<0.001). ON-SXB 4.5 g significantly reduced cataplexy episodes vs placebo at week 1 (P<0.05). Post hoc analyses investigated ON-SXB efficacy on ESS score, VAS sleep quality, and VAS refreshing nature of sleep at weeks 1 and 2.

Methods: Participants in the double-blind, phase 3 REST-ON (NCT02720744) trial were ≥16 years old, had narcolepsy type 1 or 2, and were randomized 1:1 to ON-SXB (4.5 g, 1 week; 6 g, 2 weeks; 7.5 g, 5 weeks; 9 g, 5 weeks) or placebo. Participants recorded ESS scores and VAS for sleep quality and refreshing nature of sleep (1-100; 1=poor quality/unrefreshing sleep; 100=good quality/refreshing sleep) using electronic diaries. P-values were calculated using a mixed-effects model for repeated measures in the modified intent-to-treat (mITT) population (ie, participants receiving ≥1 dose of study drug having ≥1 efficacy assessment at week 3).

Results: In the mITT population (n=190; ON-SXB, n=97; placebo, n=93), baseline ESS scores were 16.6 and 17.5 with ON-SXB and placebo, respectively. At week 2, ESS score was significantly improved with ON-SXB vs placebo (P<0.02) with numerical improvement seen at week 1. At baseline, sleep quality was 53.8 and 55.9 on VAS in the ON-SXB and placebo groups, respectively, and baseline refreshing nature of sleep was 46.5 and 49.9. At weeks 1 and 2, sleep quality (P<0.01; P<0.001) and refreshing nature of sleep (P<0.05; P=0.001) were significantly improved for ON-SXB vs placebo.

Conclusion: Improvement in daytime sleepiness, sleep quality, and refreshing nature of sleep occurred with ON-SXB beginning the first week of treatment. Some patients may experience early narcolepsy symptom relief with ON-SXB.

Support (If Any): Avadel Pharmaceuticals

0408

A NARCOLEPSY DETECTION PARADIGM: AUTOMATED NOCTURNAL DETECTION AND NOTIFICATION OF SLEEP ONSET RAPID EYE MOVEMENT PERIODS

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Introduction: Rapid eye movement (REM) sleep detected by polysomnography (PSG) occurring within 15 minutes of nocturnal sleep (sleep onset REM period; SOREMP) is a known biomarker

for hypocretin-deficient narcolepsy. However, the SOREMP is often underappreciated when observed in patients undergoing routine diagnostic sleep testing, evidenced by the paucity of further evaluation for hypersomnia in these individuals. To enhance identification of SOREMP episodes, we developed an automated process to detect and advise sleep clinicians of sleep onset REMs. This study aimed to evaluate the impact of automated SOREMP notification on clinician recommendations for narcolepsy diagnostic evaluation and multiple sleep latency test (MSLT) outcomes.
Methods: The automated SOREMP notification program was offered to all sleep clinicians within a large multicenter sleep clinic network. De-identified sleep studies were uploaded to a secure data cloud for real-time automated SOREMP detection. Algorithmic-determined SOREMPs underwent human adjudication by a team of expert registered sleep scorers. Clinicians were advised of the presence of SOREMPs within the interpretation platform via a visual banner. Clinician recommendations and future testing (including MSLTs) were naturalistically tracked.
Results: Of 17,447 sleep studies processed over 3 years, 145 exhibited a SOREMP (0.8%). Five studies were excluded from primary analyses because of a prescheduled MSLT (n=2 narcolepsy; n=2 idiopathic hypersomnia; n=1 "normal"). Of the remaining 140 patients, 19 (14%) were recommended for further narcolepsy evaluation/MSLT; to date, 4 patients have had an MSLT (n=3 narcolepsy; n=1 "normal"). Excluding the PSG SOREMP, MSLT outcomes were #1: 2 SOREMPs and MSL=4.7 min; #2: 3 SOREMPs and MSL=3.0 min; #3: 5 SOREMPs and MSL=4.6 min; #4: 0 SOREMPs and MSL=11.7 min.
Conclusion: This study implemented enhanced identification and subsequent clinician notification of nocturnal SOREMPs using a novel sensitive SOREMP detection paradigm. This methodology resulted in recommendation of 19 patients, who otherwise may have gone undetected, for further narcolepsy evaluation. When conducted, MSLTs most often supported a narcolepsy diagnosis. This is a call to action for medical providers to critically evaluate patients who exhibit a PSG SOREMP, as it may provide a unique opportunity to identify and treat narcolepsy. Further research is needed to better understand the low referral rate.
Support (If Any): Jazz Pharmaceuticals.

0409

SELF-PERCEIVED SLEEP DURING THE MAINTENANCE OF WAKEFULNESS TEST: HOW DOES IT PREDICT ACCIDENTAL RISK IN PATIENTS WITH SLEEP DISORDERS?

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Introduction: The objective of this study is to determine whether the feeling of having slept or not during the Maintenance of Wakefulness Test (MWT) is associated with the occurrence of self-reported sleep-related traffic near misses and accidents in patients with sleep disorders.
Methods: This study was conducted in patients hospitalized in a French sleep center to perform a 4 × 40 min MWT. Relationship between mean sleep latency on the MWT, feeling of having slept or not during MWT trials and sleep-related near misses and accidents reported during the past year was analyzed.
Results: One hundred and ninety-two patients suffering from OSAS, idiopathic hypersomnia, narcolepsy, restless leg syndrome or insufficient sleep syndrome were included. One hundred and sixty-five patients presented no or one misjudgment of feeling of having slept during MWT trials while 27 presented more than two misjudgments. Almost half of the latter (48.1%) reported a sleepiness-related traffic near miss or accident in the past year versus only one third (27.9%) for the former ($p < 0.05$). Multivariate logistic regression showed that patients with more than two misjudgments had a 2.52-fold (95% CI, 1.07–5.95, $p < 0.05$) increase in the risk of reporting a sleepiness-related near miss/accident.
Conclusion: Misjudgment in self-perceived sleep during the MWT is associated with the occurrence of self-reported sleepiness-related traffic near misses and accidents in the past year in patients suffering from sleep disorders. Asking about the perception of the occurrence of sleep during the MWT could be used to improve driving risk assessment in addition to sleep latencies.
Support (If Any): This was not an industry supported study. This project was supported by a grant from the French Sleep Society (SFRMS).

0410

UTILITY OF THE URINE DRUG SCREEN IN MAINTENANCE OF WAKEFULNESS TESTING INTERPRETATION - A SINGLE-CENTER, RETROSPECTIVE ANALYSIS IN PEDIATRIC PATIENTS

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Introduction: Accurate assessment of hypersomnia depends upon consideration of several factors, including use of medications that affect alertness and sleep organization. Urine drug screens (UDS) are recommended when assessing hypersomnia, but there is little standardization with respect to screening methods, types of substances detected, and use in maintenance of wakefulness test (MWT) interpretation, in part because there is scant literature relating UDS results to patients' characteristics, MWT findings and implications.
Methods: A retrospective analysis was performed in adolescents evaluated at Cincinnati Children's Sleep Center between 2008 and 2021 who underwent MWT with concurrent UDS to determine the adequacy of hypersomnia treatment. UDS in our laboratory were performed by Qualitative Immunoassay/Gas Chromatography-Mass Spectrometry/Liquid Chromatography-Tandem Mass Spectrometry.
Results: A total of 109 MWTs were accompanied by UDS in 79 patients. Patients were 17.7 [16.6, 18.6] years old (median, [IQ range]), 41.3% female, 68.8% White, 25.7% Black, 5.5% Other, with a BMI of 25.8 [22.1, 31.8] kg/m2. 85.3% had narcolepsy. In addition to prescribed medications, caffeine was positive in 54.1% of UDS, and diphenhydramine was positive in 58.7%. No patients reported use of caffeine or diphenhydramine on the day of MWT. There were no significant demographic differences between those who tested positive and negative for caffeine. The median sleep latency in those with caffeine-positive UDS was longer than those with caffeine-negative UDS, although it did not reach statistical significance (27.3 [14.7, 38.3] vs 19.1 [9.8, 36.1] minutes; P=0.15). Patients with a positive UDS for diphenhydramine all took modafinil/armodafinil. In addition, 80% of patients taking modafinil/armodafinil had diphenhydramine-positive results. Nicotine and cannabinoids were detected in 2 UDS.

Conclusion: Two unexpected substances (caffeine and diphenhydramine) were found on UDS during MWTs in a significant proportion of our cohort. Caffeine may influence the results of MWTs, although further investigations are warranted. The unexpected presence of diphenhydramine is a false positive for those patients on modafinil/armodafinil (supported by literature and confirmed by our laboratory director). Sleep clinicians should be aware of these findings and the implications of unexpected substances when interpreting MWTs.
Support (If Any): Cincinnati Children's Hospital Research Fund

0411

ONCE-NIGHTLY SODIUM OXYBATE DOSE TITRATION AND TOLERABILITY: INTERIM DATA FROM RESTORE

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Introduction: Extended-release, once-nightly sodium oxybate (ON-SXB; FT218) is under FDA review for the treatment of adults with narcolepsy. RESTORE, an ongoing, open-label extension/switch study (NCT04451668), evaluates long-term ON-SXB safety and tolerability. This interim analysis assessed dosing titration, tolerability, and study continuation.
Methods: RESTORE enrolls adults with narcolepsy in 1 of 3 groups: those with prior REST-ON participation but no current oxybate use (Group A), those who switched from twice-nightly oxybates (Group B), and oxybate-naïve patients (Group C). No patients rolled directly from REST-ON to RESTORE. Initial dose for Groups A/C was 4.5 g/night. Group B switched to ON-SXB from stable doses of twice-nightly oxybate to the nearest equivalent single dose. Investigators could increase or decrease dose by 1.5-g increments weekly as needed. Descriptive statistics were used to analyze dose titration and discontinuations.
Results: At an interim data cutoff date of November 14, 2021, 99 participants were enrolled and had received ≥1 dose of ON-SXB (not currently taking oxybate, n=24; switch, n=75). For Groups A/C, 5 (21%) participants continued the 4.5-g dose, 8 (33%) increased to 6 g, 8 (33%) increased to 7.5 g, and 3 (13%) increased to 9 g by this data cutoff. Most Group B participants received initial ON-SXB doses of either 9 g (n=27) or 7.5 g (n=24). For Group B participants with >1 visit, 41 maintained their initial dose, 20 increased the dose, and 8 increased the dose but then later decreased it. All but 2 Group B participants with initial 9-g doses of ON-SXB maintained this dose. Twenty participants (20%) discontinued study treatment since the first patient enrolled in July 2020; the primary reason was withdrawal of consent (n=3; 3%). Two (2%) discontinued due to adverse reactions: vivid dreams/anxiety/lightheadedness and lack of efficacy (7.5 g); and difficulty breathing (6 g). Two discontinued due to taste/texture (2%); the remainder for miscellaneous reasons (eg, withdrew consent, could not adhere to schedule, left the country, caring for sick parent/child, wanted to get pregnant, using cannabis).
Conclusion: These interim data indicate that the majority of participants in all groups titrated to therapeutic and tolerable doses of ON-SXB.
Support (If Any): Avadel Pharmaceuticals

0412

POST-TRAUMATIC NARCOLEPSY IN 9 MILITARY VETERANS WITH A HISTORY OF A HEAD INJURY

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Introduction: Head injuries can be associated with hypersomnia acutely and chronically and can occur in those with mild/moderate/severe head injuries and with or without loss of consciousness. If hypersomnia persists, additional evaluation is warranted. Head injuries are increasingly reported in the military due to falls, assaults, motor vehicle accidents, and IED explosions, with some reporting, repeated blast injuries; secondary narcolepsy should be considered within the differential. Untreated narcolepsy can lead to safety issues for both the patient and others; therefore, aggressive evaluation is necessary with a PSG/MSLT combination and/or by the patient meeting the diagnostic criteria outlined in the DSM-V.
Methods: At the 2021 SLEEP conference, we presented a poster on our retrospective chart review of 176 patients diagnosed with narcolepsy from 2013 through 2020, with 50 patients having a history of head injury (28.4%). Of those 50 patients, nine were military veterans who reported a history of some degree of traumatic brain injury. While the majority had coexisting psychiatric disorders and/or other sleep disorders, the complaints of excessive daytime sleepiness were persistent despite aggressive treatment of the other associated diseases. The diagnosis of narcolepsy was confirmed by MSLT and/or DSM-V criteria.
Results: This study is a case series of 9 U.S. military veterans diagnosed with narcolepsy and a head injury history. There were eight males and one female, with the average age being 48. Five of the patients were diagnosed with type 1 narcolepsy with cataplexy, the other four without cataplexy were all on long-term treatment with antidepressants. The use of antidepressants while evaluating narcolepsy should be considered as they are REM suppressants, can interfere with MSLT findings, and can inhibit cataplexy symptoms preventing the appropriate diagnosis of Narcolepsy by DSM-V criteria.
Conclusion: Persistent hypersomnia in a patient with a history of a head injury could suggest a disorder of narcolepsy, and appropriate evaluation for this disorder appears indicated. The military having a high risk of head injuries may require assessment of narcolepsy while in active duty or long after discharge as the hypersomnia may be chronic and previously undiagnosed.
Support (If Any): **No support was given for this research

0413

ARE HIGH INTELLECTUAL ABILITIES A PROTECTIVE FACTOR FOR PSYCHO-SOCIAL REPERCUSSIONS IN CHILDREN WITH NARCOLEPSY?

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Introduction: Narcolepsy can have deleterious impact on cognitive and psychosocial functioning. Adequate intellectual abilities are generally a protective factor for bio-psycho-social adjustments in chronic disorders. The main objective of this study was to describe sleep, cognitive

abilities and psychosocial repercussions between children with narcolepsy and controls according to the intellectual abilities' classification.
Methods: Children with narcolepsy and controls underwent one-night polysomnography, completed an intellectual abilities assessment (WISC) and filled in the Epworth Sleepiness Scale for children, the Insomnia Severity Index, the Children Depression Inventory and the Conners. Comparisons between children with narcolepsy and controls were made in two subgroups with High intellectual Potentialities (HP; with an IQ or a verbal or reasoning index higher or equal to 130 evaluated by the WISC) or without HP.
Results: The group with HP consisted of 25 children with narcolepsy (40% boys, median 11,5 years) and 25 controls (68% boys, median 11,7 years). Compared to the controls, the children with narcolepsy did not present the same intellectual profile at the WISC (lower perceptual reasoning index and less discrepancy between verbal and perceptual indexes). They had fewer conduct disorders and a tendency to have fewer school difficulties, learning disabilities, and impulsivity than controls. The group without HP consisted of 22 children with narcolepsy (55% boys, median 12,1 years) and 21 controls (68% boys, median 10 years). The children with narcolepsy presented the same intellectual profile at the WISC as their peers without narcolepsy, but they reported more school difficulties and higher insomnia scores. Compared to controls, both groups of children with narcolepsy had higher sleepiness scores and showed a classic pattern of narcolepsy characteristics on the PSG. There was no difference for the socio-economic level of parents between groups.
Conclusion: In children with narcolepsy, high intellectual abilities act as protective factor against the impact of the disease on cognitive and adaptive functioning, whereas normal-to-low intellectual abilities predict a greater impact of the pathology on daily-life functioning, highlighting the need for multifactorial management.
Support (If Any): This work was supported by a French Grant from the SFRMS to Marine Thieux.

0414

ESTIMATED PREVALENCE OF IDIOPATHIC HYPERSOMNIA IN THE WISCONSIN SLEEP COHORT

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Introduction: Idiopathic hypersomnia (IH) is a neurologic condition characterized by chronic excessive daytime sleepiness despite normal sleep duration in which sleepiness is unexplained by other sleep disorders, behaviors, or other identifiable causes. Population-based prevalence estimates of IH are unavailable, though a recent analysis of a US insured population found ~1/10,000 persons were diagnosed with IH. Here we estimate IH prevalence in the Wisconsin Sleep Cohort (WSC).
Methods: The WSC is an epidemiology cohort recruited from a working population. To characterize IH we used measures of subjective (Epworth Sleepiness Scale, ESS) and objective sleepiness (Multiple Sleep Latency Tests, MSLT), polysomnography, sleep diaries, and extensive questionnaires. IH was defined as the union of: ESS>10; MSLT<8 minutes; <2 sleep-onset REM periods; apnea-hypopnea index (AHI)<15 (we also estimated prevalence using an AHI<5 cutpoint); >=6 hours habitual daily sleep; and non-shift worker. Other explanations for sleepiness were also investigated.
Results: Among 792 WSC participants (48% female, mean age=59 years [range=40-78 years]), we estimate an IH prevalence=3.8%, 95% CI=2.6-5.4%). We arrived at this estimate thusly: of n=792 participants, n=275 (35%) had ESS>10; of these, n=89 had MSLT<8 minutes; of these, n=71 had <2 sleep onset REM periods; of these, n=35 had an AHI<15; of these, n=33 slept >=6 hours/night; and, of these, n=30 were non-shift workers. Comparing the 30 so-defined "IH participants" to non-IH participants, respectively: 57% (IH) vs. 48% (non-IH) (NS) were female, mean age was 57 vs. 59 years (NS), mean AHI was 4.6 vs. 13.3 (by definition of IH, mean AHI was lower for IH participants), mean sleep duration was 7.6 vs. 7.7 hours (NS), and sedative use prevalence was 3% vs. 10% (NS). No IH participants reported a history of heart failure, heart attack or stroke. Prevalence of IH using an AHI cutpoint of 5 (i.e., IH only classified in participants with AHI<5), we find an IH prevalence of 2.4% (95% CI=1.5-3.7%).
Conclusion: Idiopathic hypersomnia may be more prevalent than previously assumed: approximately 2 to 4% of Wisconsin Sleep Cohort participants had evidence of hypersomnia that could not be explained by other sleep disorders, insufficient sleep, shift work or other examined factors.
Support (If Any): This work was supported by the National Heart, Lung, and Blood Institute (NHLBI, R01HL62252), National Institute on Aging (NIA, R01AG058680) and the National Center for Research Resources (NCRR, 1UL1RR025011) at the US National Institutes of Health, as well as a grant from Jazz Pharmaceuticals.

0415

DOES HLA DQB1*0602 TESTING AT OUR CENTER IMPROVE THE MANAGEMENT OF THE PATIENT WITH SUSPECT NARCOLEPSY? A QUALITY IMPROVEMENT PROJECT

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Introduction: The gene DRB1*06:02, a subtype of the DQ6 antigen, has been identified as the DQ6 subtype with the strongest association with narcolepsy type 1 (NT1). As many as 98% of patients diagnosed with narcolepsy-cataplexy are positive for DQB1*06:02. However, DQB1*06:02 has a prevalence of 12-38% in the general population and is commonly found in individuals without NT1. Testing for DQB1*06:02 may still be helpful in the diagnosis of patients with symptoms characteristic of narcolepsy owing to its high negative predictive value of 99%. When ordered appropriately, HLA-testing may reduce unnecessary sleep studies on patients.
Methods: All patients who underwent genetic testing for HLA DQB1*06:02 at our institution between 2015 and 2021 were included (n=8). A retrospective chart review was conducted to gather data on age, gender, total sleep time, apnea-hypopnea index, sleep efficiency, sleep latency, rapid eye movement (REM) latency, mean sleep latency, sleep-onset REM episodes, HLA DQB1*06:02 result, ordering specialty, whether genetic testing was performed before or after multiple sleep latency test (MSLT) and the final diagnosis. These parameters were evaluated in all patients to determine the utility of genetic testing in narcolepsy.
Results: The patients' age ranged from 15 to 83 years old and 6 of 8 patients (75%) were male. 38% of tested patients were positive for HLADQB1*06:02. One patient with narcolepsy type 1 by MSLT was negative for HLA DQB1*06:02. 1 of 3 patients (33%) with a positive HLA DQB1*06:02 proceeded to have an MSLT performed at our institution. The ordering specialty was neurology in 7of 8 (87.5%) patients.

Conclusion: HLA DQB1*06:02 testing should not be ordered on patients with an MSLT consistent with narcolepsy. If a high index of suspicion for narcolepsy is present and HLA DQB1*06:02 testing is ordered, a positive result should be followed by an MSLT as it was uncertain an MSLT was ever obtained anywhere in these patients. Genetic testing with HLA DQB1*06:02 did not change management in any of the patients where it was performed. Consultation with a sleep specialist prior to performing HLA DQb1*06:02 testing to determine its medical necessity may be a cost-effective strategy.
Support (If Any): none

0416

THE IMPACT OF IDIOPATHIC HYPERSOMNIA ON SOCIAL AND ROMANTIC RELATIONSHIPS OF YOUNG ADULTS

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Introduction: Idiopathic hypersomnia (IH) is a rare and debilitating neurologic disorder characterized by hypersomnolence, often beginning in adolescence. As IH has significant impacts on quality of life and may have greater social impact than narcolepsy, we studied how IH impacts social, romantic, and sexual relationships in young adults.
Methods: Young adults (18-39 years; N=106) with a self-reported IH diagnosis were recruited through national patient organizations. Participants completed an online survey to evaluate social, romantic, and sexual relationships, and communication with medical providers.
Results: Participants (mean=29.6 years; SD=5.2) were primarily female (90%), White/Caucasian (90%) and employed (80%). Almost all participants indicated that IH made social life or entering relationships more difficult (98% and 92%, respectively). Eighty-nine percent of participants indicated that IH had affected their sex life ("Too tired to engage in sexual activities or to feel aroused. …I want to sleep if I am in bed …"). IH symptoms impacted relationships in majority of participants (84%) and contributed to the breakup of a romantic relationship for almost 1 in 3 (32%). Rates of cohabitation and marriage were comparable to nationally representative samples. On the Multidimensional Scale of Perceived Social Support, participants reported receiving significantly more support from their significant others (mean=4.3; SD=1.8) compared to their family (mean=3.9; SD=1.6; $p<.05$) or friends (mean=4.0; SD=1.6; $p<.05$). There was no difference between the level of support received from family or friends ($V = 2154$; $p = .77$). Medical providers rarely asked about the social (34%) or sex lives (9%) of participants. In contrast, many participants wanted clinicians to ask about the impact of IH symptoms on social life (70%) and sex life (35%).
Conclusion: IH substantially impacts social and romantic health in young adults. Similar to findings in narcolepsy, individuals with IH appear to prioritize romantic partnerships over other personal relationships. Many participants were interested in discussing their social and sexual relationships with their medical providers. However, only a small proportion of clinicians ask about these relationships. To provide effective treatment for the whole patient, clinicians should be prepared to evaluate and provide further support for the social health of young adults with IH.
Support (If Any): Jazz Pharmaceuticals.

0417

ODDS RATIO PRODUCT REVEALS DISTINCT SLEEP PHENOTYPES IN IDIOPATHIC HYPERSOMNIA

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Introduction: The pathophysiology of idiopathic hypersomnia with long sleep times (IH) remains an enigma. Alternate methods to characterize sleep such as the Odds Ratio Product (ORP), a continuous measure of sleep depth, has the potential to improve understanding of IH.
Methods: The Odds ratio product is a continuous measure of sleep depth and propensity ranging 0 (very deep sleep) to 2.5 (Least sleep propensity). The difference between 2.5 and ORP in any epoch indicates extent of wake suppression (sleep depth) for that epoch. The cumulative sleep index (CSI) is the integral of sleep suppression across recording time thereby reflecting both the duration and depth of sleep over specified intervals (higher value is deeper and longer sleep). 36 patients with long sleep (600 minutes or longer) recorded through unconstrained polysomnography were analyzed using ORP across the full study (12.7±1.7 hours). Participants were divided into quartiles, 9 patients each(Q1-Q4) based on accumulated sleep across the entire study.
Results: The mean age for the cohort was 35.8 ± 16.2, of which 29/36 were females. Total sleep time by visual scoring was 679.4 ± 96.4 minutes (range: 601.5 - 1145) minutes). The whole night CSI mean was 989.39 ± 271.64 units (range: 345 to 1427). The quartile values were 618.33 ± 178.83, 919.33 ± 67.27, 1142.89 ± 39.01, and 1277 ± 69.39 units, and not related to total recording or sleep time. The NREM sleep ORP was 1.43± 0.32, 1.06 ± 0.22, 0.73± 0.13 and 0.67 ± 0.19, respectively. This distribution was true for REM sleep ORP also: 1.52 ± 0.30, 1.26 ± 0.19, 1.05 ± 0.25, and 0.84 ± 0.21, respectively. The trait-like ORP-9 (9 seconds post-arousal), and a reflection of sleep fragmentation propensity, was also similarly distributed: 1.60 ± 0.30, 1.29 ± 0.27, 0.92 ± 0.15, and 0.80 ± 0.18, respectively. All comparisons were statistically significant by Tukey multiple comparisons.
Conclusion: Patients with IH are not homogenous, showing a range of sleep depth in both NREM and REM sleep regardless of total sleep time. These phenotypes of IH could reflect unique endotypic mechanisms, requiring different therapies or have differential treatment responses.
Support (If Any):

0418

USE OF ACTIGRAPHY FOR THE OPTIMIZATION OF THE DIAGNOSIS AND TREATMENT OF HYPERSOMNIA

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Introduction: Actigraphy and sleep logs are used prior to Mean Sleep Latency Test (MSLT) testing to effectively interpret MSLT. Inaccuracies in sleep logs may inadvertently mask insufficient sleep, thereby resulting in a false positive MSLT. We evaluate the use of actigraphy in comparison to patient-reported sleep logs in the diagnosis and treatment of hypersomnia.
Methods: Retrospective analysis of n=56 patients (average age 39±16.8 years, 19.5% male) who underwent evaluation for hypersomnia with actigraphy, sleep diary, polysomnogram (PSG), and MSLT in 2021 at the Cleveland Clinic was completed. Data

was collected from the electronic medical record, actigraphy and polysomnography softwares. Positive MSLT (MSL) was defined as ≤8min. Average total sleep time (TST) from actigraphy and sleep logs were divided into three different time points; inadequate TSTs were defined at ≤8hours and ≤7hours, and invalid TST at ≤6hours. Paired t-test was used to compare TST from actigraphy and sleep diary. Receiver operating characteristic (ROC) analysis was performed to investigate the discrimination of MSLT(≤8min) by total sleep time from actigraphy and sleep logs using area under curve (AUC).

Results: Mean TST did not have a statistically significant difference between actigraphy and sleep logs (7.8±1.3 hours vs. 8.0±1.5 hours, p=0.53). However, on sub-analysis, out of 20 people who reported >8hours average TST on sleep logs, 11 were objectively found to have ≤8hours of average TST on actigraphy (55%). Of the 34 who reported >7hours TST on sleep logs, 8 had ≤7hours on actigraphy (24%). Of the 41 who reported >6hours TST on sleep logs, 1 had ≤6hours on actigraphy (2%). On MSLT, the average MSL was 12.7±5.1min, with 20% of patients with times ≤8min. Actigraphy performs better than sleep logs in discriminating MSL ≤8min (AUC 0.67 vs. 0.61).

Conclusion: Actigraphy is more objective than sleep logs and thus less prone to human recall errors. This study demonstrates the utility of actigraphy in the validation of the MSLT and in the accurate diagnosis of disorders of hypersomnia. In the future, our continued collection of an actigraphy and sleep log database will allow for more detailed analyses including consideration of the influence of medications on these findings.

Support (If Any):

0419

CHARACTERIZATION OF SLEEP QUALITY IN PATIENTS WITH IDIOPATHIC HYPERSOMNIA USING CARDIOPULMONARY COUPLING.

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Introduction: Idiopathic Hypersomnia (IH) is characterized clinically by excessive daytime sleepiness, prolonged or unrefreshing sleep, and sleep inertia. The ICSD-3 classifies IH as having expected proportions of NREM and REM sleep, normal REM latency and relatively high sleep efficiency. However, there is limited granular data on sleep quality in these patients and whether this disease state comprises of patients with a homogenous spectrum of sleep quality. The aim of this study is to describe the sleep quality in patients with IH using the ECG derived sleep spectrogram.

Methods: This is a single center cross sectional study where we identified 37 consecutive extended sleep studies for patients with 10 or more hours of total sleep time (TST). The sleep spectrogram is an ECG or plethysmography based system which evaluates sleep stability based on the principle of autonomic and respiratory oscillations (cardiopulmonary coupling). High frequency coupling (HFC) is associated with stable NREM sleep. Sleep quality index (SQI) is strongly weighted by HFC. We a priori decided to divide this population into 2 groups based on SQI ≥55 (there is published supportive data for using this threshold in adults) and compare them using T-test. Multivariable logistic regression was performed adjusting for age, sex, TST and apnea-hypopnea index-3% (AHI) <10 to assess predictors of high or low SQI which was discovered.

Results: The mean age for the cohort was 35.4 years (SD 16.2), of which 30 (81%) were females. Mean TST was 660 minutes (SD 16.2) with mean sleep efficiency of 86% (SD 9) and mean SQI of 59% (SD 19.1). Mean AHI was 10.4 (SD 12.3). Stratifying the cohort based on SQI gave us 2 distinct groups with mean SQI of 71.5 (SD 9.3) in group with SQI≥55 and mean SQI of 38.5 (SD 11.6) in group with SQI <55 [p-value <0.001]. In a logistic regression analysis, the SQI was not predicted by AHI <10, age, gender or total sleep time.

Conclusion: Based on our cohort, at least two clusters were identified in IH. We anticipate that the findings here will lead to further insights in IH physiology and phenotypes.

Support (If Any):

0420

CHARACTERIZATION OF BRAIN AGE IN PATIENTS WITH PROLONGED SLEEP DURATION

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Introduction: We identified 35 consecutive extended sleep studies for patients with 10 or more hours of total sleep time, and applied the BAI model to these studies. The BAI model was trained using sleep studies from relatively healthy participants. The sleep EEG features were extracted from both the spectral domain and the waveform. For each sleep stage, we extracted 96 features, and each of the features was averaged across the sleep stages. The resulting features were concatenated to form 480 features to represent the entire recording of sleep. These features are fed into a linear regression model and then adjusted to reduce age-dependent bias.

Methods: We identified 35 consecutive extended sleep studies for patients with 10 or more hours of total sleep time, and applied the BAI model to these studies. The BAI model was trained using sleep studies from relatively healthy participants. The sleep EEG features were extracted from both the spectral domain and the waveform. For each sleep stage, we extracted 96 features, and each of the features was averaged across the sleep stages. The resulting features were concatenated to form 480 features to represent the entire recording of sleep. These features are fed into a linear regression model and then adjusted to reduce age-dependent bias

Results: 35 extended polysomnograms were reviewed for patients undergoing evaluation for hypersomnia, with a median age of 27 years (range 16-76), and female predominance (28/35, 80%). This hypersomnia cohort forms two clusters by Gaussian mixture modeling. Patients in the first cluster exhibit a brain age that correlates well to chronological age (mean BAI = 4.4yr), while patients in the second cluster exhibit a brain age 12.4 years younger than chronological age (mean BAI = -12.4yr). The EEG spectrogram in the low BAI cluster shows high spindle band power, high delta band power, and high peak frequency of posterior dominant rhythm when compared to their age norms.

Conclusion: A subset of hypersomnia patients demonstrates a combination of EEG features associated with lower chronological age. We anticipate that the findings here will lead to further insights in IH physiology and phenotypes.

Support (If Any): NIH R01NS102190, R01NS102574, R01NS107291, RF1AG064312, R01AG062989, R01AG073410

0421

THE PUPILLARY LIGHT REFLEX DETECTS HYPERAROUSAL AND DISCRIMINATES BETWEEN ADULTS WITH NIL VERSUS MODEST INSOMNIA SYMPTOMS

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Introduction: Physiologic and psychologic hyperarousal is a leading candidate mechanism behind insomnia symptoms. Increased levels of physiologic arousal have been demonstrated in insomnia patients versus healthy sleepers using a variety of methods including brain PET, Multiple Sleep Latency Testing, ambulatory core body temperature, and sympathetic nerve microneurography. All of these methods, however, are expensive, or technologically intensive, or invasive. In contrast, the pupillary light reflex (PLR) is comparatively inexpensive, portable, easy to measure, and well-tolerated by patients. The average constriction velocity (ACV) in response to a controlled light stimulus is an indicator of physiologic arousal, with more rapid constriction indicating greater arousal.
Methods: Forty community volunteers provided informed written consent to measurement of their PLR after a period of dark adaptation with the NeurOptics PLRTM-3000 Pupillometer (Laguna Hills, CA), which continuously measures pupil size to a precision of 0.1 mm, at a frequency of 30 Hz. None of the participants were seeking or receiving mental health services, were taking psychotropics, or were using any prescribed or over the counter medication that might affect the PLR. Participants also completed the Patient Health Questionnaire-9 (PHQ-9) and the Insomnia Severity Index (ISI). The protocol was approved by the local IRB.
Results: Sixteen of the volunteers had an ISI score > 4 ("modest ISI"), and 24 had an ISI score < 4 (nil ISI). The overall sample was 26.4 + 9.1 years old, 62.5% female, and 30% non-white, with no significant differences between the ISI score groups. The "nil ISI" and "modest ISI" groups had ISI scores of 1.2 + 1.3 versus 8.7 + 3.6 ($p<0.001$), PHQ-9 scores of 1.5 + 1.3 versus 5.4 + 4.4 ($p<0.005$), and ACV of -2.7 + 0.6 versus -3.1 + 0.5 mm/sec ($p<0.05$), respectively.
Conclusion: This small study of community volunteers showed PLR evidence of relative hyperarousal in those participants with modest levels of insomnia symptoms. With further development, the PLR may have promise in practical identification of a "hyperarousal subtype" of insomnia patients.
Support (If Any): None

0422

INSUFFICIENT SLEEP IN UNDERGRADUATE STUDENTS: AN INTERVENTION BASED ON A SYSTEMATIC LITERATURE REVIEW

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Introduction: Sleep is essencial to health, and to the performance of daily activities, and mood, memory, attention, and cognitive processes.
Methods: We systematically reviewed the literature about the sleep in undergratuate students from 2019 to 2020, also we applied a semi-structured questionnaire in 300 undergrate students between 18-24 years of age. Sixteen studies met inclusion criteria in databases: MEDLINE/PUBMED, SCIELO and LILACS on circadian cycle disorders and daytime sleepiness in undergraduate students. The descritptors were applied in order to delimit the articles in the objectives of this study: sleep, undergrade students, daytime sleepiness and circadian cycle disorders. We applyed on-probabilistic sampling technique using Health Educional Content Validation instrument that was composed by 15 items to analyse sleep habbits in undergratuate students.
Results: 7591 scientific articles were analyzed, and only 38 were submitted to the application of the PICOS strategy. We included 16 articles in this systematic literate review sample. The studies have shown that the quality of sleep in these students was straongly impaired by stress, depression, family income and behavioral variables. The answers from the Goggle forms analyses with 76.3% of excessive daytime sleepiness, in the area of the questionnaire used a scale from 1 to 5 (where 1 was very little in order to score peculiarities related to the students habits in relation to a routine that values Sleep Hygiene. Fixed times for waking up on weekdays (96, 6%), and only 24.4% of the sample had a fixed time to sleep on weekends. More than 150 students (53.2%) made no effort to stay away from the screen before sleeping. The distribution of responses showed that an average number of people try to avoid using the bed to work or watch television (73.9%) and try to avoid heavy foods before bed (83.1%). We found that the consequences of insufficient sleep, such as insomnia and daytime sleepiness were prevalente in females, and among students who didn't practice sleep hygiene, were colays and falling asleep during class, twice the risk of depression and headache.
Conclusion: The prevalence of sleep disorders among undergraduated students needs to be evalute, preventing the harmful consequences in their cognitive decisions.
Support (If Any):

0423

ASSOCIATIONS OF INDIVIDUAL BEHAVIORS AND AMBIENT FACTORS IN THE SLEEP ENVIRONMENT WITH NIGHTTIME SLEEP PARAMETERS IN PREGNANT WOMEN WITH INSOMNIA

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Stanford University School of Medicine [2]

Introduction: Sleep hygiene and environment are important for adequate sleep quantity and quality. We examined two aspects of the sleep environment, individual behaviors and ambient factors, with nighttime sleep parameters in pregnant women with insomnia.
Methods: We used baseline data from a randomized controlled trial of insomnia treatment during pregnancy for this cross-sectional analysis (n=70). Women completed a questionnaire assessing whether they regularly engaged in five individual behaviors in bed (yes/no) and how much their sleep was disrupted by seven ambient factors (scale from 1=not very much to 5=very much) and wore an Actiwatch 2 for a subsequent 7-day period. Responses of 4 or 5 for ambient factor items were categorized as ambient factors perceived to disrupt sleep. Generalized estimating equation regression models were used to estimate associations of individuals behaviors and ambient factors perceived to disrupt sleep with actigraphy-measured total nighttime sleep duration and sleep efficiency.
Results: The most commonly endorsed individual behaviors were using the internet/computer in bed (64%) and watching television in bed (43%), followed by talking on the phone in bed, listening to music in bed, and playing video/electronic games in bed (16-27%). Watching television in bed was associated with 23 fewer minutes of actigraphy-measured nighttime sleep (95% CI: -44, -1). No individual behavior was associated with actigraphy-measured sleep efficiency (all $P>0.05$). The most commonly endorsed ambient factors perceived to disrupt sleep were environmental noise (41%) and

uncomfortable temperature (37%), followed by movement from others sharing the bed, having to take care of children in the middle of the night, someone else snoring, and light (24-29%). No ambient factors perceived to disrupt sleep were associated with actigraphy-measured nighttime sleep duration or efficiency (all P >0.05).
Conclusion: Individual behaviors and ambient factors perceived to disrupt sleep were common in pregnant women with insomnia. In this study, only watching television in bed was associated with objectively-measured nighttime sleep duration. Our findings suggest that future research could investigate potential interfering roles of arousal and cognitive factors contributing to insomnia during pregnancy.
Support (If Any): National Institutes of Health (K99HD100585, R01NR013662)

0424

INFLUENCE OF DAYTIME NAPPING ON THE DISCREPANCY BETWEEN SUBJECTIVE AND OBJECTIVE NIGHTTIME SLEEP MEASURES IN PREGNANT WOMEN WITH INSOMNIA

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Introduction: Previous research has documented a tendency among adults with insomnia to underestimate nighttime sleep duration compared to actigraphy estimates. We examined whether discrepancy in nighttime sleep parameters is impacted by daytime napping behavior.
Methods: We used baseline data from a randomized controlled trial of insomnia treatment during pregnancy for this cross-sectional analysis (n=97). Women self-reported daytime napping and nighttime sleep characteristics using a 7-day sleep diary and wore an Actiwatch 2 during the same 7-day period. Two women napped daily and were excluded from this analysis. The remaining sample was categorized as intermittent nappers [naps on some but not all days; n=62 (65%)] or non-nappers [no naps on any days; n=33 (35%)]. We summarized daily discrepancy between self-reported and actigraphy-measured nighttime sleep duration and efficiency by daytime napping behavior using means and t-tests.
Results: Intermittent nappers provided data for 130 days with naps and 260 days without naps. Non-nappers provided data for 198 days. Among intermittent nappers, there was no meaningful subjective-objective discrepancy for nighttime sleep duration or efficiency (mean discrepancy=1 minute for duration; -0.4% for efficiency); this did not differ between days with naps and days without naps (p=0.98 for sleep duration; p=0.33 for sleep efficiency). Among non-nappers, subjective-objective discrepancy was present (intermittent nappers vs non-nappers p=0.001 for duration; p=0.04 for efficiency), with self-report underestimating actigraphy-measured nighttime sleep duration by 28 minutes and nighttime sleep efficiency by 3.5%.
Conclusion: Pregnant women with insomnia who did not nap tended to underestimate nighttime sleep duration and efficiency compared to actigraphy measurement, as has been reported in the general population of adults with insomnia. However, there was no meaningful subjective-objective discrepancy for nighttime sleep duration and efficiency among those who napped intermittently, regardless of that day's napping behavior. It is possible that daytime napping impacts overall accuracy of perceived nighttime sleep. However, because some people with insomnia are unable to nap even when given the opportunity, it is possible that not napping and sleep discrepancy share a common underlying cause. Future research is needed to test if results replicate to non-pregnant populations and explore mechanisms that may explain these findings.
Support (If Any): National Institutes of Health (K99HD100585, R01NR013662)

0425

NEW ONSET INSOMNIA FOLLOWING COVID-19 INFECTION

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Introduction: Post-COVID neuropsychiatric symptoms have a significant impact on morbidity following COVID-19 infection. We present three patients without a prior history of insomnia symptoms who developed new-onset and chronic insomnia following infection with COVID-19.
Methods: Retrospective chart review was performed on three patients who presented to an ambulatory sleep clinic with complaints of new onset insomnia following COVID-19 infection.
Results: Three patients without a history of prior insomnia developed difficulty initiating or maintaining sleep during or following COVID-19 infection. Patient 1 developed symptoms of insomnia 2 weeks after recovery from COVID-19 infection. Symptoms improved after 5 months with a combination of hydroxyzine and cognitive behavioral therapy for insomnia (CBTi). Patient 2 developed insomnia at the same time as COVID-19 infection and symptoms consisted of sleep onset and maintenance insomnia. Hydroxyzine and trazodone were ineffective. Symptoms improved with zolpidem and CBTi. Patient 3 had a more severe course of COVID-19 infection requiring management in the intensive care unit that coincided with onset of insomnia. He presented to sleep clinic with new insomnia complaints but was also found to have moderate obstructive sleep apnea and periodic limb movements on polysomnography and prior history of restless legs. The patient was treated with a combination of positive airway pressure therapy and a dopamine agonist with plans to follow up to reassess severity of insomnia at future visit.
Conclusion: Three patients without a prior history of insomnia developed insomnia following infection with COVID-19. Management included a combination of CBTi and pharmacotherapy as well as treatment of underlying sleep disorders (OSA, RLS) when applicable. Further work is needed to understand the prevalence of new onset insomnia in patients following COVID-19 infection and best therapeutic approaches in this unique population.
Support (If Any):

0426

SHALLOWER SLEEP DEPTH IN THE LABORATORY IS NOT RELATED TO INSOMNIA SEVERITY

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Introduction: In insomnia, classical sleep scoring parameters are often uncorrelated with symptom severity and may not fully capture more subtle alterations in the polysomnogram (PSG) that could contribute to clinical symptoms. The odds ratio product (ORP) is a well-validated, continuous index of sleep depth (range

0=deep sleep; 2.5=full wakefulness) that offers an alternative to traditional staging. It is unknown whether ORP is related to self-reported insomnia severity. We hypothesized that individuals with insomnia would exhibit higher ORP values than healthy controls (reflecting less deep sleep) which would be associated with greater insomnia severity.
Methods: This is a secondary analysis of data from a study in which n=15 participants with chronic insomnia disorder and n=15 age- and sex-matched healthy controls completed an in-laboratory protocol (N=30; 66% female; 36±8 years; 63% White). Participants had their sleep monitored with in-lab PSG. The Insomnia Severity Index (ISI) was used to estimate sleep disturbance severity. PSG were used to calculate classical sleep scoring parameters as well as the average ORP in each sleep stage. Independent samples t-tests compared means between the insomnia and healthy control groups and Pearson's correlations assessed relations between PSG/ORP outcome measures and ISI scores.
Results: The insomnia group's mean (SD) ISI score was 14.13 (6.00) and significantly higher than the control group's (1.73 (2.37); corrected $p < 0.001$). There were no statistically significant between-group differences for classically-scored sleep parameters or average ORP values after correcting for multiple comparisons. Interestingly, means for the insomnia group's average ORP values tended to be higher than those of the control group's. ISI scores were not significantly associated with average ORP values across or within groups.
Conclusion: Insomnia does not appear to be associated with alterations in global sleep depth when measured in a laboratory setting, but there is a need to conduct more detailed analyses on patterns across the night.
Support (If Any): Merck, Inc. Investigator Studies Program

0427

HAVING INSOMNIA VS. IDENTIFYING AS AN "INSOMNIAC": WHAT IS THE ROLE OF INSOMNIA SEVERITY?

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Introduction: The present study sought to evaluate whether insomnia severity (i.e., sleep continuity disturbance) is worse in those who endorse insomnia identity (i.e., identify as an "insomniac") vs. those who endorse "having insomnia."
Methods: This study utilized a cross-sectional group design in an archival/community dataset that was collected in the Philadelphia area. This dataset (n=3,483) was comprised of adults between 18 and 90 years of age ($\bar{X}$age=53.6±11.0; female [76.4%]; White [91.4%]). All subjects in this analysis endorsed sleep problems. Subjects answered questions regarding demographics, sleep continuity (in minutes), and insomnia identity ("Do you think of yourself as someone that has insomnia" and "do you think of yourself as an 'insomniac'"?). For both questions, individuals were categorized by their answers: strongly agree, agree, undecided, disagree, strongly disagree. MANOVAs and two-way ANOVAs were conducted to assess group differences (α=.01).
Results: Most individuals endorsed "having insomnia" (n=2,301 [66.1%; strongly agree and agree]) but did NOT endorse being an 'insomniac' (n=1,981 [56.9%; undecided, disagree, and strongly disagree]). For all measures, except TST, the two groups did not differ with respect to insomnia severity (i.e., SL[55.4±48.5;60.5±52.1], WASO[45.1±51.7;47.6±55.3], EMA[71.8±51.6;72.9±52.4], and TST [328±75.5;319.6±76.4, p=.009]). The magnitude of the differences between these groups ranged from 1-10 minutes.
Conclusion: It was found that individuals are more likely to endorse 'having insomnia' than they are to endorse being an 'insomniac.' Despite the implicit differences in "having" something vs. "being" something, the groups did not differ appreciably with respect to sleep continuity. Thus, the tendency to have insomnia identity may not be related to insomnia severity considerations. It is possible, if not likely, that such differences may be related to frequency or chronicity of insomnia. Barring, or in addition to these things, insomnia identity may be related to the mismatch between sleep ability and need and/or related to other non-specific factors. Future directions include refining the group definitions to include forms of insomnia identity that occur with relatively normal sleep continuity (i.e., normal severity and/or frequency and/or chronicity). It will also be important to evaluate whether the various forms of insomnia identity vary with age, sex, or disease comorbidity.
Support (If Any): K24AG055602

0428

A NATIONAL SURVEY OF 1000 PATIENTS' AND 450 PHYSICIANS' VIEWS AND ATTITUDES ON INSOMNIA CARE

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Introduction: While the importance of restful sleep is espoused by patients and physicians alike, sleep health may not be receiving appropriate consideration during patient visits with HCPs. This study is the first to survey both patients with sleep difficulties as well as physicians who treat insomnia, in order to understand the perspectives of each group.
Methods: Patient and HCP online surveys were conducted by The Harris Poll from September to October 2021 in the USA. Patient participants were adults ≥18 years with a diagnosis of insomnia by an HCP or with self-reported difficulties sleeping for ≥3 nights/week over ≥3 months. The patient survey consisted of 51 questions pertaining to sleep difficulties, interactions with HCPs, and treatment options. The 34-question HCP survey pertaining to approaches and beliefs regarding insomnia diagnosis and management was completed by primary care physicians (PCPs) and psychiatrists.
Results: The respondents included 1001 patients (54% female; mean age 44.6 years) and 452 physicians (300 PCPs, 152 psychiatrists) who had opted-in for surveys, sourced from 100+ panels. Notable findings included that a majority of patients with sleep difficulties reported feeling frustrated (54%), irritated (52%), stressed (51%) and/or reported that their mood is negatively impacted (59%). While nearly all PCPs (98%) and psychiatrists (97%) affirmed that sleep is critical to good health, only 12% of PCPs and 24% of psychiatrists routinely conducted a full sleep history. Regarding treatment, 66% of patients did not think that current treatment options adequately improve their trouble sleeping; while

50% of PCPs felt their patients are satisfied with their current treatment. Moreover, 55% of people with trouble sleeping believed that there is a stigma associated with taking prescription sleep medications.
Conclusion: This first-ever survey of patients with insomnia and doctors treating this condition provides evidence that both groups agree on the importance of sleep and that treatment is often perceived as ineffective. Also of note, relatively few physicians conduct a sleep history and patients report that there is stigma associated with taking medications for insomnia. Most notably, this survey identifies the need to address our limited understanding and the insomnia conversation gap regarding key issues about insomnia treatment.
Support (If Any): Idorsia Pharmaceuticals, Ltd.

0429

INSOMNIA VS POOR SLEEP: CHARACTERISTICS OF SLEEP COMPLAINTS IN A SOCIAL MEDIA SAMPLE

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The Insomnia Clinic [1]

Introduction: There is a tendency for individuals to interpret sleep difficulties as "poor sleep" rather than insomnia. This occurs even though when many individuals describe their symptoms, they often describe symptoms of insomnia. Indeed, they reject the label of insomnia as applying to their specific sleep difficulties. Misinterpreting chronic insomnia as simply "poor sleep" may prevent or delay treatment seeking behavior and thereby prolong/worsen associated negative outcomes. Little is known about the sleep characteristics and rate of chronic insomnia in individuals who interpret their sleep disturbance as “poor sleep.”
Methods: 44,439 individuals age 30+ were shown an advertisement on social media with the prompt, "Poor sleep is annoying but insomnia is a serious issue. Take this free 1-minute quiz to learn the difference between insomnia and poor sleep." 1533 clicked on the ad to view the quiz and 468 completed the quiz. We included 449 responses in the current analysis. Nineteen were excluded as no insomnia symptoms were endorsed. The quiz queried DSM-V chronic insomnia diagnostic criteria. After completing the survey, the website supplied respondents with automated feedback and education about their responses.
Results: The quiz did not collect demographic information. However, those who clicked on the ad were 84% female and 87% age 55+. Sixty-nine percent (n=310) of responses met full diagnostic criteria. Reasons for not meeting diagnostic criteria were 13% (n=59) no sleep dissatisfaction, 10% (n=45) symptom frequency <3 nights/week, 6% (n=25) symptom duration <3 months, 7% (n=31) denied daytime symptoms, and 5% (n-21) inadequate opportunity for sleep. 54% (n=244) endorsed short sleep duration (<6 hours) despite adequate opportunity for sleep.
Conclusion: Of community members responding to the advertisement, over 2/3 met full diagnostic criteria for chronic insomnia and over 50% appear to have the more severe phenotype of insomnia with short sleep duration. Formal study of subjective sleep disturbance interpretation may help develop effective methods for communicating with insomnia sufferers who may minimize or not recognize the seriousness of their sleep disturbance.
Support (If Any): None

0430

BEYOND SYMPTOMS: USING THE COST OF INSOMNIA CHECKLIST TO CHARACTERIZE THE SUBJECTIVE BURDEN OF INSOMNIA.

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Introduction: Traditional symptom focused assessments do not characterize the subjective impact of insomnia on patient's function and quality of life (QOL). The authors developed the Cost of Insomnia Checklist (CIC) to evaluate the effects of insomnia in the life domains most meaningful to patients. In bringing attention and awareness to these areas, such a tool may increase patient motivation to look for, initiate, and or persist in treatment. It may also help overcome habituation effects that lead patients to minimize the seriousness of insomnia.
Methods: The CIC has 68 items across seven categories (financial; health; family; cognition; mental and emotional; work; social and recreational). We developed CIC items based on clinical interviews with chronic insomnia patients in a behavioral sleep medicine clinic. Ninety-five patients completed the CIC during their clinical evaluation for chronic insomnia.
Results: Participants were 53% female, 81% white, 57% employed, 56% married, and 23% living alone with a mean age of 50.48 (+/-16.03) and mean BMI of 24.91 (+/-5.29). Patients endorsed an average of 21.9 (SD 33.9; Median=21) items with a range of 4 to 52 items. The most often endorsed items (>70%) focused on not feeling rested, worry about sleep, daytime sleepiness and fatigue, and memory and attention problems. 97% of respondents endorsed one or more additional items. The most frequently endorsed additional items were “can't maintain energy level” (69.5%), “too tired to exercise” (57.9%), “discomfort of sleeplessness” (56.8%), “irritable/unkind to others” (55.8%), “can't think of the words I want to use” (54.7%), “unmotivated/uninterested” (54.7%), “daytime discomfort after a bad night” (53.7%), “stressed without good reason” (52.6%), “worry about daytime function” (51.6%), “news/doctors tell me Insomnia is bad for me” (50.5%).
Conclusion: The CIC evaluates the effect of insomnia in many life domains and may help patients recognize the impact of insomnia on daytime function and QOL. Future studies will measure how the CIC correlates with treatment participation, adherence, and outcomes. Future studies will also support revision of the CIC to keep only items not measured by other instruments.
Support (If Any): None

0431

EXAMINING THE INDIRECT EFFECTS OF ACCULTURATION STRESS ON INSOMNIA THROUGH ALCOHOL USE AND BROODING AMONG LATINX WOMEN AND MEN

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Introduction: Acculturation stress, a type of sociocultural stress, and insomnia have been consistently, positively associated among Latinx populations; however, the mechanisms of this association remain elusive. Models of insomnia suggest maladaptive coping strategies, such as brooding and alcohol use, may drive the relationship between stress and this disorder. Because acculturation stress has been positively associated with brooding and alcohol use, these coping strategies may explain the relationship between acculturation stress and insomnia among Latinxs. Additionally, gender differences in the use of these coping strategies and insomnia have

been well documented. Thus, we examined the indirect effects of acculturation stress on insomnia through brooding and alcohol use among Latinxs and explored gender differences in these effects.
Methods: Separate bias-corrected boot-strap tests of mediation with case resampling (1000 replications) were conducted to examine the indirect effect of acculturation stress measured using the Hispanic Stress Inventory(HSI), on insomnia, measured with the Insomnia Severity Index(ISI), through brooding and alcohol use. These tests were conducted using cross-sectional survey data from healthy Latinx adults participating in the Latino Sleep and Health Study(n=187). Unadjusted models were the primary models. Progressive adjustments were made to account for age and socioeconomic status. Stratified analyses by gender were conducted to explore potential differences in the mediation models between Latinx women and men.
Results: Participants were Mage=37.43(SD=13.67), 64.17% were women, and 30.48% were of low socioeconomic status. Participants reported a mean HSI of 9.28(SD=9.51), brooding score of 9.44(SD=2.88), and ISI of 6.65(SD=5.51). In a typical week, participants consumed M=2.61 alcoholic beverages(SD=4.68). In primary models, the total and direct effects of acculturation stress on insomnia were significant, (b=0.04,95%CI:0.02-0.06; b=0.02,95%CI:0.004-0.04). The indirect effects of acculturation stress through brooding were also significant (b=0.02, 95%BCa CI:0.01-0.03). Among women, these indirect effects had larger coefficients than among men (b=0.02,95%BCa CI:0.01-0.04; b=0.01,95%BCa CI:0.004-0.04). Alcohol use was not a significant mediator in this relationship, (b=-0.001,95%BCa CI:-0.004-0.0002).
Conclusion: These findings suggest that psychological interventions targeting Latinxs should aim to reduce brooding as a coping strategy for acculturation stress to promote healthy sleep. Future studies should replicate these analyses in temporally ordered data to test the causal relationships among these variables.
Support (If Any):

0432

INSOMNIA IS ASSOCIATED WITH ENDOTHELIAL DYSFUNCTION IN YOUNG ADULTHOOD: THE PENN STATE CHILD COHORT

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Introduction: Clinical and population-based studies in middle-aged and older adults have shown that insomnia is associated with prevalent and incident cardiovascular diseases. However, there is a lack of studies demonstrating an association between insomnia and subclinical cardiovascular measures such as endothelial function in young adults from the general population.
Methods: We studied 200 subjects from the Penn State Child Cohort (20-30 years old, 47% male, 22% racial/ethnic minority), who underwent a thorough clinical history and physical examination to ascertain the presence of sleep disorders and body mass index (BMI), in-lab polysomnography to ascertain the apnea/hypopnea index (AHI), and Doppler ultrasound to assess flow-mediated dilation (FMD). We identified the presence of moderate-to-severe difficulties initiating and/or maintaining sleep (i.e., poor sleep) and of insomnia, the latter including a physician diagnosis of the disorder. The study outcome was FMD as a continuous measure and the square root of FMD (sqrt-FMD) to test the robustness of the analysis. General linear models adjusted for sex, age, race/ethnicity, BMI, AHI, alcohol intake, and sleep medication use.
Results: Compared to normal sleepers (0.111±0.003), subjects with poor sleep (0.104±0.006) and insomnia (0.092±0.008) showed a significant association with lower FMD levels (p-linear<0.05), with subjects with insomnia having significantly lower FMD levels (p=0.029). Results remained significant and in the same direction based on sqrt-FMD (p-linear=0.015).
Conclusion: These data indicate that insomnia is associated with increased risk for cardiovascular disease as early as young adulthood, and independent of major contributors such as obesity, sleep apnea or alcohol use. These data further reinforce the need to include insomnia as a target in the preventative efforts for cardiovascular disease.
Support (If Any): National Institutes of Health (R01HL136587, UL1TR000127)

0433

DOES SOCIAL MEDIA USE BEFORE BED LEAD TO SLEEP CONTINUITY DISTURBANCE?

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Introduction: Research shows that the use of electronics before bed can negatively impact the circadian rhythm and sleep. Less is known, however, about social media use in relation to sleep continuity disturbance (i.e., insomnia). In the early months of the COVID-19 pandemic, social media use increased and updates about the pandemic were easily accessible online. It is possible that social media use before bed could introduce additional psychological stressors due to availability of negative content online and known correlations to depression and anxiety. Thus, the aim of this research was to examine how social media use before bed influenced different subtypes of insomnia during the initial months of the pandemic.
Methods: 4,138 adults (mean age = 45.8 years; 79% women) completed a national online survey during April – June 2020. Social media use before bed was measured using the first item on the Social Media Engagement questionnaire (i.e., "How often do you use social media in the 15 minutes before you go to sleep?"). Participants responded to this item based on how many days per week (range = 1-7). Sleep disturbance was assessed using a retrospective sleep diary and the Insomnia Severity Index (ISI). The sleep diary asked about sleep continuity (e.g., sleep latency, wake after sleep onset, total sleep time) during the past month.
Results: Results from separate regression analyses supported that social media use before bed was positively related to greater ISI scores, b = 0.25, t = 8.0, p < 0.001. For example, those who use social media before bed every day reported greater mean ISI scores and sleep latency times (mean ISI = 9.5; SL = 37.5 minutes) compared to those who reported never using social media before bed (mean ISI = 7.7; SL = 27.9 minutes). In contrast, social media use before bed was not related to other sleep continuity variables.
Conclusion: The present data supports that social media use before bed is related to insomnia symptoms, specifically difficulty with sleep initiation. These findings are significant as they may help us understand which aspects of insomnia are most vulnerable to the negative impact of online social interactions,

especially during a highly stressful period, such as the COVID-19 pandemic.
Support (If Any): K23HL141581 (PI: Vargas); R25HL10544 (PI: Jean-Louis); K24AG055602 (PI: Perlis)

0434

THE RELATIONSHIP BETWEEN SPIRITUALITY AND INSOMNIA IN MILITARY SOLDIERS

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Introduction: Insomnia is prevalent among military soldiers and contributes to poor physical and mental health outcomes. Spirituality has been found to mitigate mental and physical health complaints; however, there is a dearth of research on its relationship with insomnia, particularly among military soldiers. Therefore, this study examined the associations between spirituality, religiosity, and insomnia in a sample of Army soldiers.
Methods: Data were acquired from the All Army Study of the Army Study to Assess Risk and Resilience in Servicemembers (STARRS; N=21,449; mean age= 28.6; 88.24% male). Participants completed the Brief Insomnia Questionnaire, and current insomnia status was determined by DSM-5 criteria. They also completed questions on religious affiliation, how often they attend religious services, and how religious or spiritual they consider themselves on a 4-point scale (1-Very to 4-Not at all). Chi-Square analyses were used to assess the magnitude of relationships.
Results: A total of 19.45% of this sample had insomnia. Self-reported religious affiliation was more common in those without insomnia (73.5%) than those with insomnia (69.9%; p<.0001). Self-reported spirituality and religiosity were associated with lower rates of insomnia (p<.0001; p<.0001). However, insomnia was associated with higher rates of regular attendance of religious services (29.8% vs. 26.0%; p<.0001).
Conclusion: In this sample of Army servicemembers, insomnia was less prevalent among those with a religious affiliation and those with regular attendance at religious services. In contrast, individuals with insomnia reported themselves to be less religious or spiritual compared to those without insomnia. These findings underline the importance of further research to understand whether spirituality provides any protective effects against insomnia.
Support (If Any): This publication is based on public use data from Army STARRS (Inter-university Consortium for Political and Social Research, University of Michigan-http://doi.org/10.3886/ICPSR35197-v1), funded by U.S. NIMH-U01MH087981. KEM's time was supported by the U.S Department of Veterans Affairs, Veterans Health Administration (Clinical Science Research and Development Service – IK2 CX001874). EAK's time was supported by the U.S Department of Veterans Affairs, Rehabilitation Research and Development Service – 1IK2 RX001836.

0435

THE RELATIONSHIP BETWEEN PATHOGEN AVOIDANCE AND INSOMNIA SYMPTOMS: RESULTS FROM A LONGITUDINAL STUDY CONDUCTED DURING THE COVID-19 PANDEMIC

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University of Arkansas [1]

Introduction: Pathogen avoidance has intensified during the past two years because of fear related to the high transmissibility of SARS-CoV-2. This trend aligns with previous research that found increases in pathogen avoidance as a result of impaired immune system functioning, such as in the case of autoimmune disease. Another link to compromised immunity is the presence of insomnia symptoms, which may interfere with a healthy immune response to pathogens. It is not clear, however, if insomnia could be an immuno-compromising factor that leads to a compensatory increase in pathogen avoidance. Therefore, the purpose of the present study was to explore the relationship between situational pathogen avoidance and insomnia symptoms during the COVID-19 pandemic.
Methods: A national online survey was conducted at two time points: April-June 2020 (baseline) and January-March 2021 (follow-up). Insomnia symptoms were assessed using the Insomnia Severity Index (ISI). Affective, cognitive, and behavioral responses that comprise pathogen avoidance psychology, especially as it pertains to avoidance of potentially pathogenic social stimuli, were assessed with the Situational Pathogen Avoidance (SPA) scale.
Results: 2,980 adults (mean age = 47 years) completed both surveys. Overall, the means on the SPA scale at both time points were higher than previously published norms (mean at both timepoints = 5.4), suggesting that average pathogen avoidance increased since the onset of the pandemic. The mean differences in the SPA scale varied by insomnia symptoms (at both time points), with participants who endorsed clinically elevated insomnia (ISI >14) reporting higher pathogen avoidance (baseline, $F(1,2972) = 10.4$, $p = 0.001$; follow-up, $F(1,2918) = 26.6$, $p < 0.001$).The mean differences in the SPA scale by insomnia were greater at follow-up compared to baseline (mean difference at baseline = 0.19; mean difference at follow-up = 0.33). This suggests that, compared to the initial months of the pandemic (Apr–June 2020), the relationship between insomnia and situational pathogen avoidance was stronger post-pandemic peak (Jan–Mar 2021).
Conclusion: Our findings suggest that there is a positive correlation between insomnia symptoms and situational pathogen avoidance. Furthermore, results indicated that this relationship became stronger as the pandemic went on.
Support (If Any): K23HL141581 (PI: Vargas); R25HL10544 (PI: Jean-Louis); K24AG055602 (PI: Perlis)

0436

EFFECT OF SLEEP ON THE RELATIONSHIP BETWEEN PAIN RELATED DISABILITY AND NEURAL CORRELATES OF PAIN PROCESSING IN ADULTS WITH FIBROMYALGIA AND INSOMNIA

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University of Missouri [1]

Introduction: Up to 80% of adults with fibromyalgia experience insomnia. While sleep and pain are known to be associated, sleep's role in the association between pain related disability and neural correlates of pain processing is unknown. We evaluated whether sleep moderates the association between brain activity in response

to painful stimuli and pain related disability in adults with fibromyalgia and insomnia (FMI).
Methods: Twenty-nine adults with FMI (Mage=57.2, SD=13.1) wore Actiwatch 2s over 14 days, completed the Pain Disability Index (PDI), and underwent fMRI using a quantitative sensory testing (QST) protocol involving thermal stimuli. Twelve brain regions with significant activation changes to QST (identified previously, PMID34310276) were included as dependent variables, PDI score as independent variable and actigraphic sleep variables (Sleep Onset Latency (SOL), Total Sleep Time (TST), Sleep Efficiency (%SE)) as moderators in the analysis. For moderation at significance levels of $p<0.05$ (and trends at $p<0.1$), significance of simple slopes at high (1 SD above), average and low (1 SD below) sleep levels were examined.
Results: %SE moderated the relationship between right cingulate gyrus (rCG) activity and PDI score (B=0.0009, SE=0.0003, p=.016, R^2=0.22). At lower values of %SE (but not at average or higher levels), there was a negative association between rCG activity and PDI score (B=-0.0166, SE=0.0064, p=0.016). Moderating impact of SOL (B=-0.0002, SE=0.0001, p=.05, R^2=0.14) and TST (B=0.0002, SE=0.0001, p=.06, R^2=0.15) trended towards significance. [MCS1] PDI and rCG activity showed negative associations at highest levels of SOL, while PDI and right inferior frontal gyrus activity showed positive associations at highest levels of TST.
Conclusion: Since the rCG is involved in gating, integration and classification of pain signals, decreased activation in rCG could reflect reduced modulation of pain processing in the region. Preliminary results indicate that at lower levels of sleep efficiency, this decrease in modulation of pain processing is associated with greater perceptions of disability related to pain. Further studies in larger samples are warranted to understand the causal effects, if any, of sleep on pain related disability and the neural correlates of pain processing.
Support (If Any): NIAMS-R01AR055160/S1; PI-McCrae

0437

PSYCHOMETRIC EVALUATION OF THE INSOMNIA SEVERITY INDEX IN NURSES

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Introduction: This secondary analysis was conducted to examine the psychometric properties of the Insomnia Severity Index (ISI) in a sample of non-shift working nurses. Insomnia is a common sleep disorder and has been linked to poor physical, psychological, and cognitive outcomes and increased accidents. Unique features of this sample (e.g., long shifts, patient care, quick emergency response) create a need for population-specific validation of the commonly used ISI. Study I assessed convergent and discriminant validity between the ISI, sleep diary, and other sleep and psychosocial measures. Study II assessed the test-retest validity of the ISI.
Methods: Participants (N = 289) were nurses from two regional hospitals in north Texas recruited for a parent study (268 females, M age = 40.67 years; SD = 11.03; 79.9% White) who completed daily sleep diaries and sleep and mental health screeners at four timepoints. Shift workers and participants who did not complete the ISI at baseline were excluded from the analysis.
Results: The ISI had medium to large correlations with measures intended to establish convergent validity including sleep onset latency (r = .41), wake time after sleep onset (r = .40), sleep efficiency (r = -.45), sleep quality (r = .66), and sleep related impairment (r = .67). Examination of ISI items and analogous sleep diary parameters showed small to large correlations (rs = .13-.53). The ISI had small to large correlations with measures intended to establish discriminant validity including nightmares (r = .25), circadian preference (r = -.26), shiftwork-related disorders (r = .09) and PTSD (r = .36), depression (r = .69), anxiety (r = .51), and perceived stress (r = .43). The ISI demonstrated good test-retest reliability from baseline to 1-month (ICC = .88), 6-month (ICC = .77), and 11-month follow up (ICC = .74).
Conclusion: The ISI demonstrated good psychometric properties and is a psychometrically strong measure for the assessment of insomnia severity in nurses. Overlap with psychological symptoms suggests caution while interpreting these constructs.
Support (If Any): This study was supported by a grant from the National Institute of Allergy and Infectious Diseases, Grant/Award Number: R01AI128359-01.

0438

THE IMPACT OF UNIT COHESION ON INSOMNIA SYMPTOMS AMONG ARMY SOLDIERS

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Introduction: Sleep disturbance is common in military personnel and is often related to stressful conditions and deployment to a warzone. Among soldiers, the achievement of unit goals and performance is often dependent upon how cohesive members of the unit are. The quality of unit experiences in terms of reliance on other unit members, feeling respected, and interpersonal relationships could impact the ability to sleep at night. The primary hypothesis of this analysis was that poorer quality unit experiences would be associated with worse sleep at night.
Methods: Data were acquired from the All Army Study of the Army Study to Assess Risk and Resilience in Service members (STARRS; N= 21,449; 28.65 {SD=7.45} years old; 88.24% male). Participants completed the Brief Insomnia Questionnaire, and current insomnia status was determined by DSM-5 criteria. They also completed survey items related to how much respect they had for their officers and other members of their unit as well as how much respect they received in return, their overall morale and if they felt they could rely on members of their unit. T-tests and Chi-square tests were used to examine the associations between insomnia and unit experiences.
Results: More negative feelings about unit cohesiveness was associated with higher rates of insomnia ($t(19401)= -41.19$, $p<.0001$). Similarly, greater feelings of not being respected by other unit members was associated with higher rates of insomnia ($X2$ (3, $N=19275) = 869.9$, $p<.0001$). Strongly believing that the job reward was not worth the effort that was put into their work also had a significant increase in disturbed sleep ($X2$ (4, $N=19214) = 1120.5$, $p<.0001$).
Conclusion: These results demonstrate that, among Army soldiers, poorer quality experiences with other unit members are related to higher rates of insomnia symptoms. Service members who felt they could not rely on other members of their unit, did not feel their officers respected them, and could not speak openly to officers endorsed strong feelings regarding how cohesive their unit was and ultimately reported poorer sleep.
Support (If Any): This publication is based on public use data from Army STARRS (Inter-university Consortium for Political and Social Research, University of Michigan-http://doi.org/10.3886/ICPSR35197-v1), funded by U.S. NIMH-U01MH087981. KEM's

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0439

A POLYSOMNOGRAPHIC MARKER OF SLEEP QUALITY USING ODDS RATIO PRODUCT ARE ASSOCIATED WITH INSOMNIA SYMPTOMS IN A DOSE-RESPONSE RELATIONSHIP

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Introduction: Insomnia is primarily diagnosed with subjective complaints because objective biomarkers are limited. In the current study, we assessed whether a polysomnographic marker of sleep quality (odds ratio product; ORP) was associated with different types of insomnia symptoms.
Methods: 416 participants (age 46.2±12.5; 176 females) recorded their sleep with an in-home Type 2 PSG test using the Cerebra Sleep System and filled out sleep questionnaires. Sleep quality was measured using odds ratio product (ORP) derived from frontal EEG channels across the duration of the recording (ORPTRT). On the questionnaires, participants reported whether they experienced any of the following insomnia symptoms at least three times a week: trouble falling asleep, trouble staying asleep, and waking up earlier than desired. Participants were then classified based on the total number of insomnia symptoms reported. An ANOVA, controlling for age, was performed to compare the effect of the number of insomnia symptoms on ORP.
Results: 199 participants reported no insomnia symptoms, while the remaining 217 reported at least one symptom three nights a week (1 symptom: n = 62, 2 symptoms: n = 83, 3 symptoms: n = 70). There was a significant effect of number of insomnia symptoms on ORPTRT $F(3,414)=3.45$, $p=.017$. There were significant differences between ORPTRT in participants who reported 0 symptoms (.991±.267), and participants who reported 2 symptoms (1.11±.259) ($t(282) = -3.57$, $p<.001$), and between 0 and 3 symptoms (1.13±.31 ($t(269) = -3.46$, $p<.001$). Even within individuals reporting insomnia symptoms, there were significant differences in ORPTRT between participants who reported 1 and 2 symptoms ($p=.024$), and 1 and 3 symptoms ($p=.029$).
Conclusion: The more insomnia symptoms that were reported, the greater the impairment in sleep quality using ORP were found. Further research could explore if treatment interventions aimed at reducing ORPTRT might be useful to help treat insomnia.
Support (If Any):

0440

SUBJECTIVE SLEEP OUTCOMES WITH LEMBOREXANT AMONG SUBJECTS WITH INSOMNIA AND CLINICALLY MEANINGFUL DECREASES ON THE INSOMNIA SEVERITY INDEX

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Introduction: Lemborexant (LEM) is a dual orexin receptor antagonist approved in multiple countries for the treatment of adults with insomnia. In Study 303 (NCT02952820), LEM provided significant benefit on sleep outcomes including patient-reported (subjective) sleep onset latency (sSOL) and wake after sleep onset (sWASO) versus placebo (PBO). This post-hoc analysis assessed these measures in Insomnia Severity Index (ISI) responders, defined as subjects with clinically meaningful reductions (≥7 points) in ISI total scores (ISI-TS).
Methods: Study 303 was a 12-month, PBO-controlled (first 6mo), randomized, double-blind, phase 3 study in subjects with ISI-TS ≥15 (moderate to severe insomnia). Subjects (n=949; Full Analysis Set [FAS]) received LEM (5mg [LEM5]; 10mg [LEM10]) or PBO for 6mo. Changes from baseline (CFB) in sSOL (min) and sWASO (min) at 6mo were analyzed in ISI responders from the FAS and in subjects with severe insomnia (baseline ISI-TS ≥22), using mixed-effect model repeated measurement analysis.
Results: At 6mo, 175 (LEM5), 151 (LEM10), and 124 (PBO) subjects were ISI responders; of these, 46 (LEM5), 48 (LEM10) and 29 (PBO) had severe insomnia. CFB in the FAS in median sSOL was significantly greater with LEM5 (−21.8) and LEM10 (−28.2) versus PBO (−11.4; both $P<0.001$). ISI responders also had significantly greater decreases in sSOL with LEM (LEM5: −26.7, $P<0.01$; LEM10: −32.6, $P<0.001$) than PBO (−18.0). In ISI responders from the severe insomnia subgroup, greater CFB in median sSOL was observed with LEM10 (−41.4) than with PBO (−32.1; $P>0.05$), but not with LEM5 (−32.9, $P>0.05$). Least-squares mean (standard error) CFB in sWASO in the FAS was −46.8(3.7) with LEM5 ($P<0.001$), −42.0(3.7) with LEM10 ($P<0.05$), versus −29.3(3.6) with PBO. In ISI responders, CFB in sWASO was greater with LEM10 (−52.7[4.0], $P>0.05$) and significantly greater with LEM5 (−58.9[3.8], $P<0.01$) versus PBO (−43.6[4.4]). In ISI responders from the severe insomnia subgroup, greater CFB was observed with LEM5 (−91.6[9.5]) versus PBO (−70.2[11.1]); $P>0.05$); CFB with LEM10 (−71.4[9.0]) was similar to PBO.
Conclusion: ISI responders including those from the severe insomnia subgroup reported greater CFB in sSOL and sWASO than the FAS that was somewhat dose dependent. LEM generally showed benefit versus PBO.
Support (If Any): Eisai Inc.

0441

TREATING INSOMNIA DISORDER IN BLACK WOMEN: RESULTS FROM AN INTERNET-BASED, RANDOMIZED CLINICAL TRIAL OF A CULTURALLY TAILORED INTERVENTION

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Introduction: Black women are at high risk for insomnia. Despite considerable interest in addressing sleep health disparities, there is very limited research investigating the efficacy of gold standard treatment (cognitive-behavioral therapy for insomnia; CBT-I) among this minority population. Further, we are not aware of any data studying whether a culturally tailored intervention would improve treatment efficacy and/or engagement among Black women.
Methods: We conducted a randomized clinical trial within a national, longitudinal cohort study (Black Women's Health Study; BWHS). BWHS participants with elevated insomnia symptoms were randomized to receive: (1) automated Internet-delivered CBT-I (Sleep Healthy Using the Internet; SHUTi); (2) a stakeholder-informed, tailored version of SHUTi for Black women (SHUTi-BWHS); or (3) patient education about sleep (PE). Primary outcomes were insomnia severity (Insomnia Severity Index; ISI) and treatment engagement (completion of the intervention). We hypothesized that both SHUTi and SHUTi-BWHS would lead to significantly decreased insomnia severity compared to PE, and that SHUTi-BWHS participants would be more likely to complete the intervention.
Results: Three-hundred and thirty-three Black women (mean age=59.3 years) were enrolled in the trial. Those randomized to receive either SHUTi or SHUTi-BWHS had greater reductions in ISI scores at 6-month follow-up (-10.0 and -9.3 points, respectively) compared to PE (-3.6 points). More participants randomized to SHUTi-BWHS completed the intervention compared to those randomized to SHUTi (78.2% vs 64.8%; $p<.01$). Participants who completed either SHUTi or SHUTi-BWHS showed greater reductions in insomnia severity compared to non-completers (-10.4 vs -6.2 points; $p<.01$).
Conclusion: Both SHUTi and SHUTi-BWHS improved sleep outcomes more than an active control. The culturally tailored SHUTi-BWHS program was more effective at engaging participants with the program as a greater proportion completed the full intervention, which was associated with greater improvements in sleep outcomes. These compelling data demonstrate that offering a culturally adapted program is a possible path in efforts to address the sleep health disparities facing Black Americans.
Support (If Any): This trial was funded by Patient-Centered Outcomes Research Institute grant AD-2017C1-6314. National Cancer Institute grant U01 CA164974 supports the BWHS infrastructure.

0442

IMPROVED RESILIENCE FOLLOWING COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA MEDIATES TREATMENT OUTCOMES AND PROTECTS AGAINST LONG-TERM INSOMNIA AND DEPRESSION

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Introduction: While the negative consequences of insomnia are well-documented, a strengths-based understanding of how sleep can promote health promotion is still emerging and much-needed. Correlational evidence has connected sleep and insomnia to resilience; however, this relationship has not yet been experimentally tested. This study examined resilience as mediator of treatment outcomes in a randomized clinical trial with insomnia patients.
Methods: Participants were randomized to either digital Cognitive Behavioral Therapy for insomnia (dCBT-I; n=358) or sleep education control (n=300), and assessed at pre-treatment, post-treatment, and one-year follow-up. A structural equation modeling framework was utilized to test resilience as a mediator of insomnia and depression. Risk for insomnia and depression was also tested in the model, operationalized as a latent factor with sleep reactivity, stress, and rumination as indicators (aligned with the 3-P model). Sensitivity analyses tested the impact of change in resilience on the insomnia relapse and incident depression at one-year follow-up.
Results: dCBT-I resulted in greater improvements in resilience compared to the sleep education control. The improved resilience was a significant mediator of reduced insomnia and depression severity following treatment. Furthermore, improved resilience following dCBT-I also reduced insomnia and depression at one-year follow-up by lowering latent risk. Sensitivity analyses indicated that each point improvement in resilience following treatment reduced the odds of insomnia relapse and incident depression one year later by 76% and 65% respectively.
Conclusion: Improved resilience is a contributing mechanism to treatment gains following dCBT-I and may further protect against longer-term insomnia and depression by reducing risk.
Support (If Any): K23HL138166; R01HL159180

0443

LIFE VALUES EXPRESSED BY FEMALE VETERANS ENGAGED IN AN ACCEPTANCE AND COMMITMENT-BASED BEHAVIORAL THERAPY FOR PRIMARY INSOMNIA

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Introduction: Women Veterans disproportionately suffer from insomnia, which negatively impacts health and overall quality of life. Insomnia can result in fewer value-based choices and less engagement in meaningful life activities. This study sought to identify common life values expressed by women Veterans engaged in an acceptance-and commitment-based behavioral therapy for primary insomnia.
Methods: 74 female-identifying Veterans (mean age=48.3 years; 47.3% non-Hispanic White, 28.4% Black/African American, 23.0% Hispanic/Latina, 12.2% American Indian/Alaska Native, 5.4% Asian American and 9.5% Other) who met DSM-5 diagnostic criteria for Insomnia disorder were randomly assigned to an acceptance-based behavioral treatment for insomnia called Acceptance of the Behavioral Changes to treat insomnia (ABC-I; compared to a similarly structured group receiving CBT-I). Women in the ABC-I group received 5 weekly, 60-minute sessions containing key components of sleep restriction, stimulus control, and sleep hygiene. In place of traditional cognitive therapy exercises, we incorporated essential components of Acceptance and Commitment Therapy (ACT), such as the identification of values. Outcome measures included qualitative responses of values identified by participants. Qualitative responses were coded by three separate raters who coded participant stated values into five categories: Work/Education, Relationships, Personal Care/Health, Leisure, and Pets.
Results: The three independent coders reached 100% agreement after independent coding and adjudication. The five categories are listed in order of frequency of response: 1) Relationships (n =68); 2) Personal Care/Health (n =51); 3) Work/Education (n =46); 4) Pets (n =12) and; 5) Leisure (n =5).
Conclusion: The current study showed that personal and social relationships are of high importance to women Veterans undergoing behavioral treatment for insomnia, followed by personal care and health, which includes spirituality/religion, and physical and mental health. Findings indicate that incorporating outcomes of insomnia treatment trials that assess relationship quality may prove important in future studies of women Veterans with sleep disorders. Further, identifying common shared values among women Veterans is an important first step in developing and adapting treatments for insomnia that help to improve quality of life.
Support (If Any): VA HSR&D IIR 13-058-2 and RCS-20-191, NIH K24 HL143055; VA GLAHS GRECC

0444

THE EFFECT OF DISTINCT COMPONENTS OF CBT-I ON SLOW WAVE POWER AND ENERGY

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Introduction: Cognitive-behavioral therapy for insomnia (CBT-I) is an effective multi-component treatment known to improve sleep in older adults with insomnia, including increasing NREM slow-wave activity (SWA) EEG power (0.5 – 4.75Hz) and sleep depth. However, the relative contributions of distinct components of CBT-I to changes in SWA remain unknown.
Methods: We examined the relative impact of specific components of CBT-I: behavioral therapy (sleep restriction + stimulus control) (BT), cognitive therapy (CT), and combined BT and CT (CBT) on SWA in 111 older adults (75 female; mean age: 69±6.1 years) with insomnia (Insomnia Severity Index >10). Participants underwent polysomnography (PSG) at baseline prior to being randomized to a 6-session treatment regimen of BT, CT, or CBT. PSG was reassessed immediately following treatment and at 6-months follow-up. We computed SWA and time-accumulated slow-wave energy (SWE) at each time point. Mixed-effects models compared treatment efficacy on SWA and SWE outcomes.
Results: We identified significant time-by-treatment interactions for both SWA (B=0.69, t=2.14, p=0.034) and SWE (B=0.93, t=1.98, p=0.049). Post-hoc tests revealed that SWA/SWE increased from baseline to the end of treatment for CT group (SWA: d=0.42, SWE: d=0.54), while there were limited changes in the BT (SWA: d=0.27, SWE: d=0.29) and in the CBT groups (SWA: d=0.18, SWE: d=0.06). These changes were absent at 6-month follow up.
Conclusion: Our preliminary results indicated that different components of CBT-I have distinct effects on SWA/SWE with CT alone indicating improved NREM sleep quality. Given previous findings of lower SWA for sleep misperceptors underestimating their sleep depth, compared with good-sleepers, this result may suggest that reducing misperception of sleep with CT increases SWA/SWE. Further study is needed to dissociate the effect of BT from CT in combined CBT-I.
Support (If Any):

0445

NON-PHARMACOLOGICAL INSOMNIA THERAPY IS ROBUST TO CO-OCCURRING PAIN IN OLDER ADULTS

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Introduction: Pain worsens insomnia symptoms and increases hyperarousal during sleep. The effectiveness of treatments for

improving insomnia symptoms may therefore be affected by co-occurring pain, though this currently remains unknown.
Methods: We tested the hypotheses that (1) higher levels of pain will lead to smaller improvements in subjective and objective markers of insomnia following a non-pharmacological insomnia treatment and (2) insomnia treatment will moderate the relationship between pain and markers of insomnia. 114 adults >60 years (age=69.7, SD=6.3, 66% female) with insomnia (Insomnia Severity Index [ISI] score >10, Mean=16.1, SD=4.5) underwent polysomnographic (PSG) recordings before and after completing a 6-session non-pharmacological insomnia treatment regimen. Pain severity (Brief Pain Inventory), insomnia symptoms (ISI), and hyperarousal derived from the PSG (relative α-band power [7.5-12.0Hz] across all sleep stages) were acquired at each time-point. Two-tailed paired t-tests were used to determine the main effects of treatment on insomnia and alpha power. Ranked-correlation tests were used to assess the impact of baseline pain on treatment outcomes, and mixed-effects models were employed to assess whether the relationship between pain and markers of insomnia differed pre- and post-treatment.
Results: Non-pharmacological insomnia treatment reduced insomnia symptom severity ($t=19.4$, $p<0.001$) but not α-power ($t=0.97$, $p=0.33$). Baseline pain severity was not associated with insomnia symptom improvement ($\rho=-0.09$, $p=0.49$) nor with changes in α-power ($\rho=-0.19$, $p=0.23$). There was no significant pain-by-time interaction in determining insomnia symptom improvement ($\beta=-0.05$, $t=-0.18$, $p=0.86$), and a trending pain-by-time interaction in determining changes in α-power ($\beta=-0.007$, $t=-1.8$, $p = 0.07$).
Conclusion: These findings suggest that pain is not likely to alter the effectiveness of non-pharmacological treatment for subjective insomnia symptoms, but pain may reduce change in the markers of hyperarousal in older adults with co-occurring pain and insomnia.
Support (If Any): National Institute of Mental Health grant 1R01MH101468-01

0446

TRENDS AND PATTERNS IN PRESCRIPTIONS OF HYPNOTICS FOR THE TREATMENT OF INSOMNIA IN JAPAN: ANALYSIS OF A NATIONWIDE JAPANESE CLAIMS DATABASE

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Introduction: Optimal treatment of insomnia is uncommon, given the lack of awareness regarding insomnia management. While the treatment landscape for insomnia has evolved following the introduction of orexin receptor antagonists (ORA), few studies have examined prescribing patterns of hypnotics. We analyzed data from a claims database to examine real-world use of hypnotics in Japan.
Methods: Patients (aged ≥20 to <75 years old) with insomnia diagnosis, prescribed ≥1 hypnotic and continuous enrollment for ≥12 months before the index date were extracted from the JMDC claims database between April 1st, 2009 and March 31st, 2020. Patients were classified as new users of hypnotics or long-term users (prescribed the same mechanism of action [MOA] for ≥180 days). Trends (2010–2019) and patterns (2018–2019) in hypnotics prescriptions were analyzed.
Results: The analysis comprised of 130,177 new users and 91,215 long-term users (2010–2019). Nearly all new users (97.1%–97.9%) were prescribed a single MOA in each year. In 2010, almost all new users (94.0%) of hypnotics were prescribed GABAA-receptor agonists (benzodiazepines [BZD] or z-drugs). The proportions of patients prescribed BZD declined over time (from 54.8% in 2010 to 30.5% in 2019), whereas those prescribed z-drugs remained stable (~40%). The proportion of patients prescribed a melatonin receptor agonist increased slightly (3.2% to 6.3%), while those prescribed ORA increased substantially (0% to 20.2%). Among long-term users, the proportion of patients prescribed BZD steadily declined over time, but more than half were prescribed BZD. Unlike new users, a lower proportion of long-term users were prescribed ORA (0% in 2010, 4.3% in 2019). Analyses using 2018–2019 data showed that a combination of multiple (≥2) MOAs was prescribed to a higher proportion (18.2%) of long-term users than new users (2.8%). The prescription patterns of hypnotics were comparable among patients stratified by age, sex, medical specialty, and psychiatric comorbidities.
Conclusion: The present study showed distinct characteristics in the patterns and trends of the prescriptions of hypnotics among new users and long-term users in Japan. The high proportion of long-term BZD users suggests the need for educating clinicians about the optimal care pathway for insomnia.
Support (If Any): MSD K.K., Tokyo, Japan

0447

RACIAL DISPARITIES IN PATIENT OUTCOMES AND TREATMENT ENGAGEMENT IN COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA AMONG PREGNANT WOMEN.

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Introduction: Insomnia affects over half of pregnant women, and epidemiological data suggest that insomnia rates are twice as high among black women relative to white women in pregnancy. Recently, cognitive behavioral therapy for insomnia (CBTI) has been supported as an efficacious intervention for prenatal insomnia. However, it remains unclear whether CBTI is equally efficacious across racial groups, which is necessary to help reduce race-related disparities in prenatal insomnia.
Methods: This study is a secondary analysis of a single-site trial. Thirty-nine women who self-identified as white (n=24) and black (n=15) completed CBTI during pregnancy. Insomnia was measured using the Insomnia Severity Index (ISI). Before CBTI, patients reported sociodemographics. Treatment outcomes were collected a week after completing treatment during pregnancy.
Results: Although racial groups did not differ in ISI before treatment, white patients reported significantly larger decreases in ISI relative to black patients after CBTI (-5.75 vs -2.13, p=.046). Notably, black women were less engaged in treatment than white women based on mean number of sessions attended (4.20 vs 5.54 sessions, p=.013). Even so, multivariate linear regression showed that posttreatment ISI was 4 points higher for black women than white women (b=4.10, p=.049) when controlling for baseline ISI (p=.001), obesity (p=.072), poverty (p=.091), sessions attended (p=.155), and short sleep (p=.406). Notably, 41.7% of white CBTI patients remitted relative to 26.7% of black CBTI patients, suggesting that white women are 56% more likely to remit from CBTI than black women.
Conclusion: Our data suggest that black pregnant women exhibit poorer response to digital CBTI than white pregnant women. Moreover, racial disparities in CBTI response during pregnancy were not attributable to differences in session attendance. We must identify barriers to treatment response in black women, thereby

guiding refinement to CBTI to provide better care for black women during pregnancy.
Support (If Any): Ameriican Academy of Sleep Medicine

0448

SELF-CARE TRAJECTORIES AND SLEEP CHARACTERISTICS IN PEOPLE WITH HEART FAILURE AND INSOMNIA

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Introduction: Sleep disturbance is common among people with heart failure (HF) and associated with poor self-care. The purpose of this study, a secondary analysis of data from a randomized controlled trial of the sustained effects of cognitive behavioral therapy for insomnia compared to HF self-management, was to examine the extent to which these interventions improved HF self-care trajectories and the associations between changes in sleep and self-care trajectories.
Methods: We measured changes in self-care maintenance (daily activities), management (symptom management), and confidence (self-efficacy), components of self-care (SC: Self-care of Heart Failure Index) and self-reported sleep characteristics [Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), daytime sleepiness (PROMIS Sleep Impairment)] at baseline and 3, 6, and 12 months post-intervention. We used group-based trajectory modeling to identify self-care trajectories and generalized linear models to identify the associations between changes in sleep and SC trajectories.
Results: We included 175 participants [N = 91 HS; age M = 63 years (12.9); n = 110 (57.1%) male; n = 133 (76.0%) White]. At baseline, SC maintenance, management, and confidence were poor overall [M = 66.3 (16.4); 53.4 (23.8); 68.1 (20.3), respectively]. We identified four self-care trajectories. Class A (poor SC maintenance & management; moderate confidence: N = 47, 26.9%); Class B (low self-care management & confidence, moderate maintenance: N = 68, 38.9%): Class C (high maintenance & management, low confidence; N = 42, 24.0%); Class D (high on all SC: N = 18, 10.3%). There was no significant difference in changes in self-care over time between HS and HH, but both groups improved at 3 and 6 months on self-care maintenance, and self-care management improved at 12 months over baseline ($p < .05$). Participants in all classes improved on insomnia severity and sleepiness ($p< .05$) over time.
Conclusion: We found that insomnia and sleepiness improved even those with poor self-care suggesting that adequate HF SC may not be needed to improve insomnia. Future research is needed to determine if a combination of HF self-management and CBT-I improves SC trajectories in this population.
Support (If Any): R01NR016191 and P20NR014126

0449

CORRELATIONS BETWEEN SLEEP PARAMETERS AND ISI TOTAL SCORE IN SUBJECTS WITH MODERATE TO SEVERE INSOMNIA TREATED WITH LEMBOREXANT

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Introduction: Lemborexant (LEM) is a dual orexin receptor antagonist (DORA) approved in multiple countries for the treatment of adults with insomnia. In Study 303 (NCT02952820), LEM provided significant benefit on subject-reported sleep measures versus placebo (PBO). This post hoc analysis investigated whether changes from baseline in sleep parameters with LEM are correlated with insomnia disorder severity.
Methods: Study 303 was a randomized, double-blind, PBO-controlled (first 6mo [Period 1]), phase 3 study. During Period 1, subjects received LEM 5mg (LEM5), LEM 10mg (LEM10), or PBO. During Period 2 (second 6mo), LEM subjects continued their assigned dose and PBO subjects were rerandomized to LEM5 or LEM10 (rerandomized subjects not reported here). The correlation between changes in subject-reported sleep parameters (sleep onset latency [sSOL], wake after sleep onset [sWASO], sleep efficiency [sSE], total sleep time [sTST]) and insomnia disorder severity, as assessed by the Insomnia Severity Index total score (ISI-TS) were evaluated in the Full Analysis Set (FAS; ISI-TS ≥15) and in a subgroup of subjects with severe (ISI-TS ≥22 at baseline) insomnia over 12mo for LEM and over 6mo for PBO.
Results: Among 949 (PBO=318; LEM5=316; LEM10=315) subjects, 223 (PBO=65; LEM5=84; LEM10=74) had severe insomnia at baseline. Within each sleep parameter and severity group, baseline values were similar across treatments. Overall, strong to very strong correlations were observed between changes from baseline in sleep parameters and decrease in ISI-TS, regardless of treatment, as determined by correlation coefficients for sSOL (LEM5=0.973 [P=0.0053]; LEM10=0.997 [P=0.0002]; PBO=0.844 [P=0.361]), sSE (LEM5=–0.937 [P=0.0188]; LEM10=–0.992 [P=0.0008]; PBO=–0.950 [P=0.2018]), sWASO (LEM5=0.937 [P=0.0187]; LEM10=0.996 [P=0.0003]; PBO=0.979 [P=0.1299]), and sTST (LEM5=–0.876 [P=0.0515]; LEM10=–0.974 [P=0.0050]; PBO=–0.933 [P=0.2346]). Strong to very strong correlations were also observed in subjects with severe insomnia: sSOL (LEM5=0.818 [P=0.0904]; LEM10=0.823 [P=0.0868]; PBO=0.828 [P=0.3788]), sSE (LEM5=–0.860 [P=0.0616]; LEM10=–0.975 [P=0.0048]; PBO=–0.961 [P=0.1792]), sWASO (LEM5=0.871 [P=0.0544]; LEM10=0.936 [P=0.0194]; PBO=0.875 [P=0.3213]), and sTST (LEM5=–0.843 [P=0.0729]; LEM10=–0.969 [P=0.0095]; PBO=–0.974 [P=0.1449]).
Conclusion: Across the study period, changes from baseline in reported nocturnal sleep parameters correlated with reductions in severity of insomnia disorder regardless of insomnia severity at baseline.
Support (If Any): Eisai Inc.

0450

EFFECT OF LEMBOREXANT ON EARLY MORNING AWAKENING IN SUBJECTS WITH SEVERE PROBLEMS WITH WAKING TOO EARLY

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Introduction: Lemborexant (LEM) is a dual orexin receptor antagonist approved in multiple countries for the treatment of adults with insomnia. In Study E2006-G000-304 (Study 304; NCT02783729), LEM improved sleep onset and sleep maintenance. This analysis evaluated treatment with LEM in subjects reporting "problems waking up too early" on the Insomnia Severity Index (ISI) Item-3 as assessed by wake after sleep onset in the second half of the night (WASO2H).
Methods: Study 304 was a 1-month, randomized, double-blind, placebo(PBO)-controlled and active-comparator (zolpidem extended-release 6.25mg [ZOL]) study of LEM 5mg (LEM5) and LEM 10mg (LEM10). Subjects whose baseline scores were

≥3 (severe/very severe) for ISI Item-3 were included in this analysis. WASO2H was defined as minutes of wake during the interval from 240 minutes after lights off until lights on (based on 8hr time in bed). WASO2H was measured at Days 1/2 and 29/30 using polysomnography and averaged across consecutive nights; change from baseline was analyzed using mixed effect model repeated measurement analysis.

Results: Treatment groups were (number of subjects: treated/had ISI Item-3 scores ≥3) LEM5 (220/140), LEM10 (219/140), ZOL (216/158) and PBO (180/122). Baseline mean (standard deviation) WASO2H (minutes) ranged from 77.8-82.25 (30.3-35.5) across treatment groups. By Day 1/2, WASO2H improved significantly with LEM versus ZOL and PBO. Least-squares mean (LSM; standard error [SE]) WASO2H change from baseline at Day 1/2 was -15.56(2.3) (PBO), -34.19(2.2) (LEM5), -42.54(2.2) (LEM10), and -27.82(2.1) (ZOL); all P<0.0001 versus PBO, P=0.0222 and P<0.0001 for LEM5 and LEM10 versus ZOL, respectively. Improvements in WASO2H were maintained through Day 29/30. LSM (SE) change from baseline in WASO2H at Day 29/30 was -15.07(2.5) (PBO), -30.06(2.4) (LEM5), -34.30(2.4) (LEM10), -25.30(2.3) (ZOL); all P<0.002 versus PBO, P=0.1187 and P=0.0033 for LEM5 and LEM10 versus ZOL, respectively. ISI Item-3 improved from ≥3 at baseline to <3 for most LEM5 (97/137[70.8%]) and LEM10 (92/133[69.2%]) treated subjects.

Conclusion: LEM provided significant benefit in WASO2H versus PBO (LEM5 and LEM10) and versus ZOL (only LEM10 at Day 29/30) among subjects with severe/very severe problems with waking too early. Improvements reported for ISI Item-3 for LEM subjects supports this benefit.

Support (If Any): Eisai Inc.

0451

EFFECT OF LEMBOREXANT TREATMENT ON POLYSOMNOGRAPHIC SLEEP MEASURES IN OLDER ADULTS WITH INSOMNIA AND OBJECTIVE SHORT SLEEP

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Introduction: In Phase 3 Study 304 (NCT02783729), lemborexant (LEM) provided significant benefit versus placebo (PBO) on polysomnographic (PSG) and sleep diary-based sleep onset and maintenance outcomes over 1mo in subjects with insomnia disorder. Based on evidence that patients with insomnia and objective short sleep (ISS [total sleep time; TST] <6hrs) may respond less well to interventions such as cognitive behavioral therapy for insomnia (CBT-I) than patients with insomnia and objective long sleep (TST ≥6hrs), we conducted post-hoc analyses of LEM efficacy in the ISS subgroup (subjects with PSG TST<6hrs).

Methods: Study 304 was a 1mo, randomized, double-blind, PBO- and active-controlled, parallel-group study in female (age ≥55y) and male (age ≥65y) subjects (n=1006). Subjects received PBO, LEM 5mg (LEM5), LEM 10mg (LEM10), or zolpidem tartrate extended-release 6.25mg (ZOL). Latency to persistent sleep (LPS) and wake after sleep onset (WASO) were assessed at Nights (NT) 1/2 and NT29/30 using PSG and averaged; change from baseline (paired PSGs during single-blind PBO run-in) were analyzed using mixed-effect model repeated measurement analysis.

Results: The ISS subgroup comprised 710/1006 (70.58%) subjects. Mean (SD) baseline LPS was similar across treatments: PBO=52.80(35.73); ZOL=54.77(40.93); LEM5=54.28(39.30); LEM10=53.31(34.45). On NT1/2, LEM5/10 led to statistically significantly greater (P<0.05) decreases from baseline (PBO=−9.65[36.52]; ZOL=−17.78[36.34]; LEM5=−22.02[31.62]; LEM10=−25.42[34.73]) versus PBO and ZOL. On NT29/30, LEM5/10 led to statistically significantly greater (P<0.0005) decreases from baseline (PBO=−11.88[35.09]; ZOL=−12.57[38.50]; LEM5=−25.37[37.06]; LEM10=−28.20[34.75] versus PBO. ZOL was not different from PBO. Mean (SD) baseline WASO was similar: PBO=123.79(37.21); ZOL=128.37(38.94); LEM5=128.14(37.52); LEM10=129.07(37.98). On NT1/2, LEM5/10 led to statistically significantly greater (P<0.0001) decreases from baseline (LSM[SE]: PBO=−23.52[2.74]; ZOL=−54.74[2.47]; LEM5=−60.58[2.45]; LEM10=−69.35[2.41] versus PBO. LEM10 was significantly different than ZOL (P<0.0001). On NT29/30, LEM5/10 led to statistically significantly greater (P<0.0001) decreases from baseline (PBO=−29.62[3.09]; ZOL=−46.86[2.80]; LEM5=−52.67[2.74]; LEM10=−55.37[2.70] versus PBO. LEM10 was significantly different than ZOL (P<0.05).

Conclusion: The data support LEM as an effective therapy for older adult patients with ISS and suggest LEM may be more beneficial than ZOL, particularly for patients with ISS and sleep onset difficulties. These findings suggest that LEM may be a reasonable therapy to consider for treating older patients with ISS where CBT-I may have relatively limited efficacy.

Support (If Any): Eisai Inc.

0452

LEMBOREXANT TREATMENT OF OLDER ADULTS WITH INSOMNIA AND OBJECTIVE SHORT SLEEP: RATES OF RESPONSE AND REMISSION

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Introduction: In Phase 3 Study 304 (NCT02783729), lemborexant (LEM) provided significant benefit versus placebo (PBO) on polysomnographic (PSG) endpoints and sleep diary-based sleep onset and maintenance outcomes over 1mo in subjects with insomnia disorder. The study also included the Insomnia Severity Index (ISI) to ensure sufficient insomnia severity at baseline (ISI total score ≥13) and for use as an outcome measure. Subjects met criteria for insomnia disorder and were confirmed to spend between 7-9 hours in bed. Subjects had insomnia with objective short sleep (ISS; [total sleep time; TST] <6hrs) or objective long sleep (TST ≥6hrs). Since patients with ISS may respond less well to therapeutic approaches such as cognitive behavioral therapy for insomnia (CBT-I), we examined rates of response and remission with LEM as defined by the ISI in the ISS subgroup.

Methods: Study 304 was a 1mo, randomized, double-blind, PBO- and active-controlled, parallel-group study in female (age ≥55y) and male (age ≥65y) subjects (n=1006). Subjects received PBO, LEM 5mg (LEM5), LEM 10mg (LEM10), or zolpidem tartrate extended-release 6.25 mg (not reported). Baseline PSGs were obtained during a single-blind PBO run-in, followed by paired PSGs on Nights 1/2 and Nights 29/30. The ISI was given at baseline and end of treatment. For these post-hoc analyses, responders were defined as subjects whose decrease from baseline on the ISI was ≥7pts, while remitters achieved ISI total scores <8pts. LEM5 and LEM10 vs PBO differences were evaluated using chi-square tests.

Results: 525/743 (70.66%) of subjects in the PBO/LEM groups were in the ISS subgroup. For LEM5, 99/176 (56.25%) were responders and 49/176 (27.84%) were remitters. For LEM10, 97/180 (53.89%) were responders and 50/180 (27.78%) were remitters. For the PBO group, 59/140 (42.14%) were responders and 21/140 (15.00%) were remitters. The responder and remitter rates for

LEM5 and LEM10 were statistically significantly greater than those for PBO (all P<0.05).
Conclusion: Older adults with ISS achieved clinically meaningful improvement with LEM as assessed at the end of one month of treatment, with nearly 30% considered remitters and >50% considered treatment responders. LEM is a potential therapy for ISS patients who may have limited response to CBT-I.
Support (If Any): Eisai Inc.

0453

LEMBOREXANT EXPOSURE IS INDEPENDENT OF RACE

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Introduction: Some hypnotic treatments for insomnia require dosing consideration due to exposure differences based on patient characteristics. Lemborexant (LEM) is a dual orexin receptor antagonist approved in multiple countries for the treatment of adult insomnia. LEM is not associated with exposure differences based on sex, age, or BMI that impact dosing. The potential impact of race on exposure was determined in two stand-alone pharmacokinetic (PK) studies and by modeling data from studies comprising the LEM clinical development program, which included healthy subjects and insomnia patients.
Methods: Study 003 (NCT02039089) was a single-center, multiple-dose, randomized, double-blind, placebo-controlled, parallel-group study in healthy Japanese and White subjects. Study 014 (NCT04555733) was a phase 1, single center, open-label, single and multiple oral dose study in healthy Chinese subjects. Additionally, effect of race on LEM exposure was independently examined as part of a population PK analysis incorporating LEM data from 9 Phase 1 studies (n=407), and Studies 201 (NCT01995838; n=235), 303 (NCT02952820; n=726) and 304 (NCT02783729; n=524) (Lalovic et al., 2020). Plasma concentrations of LEM were quantified from plasma by validated liquid chromatography with tandem mass spectrometry. Adverse events (AE) were recorded.
Results: Exposure of LEM increased in an approximately dose-proportional manner across the dose range (2.5 mg to 25 mg) in studies 003 and 014. There were no significant exposure differences between Japanese and White subjects following single LEM10 administration on Day 1 in Study 003 (maximum concentration [Cmax] mean[SD], ng/mL: Japanese, 46.5[25.8]; White, 47.3[28.1]; area under the curve from time zero to 24h [AUC0-24] mean[SD], ng·h/mL: Japanese, 231[40.2]; White, 208[83.4]) or when comparing PK data from Chinese subjects in Study 014 following single dose administration on Day 1 (Cmax mean[SD], ng/mL: LEM5, 29.8[12.8]; LEM10, 56.2[16.9]; LEM25, 116[46.8]; AUC0-24 mean[SD], ng·h/mL: LEM5, 106[29.9]; LEM10, 205[35.6]; LEM25, 549[116]) to Japanese and White subjects in Study 003. These results are supported by the cross-study, population PK model-based analysis, indicating no significant clinical or statistical differences in LEM PK attributable to the intrinsic factor race.
Conclusion: LEM exposure is not significantly affected by race. Therefore, dosing of LEM can be consistent across patient populations from different racial groups.
Support (If Any): Eisai Inc.

0454

RESPONSE TO LEMBOREXANT IN OLDER SUBJECTS WITH INSOMNIA DISORDER AND COMORBID PAIN AT BASELINE

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Introduction: The reciprocal relationship between pain and poor sleep has been well established. Pain interferes with sleep, and insomnia increases pain sensitivity, thus reducing quality of life. Therefore, it is of clinical importance to evaluate whether a sleep-promoting drug such as the dual orexin receptor antagonist, lemborexant (LEM; approved in multiple countries to treat adults with insomnia) can improve sleep in older patients, in whom both sleep and ongoing pain are prevalent.
Methods: Study 304 (NCT02783729), was a 1-month, double-blind, PBO- and active-controlled study in subjects age ≥55y with insomnia (full analysis set [FAS]=1006). Those who also endorsed some/severe pain at baseline on the pain/discomfort dimension of the EuroQual-5 Dimension-3 Level scale (EQ-5D-3L; no problems/some problems/extreme problems) at baseline were eligible for these post-hoc analyses. Medical history of pain conditions and/or ongoing therapy were not required for eligibility and were not evaluated. Subjects were randomized to bedtime doses of placebo, LEM 5mg (LEM5),10mg (LEM10) or zolpidem tartrate extended release (not reported here). Changes from baseline (CFB) in objective sleep parameters assessed by polysomnography (latency to persistent sleep [LPS]; wake after sleep onset [WASO]) were analyzed by mixed-effect repeated measures analyses adjusted for relevant factors.
Results: Approximately 18% of the FAS reported some or extreme pain at baseline (PBO=55; LEM5=78; LEM10=50). For LPS, baseline median values (minutes) were 31.0, 29.4 and 42.1 for PBO, LEM5 and LEM10, respectively. Median CFB for LPS were larger and statistically significantly different for both LEM doses compared with PBO at the beginning of treatment (mean of Nights 1/2: +2.5; -8.4, -15.8; P<0.005); and were (mean of Nights 29/30: -7.1,-9.9, -9.0) at the end of treatment LEM5 (P=0.031), LEM10 (P=0.054). For WASO, baseline median values (minutes) were 101.0, 103.6 and 111.1 for PBO, LEM5 and LEM10, respectively. Median CFB for WASO were larger and statistically significantly different (P<0.001) for both LEM doses compared with PBO at the beginning (Nights 1/2; -1.5; -41.5, -64.4) and end of treatment (Nights 29/30; -1.1, -37.9, -52.5).
Conclusion: These data suggest that lemborexant can effectively treat insomnia in older adults with concomitant painful conditions.
Support (If Any): Eisai Inc.

0455

THE INSOMNIA DAYTIME SYMPTOMS AND IMPACTS QUESTIONNAIRE: AN ANALYSIS OF CLINICALLY MEANINGFUL CHANGE USING PHASE 3 CLINICAL TRIAL DATA

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Introduction: The Insomnia Daytime Symptoms and Impacts Questionnaire (IDSIQ) is a new validated patientreported outcome (PRO) instrument evaluating daytime functioning in people with

insomnia. It comprises 14 items grouped into 3 domains: Alert/Cognition, Mood, and Sleepiness. To further explore the ability of the IDSIQ to capture clinically meaningful changes in daytime functioning resulting from treatment, we estimated withinsubject changes in IDSIQ scores using phase 3 trial data.

Methods: A randomized double-blind placebocontrolled trial of daridorexant in adults with insomnia (NCT03545191), in which subjects completed the IDSIQ daily during treatment, provided data for blinded analyses. Spearman correlations were calculated for changes in IDSIQ scores and potential anchors: Insomnia Severity Index, Patient Global Assessment of Disease Severity, Patient Global Impression of Severity, and Patient Global Impression of Change, applying a prespecified threshold of 0.30 (moderate association). Anchor-based analyses of weekly average IDSIQ total and domain scores were used to estimate responder definitions (RDs). The various RD estimates were triangulated to identify values where they converged. Distribution-based and receiver operating characteristic analyses calculated standard error of measurement (SEM), 0.5 standard deviation (SD), and Youden's index as supportive evidence for anchor-based RD estimates.

Results: The analysis included 930 subjects (18-88 years). Score change correlations for the potential anchors and IDSIQ at month 1 (0.36–0.44) and month 3 (0.45–0.57) were all >0.30. Triangulation of mean IDSIQ score changes in subjects with clinically relevant improvement on the different anchors supported RD thresholds for clinically meaningful change of 17 points for the IDSIQ total score, 9 points for the Alert/Cognition domain, 4 points for the Mood domain, and 4 points for the Sleepiness domain. SEM and 0.5 SD values were within the ranges of anchor-based IDSIQ score changes, and Youden's index was maximized or near-maximized when the RD estimates were used as thresholds for identifying responders based on the anchors.

Conclusion: The IDSIQ is sensitive to changes in patients who experience daytime impacts of insomnia and can be used to assess treatment efficacy on daytime functioning in patients with insomnia.

Support (If Any): This work was funded by Idorsia Pharmaceuticals Ltd.

0456

COMPARATIVE SAFETY AND EFFICACY OF HYPNOTICS: A QUANTITATIVE RISK-BENEFIT ANALYSIS

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Introduction: Hypnotics continue to be preferentially used in practice for the treatment of chronic insomnia, yet the comparative safety and efficacy of medication options are unclear. While several position statements and network meta-analyses have provided some guidance, none have provided a quantitative assessment of risk-benefit. In the present analysis, each therapeutic class commonly used for chronic insomnia is quantitatively ranked with respect to safety, efficacy, and risk-benefit.

Methods: Safety data for FDA-approved hypnotics were extracted from the package insert adverse event tables and standardized to form a placebo-adjusted adverse event rate per 1000 (AEr). Efficacy data were extracted from randomized controlled trials identified in professional society position statements and published systematic reviews. The efficacy metric was computed from placebo adjusted pre-post change scores for self-reported sleep continuity (i.e., sleep latency [SL], wake after sleep onset [WASO], and total sleep time [TST]) and represented as a summed composite effect size score (SWT). Risk-benefit (R/B) was represented as a ratio between AEr and SWT. Comparative safety, efficacy, and risk-benefit metrics were calculated for five therapeutic classes: Benzodiazepines (BZs), non-benzodiazepine benzodiazepine receptor agonists (BZRAs), dual orexin receptor antagonists (DORAs), melatonin receptor agonists (MELAs), and sedating antidepressants (SADs).

Results: With respect to safety, MELAs had the lowest adverse event rate (AEr=43.1) and BZRAs had the highest rate (AEr=255.0). With respect to efficacy, BZs were the most efficacious (SWT=1.94, Mean ES=0.59) and MELAs were least efficacious (SWT=0.11, Mean ES=0.02). Overall, with respect to risk-benefit, SADs had the most favorable profile (R/B=69.5), while MELAs had the least favorable profile (R/B=395.7).

Conclusion: The optimal selection of hypnotics requires consideration of both risk and benefit. Findings suggest that SADs can be considered the first-line pharmacotherapeutic option due to the superior risk-benefit profile. If treatment responses are inadequate or if SADs are contraindicated, risk-benefit rankings may serve as a decision tree as part of a medical algorithm protocol to guide treatment selection for patients with chronic insomnia.

Support (If Any): Sleep Research Society Mentor-Mentee Award (Cheung); K24AG055602 & R01AG054521 (Perlis)

0457

DEVELOPMENT AND UTILITY OF A MOBILE HEALTH APPLICATION INTEGRATED WITH THE ELECTRONIC HEATH RECORD FOR TREATMENT OF CHRONIC INSOMNIA DISORDER

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Introduction: Cognitive behavior therapy for insomnia (CBT-I), a first-line therapy for patients with chronic insomnia disorder (ChID), is underutilized due to reduced access to trained providers and other barriers. We developed an interactive care plan (ICP) combining individual aspects of CBT-I. This ICP, which integrates with the electronic health record (EHR), is designed to deliver personalized and scalable CBT-I to patients with ChID. We report data from initial implementation and evaluation of a ChID ICP deployed at a tertiary sleep medicine clinic.

Methods: The ICP was developed following patient and provider interviews and focus groups. Patients diagnosed with ChID were offered enrollment and engaged in the ICP through an app. The ICP has embedded logic that may escalate care or offer an exit from the program, depending upon the patient's response to questions. Key variables ascertained from the patient included sleep efficiency (SE), sleep timing and the Insomnia Severity Index (ISI), and how satisfied they were with their progress (Likert scale). We also measured In Basket messaging related to use of the ICP.

Results: A total of 222 patients [57% female, age=56.4±15.9 years (average ±SD), 92.7% white] were enrolled in the initial 120 days of ICP implementation. Most referrals were initiated by physicians or

advanced practitioners (77.9%). ISI at initiation was 15±5.18 and SE was 74.55±16.65%. Patients spent 35.9±26.25 days engaging with the ICP. The ISI score at 28 days was 12.89±4.98 and SE was 78.9±13.4% with both showing significant improvement from baseline (p=0.013; p=0.002; respectively). Self-rated satisfaction with progress did not significantly correlate with actual improvement in ISI or SE (p>0.05). The ICP generated 3.89±2.3 In Basket messages per patient.

Conclusion: Patients who actively engaged with the ICP showed significant improvements in insomnia severity and sleep efficiency. While a majority of the patients were neutral towards the ICP and only a small minority expressed dissatisfaction, these data indicate that the ICP will have clinical utility in busy sleep medicine practices with reduced access to behavioral sleep specialists.

Support (If Any):

0458

THE SLEEP DIARY QUESTIONNAIRE: AN ANALYSIS OF MEANINGFUL CHANGE IN SUBJECTIVE TOTAL SLEEP TIME USING PHASE 2 AND PHASE 3 CLINICAL TRIAL DATA

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Introduction: The Sleep Diary Questionnaire (SDQ) is a new content-valid 17-item sleep diary adapted from the Consensus Sleep Diary. It assesses key sleep parameters including total time asleep the previous night or "subjective total sleep time" (sTST). People with insomnia value increasing sTST as a key treatment outcome. We estimated meaningful withinpatient change for sTST from two clinical trials in adults with insomnia.

Methods: Data from a 2-week, phase 2 open-label trial of zolpidem (NCT03056053) and blinded data from a 3-month, phase 3 randomized placebo-controlled trial of daridorexant (NCT03545191) were used. In both trials, subjects completed the SDQ daily before and during treatment. Changes in weekly average sTST were calculated using anchor-based analyses that included patient and clinicianreported outcome measures whose correlations with change in weekly average sTST were at least moderate (Spearman correlation coefficient ≥|0.3|). The outcome measures were Insomnia Severity Index, Patient Global Assessment of Disease Severity, Patient Global Impression of Severity, Patient Global Impression of Change, Clinician Global Impression of Severity, and Clinician Global Impression of Change. Distribution-based analyses calculated standard error of measurement (SEM) as supportive evidence. Change estimates from the anchor and distributionbased analyses were "triangulated" to identify a value where they converged.

Results: In the phase 2 trial (N=114), mean increases in sTST from baseline in subjects with meaningful improvements on the anchors were 60.1–83.2 min at day 8 and 55.5–93.5 min at day 15. SEM was 51.1 min at day 8 and 55.5 min at day 15. In the phase 3 trial (N=930, pooled across treatment arms), mean increases in sTST were 36.5–76.2 min at month 1 and 47.3–87.7 min at month 3. SEM was 43.2 min at month 1 and 53.3 min at month 3. Triangulation of these results supported a meaningful change threshold of 55 min.

Conclusion: Our findings support the importance of using sTST to assess insomnia from the patient's perspective and provide useful information that an increase in sleep time of almost 1 hour is meaningful to patients.

Support (If Any): This work was funded by Idorsia Pharmaceuticals Ltd.

0459

THE FIRST STEP OF A TRIAGED STEPPED-CARE DELIVERY OF CBTI: A PRELIMINARY REPORT FROM THE RESTING STUDY

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Introduction: Both online and therapist-led cognitive behavioral therapy for insomnia (CBTI) are effective. However, little is known about the optimal combination and sequence to maximize both access and effectiveness. The RESTING study is a randomized controlled trial assessing the effectiveness of a triaged stepped care approach (STEPPPED-CARE) to delivering CBTI that utilizes a simple five-item Checklist to determine which patients should start treatment with online versus therapist-led CBTI.

Methods: Adults 50 years and older (N=222; age = 63.1 (SD=8.2); 74% female) with insomnia disorder who met the study's broad eligibility criteria were randomized to STEPPED-CARE (N=112) or to ONLINE-ONLY CBTI (N=110). Participants in the STEPPED-CARE arm who responded yes to any Checklist item (Checklist Yes) received therapist-led CBTI (N=61); the rest (Checklist NO) received the online CBTI program Sleepio (N=62). All participants in the ONLINE-ONLY arm received Sleepio. Randomization was stratified by Checklist (Yes/No). We used mixed effects models with an Arm by Checklist by Time interaction to determine the effect of STEPPED-CARE on insomnia severity two months after randomization, using the Insomnia Severity Index (ISI).

Results: A mixed effects model revealed an Arm by Checklist by Time interaction (p=0.013). Post-hoc analyses within stratum revealed that within the Checklist Yes stratum, participants assigned to STEPPED-CARE (all received therapist-led treatment) experienced significantly greater reduction in ISI (from 16.2 (SD=1.2) to 11.6 (SD=2.1)) than those assigned to ONLINE-ONLY (from 16.2 (SD=1.2) to 13.7 (SD=1.4); p=0.007, d=0.22). Among those in the Checklist No stratum, there was no Arm difference in ISI change. The combined mean ISI in the Checklist No group was 14.8 (0.8) at baseline and 11.2 (0.8) at 2 months. Overall, remission of insomnia (ISI<8) was attained by 23% of those in STEPPED-CARE and 15% of those assigned to ONLINE-ONLY.

Conclusion: Results support the efficacy of the first step of a triaged stepped care approach to CBTI among middle age and older adults with insomnia disorder. Given minimal exclusion criteria, results from the current trial are generalizable to individuals with comorbidities and those who use hypnotics, offering a way to triage patients to digital or therapist-led CBTI effectively and efficiently.

Support (If Any): R01AG057500

0460

FIRST-LINE TREATMENT PATTERNS IN PATIENTS WITH INSOMNIA: A LARGE-SCALE, REAL-WORLD COHORT STUDY

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Introduction: Current pharmacologic treatments for insomnia are not universally effective, are associated with a range of adverse events, can cause daytime impairment, and have the potential to be abused. With no consistent standard of care, many patients with insomnia experience multiple dose changes and medication switches. The current study leveraged large-scale, real-world data to investigate the pharmacological treatment patterns of patients with insomnia.

Methods: Exploratory analyses were performed on claims data from the HealthVerity US primary care claims database. Data from 10/2015 to 3/2020 were obtained for patients aged 18+. Prescribing patterns, including initial treatment, switching, concomitant treatment, and discontinuation were explored.

Results: Of approximately 1.4 million individuals, 265,382 (~19%) had an insomnia diagnosis and 42.4% of that group were prescribed hypnotic medications. Among those, first prescriptions were most frequently a Z-drug (zolpidem, eszopiclone, zaleplon; 35.8%), trazodone (25.0%), a benzodiazepine (15.6%), or another class (23.6%; includes orexin receptor antagonists, antidepressants, melatonin agonists, etc.). For those receiving a benzodiazepine first, median treatment duration was 55 days, 80.4% of subjects discontinued, 11.6% were switched to a different medication, and 7.9% received concomitant treatment with another sleep medicine. For those first receiving a Z-drug, median treatment duration was 81 days, 87.3% discontinued, 8.2% were switched, and 4.4% received concomitant treatment. For those receiving trazodone first, median treatment duration was 104 days, 85.8% of patients eventually discontinued, 5.8% of patients received concomitant treatment with an additional hypnotic agent, and 8.4% switched to a different hypnotic. Furthermore, of those switched from trazodone, 22% were switched to a benzodiazepine, 31% to a Z-drug, and 47% to a medication of another class.

Conclusion: These results demonstrate a lack of a standard first-line treatment approach for insomnia; it is likely that physicians have their own preferences, or that they might tailor treatment choice to individual patient characteristics. Additionally, more insomnia patients are discontinued from medical treatment than are switched to a different medicine. Further study is needed to determine what proportion of treatment discontinuation is due to successful treatment, versus being due to adverse events or lack of efficacy.

Support (If Any): Idorsia Pharmaceuticals, Ltd.

0461

DOES "TIB" DIFFERENTIATE BETWEEN GOOD SLEEPERS AND SUBJECTS THAT DEVELOP ACUTE OR CHRONIC INSOMNIA? A 2ND ANALYSES

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Introduction: According to the 3P model of insomnia, the variable that mediates the transition from acute to chronic insomnia is "sleep extension" (the behavioral tendency to expand sleep opportunity to compensate for sleep loss). Recently, this proposition was prospectively evaluated by assessing how Time-in-Bed (TIB) varied, week-by-week, relative to the incidence of acute insomnia in four groups, those that: maintained good sleep (GS,n=911), recovered good sleep (AI-REC,n=244); had persistent poor sleep (AI-PPS,n=65); and developed chronic insomnia (AI-CI,n=23)). Significant differences for pre-to-post acute insomnia TIB were not detected for the insomnia groups (as compared to one another or as compared to GSs). The observed trends suggested that the increases in TIB observed were minor (< 15 min overall, at 2 weeks, and at 12 weeks post AI). In the present analysis, a more granular evaluation was undertaken to assess whether sleep extension occurs on the nights following poor sleep bouts.

Methods: The same data set and subject groups were modeled for TIB occurring on the night following a poor night's sleep (≥ 30 min for SL or WASO or EMA) for the post-acute insomnia interval (by weekday and weekend). Linear mixed effects model was used to account for up to 1 year of repeated nights per subject.

Results: During the weekdays, the groups did not differ with respect to TIB following a poor nights' sleep. On average, the four groups (including good sleepers) did not vary TIB by more than 5 minutes. During the weekends, all four groups tended to restrict TIB. In this instance, AI-CI subjects restricted TIB the least (AI-CI -17.2[5.11]; (GS -25.7[SE 1.58]; AI-PPS -27.6[6.1]; AI-REC -32.3[1.9].

Conclusion: As with the prior analysis, the transition to CI does not appear to be triggered by sleep extension. In the present analysis there is some evidence to support the notion that AI-CI subjects restrict TIB less. This counterintuitive finding needs to be further evaluated taking into account sleep timing. That is, time-to-bed and time-out-of-bed may vary (show the attempt to extend sleep opportunity) while TIB does not change appreciably (owing to limitations in sleep ability [plasticity]).

Support (If Any): Support: R01AG041783;K24AG055602;R01AT003332

0462

BASELINE SLEEP DISTURBANCE AND INABILITY TO DISCONTINUE CHRONIC HYPNOTIC USE

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Henry Ford Health System [1]

Introduction: Clinicians prescribing hypnotics remain concerned regarding the inability to discontinue hypnotics after chronic use, which has never been directly tested in a controlled prospective study using self-administration choice methodology. This study reports on difficulty discontinuing medication as a function of basal

sleep disturbance in insomnia subjects instructed to stop taking their study medication after 6 months of nightly use.
Methods: DSM-V diagnosed insomnia subjects, aged 23-61 yrs, (n=39, 34 females), with no other sleep disorders, unstable medical or psychiatric diseases or drug dependency completed the trial. Following a screening polysomnogram participants were randomized to zolpidem XR (12.5 mg), eszopiclone (3 mg), or placebo nightly for 6 months (blinded groups A: n=15, B: n=11, C: n=13). After 6 months, nightly use, over a 2-week choice period, they were instructed to discontinue hypnotic use, but if necessary, to self-administer either 1, 2, or 3 capsules of their assigned "blinded" medication (zolpidem XR 6.25 mg, 6.25 mg, placebo; eszopiclone 2 mg, 1 mg, placebo as capsules 1, 2 and 3 respectively; or 3 placebos).
Results: Over the 14 nights 20 subjects took zero (51%) capsules; among the 19 taking capsules the median number chosen was 3. Most took one capsule per night; 6 took > 1 capsules on a given night. Importantly 1 subject took every capsule (42) available. Overall, the number of capsules taken declined from week 1 to 2 ($p < .005$). Those with baseline PSG SE <81% did not reduce capsule choice from week 1 to 2 ($p < .02$). Group A choose more capsules than groups B and C ($p < .01$).
Conclusion: The majority (85%) of the participants discontinued 6-month nightly hypnotic use (i.e. took < 6 total capsules over the 14 discontinuation nights) and among those taking capsules the rate declined from week 1 to 2. Baseline SE <81% may help identify those with difficulty discontinuing.
Support (If Any): NIDA, grant#: R01DA038177 awarded to Dr. Roehrs.

0463

SLEEP ASSESSED BY ACTIGRAPHY DURING DISCONTINUATION OF CHRONIC HYPNOTIC USE

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Introduction: Inability to discontinue chronic hypnotic use by people with insomnia remains a clinical problem. Sleep was recorded by actigraphy during a two-week discontinuation in an on-going "blinded" clinical trial in which people with insomnia were instructed to discontinue their study medication after 6 months of nightly use.
Methods: DSM-V diagnosed people with insomnia (n=39, 34 females), aged 26-61 yrs, with no other sleep disorders, unstable medical or psychiatric diseases or drug dependency completed the clinical trial. Participants were randomized to zolpidem XR (12.5 mg), eszopiclone (3 mg) or placebo nightly for 6 months (blinded groups A: n=15, B: n=11, C: n=13). After 6 months, over a 2-week choice period, they were given the instruction to discontinue their nightly hypnotic use with an opportunity, if necessary, to self-administer either 1, 2, or 3 capsules of their assigned medication (zolpidem XR 6.25 mg, 6.25 mg, placebo; eszopiclone 2 mg, 1 mg, placebo as capsules 1, 2 and 3 respectively; or 3 placebos). Sleep was recorded by actigraphy and sleep latency (LAT), wake after sleep onset (WASO), and sleep efficiency (SE) were determined.
Results: Twenty subjects (51%) stopped taking study medication when told to discontinue, while 19 took a median of 3 capsules over the 14 nights. The number of capsules chosen declined from week 1 to week 2 ($p < .005$), while WASO (7-night means) increased from week 1 to week 2 ($p < .02$). However, LAT, WASO, and SE never went beyond the 7-night means recorded at baseline. Discontinuation night 1 and 2 also did not differ from baseline nights 1 and 2.
Conclusion: Most participants successfully discontinued hypnotic use when instructed to do so. While some degree of sleep disturbance returned, it never exceeded the baseline levels.
Support (If Any): NIDA, grant#: R01DA038177 awarded to Dr. Roehrs.

0464

PATIENT PERSPECTIVES ON FACILITATORS AND BARRIERS TO ENGAGEMENT WITH DIGITAL CBT-I

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Introduction: Digital Cognitive Behavioral Therapy for Insomnia (dCBT-I) is a highly effective self-guided mHealth treatment for insomnia; however, completion and adherence rates are poor, especially among marginalized individuals. The present study explored facilitators and barriers to engagement with dCBT-I.
Methods: Thematic analysis was conducted on qualitative data collected in those who engaged with dCBT-I. A total of 151 written feedback, 34 individual interviews, and 1 focus group of six racial minorities with low socioeconomic status (SES) was used. A combined inductive and deductive approach was utilized, where an initial codebook was developed but emergent codes were also included in the coding process. Consensus between four independent coders were achieved prior to thematic analysis.
Results: Thematic analysis revealed five themes: digital person to person component, type and extent of information, users' sense of autonomy, app functionality, and importance of tailored content. Overall, users felt that the dCBT-I content was engaging (e.g., "easily understandable", "well-paced"), and valued the accessibility of a digital treatment (e.g., "I greatly enjoyed the weekly sessions in the privacy of my own home"). Participants across demographic groups felt that the virtual therapist (i.e., "The Prof") increased engagement (e.g., "The Prof was entertaining", "The Prof has a great voice…educated and soothing without condescension").Barriers to engagement, particularly in those with lower SES, included eHealth literacy (e.g., "I had issues filling out my sleep diary") and a desire for more human contact (e.g., "I maybe would have liked more communication throughout, maybe just checking in once to see if things were okay"). There was strong consensus among non-completers that additional support would have prevented treatment dropout (e.g., "HELP button or someone you could've asked questions"). Others expressed concerns about the lack of tailoring to their specific circumstances (e.g., "this system does not take into consideration 'physical' causes of my sleep problems").
Conclusion: Although dCBT-I has high accessibility and scalability, those with lower health literacy may experience lower self-efficacy and negative outcome expectancy as barriers to treatment engagement and completion. There is support that enhancing dCBT-I with personalized support and tailored content may improve treatment adherence and completion.
Support (If Any): K23HL136188; R01HL159180

0465

EXPLORING DIFFERENCES IN SELF-REPORT SLEEP MEASURES IN ADULTS WITH INSOMNIA WHO USE OR DO NOT USE SLEEP MEDICATION

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Introduction: Adults seeking non-pharmacological treatment for insomnia often present for care already taking prescription medication for sleep. Understanding how such patients differ from those who do not use medication could be useful for guiding treatment. This study examined associations between sleep medication use and measures of self-report sleep characteristics at baseline in an RCT of cognitive behavioral therapy for insomnia (CBTI).
Methods: We examined baseline data from 237 middle-to-older-aged adults with insomnia disorder (175 women, M age = 63.17) enrolled in the ongoing RCT on Effectiveness of Stepped-Care Sleep Therapy (RESTING). Participants were dichotomized by whether they reported taking at least one prescription medication for sleep. Sleep measures included the Insomnia Severity Index (ISI), PROMIS Sleep-Related Impairment short form, Epworth Sleepiness Scale (ESS), Cognitive Presleep Arousal Scale, Dysfunctional Attitudes and Beliefs About Sleep Scale, and two weeks of sleep diaries yielding average nightly sleep onset latency, wake time after sleep onset, total sleep time, and sleep quality ratings. MANOVA compared medication users and non-users across sleep measures.
Results: Seventy-seven (32.5%) participants reported taking at least one prescription medication for sleep at baseline. MANOVA results indicated that sleep measures collectively differed by medication use, $F(9, 226) = 3.74$, $p < .001$; Wilk's $\Lambda = .87$, partial η-sqd = .13. Bonferroni-adjusted follow-up comparisons ($p < .005$) found that only ESS significantly differed between medication users and non-users, $F(1, 234) = 15.17$, $p < .001$; partial η-sqd = .06. Medication users had lower sleepiness scores (M = 5.86, SD = 4.68) than non-users (M = 8.46, SD = 4.84). The association between medication use and less daytime sleepiness was maintained after adjusting for ISI.
Conclusion: Sleep medication use displayed little association with sleep measures in adults about to undergo CBTI, excepting endorsement of less daytime sleepiness by medication users. While more research is needed to understand the implications of sleep medication use for adults engaging in CBTI, these initial findings suggest that CBTI therapists should be thoughtful about sleepiness in non-medication users, and the potential emergence of sleepiness among patients who engage in sleep medication taper while in treatment.
Support (If Any): 1R01AG057500

0466

LIVING ALONE AS A PREDICTOR OF SYMPTOM CHANGE DURING COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA

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Introduction: Interpersonal factors have implications for sleep quality. Research has begun to explore how such factors may play a role in cognitive behavioral therapy for insomnia (CBTI). This study investigated whether living alone predicts reductions in insomnia severity and sleep-related daytime impairment across the first two months of treatment in a trial of CBTI.
Methods: Participants were 224 middle-to-older-aged adults with insomnia (166 women, M age = 63.16) enrolled in the ongoing Randomized Controlled Study on Effectiveness of Stepped-Care Sleep Therapy (RESTING). All study participants received CBTI, delivered either via a therapist or a validated software program. At baseline, participants indicated whether they lived alone or with at least one other person. The Insomnia Severity Index (ISI) and PROMIS Sleep-Related Impairment (SRI) short form were administered at baseline and two months after starting treatment. Mixed effects models assessed whether living alone predicted reduction in symptoms across the first two months of CBTI.
Results: Across the total sample, ISI scores decreased from baseline to two months (β=-3.52, SE=0.35, $p<.001$, 95% CI=-4.20, -2.84). Living alone was not associated with baseline ISI scores nor change in ISI score. A reduction in PROMIS SRI score was also observed in the total sample from baseline to two months (β=-4.18, SE=0.50, $p<.001$, 95% CI=-5.15, -3.21). Living alone was not associated with baseline SRI score, but it did predict reduction in SRI score (β=-3.23, SE=0.88, p=.001, 95% CI=1.31, 5.15). Participants living alone displayed less reduction in SRI compared to those living with at least one other person.
Conclusion: Participants undergoing CBTI who live alone experienced reduction in insomnia severity over the course of treatment, but they displayed less improvement in daytime sequalae of poor sleep compared to those living with others. Future studies should further explore how living status contributes to insomnia treatment response across both nighttime and daytime sleep symptomology. Regular engagement with others living in the home may be important for insomnia treatment to translate into perceived functional improvements during the day.
Support (If Any): 1R01AG057500

0467

PREFERENCE FOR DIGITAL CBTI: CHANGES DUE TO THE COVID-19 PANDEMIC IN A RANDOMIZED CONTROLLED TRIAL OF CBTI FOR MIDDLE AGED AND OLDER ADULTS

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Introduction: Digital CBTI programs are effective at treating symptoms of insomnia. They also have the potential to increase treatment reach, convenience, and affordability for patients, and to reduce long wait times for behavioral sleep medicine providers. The COVID-19 pandemic has instigated an increased reliance on the use of technology for many. Thus, this study evaluates middle aged and older adults before and during the COVID-19 pandemic to assess: (1) differences in treatment modality preference (digital vs. therapist-led CBTI) and (2) sleep-related predictors of treatment modality preference.
Methods: Participants were older adults (N=229, 74% female, mean age=63.14) who were enrolled in the RCT of the Effectiveness of Stepped-Care Sleep Therapy in General Practice (RESTING) study. At baseline, participants rated if they would prefer to access CBTI digitally or with a CBTI therapist, either in person or via telemedicine. After March 2020, in person was no longer listed

as an option. Participants completed the Insomnia Severity Index (ISI) and a two-week sleep diary that allowed for an assessment of total sleep time (TST), sleep onset latency (SOL), and wake after sleep onset (WASO). Analyses compared responses to these items from participants completing assessments before March 2020 (Pre-Covid; n=74, 65% female, mean age=62.52) and after March 2020 (During-Covid; n=155, 78% female, mean age=63.44).
Results: Pre-Covid, 26% of participants preferred digital treatment, 47% of participants preferred a therapist-led intervention, and 27% did not express a preference. During-Covid, 35% of participants preferred digital treatment, 32% of participants preferred a therapist-led intervention, and 32% did not express a preference. This difference was statistically significant (c2=4.24, p=0.04). Responses were not significantly different between the first six months and the most recent six months of the pandemic (p=0.60). None of the sleep measures (ISI, TST, SOL, WASO) were associated with treatment modality preference in the full sample, Pre-Covid, or During-Covid.
Conclusion: The COVID-19 pandemic was associated with increased preference for digital CBTI among patients who are 50 and older, regardless of insomnia severity. Findings suggest that digital CBTI may be an acceptable treatment to many individuals with insomnia, thus increasing its dissemination potential.
Support (If Any): R01AG057500 and T32MH019938

0468

PREDICTORS OF RESPONSE TO DIGITAL CBTI IN A RANDOMIZED CONTROLLED TRIAL OF MIDDLE AGED AND OLDER ADULTS WITH INSOMNIA

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Introduction: Digital CBTI (dCBTI) may serve as a good initial intervention in a stepped-care approach to treat insomnia. Understanding who is likely to respond to dCBTI can guide triaging of care, thus shortening wait times for those who most need to meet with an insomnia therapist. The purpose of this study was to examine baseline predictors of response to a dCBTI program after two months of access.
Methods: Participants were 173 middle aged and older adults with insomnia (M age=63.56 [SD=8.43], 76% female) who received the dCBTI SleepioTM for two months in the RCT of the Effectiveness of Stepped-Care Sleep Therapy in General Practice (RESTING) study. Baseline predictors included the Epworth Sleepiness Scale (ESS), Dysfunctional Beliefs and Attitudes about Sleep (DBAS), preference for treatment (digital vs. therapist-delivered), and comfort with technology. At baseline and two-month follow-up, participants completed outcome measures, including the Insomnia Severity Index (ISI) and the PROMIS-Sleep Related Impairment (PROMIS-SRI). Multilevel modeling was used.
Results: In the full sample, no predictors were associated with change on the ISI. Among our predictors, only higher DBAS scores were associated with a smaller reduction in PROMIS-SRI scores from baseline to two-month follow-up (Beta=-0.88, SE=0.35, p=0.01 , 95% CI=-1.57, -0.19). Among those who preferred digital CBTI (n=52), none of the predictors were associated with the ISI or PROMIS-SRI. Among those who preferred therapist-led CBTI (n=66), greater comfort with technology was associated with greater reduction on the ISI (Beta=-1.77, S =0.78, p=0.02 , 95% CI=-3.30, -0.24) and higher DBAS scores were associated with a smaller reduction on the PROMIS-SRI (Beta=-1.63, S =0.56, p<0.01 , 95% CI=-2.73, -0.53).
Conclusion: The results highlight the importance of targeting dysfunctional beliefs and attitudes, which is consistent with research examining the DBAS in CBTI. Results also indicate that patient preference is an important factor to consider when triaging patients to insomnia care. While additional predictors should be examined, these preliminary findings indicate that dCBTI may be a good initial treatment option for those with high level of comfort using technology and lacking a preference for therapist-led CBTI.
Support (If Any): R01AG057500 and T32MH019938

0469

THE APNEA AND INSOMNIA RESEARCH (AIR) TRIAL: AN INTERIM REPORT

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Introduction: Many sleep apnea patients suffer from comorbid insomnia disorder. Although cognitive behavioral insomnia therapy (CBTI) has proven effective for insomnia among such patients, access to trained CBTI providers remains limited. The current study is testing a digital CBTI (dCBTI) among PAP-prescribed sleep apnea patients with comorbid insomnia.
Methods: Patients enrolled in this trial complete baseline measures and are randomized to dCBTI or sleep hygiene (CTRL). After 8 weeks, all patients are reassessed. Patients in the dCBTI arm who reach remission by this time point are offered no additional insomnia treatment, whereas those who do not achieve insomnia remission are randomly assigned either another 8 weeks of dCBTI or a therapist delivered CBTI (TCBTI). All groups are reassessed at the end of this second 8-week treatment phase and then again at 3- and 6-month follow-ups. This report considers changes in scores on the Insomnia Severity Index (ISI) from baseline to the end of the second 8-week treatment, as well as insomnia remission (ISI < 8) and responder rates (> 8 point decline on the ISI) of dCBTI and TCBTI relative to the CTRL. The sample for this report included the first 305 participants (mean age = 56.5±12.5 yrs.; 57.1% females).
Results: Both dCBTI and TCBTI recipients showed greater (p = .0001) and comparable reductions in ISI scores from baseline to the end of the second 8-week treatment phase than did those in the CTRL group. Average ISI score improvements moved dCBTI and TCBTI recipients from moderately severe to mild insomnia symptoms. Significant group differences were noted for both the responder (X2 (2) =19.29, p < 0.0001) and remission rates (X2 (2) =13.89, p = 0.001). Responder rates for those participants switched to TCBTI (50%) were noteably higher than those continued with dCBTI (30.5%) and those in the CTRL group (19.2%); but remission rates were comparable (30.5% vs. 29.2%) and sigificantly higher than the rates shown by the CTRL group (19.2%).
Conclusion: The dCBTI tested compares well with TCBTI for reducing insomnia symptoms and achieving insomnia remission in those with insomnia and sleep apnea, but insomnia responder rates may be improved by switching patients to TCBTI.
Support (If Any): Funding support from the National Heart, Lung and Blood Institute, Grant # 1R01HL130559-01A1.

0470

PRE-TREATMENT OBJECTIVE SHORT SLEEP IS ASSOCIATED WITH POOR TREATMENT RESPONSE IN PATIENTS WITH INSOMNIA AND MAJOR DEPRESSION: A REPORT FROM THE TRIAD STUDY

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Introduction: Several studies have shown that patients with short sleep duration show a poor response to cognitive behavioral insomnia therapy insomnia (CBT-I) but such studies have not included patients with comorbid conditions. This study was conducted to determine whether pre-treatment sleep duration moderates the response of patients with major depression (MDD) and insomnia (ID) disorders to a combined CBT-I and antidepressant medication treatment.

Methods: This study involved a secondary analysis of data from the TRIAD trial that tested combined CBT-I/antidepressant medication treatment of patients with MDD and ID. Participants (N=99; 70 women; Mage = 47.7 +/-12.4 yrs.) completed pre-treatment polysomnography (PSG) and were randomly assigned to a 12-week treatment comprised of antidepressant medication combined with CBT-I or a sham quasi-desensitization therapy for insomnia (DTI). Short and longer sleepers were defined using PSG total sleep time cutoffs of <5, <6 and <7 hours for short sleep. Insomnia and depression remission determined respectively from the Insomnia Severity Index and Hamilton Rating Scale for Depression were used to compare treatment responses of short and longer sleepers defined by the cutoffs mentioned.

Results: Logistic regression analyses showed that statistically significant results were obtained only when the cutoff of <5 hours of sleep was used to define "short sleep." CBT-I recipients with > 5 hours of sleep were significantly more likely to achieve insomnia remission than were either the DTI recipients with > 5 hours of sleep (OR = 6.72; 95% CI = 2.03 – 22.26) or the CBT-I recipients with short sleep (OR = 18.92; 95% CI = 2.03 – 178.69). The longer sleeping CBT-I group was also more likely to achieve insomnia and/or depression remission than was either the longer sleeping DTI group (OR = 3.12 95% CI = 1.11 – 9.53) or the shorter sleeping CBT-I group (OR = 8.464; 95% CI = 1.40 – 51.12).

Conclusion: Sleeping <5 hours may dispose patients with comorbid MDD/ID to a poor response to combined CBT-I/antidepressant medication treatments for their insomnia and depression. Future studies to replicate these findings and explore mechanisms of treatment response seem warranted.

Support (If Any): National Institutes of Health, Grant Numbers MH078924, MH078961, MH079256 and HL096492.

0471

IDENTIFYING TRAUMA-INFORMED ADAPTATIONS TO COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA AMONG WOMEN VETERANS: RESULTS OF AN EXPERT PANEL

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Introduction: Trauma-informed care is an emerging area of health services research. While trauma-focused care specifically targets symptoms of posttraumatic stress disorder (PTSD), trauma-informed care involves tailoring interventions to meet the unique needs of patients who have experienced trauma. Insomnia and PTSD are common comorbid disorders, but no known previous studies have identified trauma-informed adaptations to cognitive behavioral therapy for insomnia (CBT-I).

Methods: We identified PTSD clinical presentations that may interfere with the delivery of effective CBT-I and possible adaptations to standard CBT-I that may address these clinical presentations based on a literature review. We then incorporated trauma-informed adaptations into a 5-session CBT-I protocol. Four Veterans Affairs (VA) Expert Trainers in CBT-I were sent the trauma-informed CBT-I materials and rating forms. They were asked to rate the extent to which PTSD clinical presentations serve as barriers to CBT-I (1=low barrier; 5=high barrier), the feasibility of possible adaptations (1=low feasibility; 5=high feasibility), and to provide qualitative feedback. A 60-minute panel meeting was convened and aggregated data from rating forms were presented and discussed. We then revised the trauma-informed CBT-I materials. Panelists reviewed the revised trauma-informed CBT-I materials and completed post-panel rating forms.

Results: The highest-ranked clinical presentations based on rating forms and panel consensus included: sleep avoidance/nighttime arousal, sleep-related self-efficacy, substance/medication use to induce sleep, and safety behaviors intended to reduce nighttime arousal. Panel meeting consensus identified the following trauma-informed adaptations to CBT-I: PTSD-related nighttime hyperarousal psychoeducation, identification of alternatives to PTSD-related safety behaviors, nightmare psychoeducation, psychoeducation about PTSD avoidance in the context of substance/medication use, cognitive techniques, and behavioral tracking to challenge beliefs and avoidant behaviors. Panelists agreed the revised trauma-informed CBT-I materials adequately addressed the PTSD clinical presentations that may limit the effectiveness of standard CBT-I for patients with comorbid PTSD.

Conclusion: This was the first study to use an expert panel to identify trauma-informed adaptations to CBT-I. Trauma-informed adaptations, including supplemental materials, may improve CBT-I outcomes for patients with comorbid PTSD. Future studies should incorporate feedback from patients with insomnia and PTSD to refine trauma-informed adaptations to CBT-I further.
Support (If Any): VA HSR&D (RCS-20-191, Martin), NHLBI (K23HL143055, Martin)

0472

DYNAMIC FEATURES OF THE TREATMENT PROCESS PREDICT DIFFERENT OUTCOMES FOR PATIENTS UNDERGOING COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA

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Introduction: Individuals who undergo Cognitive Behavioral Therapy for Insomnia (CBT-I) show different trajectories during treatment and different outcomes after treatment. However, the factors contributing to this interindividual variability have not been adequately identified. Daily sleep logs might help us understand some of these factors.
Methods: Patients with insomnia (N=34), as confirmed by clinical evaluation and Insomnia Severity Index score >10, completed 4 weeks of group CBT-I conducted in Mandarin via telehealth. Participants completed daily sleep logs and self-reported sleep quality, sleep effort and anxiety before and after treatment. Predictor variables included daily sleep efficiency and daily sleep anxiety. Response variables included pre-post changes in sleep quality, sleep effort and anxiety. Multilevel structural equation modeling was performed to examine the relationship between trajectories of change in predictors and response variables.
Results: Dynamic features of sleep log data significantly predicted individual differences in response variables. The growth rate of daily sleep efficiency during treatment significantly predicted reduced sleep effort (p=.012), decreased anxiety (p=.046), and improved sleep quality (p<.01) after treatment. Conversely, the growth rate of daily sleep anxiety during treatment significantly predicted increases in sleep effort (p<.01). In addition, daily sleep anxiety had a significant negative effect on daily sleep efficiency (p<.001), and the weaker this negative effect, the greater the reduction in sleep effort (p<.001) and anxiety (p<.01) after treatment.
Conclusion: Individuals exhibit different trajectories during treatment, which are related to different outcomes after treatment. Those who experience less wakefulness at night across treatment become less anxious about sleep and exert less effort to manage sleep, leading to better sleep quality. However, those who experience increasing anxiety across treatment exert more effort to control sleep. Finally, individuals whose anxiety is not as closely associated with sleep efficiency show greater reductions in anxiety and sleep effort post-treatment. Thus, different trajectories and treatment outcomes appear to distinguish between those individuals who are less anxious about sleep during CBT-I, and thus more willing to implement recommendations, which leads to better outcomes, and those individuals who are more anxious about sleep during treatment, and thus less willing to implement recommendations, which leads to worse outcomes.
Support (If Any):

0473

THE IMPACT ON TREATMENT ADHERENCE OF ADDING A BEDPARTNER TO CBT-I: PRELIMINARY FINDINGS FROM A RANDOMISED CONTROLLED TRIAL (PROJECT REST)

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Introduction: Cognitive Behavioural Therapy for Insomnia (CBT-I) includes often difficult-to-implement behavioural change, and this can result in poor adherence to treatment recommendations. In other CBTs, adding a significant other to "individual" therapy increases adherence. Here, we report preliminary findings from a randomised controlled trial (RCT) of a newly developed partner-assisted CBT-I.
Methods: 117 adults with DSM-5 Insomnia Disorder (age M±SD=47.9±15.3yrs; 73F) and their live-in partners participated in a single-blind parallel RCT. They were assigned 1:1:1 to 7wk individual CBT-I (Ind-CBTI), partner-assisted CBT-I (PA-CBTI), or sleep management control (CTRL) conditions. Participants completed daily sleep diary throughout the intervention. Adherence in CBT-I conditions was assessed for Sleep Restriction Therapy (deviation from bed and wake times, naps) and Stimulus Control Therapy (wake time-in-bed during daytime, overnight, and after final morning awakening). Intention-to-treat, mixed effects models examined differences in adherence for "Build" (initial phase to build sleep debt) and "Maintain" (starting the first week when sleep opportunity was titrated upwards) stages of therapy.
Results: All conditions showed significant increase in sleep efficiency (p<.001), with significantly faster increase in Ind-CBTI and PA-CBTI compared to CTRL (ps<.001). Sleep Restriction Therapy: Build stage (vs Maintain) had greater adherence to prescribed wake time (p=.045); Condition by Stage interaction (p=.010) showed PA-CBTI (vs Ind-CBTI) adhered better in avoiding naps during Build (vs Maintain). Stimulus Control Therapy: PA-CBTI (vs Ind-CBTI) adhered better to avoiding daytime wake time-in-bed (p=.017), especially during Build (interaction p=.071); Condition by Stage interaction (p=.017) showed PA-CBTI (vs Ind-CBTI) adhered better to avoiding overnight wake time-in-bed during Maintain (vs Build). Both conditions had better adherence to avoiding daytime and wake time-in-bed after final awakening during Maintain (vs Build) Stage (ps<.001).
Conclusion: Adherence to CBT-I includes multiple indicators showing distinct features as the intervention progresses across different stages. Aspects of adherence appear modifiable, and adding bedpartners to CBT-I improved adherence to specific aspects of the intervention (i.e., avoiding naps, daytime wake time-in-bed, overnight wake time-in-bed). The Build and Maintain stages of treatment appear to be associated with better adherence to different aspects of the intervention (Sleep Restriction Therapy and Stimulus Control Therapy, respectively).
Support (If Any): NHMRC grant APP1105458 (SPAD,DHB,PJN), APP1140299 (BB)Trial registration: ACTRN12616000586415

0474

THREE-ARM RANDOMISED CONTROLLED TRIAL OF COGNITIVE BEHAVIOURAL THERAPY FOR INSOMNIA, A RESPONSIVE BASSINET, AND SLEEP HYGIENE FOR PREVENTING POSTPARTUM INSOMNIA: PRELIMINARY FINDINGS ON MATERNAL INSOMNIA AND SLEEP OUTCOMES (STUDY FOR MOTHER-INFANT SLEEP).

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Introduction: Insomnia symptoms are common during the perinatal period and are linked to adverse parent/infant outcomes. This single-blind 3-arm randomised controlled trial examined how two interventions targeting different mechanisms prevent postpartum insomnia compared to sleep hygiene control. Trial registration: ACTRN12619001166167.

Methods: Participants were nulliparous females 26-32 weeks gestation with self-reported insomnia symptoms (Insomnia Severity Index [ISI] scores ≥ 8). Participants were randomized 1:1:1 to: (a) a responsive bassinet designed to support infant sleep until 6 months postpartum (RB), (b) therapist-assisted cognitive behavioural therapy for insomnia (CBT-I) delivered during pregnancy and postpartum, or (c) a sleep hygiene booklet (control condition; CTRL). Outcomes were assessed at baseline (T1), 35-36 weeks gestation (T2), and 2, 6, and 12 months postpartum (T3-T5). The primary outcome is ISI scores averaged T3-T5. Secondary outcomes are PROMIS Sleep Disturbance (SDI), Sleep-Related Impairment (SRI), and self-report total sleep time (TST). We report preliminary results on T1-T4 as T5 is ongoing. Multiple regression analyses controlling for baseline outcomes examined group differences at post-baseline timepoints.

Results: 127 participants were randomised (age M±SD=32.62±3.49; RB = 44, CBT-I = 42, CTRL = 41), and 118 (92.9%) completed T4. Compared to CTRL, CBT-I had lower ISI, SDI, and SRI at T2, T3, and T4 (all $p<.05$ except $p=.07$ and .06 for ISI at T3 and T4; Cohen's d ranges 0.39-0.99); differences in TST were non-significant at all timepoints (all $p>.25$). The RB condition had significantly longer TST at T4 (40.10 min longer, $p=.008$, $d=.63$) compared to CTRL, but these two conditions did not differ significantly on any other measures across all timepoints ($p>.22$).

Conclusion: Preliminary findings suggest CBT-I was efficacious in preventing insomnia symptoms and reducing sleep disturbance and sleep-related impairment, but did not increase maternal sleep duration postpartum. Conversely, a responsive bassinet designed to support infant sleep meaningfully increased maternal sleep duration at 6 months postpartum but did not prevent insomnia symptoms. These initial findings suggest that perinatal sleep complaints are a multifactorial problem that likely require multi-component interventions targeting different causes and mechanisms.

Support (If Any): National Health and Medical Research Council, Department of Education and Training.

0475

PREVALENCE AND POTENTIAL BENEFITS OF CANNABIS USE IN PATIENTS WITH INSOMNIA

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Introduction: Insomnia is highly prevalent amongst patients presenting to sleep centers and it can be challenging to treat. Current treatment modalities include pharmacological intervention and cognitive behavioral therapy. Cannabis use is widely prevalent and has been approved in most states in the United States for medical use. Insomnia has been approved in some states as a qualifying condition for prescribing medical marijuana. Although the sedative effects of cannabis are well known, there are no established clinical guidelines with regards to its use for the treatment of insomnia.

Methods: We conducted a retrospective chart review to determine the use and potential benefits of cannabis in patients with insomnia over a three-year period at a tertiary care academic center. All patients with cannabis/marijuana and insomnia use listed in their electronic health record were included.

Results: Our cohort included 159 patients (67 males, 91 females; mean age= 48.4 years) who had a diagnosis of insomnia and used cannabis. 62 out of 159 (39%) patients reported improvement in sleep symptoms, whereas 18 (11.3%) patients denied any improvement. The status of remaining 79 patients (49.7%) was undetermined. 40 patients were African American, 103 were white, 4 were Hispanic; the remaining were of other or unknown ethnicities. 80 (50.3%) patients were using medically prescribed marijuana for various disorders; 50 (31.4%) were using non prescribed cannabis and prescription status was undetermined in 29 (18.2%) patients. Average use of cannabis was 4.9 days per week as reported by 47 patients who used cannabis regularly.50 out of the 62 patients with diagnoses of insomnia and cannabis use who reported improvement in symptoms had a history of comorbid anxiety, whereas 37 of 62 (59.6%) patients had comorbid depression. 29 out of 62 (46.7%) patients were using selective serotonin receptor uptake inhibitors (SSRI) and 24 of 62 (38.7%) were using benzodiazepines.

Conclusion: Cannabis use is highly prevalent among patients with a diagnosis of insomnia. Patient with cannabis use may have comorbid mood and anxiety disorders and may be taking SSRIs or benzodiazepines. Sleep physicians need to be aware of cannabis use and its impact on sleep symptoms in patients with insomnia.

Support (If Any):

0476

A MOBILE APP-BASED BEHAVIORAL INTERVENTION FOR INSOMNIA AMONG COLLEGE STUDENTS

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Introduction: Nearly 60% of college students suffer from poor sleep quality and 7.7% of students meet criteria for a sleep disorder (Schlarb et al., 2017). The most common of these sleep disorders is insomnia. Cognitive Behavioral Therapy for Insomnia (CBT-I) is the frontline treatment for insomnia. The time and cost of CBT-I, however, has limited overall treatment uptake, especially among individuals with less severe symptom profiles or who are otherwise relatively healthy (e.g., college students). The goal of this study is to pilot-test a mobile application version of CBT-I (i.e., CBT-I Coach) to evaluate its effectiveness in treating insomnia symptoms

among college students. The testing will also demonstrate the feasibility of using a CBT-I app for insomnia symptom treatment.
Methods: The study uses a between- and within-subjects design to assess biweekly variations in insomnia symptom severity among college students over a period of 8 weeks. Participants are randomized into the intervention group or a wait-list control group (where they were asked to initiate the intervention after a four-week delay). Participants in both groups are asked to use the CBT-I Coach app daily for 4 weeks. Every two weeks, online surveys are completed to assess sleepiness (via the Epworth Sleepiness Scale) and the insomnia symptom severity (via the Insomnia Severity Index).
Results: While data collection is ongoing, to-date we have collected data from 17 participants. The mean baseline ISI score was 15.3. Of the 17 participants that completed the baseline, 65% (n=11) filled out the 4-week online survey. The mean ISI score at the 4-week follow-up was 12.7. Ten participants (or 59% of those that completed the baseline) completed the eight-week follow-up survey. Data collection is scheduled to be completed in April 2022, and a full summary of the results will be presented at the APSS conference in Charlotte.
Conclusion: An effective app-based version of CBT-I has the potential to increase the accessibility of behavioral interventions for sleep to populations that are often missed by healthcare providers. Making CBT-I more available to college students and young adults may also decrease the onset of more chronic forms of insomnia.
Support (If Any): N/A

0477

COMPARISON OF A NON-CONTACT SLEEP MONITORING DEVICE WITH WRIST ACTIGRAPHY IN A SAMPLE OF INDIVIDUALS WITH CHRONIC INSOMNIA

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Introduction: Non-contact devices (NCDs) have been developed to measure sleep longitudinally and unobtrusively in the naturalistic home setting. We compared longitudinal measurements from a wrist actigraph (Actiwatch-2, Philips Respironics) and from a NCD (SleepScore Max, SleepScore Labs) in a sample of adults with insomnia
Methods: N=71 adults (ages 39.0±13.0y; 50 women) who met ICSD-3 criteria for chronic insomnia and were otherwise healthy participated in an at-home sleep monitoring study. Participants continuously wore the actigraph for one week, then used the NCD to record only nightly sleep periods for the next 8 weeks. Week-by-week within-subject averages and standard deviations (SDs) over days were assessed for five major sleep parameters: total sleep time (TST), sleep onset latency (SOL), wake after sleep onset (WASO), time in bed (TIB), and sleep efficiency (SE). These sleep parameters were analyzed with mixed-effects ANOVA comparing week one (actigraphy) to the next 8 weeks (NCD), and correlations between the first week (actigraphy) and second week (NCD) were calculated.
Results: Significant differences for actigraphy versus NCD were found for the weekly averages of SOL and WASO ($F>25.8$, $p<0.001$). The NCD measured longer average SOL (M±SEM=25.0±1.5min) than actigraphy (12.6±2.0min) and less average WASO (40.5±2.7min) than actigraphy (51.1±3.2min). Further, significant differences were found for the weekly within-subject SDs of TST and WASO ($F>7.52$, $p<0.01$). The NCD measured greater SD for TST (71.6±2.8min) than actigraphy (60.0±4.7min) and greater SD for WASO (25.0±1.4min) than actigraphy (19.2±2.2min). Actigraphy and NCD weekly averages were positively correlated for TST, WASO, TIB, and SE ($p<0.001$), but not SOL ($r=0.03$, $p=0.80$). Similarly, weekly within-subject SDs were positively correlated for TST, WASO, TIB, and SE ($p\leq0.05$), but not SOL ($r=–0.03$, $p=0.81$).
Conclusion: Actigraphy and NCD were not used simultaneously, precluding a direct comparison between these measurement modalities. Nonetheless, in this ecologically valid context, significant differences were only found for the weekly averages of SOL and WASO and for the weekly within-subject variability of SOL and TST, with significant correlations between the devices for all variables except SOL. Although actigraphy tends to underestimate SOL, NCD validation against polysomnography in chronic insomnia is warranted.
Support (If Any): NIH grant KL2TR002317; research devices provided by SleepScore Labs.

0478

THE IMPACT OF NON-PHARMACOLOGICAL INSOMNIA THERAPY ON MOOD AND SLEEP IN MORNING AND EVENING CHRONOTYPES IN OLDER ADULTS

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Introduction: As individuals age, the circadian-driven timing of their sleep shifts to an earlier hour. Whether such a shift moderates the effectiveness of insomnia treatment on sleep disturbances and mood in older adults is unknown.
Methods: We tested the hypothesis that circadian preference moderates improvements in mood and insomnia symptoms following a non-pharmacological insomnia treatment. Older adults (N=111, age=69±6.4 years, female=65%) with insomnia (Insomnia Severity Index (ISI) score >10) received a 6-session treatment regimen. Circadian preference was measured at baseline with the Composite Scale of Morningness (CSM mean score=41.2±7.3, median=42). Chronotypes were classified based on a median split of CSM scores. Depression, (Geriatric Depression Scale, GDS), insomnia severity (ISI), cognitive arousal (Glasgow Content of Thoughts Inventory, GCTI), and time in bed (TIB), total sleep time (TST), and sleep efficiency (TST /TIB=SE) from sleep diaries were collected pre- and post-treatment. Tests of proportion were used to characterize differences in demographic variables between chronotypes. Ranked correlation tests were used to test associations between circadian preference and variables of interest at pre- and post-treatment. T-tests with unequal variance were used to examine whether treatment outcomes differed between chronotypes.
Results: In this study, 58% of females and 38% of males were later chronotypes ($p=0.04$). Later chronotype was associated with greater pre-treatment TIB ($p=0.01$), and earlier chronotype was associated with higher post-treatment cognitive arousal ($p=0.04$). Later

chronotypes had greater reduction in depression symptoms (Cohen's d=0.43, p=0.04), cognitive arousal (d=0.39, p=0.05), and a trend for greater reduction in TIB (d=0.37, p=0.07). Earlier chronotypes had a greater increase in TST (d=0.42, p=0.04). However, both chronotypes saw equivalent changes in SE (d=0.12, p=0.58).
Conclusion: Later chronotypes had a greater reduction in TIB, while earlier chronotypes demonstrated a significant increase in TST due to insomnia treatment, and both chronotypes had improved SE. These patterns suggest that treatment equivalently improves the consolidation of sleep, but the mechanism of this treatment effect differs by chronotype. That is, a moderating effect of circadian preference on the mechanism of improved sleep consolidation by insomnia treatment in older adults. These results suggest greater attention to age-related changes in chronotype in insomnia treatment.
Support (If Any): NIMHR01MH101468-01; MIRECC at the VAPAHCS

0479

PRESCRIBING PATTERNS FOR HYPNOTIC MEDICATION AMONG ADULTS SEEKING CBTI TREATMENT: A PRELIMINARY REPORT FROM THE RESTING STUDY

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Introduction: Use of prescription hypnotic medications is common among adults with chronic insomnia; however, little is known about prescribing patterns for hypnotic medication in middle-to-older age adults with insomnia disorder who seek to engage in cognitive behavioral therapy for insomnia (CBTI).
Methods: Participants were 235 adults aged 50 or older with insomnia disorder (mean age 63.1y [SD 7.7y], 73.6% women) enrolled in the ongoing Randomized Controlled Study on Effectiveness of Stepped-Care Sleep Therapy (RESTING). At screening, participants provided information about prescribed medications for sleep, insomnia severity (Insomnia Severity Index), daytime sleepiness (Epworth Sleepiness Scale), chronotype (Composite Morningness Questionnaire), depression (Geriatric Depression Scale) and physical and mental health (PROMIS Global-10, Physical and Mental Health Subscales).
Results: Of the 235 participants, 95 (40.4%) reported taking at least one medication prescribed to improve sleep. 26.5% were prescribed multiple medications (polypharmacy). Non-benzodiazepine receptor agonists (non-BzRAs) were the most common (prescribed to 51.6% of medication-using sample), followed by benzodiazepines (Bzs; 35.8%) and trazodone (20.0%). 25.2% of participants took a variety of other prescription medications at lower frequencies.Comparing patient characteristics for patients prescribed non-BzRAs, Bzs, and trazodone monotherapies, as well as polypharmacy, there were no significant differences in age, gender, insomnia severity or any other clinical characteristics, outside of modest associations within the PROMIS physical health scale (F[3,81]=2.78, p=.046); participants prescribed trazodone as monotherapy had significantly higher scores (better physical functioning) than participants prescribed non-BzRAs. Bzs were more likely to be prescribed as part of polypharmacy (52.9% of patients prescribed Bz) in the total medication using sample compared to those taking non-BzRAs (34.7%) or trazodone (36.8%; p<.001).
Conclusion: In this study, a high percentage of adults with insomnia seeking CBTI were also taking medications prescribed for sleep, including medications that are associated with increased risk (benzodiazepines, polypharmacy) or are not FDA-approved for insomnia (trazodone). Increasing prescriber knowledge about CBTI may promote adherence to the American Geriatric Society Beers Criteria for potentially inappropriate medication use in older adults. More research on how prescription patterns may differ among provider specialties could help target educational efforts to increase utilization of CBTI.
Support (If Any): 1R01AG057500

0480

REDUCTION IN HEALTH CARE-RELATED COSTS AFTER INITIATION OF TREATMENT WITH A PRESCRIPTION DIGITAL THERAPEUTIC FOR CHRONIC INSOMNIA: TWO-YEAR FOLLOW UP ANALYSIS OF HEALTH CARE CLAIMS DATA

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Introduction: The objective of this study was to evaluate the effectiveness of the first FDA-authorized prescription digital therapeutic (PDT) for adults with chronic insomnia that delivers evidence-based treatment (Somryst, previously called SHUTi). FDA considers PDTs to be prescription-only neurobehavioral devices that provide a computerized version of condition-specific behavioral therapy as an adjunct to clinician supervised outpatient treatment.
Methods: A pre/post multi-payer analysis of claims data was conducted, comparing two-year pre- and post-index healthcare resource utilization (HCRU) in an all-comer population of patients with self-identified sleep problems across the United States who activated the PDT between February 1, 2012 and December 31, 2018 (Index). HCRU categories assessed were: hospitalizations, treat-and-release emergency department (ED) visits, ambulatory surgical center (ASC) visits, hospital outpatient department (HOPD) visits, office visits, number of sleep medication prescriptions, and associated health care costs. Costs were estimated by multiplying HCRU by published average costs for each medical resource.
Results: 252 patients initiating the PDT were analyzed (mean age 54.2 years, 57.5% female). Compared to the pre-index period, post-index events were reduced for ED (-56.2%; P=0.001), hospitalizations (-20.9%; P=0.4), sleep medication use (-8.9%; P=0. 0.377), HOPD (-8.3%; P=0.522), and ASC (-6.7%; P=0.695). Post-index events were slightly increased for office visits (+0.7%; P=0.891). Total estimated two-year cost savings associated with the reduced rates of all services except office visits was $494,634, or $1,963 per patient.
Conclusion: In a real-world cohort of patients with self-identified sleep problems, treatment with a PDT delivering digital CBT-I was associated with clinically meaningful net reductions in health-related services and associated costs.
Support (If Any): This analysis was funded by Pear Therapeutics, Inc.

0481

EFFECTIVENESS OF A DIGITAL THERAPEUTIC COMPARED TO MEDICATIONS AND COGNITIVE BEHAVIORAL THERAPY FOR TREATING CHRONIC INSOMNIA IN ADULTS

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Introduction: Limitations on the availability of guideline-recommended cognitive behavioral therapy for insomnia (CBT-I)

constrain its use and create an unmet need for innovative ways to expand access. Digital therapeutics offer a potential solution. This study compared a digital intervention, traditional face-to-face CBT-I, and prescription medications for insomnia.

Methods: Of 184 articles identified in a systematic literature review, 13 studies reported ISI mean change from baseline data: 1 using the digital therapeutic (DT) SHUTi (now known as the prescription digital therapeutic Somryst), 1 on the medication eszopiclone, and 11 on traditional CBT. A Bayesian network meta-analysis (NMA) was performed on the mean change from baseline and the proportion of remitters using the insomnia severity index (ISI) endpoint with follow-up timepoints between 6-12 weeks. Mean change in ISI score from baseline was analyzed as a continuous endpoint while comparisons of the proportion of remitters was performed using odds ratios. The analysis used a random-effects model for the base case analysis. A surface under the cumulative ranking curve (SUCRA) analysis was performed to rank the treatments on each endpoint.

Results: Only the DT and CBT-I were significantly different than placebo. The DT had the greatest mean change from baseline in ISI from placebo (-5.77 points, 95% Credible Interval (CrI) [-8.53, -3.07]), followed by CBT-I (-4.3 points, 95% CrI [-6.32, -2.39]). In the SUCRA analysis, the DT had the highest probability (56%) of being the most effective treatment based on ISI mean change from baseline. 8 studies reported the proportion of ISI remitters. Only the DT showed a statistically significant difference in remission vs. placebo, and the DT had the highest odds ratio for remission vs. placebo (OR 12.33; 95%CrI [2.28, 155.91]). The DT had the highest probability (64%), of being the most effective treatment for inducing remission using ISI definitions.

Conclusion: The DT in this study was projected to be the most effective therapy on both mean change in ISI and ISI remission within 6-12 weeks of treatment start vs. either traditional CBT-I or medications.

Support (If Any): This analysis was funded by Pear Therapeutics, Inc.

0482

VIRTUAL REALITY GUIDED IMAGERY FOR INSOMNIA (IVR): PRELIMINARY FEASIBILITY AND OUTCOMES

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Introduction: Chronic insomnia affects approximately 10% of adults and is associated with reduced quality of life, fatigue, impaired cognition, and increased risk for illness. Cognitive behavioral therapy for insomnia (CBT-I) is a recommended frontline treatment for chronic insomnia, but is not widely accessible as the number of trained CBT-I clinicians (<500) falls significantly short of the number of patients needing treatment. Digital delivery holds great potential for increasing access to CBT-I as well as other behavioral treatment approaches. Our team recently developed and conducted preliminary testing of a novel, brief virtual reality guided imagery for insomnia (iVR) in adults with chronic insomnia.

Methods: 12 adults (Mage=38.2 years, SD=20.7, 50% female) with chronic insomnia completed 4-weeks of iVR delivered via Oculus Go headsets equipped with blue light blocking lenses and pre-loaded with a guided relaxation application, sleep hygiene instructions, and modified stimulus control instructions. Participants completed a Satisfaction Survey at post-treatment and the following outcome assessments at baseline, post-treatment, and 1-month follow-up: Insomnia Severity Index, State-Trait Anxiety Inventory, Fatigue Severity Scale, and 1-week of sleep diaries (sleep onset latency, wake time after sleep onset, total sleep time, sleep quality [1-poor, 5-excellent]). [KM1] Paired one-tailed t-tests were used to examine preliminary outcomes. Effect sizes (ES) are reported as Hedges G.

Results: Adherence (#treatment weeks completed, M=3.5, SD=0.78) and Satisfaction (greater >8.8/10 on average for overall experience and likelihood of recommending to a friend) were high. Insomnia severity (7/28, ES=1.13, p<0.01), wake time after sleep onset (12 mins, ES=0.40, p=0.03), sleep onset latency (10 mins, ES = 0.36, p=0.04), and sleep quality (0.5/5, ES=1.08, p<0.01) improved following treatment. Gains were maintained at 1-month along with additional improvements in total sleep time (36 mins, ES=0.67, p=0.03) and trending improvement in fatigue (9/100, ES=0.46, p=0.05). State Trait Anxiety Inventory and Fatigue Severity Scale scores did not improve.

Conclusion: Our pilot findings suggest iVR is feasible and promising treatment for chronic insomnia. Because the intervention can be pre-installed, iVR may be particularly useful for individuals with limited internet access (e.g., rural populations, military). Future research with a larger sample, randomized controlled design, and longer-term follow-up appears warranted.

Support (If Any): Healium, Inc-PI McCrae

0483

CLINICAL MODEL OF COMMUNITY-BASED SLEEP EDUCATION INTERVENTION FOR CHILDREN WITH IDD

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Introduction: Sleep difficulties are common for children with intellectual and developmental disabilities (IDD). We previously found that implementing the principles of community-based sleep education intervention with children with IDD through a consultative caregiver training model improved key components of sleep and was a feasible model for both providers and caregivers (MacDonald, 2021).
Methods: Record reviews were conducted from a behavioral sleep clinic for children with IDD to evaluate for the reported effectiveness of the recommendations provided on improving sleep and to gather information regarding reported caregiver implementation of recommendations. A clinical psychologist trained in community-based sleep education and IDD met with 43 children, ages 1 to 18 years old with clinical diagnosis of an IDD, and at least one caregiver, to give individualized recommendations for their caregiver-reported sleep issues. These patients were referred to the psychologist by a developmental medical provider or a sleep medical provider after medical evaluation of these concerns. Concerns consisted of sleep onset latency, nighttime wakings, and/or co-sleeping. Patients and caregivers typically met 1 to 3 months after the initial visit to report their success at implementing recommendations and to share if there were any improvements at first follow-up or questions/concerns regarding the recommendations or sleep behavior. In some cases, additional follow-up visits were typically scheduled 1 to 6 months after and these were also reviewed. The notes from these visits were evaluated using qualitative measures and tools modified from Pediatric Sleep and Autism Clinical Global Impressions Scale (Pediatric CGI; Malow, 2016) to determine effectiveness and feasibility.
Results: Qualitative and quantitative measures adapted from Pediatric CGI were used by the record reviewer to evaluate notes. It was observed that 86% of caregivers reported complying with recommendations by the first follow-up and of those who complied, 81% reported improvements in their child's sleep and/or daytime behavior. Of those who did not comply by first follow-up, only 28% saw improvement. Of those who had second follow-up, 89% of caregivers reported improvement in their child's sleep and/or daytime behavior.
Conclusion: Time-limited models of community-based sleep educational interventions within a clinical setting are reported by caregivers and clinicians to be an effective method at delivering sleep education to families and improving sleep for children with IDD. Compliance with recommendations was associated with a higher proportion of improvement in sleep and/or daytime behavior.
Support (If Any): This work was supported by the Vanderbilt Kennedy Center for Excellence in Developmental Disabilities

0484

TROUBLE SLEEPING PREDICTS FUTURE DECREASED QUALITY OF LIFE IN YOUNG CHILDREN WITH FONTAN CIRCULATION

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Introduction: Children with congenital heart disease who undergo a Fontan procedure are at higher risk of reduced health-related quality of life (HR-QOL) compared to age-matched peers. We have previously shown that current sleep disturbances are associated with decreased HR-QOL, but there is no existing longitudinal data on the relationship between sleep disturbance and HR-QOL in children with Fontan circulation.
Methods: We analyzed data from the Pediatric Heart Network Single Ventricle Reconstruction follow up study to evaluate associations between parent-reported trouble sleeping with HR-QOL as measured by the child health questionnaire (CHQ, measured at age 6 years) as well as the Pediatric Quality of Life questionnaire (PedsQL, measured at baseline as well as age 4, 5 and 6 years) in children with Fontan circulation. Presence of trouble sleeping was assessed at baseline and quality of life was assessed at baseline (age 3 years old) and annually for 3 years. Analysis was performed using the Wilcoxon sum rank test.
Results: 227 participants had data at baseline (age 3 years), and 196 participants completed HR-QOL measures at all time points. Parent-reported trouble sleeping was reported "often" or "almost always" in 11% of participants. Baseline trouble sleeping predicted decreased HR-QOL at all future time points, particularly psychosocial HR-QOL. Psychosocial HR-QOL as measured by the Peds QL was significantly lower at all time points in the group with trouble sleeping. At age 6 years, psychosocial HR-QOL remained significantly lower in the group with trouble sleeping at baseline on both the PedsQL (median score 78 [interquartile range 63, 90] vs 65 [58, 83], p=0.03) and the CHQ (median t-score 54 [47, 59] vs 47 [42, 53], p=0.002).
Conclusion: Trouble sleeping in children with Fontan circulation predicts future decreased HR-QOL. Better understanding of sleep problems is needed in children with Fontan circulation as sleep disorder treatment may lead to improved HR-QOL in this at-risk population.
Support (If Any): Funding to DC from the American Heart Association and NIH-NHLBI. Single Ventricle Reconstruction study data obtained from the Pediatric Heart Network.

0485

VERBAL HOSTILITY MODERATES PARENTAL AND CHILD SLEEP ONSET LATENCY IN CHILDREN WITH AUTISM SPECTRUM DISORDER

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Introduction: Research indicates parent and child sleep onset latency (SOL) are positively correlated. In addition, parents who have difficulty sleeping may be more tired and report using negative parenting behaviors, such as verbal hostility. Experiencing verbal hostility may increase child anxiety and make it harder for them to fall asleep. Given that up to 80% of children with ASD experience

sleep problems, it is important to understand potential relations among sleep and parenting behavior in this population. The current study examined whether verbal hostility moderated the relationship between parent and child SOL.

Methods: The sample (N=56) consisted of parents (90% female) reporting on their children aged 6-12 (M=8.63, SD = 2.00; 77% male) who expressed interest in a study exploring behavioral treatments for sleep. All children were diagnosed with ASD and had parent reported sleep complaints (e.g., difficulty falling asleep, waking up in the night). Baseline data were examined in the current analyses. Measures included an average of parent and child SOL on daily sleep diaries over 14 days of baseline. Verbal hostility was measured using the verbal hostility subscale on the Parenting Styles and Dimensions Questionnaire – Short Version. Covariates included child and parent age.

Results: Moderation analyses were conducted using SPSS PROCESS. Parent and child SOL were significantly correlated ($r(55)=.28$, $p=.04$). Parent nor child SOL were correlated with verbal hostility. The interaction between parent SOL and verbal hostility $t(1, 55) = 5.34$, $p = .02$ was significantly associated with child SOL, such that higher levels of verbal hostility exacerbated the association between greater parent and child SOL.

Conclusion: These results suggest that the association between parent and child SOL depends in part on the level of verbal hostility a parent uses to discipline their child with ASD. Future research should utilize longitudinal and experimental methodology to determine the causality of these relationships. In addition, teaching positive parenting techniques to parents of children with ASD may be an important component to behavioral sleep treatment so that both child sleep and disciplinary strategies are targeted.

Support (If Any): United States Department of Defense USAMRAA Autism Research Program (McCrae, PI; CTA W81XWH2010399).

0486

SLEEP PATTERNS OF CHILDREN WITH CRI DU CHAT SYNDROME AND AUTISM SPECTRUM DISORDER DURING THE COVID-19 PANDEMIC

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Introduction: The COVID-19 pandemic has subjected most of the world population to changes in daily life activities, mostly related to social isolation, family distancing and home confinement. Children with autism spectrum disorder (ASD) and other neurodevelopmental syndromes, such as cri du chat syndrome (CDC) might be especially sensitive to the consequences of the pandemic, as they usually require a predefined and strictly controlled routine. Even before the pandemic, sleep disorders and complaints were more frequent in these children compared with neurotypical (NT) children. This study aimed to evaluate the sleep pattern of children with CDC and ASD before and during the pandemic, comparing it with NT children.

Methods: Children and adolescents between 0-18 years` parents or legal guardians were asked to answer the adapted Brief Infant Sleep Questionnaire, related to both before and during the COVID-19 pandemic.

Results: Before quarantine, children with CDC and ASD had increased chances of sleeping in their parents' bed, of needing parental assistance to fall asleep, of taking >30min to fall asleep and of having a wake after sleep onset time >30min compared to children with typical development. Being part of the CDC group significantly increased the odds of having awakenings during the night. After quarantine, there were a decrease in the proportion of children sleeping in their own bedrooms and an increase in the odds of awakening during the night in all groups. Children with CDC and ASD had increased chances of sleeping in their parents' bed and had a significantly higher chance of taking more than 30min to fall asleep. Both the CDC and ASD group presented worse sleep patterns during the COVID-19 pandemic.

Conclusion: Our results indicated that the ASD and CDC groups usually have more sleep problems and complaints than NT children. The CDC group showed worse sleep parameters overall, even before quarantine.

Support (If Any): Our studies are supported by Associação Fundo de Incentivo à Pesquisa (AFIP), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES Finance Code 001 to GLF) and Conselho Nacional de Desenvolvimento Científico Tecnológico (CNPq – Grant #141445/2021-1 to GLF); S.T. and M.L.A. received CNPq fellowships.

0487

EXPLORATION OF SLEEP PROBLEMS AND MEDICATION USE FOR YOUTH RESIDING IN JUVENILE JUSTICE FACILITIES

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Introduction: Insufficient and disordered sleep are common among developing adolescents and can result in poor health and behavioral consequences. Previous studies have examined sleep and adolescent criminal behavior; however, little is known about adolescent sleep difficulties or disorders while residing in juvenile detention and treatment facilities. The current study explores psychiatric and sleep disorder diagnoses and medication use of youth under the care of the Department of Juvenile Services (DJS).

Methods: Participants were recruited from 11 detention and treatment facilities across Maryland. Youth (N = 67) were 13-19 years old (M = 16.8, SD = 1.2) and 84% male and 16% female. Racial Backgrounds: 55% Black, 18% White, 14% Multiracial, and 12% Other. A Healthcare staff member from each facility completed an online medical questionnaire regarding each youth's sleep history, medical diagnoses, and current medications.

Results: The most common youth diagnoses were Insomnia (N = 26), ADHD (N = 26), and Anxiety (N = 12) with 72% of youth having more than one psychiatric/sleep disorder diagnosis. The most frequently used medications were melatonin (N = 23), trazodone (N = 12), and quetiapine (N=7) and 58% were on more than one sleep/psychotropic medication. Healthcare staff ordered 25 behavioral sleep studies (e.g., DJS behavioral sleep studies consists of night resident staff tracking if youth is asleep/awake while making rounds), resulting in diagnoses of insomnia (N=9) and parasomnia (N=1). Youth with sleep studies were prescribed the following medications: trazodone (N = 5), melatonin (N = 3), other (e.g., methylphenidate, clonidine, N = 11).

Conclusion: These preliminary findings suggest that youth are experiencing poor sleep quality while residing in juvenile justice

facilities; over a third of the youth are struggling with insomnia and are prescribed Melatonin. Further data analyses will provide a better understanding of the youths' sleep problems and the effects on their overall health and well-being.

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0488

TRAJECTORIES OF INSOMNIA SYMPTOMS SINCE CHILDHOOD ASSOCIATED WITH TREATMENT OF INTERNALIZING DISORDERS IN ADULTHOOD

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Introduction: Internalizing disorders (ID) are the most common form of psychopathology, with a large proportion of individuals seeking treatment in young adulthood. Childhood insomnia symptoms, i.e., difficulties initiating or maintaining sleep (DIMS), have been shown to be associated with ID, however, little is known about the developmental trajectories of insomnia symptoms and their associated risk of receiving pharmacotherapy for ID. The present study examined the longitudinal association between trajectories of childhood insomnia symptoms and risk of receiving treatment for ID in young adulthood.

Methods: We analyzed data from the Penn State Child Cohort, a population-based sample of 505 children (Mdn=9y), who were followed-up 8 years later as adolescents (Mdn=16y) and 15 years later as young adults (Mdn=24y). Insomnia symptoms were defined as parent-reported (childhood) or self-reported (adolescence and young adulthood) moderate-to-severe DIMS. The trajectories of insomnia symptoms across the three time-points were identified as never, remitted, waxing-and-waning, incident and persistent. The presence of ID was defined as a self-report of a diagnosis of mood and/or anxiety disorders, whether they had received treatment or not and whether treatment consisted of prescription psychotropic medication (i.e., antidepressants, anxiolytics). Logistic regression models were adjusted for sex, race/ethnicity, age, and any childhood or adolescent history of a psychiatric diagnosis or psychotropic medication use.

Results: Persistent (OR=3.0) and incident (OR=3.3) trajectories, but not waxing-and-waning (OR=1.1) or remitted (OR=0.8) trajectories, were associated with increased odds of ID that did not receive treatment in adulthood. Additionally, the odds of receiving treatment for ID with prescription psychotropic medication in adulthood were increased in those with persistent (OR=3.4), incident (OR=3.5) and waxing-and-waning (OR=2.1) trajectories, but not in those with a remitted trajectory (OR=0.7).

Conclusion: Childhood-onset persistent insomnia symptoms as well as adult-onset incident insomnia symptoms are strong risk factors for receiving treatment for mood/anxiety disorders in adulthood, while childhood insomnia symptoms that fully remit over time are not. Treatment of insomnia in youth should be an essential target as to decrease the risk of developing severe forms of mood/anxiety disorders requiring psychotropic treatment in adulthood.

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0489

SLEEP DISORDERED MEDICINE: A RESIDENTS PERSPECTIVE

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Introduction: It is known that sleep medicine is a relatively young subspeciality when compared to other more establish subspecialities, such as cardiology or intensive care medicine. The field gained noticeable recognition following the introduction of positive pressure therapy as a noninvasive method to treat obstructive sleep apnea in 1981. That new method prompted an increased interest in the area of sleep apnea and in all sleep disorders in general. For over the past four decades, sleep medicine has evolved greatly and grown significantly enough to justify the recognition of sleep medicine as an independent specialty.[1] Currently, it is considered a subspeciality that is devoted to the diagnosis and therapy of sleep disorders, which left untreated could increase the risk of chronic medical problems, such as obesity, heart disease, type 2 diabetes, depression, and stroke.[3] There are a limited number of board-certified sleep medicine physicians in the United States to date. According to the National Resident Matching Program (NRMP), there are only 88 accredited training programs accepting candidates for a total of 179 positions. The match result statistics for 2020 showed that out of those 179 openings, only 165 were filled or a 92.2% match rate.[4] The purpose of this quality improvement project was to modify and implement an effective sleep medicine curriculum in an effort to increase residents' awareness and knowledge of the field. With an increased awareness and interest, there was a secondary goal of implementing the project across different academic medical centers. This may ultimately lead to an increase in match rates and having more accredited training programs in the US.

Methods: The data presented represents survey responses of medical resident trainees from a single academic medical center, Nationwide Children's Hospital (NCH) in Columbus, Ohio. It is large teaching hospital with 129 categorical pediatric residents and 40 combined internal medicine and pediatric residents. This QI project followed the Plan-Do-Study-Act (PDSA) Cycle, which is a four-stage problem solving model classically used for improving a process or carrying out change. In order to commence this cycle, a key driver diagram was completed (Figure 1). This is a tool to assist in organizing your ideas and discover various causes that contribute to the issues targeted for improvement. The key driver divides the aim of the project into primary and secondary drivers, which represent outcomes and interventions respectively. Primary drivers are factors that are part of the system that directly impacts the aim of this QI project. Secondary drivers are opportunities for change or interventions in this effort. A survey was created with the assistance of division members of the sleep medicine program here at NCH. Once finalized and given that the study focused on the responses of current pediatric resident trainees, it was sent to the Pediatric Residency Graduate Medical Education (GME) Department for appraisal prior to its dissemination. The finalized survey had 29 fields for completion divided over 3 pages to allow for partial completion, although complete completion was desired. Time allotted to the recipients was month duration with two reminder notices.

Results: There were a total of 61 respondents that completed and returned the survey out of a total 169 recipients that received the survey. Proportionately, the breakdown of the combined residency program vs. the categorical pediatrics of the respondents was similar to the group at whole, representing 23% and 77%

respectively. The level of training was fairly comparable between postgraduate year (PGY) 1 and 3 at 25%, with an increase of the PGY 2 respondents (42.6%) and lowest comprising PGY 4 at only 3.3% of the responses received. Of the 38 trainees that completed elective rotations in pulmonary and neurology, only 2 (3.3%) participated in the formal sleep medicine clinic at the time the survey was disseminated to them. All 61 participants stated that at NCH does not require a sleep medicine rotation and only 3 (4.9%) have completed one. The survey results were reflective of a deficit in didactic sleep medicine instruction, with no respondents stating they received over 3 hours per any academic year. The quality of the instruction was responded as inadequate or poor at 71.4%. The reasoning behind the inadequate to poor instructional response was believed to be due to a simple lack of didactics at 51.3% or just an overall low priority from GME at 46.2%. When asked if they would like to increase the amount of sleep medicine education, 77.6% responded, "Yes," only one stated, "No," and the rest responded indifferently. A majority of participants reported that patients inquire the most about sleep medicine during their primary care rotations (93.1%). Although when asked which department should be the most significant in sleep medicine education, there was a relatively even split in the responses received. A slight majority of participants believed it was the responsibility of the outpatient elective rotations to require Sleep Medicine, Pulmonology, Neurology, Psychiatry, and Developmental Pediatrics instruction at 41.1%, followed by Ambulatory clinical participation at 30.4%, and Inpatient Pulmonary or Critical Care at 28.6% throughout the duration of and for the comprehensive completion of their residency program.

Conclusion: It is apparent that there are limitations to the educational opportunities for trainees in sleep medicine that are perceived to be multifactorial. The fact that there are a limited number of board-certified sleep medicine physicians in the US may be attributed to the lack of exposure and interest, as well as the absence of a sound educational curriculum that not only may increase the trainees' awareness in the field of study, but provide a comprehensive educational curriculum for sleep medicine instruction to be effectively implemented. With the requirements for trainees to have service rotations in the field of sleep medicine, this may lead to a higher interest and an increased match rate in sleep medicine, resulting in more board-certified physicians within the US. Due to the expanding number of individuals that suffer from sleep apnea and/or other sleep disorders, there is a need to have highly trained board-certified physicians to identify and treat these patients with chronic sleep disorders. In summary, the responses obtained and analyzed from the residents' surveys at NCH conveyed that there is an increasing interest from them for more exposure and instruction in sleep medicine and a need to have a sound educational curriculum to expose and instruct them in the field. The faculty and fellows at NCH have identified this need and implemented the necessary resources to provide additional and vital education to the institution's medical trainees.

Support (If Any):

0490

LONGITUDINAL ASSOCIATIONS BETWEEN SLEEP AND BEHAVIOR AND COGNITION IN PRESCHOOLERS FROM FIVE EUROPEAN BIRTH-COHORTS

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Introduction: There has been little focus on sleep and its relation to behavior and cognition in preschool-aged children. We aimed to investigate the association between sleep duration in early preschoolers (» 3.5 years of age) and later behavioral and cognitive outcomes (» 5 years of age) in European children.

Methods: We used harmonized data from five cohorts from the EU Child Cohort Network, established by the LifeCycle Project (n=16.444 children): ALSPAC and SWS from UK, EDEN and ELFE from France and INMA from Spain. Within all cohorts, total sleep duration per day and behavioral and cognitive information were reported by parents. Internalizing and externalizing behaviors were measured with the Strengths and Difficulties Questionnaire and treated as percentile scores. Verbal and non-verbal intelligence were assessed by the Wechsler Preschool and Primary Scale of Intelligence or with the McCarthy Scales of Children's Abilities depending on the cohort and treated as standardized scores. All scores were cohort specific. Associations between sleep duration during early preschool age and later behavior and/or cognition were estimated using linear regression and pooled with two-stage individual participant data meta-analysis adjusted for child, maternal and household information. Analyses were done in DataSHIELD.

Results: Global mean sleep duration was 11h54 ± 1h00 per day at mean age 3.5 years but differed by country, with children from France showing longer sleep duration than children from the UK or Spain. In multivariate meta-analysis, 1 hour of additional sleep duration per day at mean age 3.5 years was associated with reduced internalizing and externalizing behavior percentile scores at mean age 5.1 years (internalizing behavior: badjusted= -1.05, 95%-CI [-1.93, -0.18], I2: 30.3%; externalizing behavior: badjusted= -2.12, 95%-CI [-2.78, -1.47], I2: 0.0%). No association was observed between sleep duration and subsequent verbal or non-verbal intelligence

Conclusion: Longer sleep duration in early preschool age (» 3.5 years of age) was associated with subsequent lower internalizing and externalizing behavior scores (» 5 years of age), but not with verbal or non-verbal intelligence. Adequate sleep duration at an early age is important for children's later mental health.

Support (If Any): KG was granted a LifeCycle fellowship.

0491

SLEEP AMONG ADOLESCENTS IN JUVENILE DETENTION

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Introduction: Adolescents involved in the juvenile justice system demonstrate high rates of psychiatric disorders, suicidality, and trauma, all of which is associated with poor sleep. Poor sleep is common among adolescents and is associated with numerous adverse outcomes like inattention, school absenteeism, emotion dysregulation, and substance use, outcomes that are related to juvenile justice system involvement. Yet very little is known about the sleep of adolescents involved in the juvenile justice system. We conducted a medical chart review and survey of detained adolescents to describe the sleep patterns and problems among these youth.
Methods: We reviewed a random sample (26%) of the medical charts of youth detained in a juvenile detention center (n=31) over four days in Summer 2021. We reviewed all medical encounters in the month prior to the date of chart review. Additionally, 13 youth completed the Patient Reported Outcome Measurement Information System Pediatric Sleep Disturbance Short Form (PROMIS-SD). Twelve of them reported their sleep patterns while in detention.
Results: Sleep was mentioned in 23% of all medical encounters, 62% of which indicated poor sleep. Sleep treatment was documented in 24% of notes, all consisting of pharmacotherapy. A sleep diagnosis was documented on 37% of billing sheets of all youth seen by a medical provider in the detention center in July 2021. On average, participants reported lights out around 9pm (SD=35min), sleep onset latency of 74mins (SD=75mins), wake time after sleep onset of ~20 minutes (SD=16mins), and wake-up time of 7:50am (SD=67min). Youth reported average sleep duration of more than 9 hours while detained (SD=103mins). Average PROMIS-SD score was 66.2 (range 51.5-79.1)
Conclusion: Though most youth obtain the recommended amount of sleep while detained, sleep disturbance is highly common among this population and average sleep disturbance is more than one standard deviation above the average. These data may inform the type of sleep interventions that are most relevant to detained youth. Future work should focus on further examining the sleep of adolescents in the juvenile justice system and identifying feasible, acceptable, and useful strategies for implementing evidence-based sleep interventions in this setting.
Support (If Any): Dr. Levenson's effort was supported by K23HD087433

0492

FAMILY BURDEN AND KIDS' SLEEP (FAB-KIDS); PEDIATRIC SLEEP DISORDERS IMPACT ON FAMILY: A RETROSPECTIVE STUDY

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Introduction: Little is known about the far-reaching impacts of pediatric sleep difficulties on family function, though widely thought to be a common reason to seek care, few pediatric sleep centers have adequate support resources for families. Valid, reliable instruments, including the Revised Impact On Family Scale (RIOFS), exist which can be used to reflect the psychological and social impact chronic childhood illness have on family life. We aim to assess the relationship between impact on life related to pediatric sleep disorders.
Methods: Retrospective chart review. Data from medical records, sleep study reports, and RIOFS results were extracted from children undergoing clinically ordered polysomnography at a tertiary pediatric sleep center. IRB approval was obtained. Preliminary data from 91 children were analyzed with descriptive and correlational statistics. The RIOFS is a 15 item Likert scale questionnaire with possible scores of 15-60; higher scores equate higher family stress.
Results: Of the 91 subjects, 44% were girls. Average age at time of study was 8.9 (+/-5.4) years. Study types were 85% PSG, 15% titration. Average BMI percentile was 74%. Mean RIOFS score =28 (+/-9.8, 15-60). Initial correlation of RIOFS total score to PSG metrics did not show a significant correlation between hypothesized factors such as oAHI and RIOFS score (r 0.009, CI [-0.163, 0.182], p=0.927) or Sleep Efficiency (r 0.054, CI [-0.152, 0.256], p=0.609). Preliminary review suggests that the specific question on fatigue has the strongest correlation with increased AHI (r -0.171, CI [-0.047, 0.005], p=0.11).
Conclusion: In a cohort of patients referred to pediatric sleep lab, mean RIOFS total score was 28. For reference, mean total score for children with Autism Spectrum Disorder =31; with rare metabolic disorders =36.5; at home with tracheostomy and ventilator =40. Our data and published comparisons suggest high levels of family stress in patients referred for sleep studies. Supporting families with clinical social work, psychologists, therapists is key to delivery of effective family-centered care models. With ongoing study, identifiable sleep factors which may predict the highest RIOFS score may be identified. Future research is needed to investigate the best delivery of these services to this high-risk population
Support (If Any):

0493

DAYTIME SLEEPINESS IN CHILDREN WITH ASTHMA: IS IT REALLY THE LUNGS?

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Introduction: Insufficient nocturnal sleep is the most common reason of excessive daytime sleepiness. Children with asthma are at increased risk for sleep disruption secondary to nocturnal respiratory symptoms and medication effects, as well as more common behavioral pediatric sleep challenges. Not yet clear is the relative contribution of asthma severity versus behavioral factors to daytime sleepiness in a sample of children (8-17 years) with asthma.
Methods: This survey-based study was conducted in the outpatient pulmonology clinic at Nemours Children's Hospital, Delaware between 2018-2021. Children with asthma were eligible if they had a diagnosis of asthma, spoke English, and did not have a developmental disorder. Participants completed four surveys: Pediatric Daytime Sleepiness Scale (PDSS, higher scores=more sleepiness), Pediatric Quality of Life Inventory (PEDS-QL, higher scores=better quality of life), PROMIS Pediatric Anxiety short form (higher scores=more anxiety symptoms), and an investigator-designed survey assessing sleep-related technology use. Asthma factors (e.g., asthma severity, lung function [FEV1], number of prescribed asthma medications) were obtained from the electronic

medical record. Descriptives and multiple regression analyses were conducted to identify asthma severity and behavioral predictors of daytime sleepiness, controlling for demographics.
Results: Study participants (N=100) were mean age 12.1 years [SD=2.6], 54% male, and 45% Black. Persistent asthma was common (87%), with a mean of 4.2 (SD=2.5) prescribed asthma medications, and mean FEV1 of 97% (SD=17.8). On behavioral surveys patients scored: PDSS (M=14.13; range=0-31; SD=6.7), PEDS-QL (M=77.38; range=15.6-100; SD=18.6), and PROMIS (M=14.92; range=8-35; SD=7.2). 74% reported cell phone usage within 1 hour of bedtime. Multiple regression models showed that an increased number of prescribed medications (beta=0.168, p=0.042), lower patient-reported quality of life (beta=-0.310, p=0.004), increased anxiety symptoms (beta=0.203, p=0.05) and bedtime cellphone use (beta=0.290, p=0.003) were significantly associated with daytime sleepiness in children with asthma.
Conclusion: A greater number of behavioral than asthma severity factors related to daytime sleepiness in children with asthma. Strategies to reduce anxiety and bedtime cellphone use may be plausible behavioral targets to improve sleep in children with asthma. Further research to examine these associations longitudinally, and in children with more severe asthma, is warranted.
Support (If Any): None

0494

THE ASSOCIATIONS BETWEEN INSOMNIA SYMPTOMS AND EMOTIONAL REGULATION AMONG TYPICALLY DEVELOPING ADOLESCENTS DURING THE COVID-19 PANDEMIC

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Introduction: A high prevalence of sleep disturbances was observed in adolescents during the coronavirus disease (COVID-19) pandemic. This has been interpreted as being related to disruptions in daily routines and social life caused by pandemic-related societal restrictions. Although the COVID-19 pandemic interrupted the routines of all adolescents, not all adolescents developed insomnia in response to pandemic-related changes. A reduced ability to regulate negative emotions is associated with a higher risk of developing insomnia, yet it is not known if it is associated with higher levels of insomnia in adolescents. Cognitive reappraisal, which consists of changing the way one thinks about potentially emotion-inducing events, is effective in downregulating negative emotion. Expressive suppression, which is changing the way one behaviorally responds to emotion-eliciting events, can decrease a positive emotional experience but does not alter the experience of negative emotion. The objective of this study was to examine the associations between insomnia symptoms in typically developing adolescents during the COVID-19 pandemic and the tendency to use cognitive reappraisal or expressive suppression to regulate emotions. It was hypothesized that high levels of insomnia symptoms among adolescents during the COVID-19 pandemic would be associated with more frequent use of expressive suppression and less frequent use of cognitive reappraisal when regulating emotions.
Methods: 49 adolescents aged 11-16 (M= 13.43, SD= 1.67) participated in the study during the first wave of the COVID-19 pandemic in Canada (May 15 to June 30, 2020). The Insomnia Severity Index (ISI) was used to assess the severity of nighttime and daytime components of insomnia. The Emotion Regulation Questionnaire was used to assess respondents' tendencies to regulate their emotions using cognitive reappraisal or expressive suppression.
Results: Higher ISI total scores were significantly associated with lower reappraisal scores on the Emotion Regulation Questionnaire.
Conclusion: A higher level of insomnia symptoms among typically developing adolescents during the COVID-19 pandemic was associated with less frequent use of emotional regulation strategy that is effective in downregulating negative emotion. Limitations: Given the cross-sectional design of the study, it is not possible to determine causality.
Support (If Any): CIHR 418638 to Reut GruberRGPIN-2015-04467 to Reut Gruber

0495

SLEEP DISTURBANCE FEATURES DIFFERENTIALLY INFLUENCE INFLAMMATORY MARKERS IN ADOLESCENTS

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Introduction: Sleep disruption has profound effects on immune function. Many adolescents do not get adequate amounts of sleep each night, and chronic sleep disturbance has been associated with increased risk of several inflammatory diseases. However, the relationship between sleep disturbances and inflammation during adolescence is not well understood. In this study, we examined the relationship between specific features of sleep disruption and cytokine levels in adolescents.
Methods: A total of 88 adolescents (18.36 ± 0.51 years, 56.8% female) completed the Pittsburgh Sleep Quality Index (PSQI), a self-reported questionnaire used to assess subjective sleep quality over a 1-month time period. Blood plasma samples were obtained for each participant at the same timepoint to measure levels of pro-inflammatory cytokines (Interleukin (IL)-6, IL-8, tumor-necrosis factor (TNF)-alpha, and interferon (IFN)-gamma), anti-inflammatory cytokine (IL-10), and C-reactive protein (CRP). Samples were assayed using a Meso Scale Discovery multiplex immunoassay. Linear regression models were used to test the effect of PSQI sleep latency, duration, efficiency, quality, disturbance, and total score on each cytokine level, while covarying for sex and body mass index. We corrected for multiple comparisons using a False Discovery Rate (FDR) correction.
Results: Overall, disruption in sleep was associated with distinct cytokine differences. Worse sleep, reflected by the PSQI total score and greater sleep disturbance, was associated with lower IL-6 levels (p=0.013, p=0.015, respectively), however theses associations were attenuated to a trend after FDR correction (q=0.083, q=0.092, respectively). Longer sleep latency was also associated with lower IL-6 (p=0.028), and IFN (p=0.016) levels, however these effects were also attenuated after FDR correction (q=0.138, q=0.094, respectively). Reduced sleep efficiency was associated with higher TNF (q=0.046) and CRP (q=0.021) levels.
Conclusion: Our findings show that different components of sleep disruption have varying effects on cytokine release, resulting in an overall blunted immune response. This underscores the significant impact of sleep disturbances on perturbing immune function during this critical developmental period.
Support (If Any):

0496

SLEEP AND BEHAVIOR PROBLEMS IN CHILDREN WITH OVERWEIGHT AND OBESITY

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Introduction: Limited studies have examined sleep variability in children with overweight and obesity, nor do studies focused on its relation with behavior outcomes in this high risk pediatric population. The purpose of this study was to examine sleep duration and its variability in relation to behavior outcomes in school-age children with overweight and obesity.
Methods: Sleep in 246 children aged 6-9 years with overweight and obesity was assessed using actigraphy for 7 days and through the parent-report Children's Sleep Habits Questionnaire (CSHQ). Children's behaviors were assessed using parental responses on the Behavior Assessment for Children. Children were categorized into 4 groups based on the median split of the average daily sleep duration and its variability: sufficient-stable, sufficient-variable, insufficient-stable, and insufficient-variable. General linear model (GLM) analyses were performed with the 4 sleep groups as the primary predictor variable and child behavior outcomes as the dependent variable.
Results: Average daily sleep duration by actigraphy was 7.52 hours, with 84.6% of the children having clinically significant CSHQ sleep disturbance scores and 68.3% having a total behavior problem score in the clinical range. In the unadjusted and adjusted GLM analysis, children in the insufficient-stable sleep duration category had significantly higher emotion problem ($p < 0.05$), self-control problem ($p < 0.01$), and total behavior problem scores ($p < 0.01$) when compared with those in the sufficient-stable sleep duration (reference) category. Children in the insufficient-variable sleep duration category had significantly higher self-control problem scores when compared with those in the reference category ($p < 0.05$).
Conclusion: School-age children with overweight and obesity coexist with sleep and behavior problems, with those who have persistent short sleep at the greatest risk for the worst behavior outcomes.
Support (If Any): This work was supported by Ministry of Science and Technology, Taiwan, MOST 107 - 2314 - B - 002 - 025 - MY3.

0497

ASSOCIATIONS BETWEEN SLEEP PROBLEMS AND ADHD SYMPTOMS IN EARLY CHILDHOOD: A LONGITUDINAL, PRIMARY-CARE BASED STUDY

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Introduction: Sleep problems are common, impairing correlates of ADHD. These associations may emerge as early as toddlerhood, suggesting sleep-focused interventions in early development may improve ADHD-related outcomes. However, previous research has been limited by cross-sectional methodology and small, clinically-referred samples. Thus, relationships between sleep and ADHD symptoms over time and in non-clinical samples remain unknown. The current study evaluated concurrent and longitudinal relationships between sleep problems and ADHD symptoms in early childhood in a large, non-clinical sample.
Methods: Children were recruited from primary care clinics at an academic medical center and assessed at two time points: T1 (n=1806, mean age: 20 months) and T2 (n=646, mean age: 37 months). Sleep problems and ADHD symptoms were evaluated via the caregiver-reported Child Behavior Checklist (CBCL) Sleep and DSM-Oriented ADHD scales, respectively. At T2, caregivers also completed the ADHD Rating Scale (ADHD-RS), which includes inattention and hyperactive/impulsive subscales. Associations between sleep and ADHD were examined using Pearson correlations at each time point. Stability of and longitudinal relationships between sleep and ADHD symptoms were also examined.
Results: Greater sleep problems were correlated with elevated CBCL ADHD at T1 ($r=.40$, $p<.001$) and T2 ($r=.49$, $p<.001$). At T2, greater sleep problems were also related to increased ADHD-RS scores ($r=.44$, $p<.001$), with similar relationships for inattention ($r=.41$) and hyperactivity/impulsivity ($r=.43$). Sleep problems ($r=.51$, $p<.001$) and CBCL ADHD ($r=.52$, $p<.001$) were moderately stable over time. Using the CBCL, partial correlations indicated that T1 sleep was associated with T2 ADHD after controlling for T1 ADHD ($r=.11$, $p<.01$); T1 ADHD was associated with T2 sleep problems after controlling for T1 sleep problems ($r=.17$, $p<.001$).
Conclusion: Sleep disturbances and ADHD symptoms were bi-directionally associated in a non-clinical sample of young children recruited in primary care. Results are consistent with conceptualization of ADHD as a 24-hour disorder and suggest that incorporating behavioral sleep techniques into empirically-based ADHD treatments may improve clinical outcomes for young children displaying ADHD symptoms. Future research may focus on 1) optimizing identification of toddlers and preschoolers at risk for sleep problems and ADHD and 2) developing interventions that can be delivered in primary care settings.
Support (If Any): P50HD093074 , K23MH108704

0498

INTRAVENOUS IRON THERAPY IN THE PEDIATRIC SLEEP CLINIC: A SINGLE INSTITUTION EXPERIENCE

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Children's Mercy Hospital [1]

Introduction: Initial reports of intravenous (IV) iron administration have been promising for children with restless legs syndrome (RLS), periodic limb movement disorder (PLMD), and restless sleep. The aim of the current study was to further evaluate the clinical response to IV iron supplementation in children seen in a pediatric sleep clinic.
Methods: We performed a retrospective chart review of children cared for in a single pediatric sleep clinic who also underwent IV iron infusion. Data regarding their sleep symptoms and ferritin levels were abstracted.
Results: Overall, 63 pediatric sleep patients underwent IV iron infusion, mostly with ferric carboxymaltose (n=60). Of the 59 patients with clinical follow-up, 39 (73%) noted improvement in at least one symptom, and 14 (26%) did not notice improvement or noticed worsening symptoms. Of the 59 patients with pre- and post-infusion labs, the average ferritin level increased from 21.7+/-13.3 to 147.9+/-120.9, $p<0.001$. Comparing patients who experienced clinical improvement versus those who did not, there were no statistically significant differences in change in ferritin levels (176.6+/-127.7 vs 120.5+/-118.1, $p=0.278$), sex (68% in females vs 77% in males, $p=0.452$), or age (8.8+/-5.9 vs 7.0+/-5.1, $p=0.391$). In terms of immediate adverse reactions to the IV infusion, 7 (11%) experienced at least 1 side effect, with the most common being behavior change (n=6) or gastrointestinal discomfort (n=4); no episodes of anaphylaxis or extravasation were noted.
Conclusion: These data provide additional support for the efficacy and safety of IV iron for pediatric RLS, PLMD, and restless sleep recalcitrant to oral iron.
Support (If Any):

0499

SLEEP AND NEUROCOGNITION IN ADOLESCENTS WITH ADHD: A POLYSOMNOGRAPHIC STUDY

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Introduction: Sleep disturbances are common among adolescents with ADHD; however, few studies have characterized the nature of ADHD-related sleep problems using the gold-standard sleep measure, polysomnography (PSG), in adolescence. Additionally, although similar cognitive deficits are common across ADHD and sleep-disordered populations, the potential role of sleep in contributing to cognitive impairment in adolescent ADHD is unknown. This study investigates differences in PSG-measured sleep among adolescents with ADHD versus healthy controls without psychiatric disorders (HC) and associations with cognition.

Methods: Sixty-two adolescents aged 13-17 (31 ADHD, mean age=15.3, 50% female) completed a psychiatric evaluation and 3 nights of ambulatory PSG. Following the third night, participants completed the Cambridge Neuropsychological Test Automated Battery (CANTAB). Sleep variables were averaged over 3 nights. Linear regressions controlling for age and sex examined group differences in a range of traditional PSG and spectral EEG indices as well as relationships between PSG/spectral indices and cognition (two summary scores derived from CANTAB: response accuracy and response time) within the ADHD group.

Results: Adolescents with ADHD displayed reduced SWS% ($F(3,51)=9.67$, $p=.003$), increased N2% ($F(3,51)=10.35$, $p=.002$), increased relative sigma ($F(3,47)=6.55$, $p=.01$) and beta ($F(3,47)=4.10$, $p<.05$) power, and a trend toward reduced relative delta power ($F(3,47)=2.95$, $p=.09$) compared to HC. Within the ADHD group, greater REM% ($r=.43$), reduced N2% ($r=-.55$), greater relative delta power ($r=.52$), higher delta power peak ($r=.56$), steeper delta decline overnight ($r=-.56$), and reduced relative theta ($r=-.53$), beta ($r=-.74$), and gamma ($r=-.67$) power were associated with better response accuracy (p's$<.05$). Greater relative delta ($r=-.51$), and reduced relative theta ($r=.55$) and beta ($r=.63$), power were associated with faster response times.

Conclusion: Although adolescents with ADHD did not differ from HC on traditional PSG measures (TST, WASO), they exhibited abnormalities in sleep stage distribution and non-REM EEG frequency spectral indices, including reduced SWS and low frequency power and increased stage 2 sleep and high frequency power overnight. Notably, similar parameters were associated with impaired cognition, suggesting sleep may contribute to cognitive deficits in ADHD. Future studies may clarify whether sleep plays a causal role in cognitive impairments in adolescent ADHD and if sleep treatments result in improved cognition in this population.

Support (If Any): K23MH108704

0500

INCREASED ADHERENCE TO LIGHT THERAPY AND PSYCHOSOCIAL OUTCOMES IN ADOLESCENTS AND YOUNG ADULTS WITH CANCER

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Introduction: Adolescent/young adult (AYA) oncology patients consistently report fatigue as one of the most distressing symptoms during treatment. Bright white light (BWL) has been demonstrated to improve the symptoms of cancer-related fatigue in adults, and our prior research demonstrated feasibility, acceptability, and preliminary efficacy of BWL in AYA with cancer. As part of the trial examining the feasibility and acceptability of BWL in AYA, we explored whether adherence affected patient outcomes in the BWL group.

Methods: Twenty-seven participants were randomized to receive BWL using LiteBook® (retrofitted with adherence monitors) for 30 minutes upon waking daily for eight weeks. Study team members met with patients weekly for the duration of the intervention to download adherence data from the monitors, administer questionnaires, and discuss barriers to adherence if necessary. Participants completed mood, quality of life, and fatigue measures at every other research visit (5 times over the duration of the study).

Results: Adherence was characterized by total number of days that participants used the light device while on study. Multivariate regression was used to examine the predictive relationship between adherence and patient outcomes. Adherence significantly predicted parent-reported physical functioning [$\beta=1.45$, $p= 0.0079$], emotional functioning [$\beta=0.87$, $p=0.0137$], and total health-related quality of life [$\beta= 0.76$, $p= 0.0218$]. Adherence did not predict any of the self-reported patient outcomes.

Conclusion: BWL is a promising treatment to improve cancer-related fatigue in AYA, and adherence is essential to treatment success. Although adherence did not predict any participant self-reported outcomes, participants with better adherence had improved parent-reported emotional and physical functioning and overall quality of life. Individually tailored interventions, including sleep hygiene psychoeducation and motivational interviewing, may be used to increase adherence to light therapy to improve patient outcomes. Measures to monitor and foster adherence should be included in future light therapy trials.

Support (If Any): This research was funded and supported by ALSAC.

0501

SLEEP PATTERN CHANGES TWO YEARS AFTER PARTICIPATING IN THE MAKOS SLEEP STUDY: THE EFFECT OF EXTENDING TOTAL SLEEP TIME AND WEIGHTED BLANKETS ON TEENAGE SWIMMERS PERFORMANCE

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Introduction: The initial Makos study was conducted in 2019, studying the effect of extending total sleep time and the use of weighted blankets (ETST+WB) on teenage swimmers' performance. In it, we found a significant improvement of 100-free style race time in teenage swimmers after ETST+WB. The aim of the

current follow-up study is to evaluate the sleep pattern of the same swimmers after 2 years.
Methods: Using an open-label prospective approach, the study investigated swimmer's event time changes, total sleep time, daytime sleepiness, and other sleep measures after 2 years of the initial changes during the first study. 8 healthy swimmers on the Makos swim team filled follow-up questionnaires and participated in a 100-yard freestyle race. Descriptive statistics, frequency distributions, and correlation using SPSS 14.
Results: Eight (6F; 2M) of the initial nine seasonal teen swimmers participated (age 13-17). Four swimmers reported headaches and one reported sore throat in the morning. Three (37.5%) reported feeling sleepy during the day and 3 reported falling asleep when riding in a car. Two reported leg movements during the night. In two years after the initial study, 100-free race time significantly improved (65.01*5.38 vs 59.32*5.43 p=0.003), but the positive effect of ETST+WB on recorded sleep time was lost and returned to baseline. There was a clear trend, but no significant difference in total sleep time among the 3 groups: (initial 8:45 *0:32; after ETST+WB 9:17*0:32; after 2 years 8:08*0:30).
Conclusion: The improvement of total sleep time with weighted blankets and encouragement during the initial study correlated with improvement of 100 free race time in seasonal teen swimmers. This improvement in total sleep time was lost and returned back to baseline after 2 years follow up.
Support (If Any): The authors report no financial relationship with any company whose products are mentioned in this manuscript, or with companies of competing products. Participants will be able to keep SKY Grand activity trackers at the end of their participation.

0502

HARMONY IN THE SLEEP LAB: A FOCUS ON RECOGNITION OF HYPOVENTILATION AND DIRECT FEEDBACK IMPROVES QUALITY OF PEDIATRIC TITRATIONS

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Introduction: Over 350 pediatric polysomnogram titrations (T-PSGs) are performed each year at the Sleep Laboratory at Children's Hospital of Philadelphia in three locations by 24 different polysomnography technologists (PSGTs) on a diverse patient population, typically performed as outpatient procedures and occasionally at the bedside as inpatients. PSGTs are responsible for titration of continuous or bilevel positive airway pressure based on flow, work of breathing, arousals, and/or gas exchange. PSGTs have varying degrees of experience; thus, maintaining quality of T-PSGs is challenging. We hypothesized that a quality improvement (QI) approach to reviewing T-PSGs with interdisciplinary education and regular feedback would improve T-PSGs. Our goal was to have >/= 80% of titrations of optimal quality.
Methods: Each T-PSG record was reviewed by a sleep physician for optimal quality, defined as appropriate signal integrity, titration, and documentation to permit definitive interpretation. Exclusion: RAM cannula use, illness, or external signal interference. Titration QI (T-QI) comments were reviewed by the sleep lab QI team bi-weekly to plan feedback. Improvement interventions for PSGTs included didactic education: lectures, presentations, and cases focusing on recognition of hypoventilation; direct feedback with teaching points by sleep physician and small group sessions with clinical supervisors to review areas for improvement; and communication of specific titration goals. Satisfaction surveys regarding recognition/titration for OSA/hypoventilation, transcutaneous CO2 signal integrity, and documentation were administered to sleep physicians.
Results: From September 2020-November 2021, PSGT education included: 1 synchronous and 2 asynchronous didactic presentations; 1:1 review of didactics with each night PSGT (n=24); T-QI feedback (2/week); and small group review sessions (4/week). 408 titrations were completed; 42 (10.3%, 2.8/month) were excluded; 366 (89.7%, 24.4/month) were reviewed for T-QI. 54.8% [50,71%] were deemed optimal during the first three months (pre-intervention) vs. 80.1% [63,96%] during the intervention period. QI satisfaction survey showed improvement in 3 of 4 domains.
Conclusion: Quality of T-PSG is enhanced by QI review of each titration, highlighting teaching points and areas for improvement via direct feedback and small group review. Education and communication among physicians, supervisors and technologists are important to support development which can result in better titrations and satisfaction.
Support (If Any): none

0503

THE RELATIONSHIPS BETWEEN THE IMPACT OF COVID-19 PANDEMIC, PARENT INSOMNIA, INFANT TEMPERAMENT, AND INFANT SLEEP: A PATH ANALYSIS

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Introduction: Increased sleep problems in adults have been repeatedly reported during the COVID-19 pandemic. However, infant sleep was understudied. We aimed to examine the relationships between the impact of the COVID-19 pandemic, parent insomnia, infant temperament, and infant sleep during the COVID-19 pandemic.
Methods: Parents from the Phoenix metropolitan area with a full-term healthy infant (<1 year) were recruited through social media from 2/27/2021 to 8/7/2021. A sample of 70 parents (baby age 5.5±3.5mo; parental age: 31.7±5.0y) completed the COVID-19 Exposure and Family Impact Survey Part 2 (CEFIS-Part 2, range: 12-60), a measure of the impact of the COVID-19 pandemic on families with higher scores indicating greater negative impact/distress; the Brief Infant Sleep Questionnaire-Revised (BISQ-R, range: 0-100), with higher scores indicating better sleep quality, more positive sleep perception, and parent behaviors promoting healthy sleep; and the Insomnia Severity Index (ISI, range: 0-28, cutoff: 10). Infant temperament was assessed with the Infant Behavioral Questionnaire-Revised (IBQ-R), including the subscale Negative Affect. Path analyses were conducted based on the Transactional Model of Infant Sleep to identify the direct effect of CEFIS scores, and indirect effects of parent ISI scores and infant IBQ-R Negative Affect scores on BISQ-R scores, with z scores of all variables and infant age as a covariate.
Results: The parent sample was predominantly female (94.3%), identified as White (72.9%), had obtained a bachelor's degree or above (71.5%), was married or in a domestic partnership (98.6%), and had household incomes >

US$70,000 (57.1%). More than one third (35.7%) experienced insomnia symptoms. The means of CEFIS, ISI, IBQ-R subscale Negative Affect, and BISQ-R scores were 29.3±9.5, 8.7±5.2, 4.1±1.1, and 68.8±12.7, respectively. After adjusting for infant age, the COVID-19 related family impact was not directly associated with BISQ-R scores, whereas parent ISI scores (β=-0.11, 95%CI [-.25, -.01]) and infant IBQ-R Negative Affect scores (β=-0.10, 95%CI [-.25, -.002]) significantly mediated the relationship.

Conclusion: The study highlighted the indirect effects of parent insomnia symptom severity and infant negative affect on infant sleep from the family impact of the COVID-19 pandemic. Future research should investigate how best to support healthy sleep for families during global crises.

Support (If Any):

0504

IDENTIFYING RISK FACTORS FOR DEVELOPING SLEEP DISORDERS

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Introduction: Sleep disorders in the pediatric clinical setting are often overlooked and under-screened. The study compared a set of clinical behavior questions and physiological risk factors with potential to increase the risk for sleep disorders within children.

Methods: A retrospective archive from electronic medical records was analyzed from 695 pediatric patients, 7-14 years old, that visited a pediatric clinic from March-November of 2019. Children or their parents reported on the presence of eight behavioral and physiological factors on the Kids Sleep Screener Questionnaire (KSSQ), which were used as potential risk factors for sleep disorders. The propensity of daytime sleepiness was measured using the Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD). Univariate analysis was performed to find frequencies to summarize the risk factors. Chi square test was used to test for associations between risk factors and ESS-CHAD. Multiple logistic regression (MLR) was used to predict different combinations of factors with ESS-CHAD. Odd ratios (ORs) and 95% CI were used to quantify the level of association. Receiver operating characteristic (ROC) with area under the curve analysis was used to compare three MLR models.

Results: The risk factors were positively ($p<0.05$) associated with ESS-CHAD. Excessive daytime sleepiness and increased sleep duration were risk factors with greater potential to predict sleep disorder. They presented 3 times greater ($p<0.05$) potential to predict sleep disorder than snoring, and 4 times than restless sleep and sleep onset latency. The two combined risk factors with greatest potential to predict sleep disorder are restless sleep with excessive daytime sleepiness, and sleep onset delay with excessive daytime sleepiness.Risk for potential sleep disorders is best assessed when considering the different risk factors with gender. Considering gender, the risk factors with greatest relationship to predict potential sleep disorders were sleep duration, excessive daytime sleepiness, night wakings and the previous discussed combinations (restless sleep with excessive daytime sleepiness, and sleep onset delay with excessive daytime sleepiness).

Conclusion: The Kids Sleep Screener Questionnaire is a potential tool to predict sleep disorder. Further studies are warranted to explore the behavior and physiological risk factors with potential to increase the risk for sleep disorders.

Support (If Any):

0505

MAINTENANCE OF WAKEFULNESS TEST CHARACTERISTICS IN PEDIATRIC POPULATIONS WITH CENTRAL HYPERSOMNIA

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Introduction: Children with central hypersomnia often have residual daytime sleepiness despite treatment with medical therapies. The Maintenance of Wakefulness Test (MWT) is an objective measure used to assess daytime alertness and responsiveness to treatment in patients with hypersomnia. There are limited data on MWT characteristics among pediatric populations. The purpose of this study was to: (1.) Compare MWT characteristics and subjective assessment between patients who passed and failed the MWT; (2.) Determine clinical management changes following MWT.

Methods: A retrospective review was conducted of all children who underwent MWT at Cincinnati Children's Hospital Medical Center from September, 2008 to June, 2021. Pass and fail assessment designations were determined by the clinician as recorded in the medical record. Demographics, Epworth Sleepiness Scores (ESS), MWT characteristics, and pharmacological modifications were recorded. A majority of patients underwent MWT prior to driving. Descriptive statistics as well as Chi-square, Fisher's exact, and Wilcoxon rank-sum testing were utilized. All variables were reported as medians with interquartile ranges.

Results: 109 MWTs were performed on 79 children with a median age of 17.7 years [16.6, 18.6]. MWTs were indicated for 4 primary diagnoses: hypersomnia (n=5), idiopathic hypersomnia (n=11), narcolepsy type 1 (n=56), and narcolepsy type 2 (n=37). 55 (50.5%) were documented as pass (P) and 54 as fail (F). No differences in age (17.5 years) [16.2,18.5] (P) vs. (17.8) [16.9,18.9] (F) (p=NS) or other demographics existed between the two groups. As expected, mean sleep latency was significantly higher among those who passed (37.3 minutes) [31.2,40.0] (P) vs. (10.8) [7.9,16.6] (F) ($p<0.001$). However, no significant differences were observed in ESS 12.0 [8.0,17.0] (P) vs. 11.0 (6.0,14.0) (F) (p=NS). Pharmacologic adjustments were made in 42/54 (77.8%) (F) vs. 17/54 (31.5%) (P). Medications were not modified in 12/54 (22.2%) (F) assessments.

Conclusion: MWT provides useful objective assessment and often leads to management changes in adolescents with central hypersomnia. A subjective sleepiness assessment (ESS) does not correlate with objective MWT assessments. We speculate that an altered perception of sleepiness in children with hypersomnia may play a role in the inaccuracy of subjective assessments commonly utilized in clinical practice.

Support (If Any): Cincinnati Children's Research Foundation.

0506

CLINICAL EFFICACY OF INTRAVENOUS FERRIC CARBOXYMALTOSE FOR RESTLESS LEGS SYMPTOMS AND LOW SERUM FERRITIN IN CHILDREN WITH AUTISM SPECTRUM DISORDER

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Introduction: Restless legs syndrome (RLS) may be underdiagnosed in children with autism spectrum disorder (ASD) due to difficulty expressing the symptoms in their own words. In addition, administration of oral iron may be particularly difficult in ASD children.
Methods: Retrospective case series of children with ASD, restless legs (RL) symptoms, and serum ferritin <30 µg/L treated with intravenous (IV) ferric carboxymaltose (FCM). Patients received a single dose of IV FCM, 15 mg/kg if weighting <50 kg or 750 mg if weighting >50 kg. Data collected included presenting symptoms, serum ferritin, iron profile, and Clinical Global Impression Scale (CGI-Severity pre-infusion and CGI-Improvement post-infusion).
Results: Nineteen subjects, 4-11 years old (12 male, median age 6, interquartile range (IQR) were included. Thirteen children took melatonin, median dose 3 mg (IQR 1-6). Full RLS diagnostic criteria were identified in 6 verbal children (31.6%). RL symptoms in the 13 other children occurred at night and began or worsened during periods of rest or inactivity and included: need for a parent to rub or massage legs (5), fidgeting (2), wiggling (2), kicking (2), pacing (1), and discomfort (1), but improvement of symptoms with movement was difficult to determine. Baseline median values were ferritin 10 µg/L (IQR 10-16), iron 66.5 µg/dL (IQR 57-96), TIBC 382 µg/dL (IQR 360-411) and transferrin 19 mg/dL (IQR 14-28). Median CGI-S was 4 (moderate symptoms) (IQR 3-4). After IV FCM all measures improved and were statistically significant at the Wilcoxon test for paired datasets. Median ferritin was 68 µg/L (IQR 62.5-109, $p<0.00045$). The median CGI-I was 1 (very much improved) (IQR 1-2). All children meeting full RLS criteria improved. Three children in the RL symptom group did not improve. Children meeting the full RLS criteria had lower baseline ferritin levels than those with a suspected diagnosis (9 µg/L, IQR 9-10 vs. 13 µg/L, IQR 10-16, Mann-Whitney test $p<0.045$).
Conclusion: The majority of children (84.2%) with ASD and RL symptoms had clinical improvement after IV FCM. All serum iron parameters improved significantly after a single IV infusion.
Support (If Any): None

0507

PREVALENCE AND COMPONENTS OF NAPTIME VS. BEDTIME ROUTINES IN YOUNG CHILDREN

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Introduction: Bedtime routines are a well-established sleep-promoting practice for young children; however, little is known about the prevalence or components of naptime routines. Thus, the aim of this study was to explore the prevalence and activities (e.g., feeding, hygiene components) of home-based naptime routines for infants and toddlers.
Methods: Mothers of 465 infants and toddlers (4-36mos; M=18.5mos) completed an online questionnaire addressing questions about naptime routines and behaviors, as well as the Brief Infant Sleep Questionnaire–Revised (BISQ-R). The sample included infants (4-11.9m; n=147), younger 1-year-olds (12-17.9m; n=87), older 1-year-olds (18-23.9m; n=75), and 2-year-olds (24-36m; n=156).
Results: Overall, 95% (n=440) reported that their child naps at home, and 65% (n=301) indicated having a naptime routine lasting approximately half an hour (M=29.0 minutes; SD=31.0). As compared to 54% reporting a consistent naptime routine (³5 times per week), ranging from 50% in 2yos to 62% in younger-1yos, 81% had a consistent bedtime routine. Overall, mothers reported a mean 69.0% (SD=24.4) similarity between naptime and bedtime routine steps. A bath (18% at naptime vs. 90% at bedtime), washing-up (30% vs. 56%), lotion use (23% vs. 80%), breastfeeding/breastmilk (21% vs. 37%), and feeding to sleep (44.% vs. 47%) were less prevalent at naptime than bedtime. Prevalence ranges by age group were: bath 12% (2yos) to 23% (infants) at naptime and 84% (infants) to 93% (2yos) at bedtime; washing-up, 28% (infants) to 34% (older-1yos) at naptime and 54% (younger-1yos) to 58% (infants) at bedtime; lotion application, 19% (2yos) to 29% (younger-1yos) at naptime and 78% (2yos) to 83% (younger-1yos) at bedtime; breastfeeding, 8% (2yos) to 35% (infants) at naptime and 13% (2yos) to 65% (infants) at bedtime; and feeding to sleep, 31% (2yos) to 57% (infants) at naptime and 35% (2yos) to 58% (infants) at bedtime.
Conclusion: Overall, nearly all infants and toddlers napped, and just over half reported having a naptime routine. Naptime routines were much less prevalent than bedtime routines, but overall contained similar activities. Feeding behaviors across naptime and bedtime routines were more similar than hygiene components (e.g., bath), with slight variation by age. Psychoeducation about a naptime routine's potential benefit may be warranted.
Support (If Any): Johnson & Johnson Consumer Inc., Skillman, NJ, USA

0508

MATERNAL PERCEPTIONS OF NAPS IN YOUNG CHILDREN

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Introduction: Sleep in young children affects both family functioning and maternal mental health and well-being. However, little is known about parental perceptions about daytime sleep. Thus, the aims of this study were to determine maternal perceptions of (1) naps overall, and (2) how naps impact child and maternal functioning.
Methods: Mothers of 465 infants and toddlers (4-36mos; M=18.5mos) completed an online questionnaire addressing questions about maternal nap perceptions, as well as the Brief Infant Sleep Questionnaire–Revised (BISQ-R). Global nap perceptions were categorized as positive or negative. Perceived impact on mother and child was also assessed.
Results: Overall, 95% (n=440) reported that their child napped. The majority of mothers agreed that naps were important (98.2%). Over one third (38.9%) wanted to change something about their child's naps and 28% reported that naps are a problem. Furthermore, the majority of mothers believed that naps were an important part of their child's day (94.6%), and that when they

nap well their child is in a better mood (97.3%), more easy-going (95.7%), has fewer tantrums (88.7%), and is a better listener (84.4%, toddlers). Fewer mothers reported that their child's nap is frustrating (21.8%) or are more trouble than they are worth (4.1%). Just under half wished their child fell asleep faster/easier for naps (49.0%), and one third wished they napped longer (35.5%).Finally, the majority of mothers believe that their child's naps are an important part of their own day (94.1%), improve their own mood (87.1%) and make them feel more calm (89.9%). When their children nap, mothers can nap themselves (51.0%), get more done in the house (91.5%), get more work done (87.4%), spend more time with others (77.9%), and spend more time doing things for themselves (79.5%).

Conclusion: Overall, the vast majority of mothers believe that their child's naps are important for their child, as well as for themselves. However, one third report that their child's nap is problematic, almost one half want to change something (e.g., that their child fell asleep faster/more easily and napped longer). Future studies are needed focusing on interventions for daytime sleep issues to improve both child and family functioning.

Support (If Any): Johnson & Johnson Consumer Inc., Skillman, NJ, USA

0509

BEHAVIORAL TOPOGRAPHY OF BEDTIME RESISTANCE IN YOUNGER AND OLDER TODDLERS

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Introduction: Sleep issues in young children are common, however little is known about bedtime resistance across development in toddlers. Thus, the aims of this study were to (1) assess the prevalence of bedtime resistance in younger and older toddlers and (2) examine differences in behavioral topography across groups.

Methods: 318 mothers of toddlers (12-36 mos; M =23.1 mos) completed an online questionnaire addressing bedtime resistance, as well as the Brief Infant Sleep Questionnaire–Revised (BISQ-R). The sample included both younger (n=162, 12-23mos) and older (n=156, 24-36mos) toddlers.

Results: Overall, 61.3% endorsed bedtime stalling/fighting/resisting, with no age difference (57.4% younger vs 65.4% older), $p > .05$. Bedtime resistance commonly occurred after lights out (60% of those who resisted). Resistance also occurred during the bedtime routine (55.9%) and with announcement of bedtime (36.9%). Older toddlers were more likely to resist at announcement of bedtime (51.0% vs. 21.5%, $p< .001$), with no other age differences for resistance timing. Of the 21 resistant behaviors assessed, younger toddlers were most likely to cry/tantrum (68.8% vs 48.0%) and climb (or attempt) out of the crib (28.0% vs 12.7%), $p < .01$. Older toddlers were more likely to engage in 16 behaviors, including these most common: wanting a snack/drink (19.4% vs. 57.8%), adult to hug/snuggle/lie down (23.7% vs 53.9%), more time doing a bedtime activity (19.4% vs 49.0%), or a specific item (19.4% vs. 46.1%), getting out of bed (25.8% vs 46.1%), or watching electronics (24.7% vs 42.2%), $p < .01$.

Conclusion: Most mothers (61%) reported that their toddler resisted in some way at bedtime. No differences in the prevalence of bedtime resistance were found between younger and older toddlers, however the behavioral presentation of resistance differed. Whereas younger toddlers were more likely to cry and attempt climbing out of the crib, older toddlers were more likely to make specific verbal requests and requesting specific activities. These differences likely stem from developing language, motor, and cognitive skills. Ways to help caregivers manage these common bedtime behaviors need to be age and developmentally-based, aligning with presenting behavioral difficulties.

Support (If Any): Johnson & Johnson Consumer Inc., Skillman, NJ, USA

0510

PARENT AND CHILD PERCEPTION OF SLEEP FOR CHILDREN WITH SENSORY PROCESSING DIFFICULTIES

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University of Pittsburgh [1]

Introduction: Roughly 5.3 million elementary children in the United States experience sensory processing (SP) difficulties, like sensitivity to touch and overstimulation with movement. These difficulties cause high levels of daytime stress and daytime dysfunction (e.g., difficulties with attention, academics, and emotional regulation). In typically developing children (without SP difficulties), high levels of daytime stress impact sleep; however, research has yet to explore sleep health in children with SP difficulties. Our study aims to use validated self- and parent-reported questionnaires to characterize differences in sleep health for children with and without SP difficulties.

Methods: Children (ages 6-10) with (n=22) and without (n=33) SP difficulties (per parent report; Autism and ADHD diagnosis excluded) were recruited for this convergent mixed-methods study. Sleep was assessed using validated self- and parent-report questionnaires, the Sleep Self-Report (SSR) and Children's Sleep Habits Questionnaire (CSHQ), and through qualitative interviews with parents. Groups were compared using t-test and Mann-Whitney U tests, with significance set a priori at $\alpha=0.05$. A rapid qualitative analysis produced themes and were integrated with the quantitative data.

Results: Parents of children with SP report significantly worse sleep quality on the CSHQ difficulties (MedianSP= 50.5, SDSP= 11.45) than parents of children without SP difficulties (MedianCON=43.0, SDCON=7.27, U= -2.92, p=.004). Children with SP deficits also report significantly worse sleep on the SSR (MSPD=42.18, SDSPD=8.26) compared to their peers (MCON=33.55, SDCON=6.71, t(53)= -4.26, p<.001). Qualitative themes highlight the higher prevalence of rigid, lengthy bedtime routines and adaptations within the sleep environment (e.g. specific pajamas, special bedding) to support sleep for children with SP difficulties. Parents of children with SP difficulties also report higher frequencies of an adult being in the room while the child falls asleep and co-sleeping in the middle of the night.

Conclusion: Parents and children both report poorer sleep in children with SP difficulties when compared to peers. Future studies should incorporate other sleep health measurement tools (e.g. actigraphy) to further understand areas to target for intervention.

Support (If Any): Sensory Integration Education Network PhD Grant (PI: Hartman, 2021); University of Pittsburgh's School of Health and Rehabilitation Science's PhD Student Award (PI: Hartman, 2021).

0511

SLEEP PROFILES IN CHILDREN WITH 22Q DELETION SYNDROME: A STUDY OF 100 CONSECUTIVE CHILDREN SEEN IN A MULTIDISCIPLINARY CLINIC

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Introduction: While previous studies have suggested a high prevalence of sleep disorders in children with 22q deletion syndrome (22qDS), they were limited by potential selection bias. In the current investigation, we assessed sleep characteristics in 100 consecutive children presenting to a multidisciplinary clinic.
Methods: Chart review of consecutive children presenting to 22qDS multidisciplinary clinic was performed. Children aged 2 to 17 years of age were included, and data were abstracted including sleep characteristics (sleep history, Childhood Sleep Habits Questionnaire [CSHQ], and free response questions), comorbid medical conditions, and demographics.
Results: Overall, 100 children were included in analysis, 85% of whom had scores on the CSHQ consistent with clinically meaningful sleep disorder. Sleep problems were common in all domains of the CSHQ, including daytime sleepiness (66%), sleep onset delay (54%), parasomnias (52%), night wakings (52%), sleep disordered breathing (49%), sleep duration (45%), bedtime resistance (38%), and sleep anxiety (33%). Overall CSHQ score was significantly associated with daytime behavioral problems and speech delay ($F(2,97) = 10.4$, $p < 0.001$, adjusted $R2 = 0.16$). The most common interventions reported to be helpful for sleep by parents were behavioral (routine, bedtime story), environmental (light avoidance at night, calming music), and pharmacologic (melatonin, clonidine).
Conclusion: These data confirm a high prevalence of sleep disorders in a large, unselected sample of children with 22qDS, and suggest an important relationship between sleep dysfunction and daytime behavioral challenges. Our findings highlight the potential role for multimodal treatment approaches including behavioral, environmental, and pharmacologic interventions.
Support (If Any):

0512

CONCURRENT AND LONGITUDINAL LINKAGES BETWEEN BEDTIME ROUTINES AND SOCIAL-EMOTIONAL DEVELOPMENT IN TODDLERS

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Introduction: Sleep is important for optimal development in early childhood. Instituting a consistent bedtime routine is an empirically supported behavioral intervention to promote early childhood sleep health. However, prior work has focused on the benefits of a bedtime routine for sleep outcomes, with little research on its potential benefits to social-emotional development. Thus, the current study examined concurrent and longitudinal associations between a consistent bedtime routine (defined as 5 or more nights per week) and social-emotional development in toddlers (ages 12.0 to 19.9 months).
Methods: Caregivers of 32 infants (M = 12.5mos, 59.4% female) completed baseline questionnaires about the frequency of their child's bedtime routine and other evening activities at their scheduled 12-month well-child visit. At their child's 15-month well visit, caregivers completed questionnaires including items on bedtime routine frequency, the communication and personal-social subscales of the Ages and Stages Questionnaire (ASQ), and the Brief Infant-Toddler Social and Emotional Assessment (BITSEA).
Results: Over half (59.4%) of caregivers reported a consistent child bedtime routine at 12 months and nearly three quarters (71.9%) reported a consistent bedtime routine at 15 months. Linear regression showed that having a consistent bedtime routine at 15 months was significantly associated with fewer concurrent social-emotional problems on the BITSEA, $B = -2.40$, $p = .009$, 95% CI [-3.86, -.94]. Toddlers who scored above the BITSEA cutoff for social-emotional concerns (31.3%) were engaged in a consistent bedtime routine less frequently (M = 4.50 nights/week) than those below the cutoff (M = 6.18 nights/week), $p = .004$, $\eta 2 = .24$. However, bedtime routine frequency at 12 months did not predict 15-month BITSEA concerns, $p > .05$. No associations emerged between bedtime routine frequency at 12 or 15 months and the communication and personal-social ASQ scores.
Conclusion: A consistent bedtime routine is concurrently, but not longitudinally, associated with positive social-emotional development, including less frequent clinically significant concerns, in toddlers at 15 months of age. Bedtime routine frequency was not linked to communication or personal-social interactions. Implementing a consistent bedtime routine may be a feasible method to promote toddlers' social-emotional development within the context of concerns.
Support (If Any): This study was partially funded by the Simms/Mann Institute

0513

SLEEP IN CHILDREN IN NEED OF A BED AND LIVING IN POVERTY

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Introduction: Healthy sleep is important for child development, with youth living in poverty and especially those who do not have a bed at greater risk for sleep issues. This study assessed sleep in school-aged children identified by social services as needing a bed and living in poverty.
Methods: Fifty-two families (100% living ≤ 100% of the US poverty line) of children ages 8-12 years (M= 9.65; 55.8% girls; 61.5% non-Latinx Black) referred to a non-profit bed provision program completed Patient-Reported Outcomes Measurement Information System (PROMIS) measures of child sleep disturbances, sleep-related impairment, and sleep practices prior to bed provision. Comparisons were made to normative data for each measure based on converted T-scores/means.
Results: T-scores (M = 50; SD = 10) for caregiver and child reported child sleep disturbances (M= 46.81 and 47.22, respectively) and sleep-related impairment (M= 56.82 and 53.33, respectively) fell within the normal range. Although few caregiver-child dyads reported clinically significant (> 1 SD above the mean) child sleep disturbances (7.7% and 10.8%, respectively), 30.7% of caregivers and 27.4% of children reported clinically significant child sleep impairment scores compared to an expected rate of 15.9% from normative data. Regarding sleep practices, few caregiver (11.5%) and child (9.8%) reports of problematic sleep timing and caregiver-rated child bedtime routine inconsistency (13.5%) were > 1 SD above the normative mean. However, 25.5% of youth reported inconsistent bedtime routine scores > 1 SD above the normative mean, while 25.0% of caregivers and 31.4% of youth reported scores > 1 SD above the

normative mean for child difficulty falling asleep without caregiver presence at bedtime. The prevalence of these elevated scores were greater than the expected prevalence of 15.9% in normative data.
Conclusion: Overall, children living in poverty and without an individual bed score similar to normative samples on sleep measures. However, a greater proportion of youth in this sample showed clinically significant sleep impairments and poor sleep practices compared to normative data. Future studies are needed to understand and promote healthy sleep among youth living in poverty.
Support (If Any): American Academy of Sleep Medicine Foundation

0514

RISK FACTORS FOR SYMPTOMS AND SIGNS OF SLEEP APNEA IMPACTING QUALITY OF LIFE IN AN URBAN PEDIATRIC COMMUNITY-BASED SAMPLE

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Introduction: Pediatric obstructive sleep apnea (OSA) disproportionately affects children from minority groups and children living in disadvantaged neighborhoods, but the risk factors that drive this risk are not well understood. We investigated the relationship between minority race/ethnicity, household risk factors (smoking, socio-economic status [SES]), and neighborhood disadvantage with OSA-related quality of life (QOL) scores in participants in the Environmental Assessment of Sleep Youth (EASY) observational study.
Methods: Families of children 5-12 years old recruited from largely low-income Boston-area neighborhoods participated in an extensive in-home evaluation of OSA risk factors. OSA-related QOL was assessed with parent-reported OSA-18 questionnaire (values >37 indicative of negative impact of symptoms and signs of OSA on QOL). Secondhand smoking (SHS) was defined by parent-report of smoking in the home. Neighborhood disadvantage was characterized using geocoded addresses, calculating the Neighborhood Socioeconomic (NSES) index. We performed logistic regression with OSA-18 >37 as the dependent variable and age, gender, race/ethnicity, BMI, household smoking, household measures of SES and NSES index as independent variables.
Results: The sample included 256 children (40%-Hispanic ethnicity, 31%-Black, 20%-White, 9%-Other; 56% were female), with a mean age 9.1±1.9 and BMI percentile 69.9±29.8. 33% and 40% of children were from households with income <$25,000 and $25,000-$75,000, respectively, and 10% had SHS exposure. Mean NSES index was 47.9±15.4 (national average of 50). An elevated OSA-18 was reported for 35% of participants and significantly associated with Hispanic ethnicity and smoking exposure (OR=2.16, CI 1.01-4.62 and OR=2.71, CI 1.2-6.3) after adjusting for age, gender, and BMI percentile. Further adjustment for family income attenuated the association of OSA-18 with Hispanic ethnicity, but a significant association with household smoking persisted. NSES index and BMI percentile were not associated with OSA-18.
Conclusion: High symptoms and signs of OSA impacting QOL were associated with Hispanic ethnicity, household smoking and SES in this diverse cohort of children living in urban and predominantly low-income communities. The study points to the need for strategies to reduce household smoking as one strategy for decreasing sleep health disparities, and the further need to understand other factors associated with low SES that increase risk for poor sleep health.
Support (If Any): NIH-NHLBI/T32HL007901, R35HL1358181, P30ES000002, K24AI106822, R01Hl137192, K23ES031663

0515

A MIDDLE SCHOOL AND HIGH SCHOOL SLEEP TRENDS IDENTIFIED BY A SCHOOL BASED SLEEP SCREENING PROGRAM

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Introduction: WUAL is a population based preventative sleep screening and education program for 7th to 12th graders through an asynchronous virtual platform. A descriptive summary of the program has been presented previously. First year results of a partnership with a middle school and high school with established delayed school start times are available and reveal unique trends across the academic year and specific patterns that differ between 7th-9th grade and 10th-12th grade.
Methods: The WUAL team consists of a board-certified pediatric sleep specialist, school guidance counselor and 2 project managers. The Protection of Pupil Rights Amendment (PPRA) was considered. A letter describing the program with an opt-out option was provided to parents prior to survey distribution. Survey data was captured using REDcap and included the Epworth sleepiness scale -CHAD (ESS) and the childhood sleep habits questionnaire (CHSQ). The surveys were completed at two-time points: December 2020 and April 2021. WUAL website was developed to serve as an educational resource and to access the surveys.
Results: A total of 346 students participated. Average weekday sleep reported by 7th- 9th graders was 8.6 hours (mean 8.9, 9 and 8 hours respectively). Average weekday sleep reported by 10th-12th graders was 7.1 hours (mean 7.1, 7 and 7.3 hours). Pairwise comparisons showed that students' raw scores on both the ESS and the CSHQ decreased from December to April (ps ≤ .002). To examine the clinical significance of these changes, students' trajectories were examined. There were 4 specific patterns of responses identified over the 2 time points: normal to normal, normal to pathologic, pathologic to normal and pathologic to pathologic. Despite the significant changes in raw scores, between 1/3 and ½ of the students with pathologic responses remained pathologic.
Conclusion: This method of screening has demonstrated a high degree of successful completion. Sleep patterns evolve over the course of the school year and for at least half of students appear to improve. There are additional differences observed between younger and older teenagers as observed by weekday sleep hours reported in 7th to 9th grade students compared to 10th to 12th grade students.
Support (If Any): Grant Funding Support from Jazz Pharmaceuticals and Janet Weis Children's Hospital (Geisinger)

0516

CHARACTERIZING SLEEP AND MOOD DURING COVID FOR YOUTH WITH ALLERGIC DISEASE

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Introduction: The COVID-19 pandemic significantly disrupted the daily lives of children and adolescents. This study aimed to characterize sleep and mood during COVID in youth with asthma and/or eczema at two times: shortly after the lifting of stay at home orders (Summer 2020 [T1]) and after youth returned to school (Winter 2021 [T2]).
Methods: Pediatric PROMIS measures (Sleep Disturbances, Sleep-Related Impairment, Anxiety, Depressive Symptoms) and the Pediatric Sleep Practices Questionnaire were administered through REDCap. Parents of younger children (YC, 5-7 years, n=16) completed proxy measures for their children, while older children (OC, 8-12 years, n=16) and adolescents (ADOL, 13-17 years, n=17) completed self-report measures.
Results: For YC, mean Sleep Disturbances T-scores significantly decreased between T1 and T2 (62.0 vs. 56.4, p=.02), with no significant changes in the other variables. For OC, there were no significant changes in mean T-scores for any of the outcomes. For ADOL, there was a significant increase in Sleep-Related Impairment between T1 and T2 (52.0 vs. 57.7, p=.003), as well as a significant increase in Depressive Symptoms (48.2 vs. 52.5, p=.04). At T1, technology use prior to bedtime was more common in ADOL (YC=37.5%, OC=37.5%, ADOL=88.2%). At T2, technology use was also more common in ADOL (YC=50.0%, OC=37.5%, ADOL=64.7%), with an increase in YC technology use and a decrease in ADOL technology use observed. Parental presence while falling asleep was greatest in YC at both time points, with no noted changes in any group across time (T1: YC=56.3%, OC=18.8%, ADOL=17.6%; T2: YC=50.0%, OC=25.0%, ADOL=11.8%).
Conclusion: This study was limited by a small sample size, but provides some insights into the sleep and mood of children and adolescents with allergic disease during the first year of the COVID-19 pandemic. Although YC had fewer sleep disturbances at T2, there was an increase in technology use prior to bedtime. For ADOL, some of the changes in sleep, technology use, and depressive symptoms were likely due to the return to school at T2. Finally, it was notable that multiple OC and ADOL required parental presence to fall asleep. Additional research is needed to understand how the ongoing pandemic is impacting children and adolescents.
Support (If Any):

0517

ASSOCIATION OF THC USAGE ON DIET, EXERCISE, AND SLEEP IN HISPANIC/LATINX TEENAGERS

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Introduction: Diet, exercise, and sleep are recognized as the three pillars of health, with the assertion that failure to address one will compromise the other two. We have previously observed an association between inhalant use on sleep in adolescents (JCSM 2021). Our previous data raised concern for disruption induced by nicotine among teenagers. Given the recent increase in THC consumption, we sought to test the hypothesis that THC use among teenagers and young adults would be associated with deleterious lifestyle factors including poor diet and minimal exercise. We further sought to test whether Hispanic/LatinX status was predictive of poor health practices.
Methods: We conducted a social media survey using Twitter and Instagram to gather data on willing participants. We obtained IRB approval and used validated instruments to gather data on variables of interest. We assessed past and current THC use including in what form (inhalant, edible etc) and concurrently obtained data on diet and exercise patterns using standardized questionnaires. People self reported race, ethnicity, gender, and other factors.
Results: Of the 471 responders who provided data, we removed suspicious data based on identical responses at a given time suggestive of 'bots'. We isolated the n=58 (37.3% Hispanic LatinX) who were in our target age range (13-25yrs) with complete data. For THC use, 27/58 participants (46.6%) responded "yes" to current usage, whereas 0 reported previous usage and 31 reported "no" (53.4%). Among people who self-identified as Hispanic/Latinx, 81.8% reported using THC currently whereas among people self-identifying as non-Hispanic, only 24.3% reported current THC use. Among the people reporting regular THC use, diet and exercise tended to be non-favorable compared to non-THC users. Of the 58 participants, only 19 reported never vaping (32.8%) while 15 (25.9%) reported vaping daily or weekly. For cigarettes only 20 people (34.5%) reported never using cigarettes whereas 14 (24.1%) reported using daily or weekly.
Conclusion: Based on our social media survey, we observed a high prevalence of vaping, cigarette smoking and THC use among adolescents and young adults. People who self-identified as Hispanic/LatinX reported high rates of THC use compared to non-Hispanic people. The implications of these findings for the sleep health of teenagers and young adults are unclear, but may provide a therapeutic target for future research.
Support (If Any): Dr. Crotty-Alexander is funded by VA Merit award and by NIH.

0518

CLINICAL CORRELATES, DIAGNOSIS, AND MANAGEMENT OF SLEEP-DISORDERED BREATHING IN YOUNG CHILDREN WITH DOWN SYNDROME

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Introduction: Individuals with Down syndrome (DS) have high rates of sleep-disordered breathing and demonstrate more severe manifestations of obstructive sleep apnea (OSA) compared with non-syndromic patients. The consequences of untreated OSA in childhood include pulmonary hypertension, cognitive dysfunction, and abnormal growth. The American Academy of Pediatrics recommends that children with DS have a sleep study by age four years. It is unclear if these guidelines are sufficient to address the burden of disease in very young patients. There is also a paucity of data regarding clinical characteristics associated with OSA and outcomes following medical or surgical intervention in this population.
Methods: A retrospective cohort study was performed at Cincinnati Children's Hospital Medical Center for all children with DS born between 2013-2019. Electronic medical record data were extracted including demographics, use of PSG, incidence of OSA, age at diagnosis, OSA severity, and interventions utilized. Statistical analysis used Fishers exact tests and analysis of variance with a significance threshold of $p < 0.05$.
Results: A total of 397 patients met inclusion criteria and 235 (59%) had a sleep study. Most patients (n = 221, 94%) had an abnormal PSG and 60% had moderate or severe disease. There was an inverse relationship between age at first sleep study and OSA severity ($p < 0.0001$). Most patients (82%) had a sleep study due to the presence of symptoms; among asymptomatic patients, 91% met polysomnographic criteria for

OSA. OSA severity was associated with increased rates of failure to thrive ($p < 0.01$), aspiration ($p = 0.005$), G-tube feeding ($p = 0.025$), and pulmonary hypertension ($p = 0.005$). Most patients (n=178, 79%) required multiple interventions to manage their OSA.
Conclusion: In this cohort of infants and young children with DS who underwent PSG, a majority had moderate to severe OSA. The pervasiveness of severe disease in young infants suggests that current surveillance guidelines are inadequate. Infants should be evaluated with PSG in the first month of life regardless of clinical symptoms. Further study is needed to prospectively evaluate the impact of early diagnosis and intervention on long term outcomes.
Support (If Any):

0519

SLEEP DYSFUNCTION IN RETT SYNDROME

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Introduction: Rett syndrome (RTT) is an X-linked neurodevelopmental disorder affecting females and is linked to mutations in the methyl-CpG-binding protein 2 (MeCP2) gene. Typical comorbidities in RTT include poor growth, feeding difficulties, hyperventilation and breath-holding, seizures, scoliosis, and disrupted sleep. A few studies indicate sleep disruption in patients with RTT yet there is minimal data on polysomnographic findings in this population. We reviewed our cohort of Rett syndrome patients who underwent polysomnography.
Methods: This retrospective case control of 10 RTT subjects (mean age, 11.19 years; ranged from 1 to 33 years) underwent standard polysomnography (PSG) recording. Subjects were compared to 10 age and gender matched controls with an AHI <5 and no chronic medical problems using a student paired t test. All studies were scored using the AASM criteria.
Results: We found our cohort to have increased N3% sleep, decreased N2%, and shorter sleep onset latency ($p< 0.05$). Trends of lower BMI, lower oxygen saturation, and shorter REM latency ($p < 0.10$ but > 0.05). Review of PSGs shows the slow wave have morphological of typical slow waves and not that of the slowing seen on wake EEG nor the epileptiform activity. 4 of the 10 PSGs are notable for frequent interictal epileptiform discharges. 2 of the 10 subjects had a central apnea index >5, 2 had an AHI >5 and 1 demonstrated hypoventilation. There were central apneas associated with hyperventilation during awake and sleep-awake transition.
Conclusion: Our cohort of RTT patients demonstrates differences in sleep architecture, manifested most notably by a high percentage of SWS. This population has high amplitude rhythmic slow (theta) activity on wake EEG, primarily in the frontal-central regions. This slowing was distinct from the epileptiform activity seen in 40% of our cohort. Central apnea also appeared in older patients and the very young. Larger population studies are needed for future research.
Support (If Any):

0520

EFFECT OF SLEEP DISORDERED BREATHING ON CONTROL AND SEVERITY OF ASTHMA ON PEDIATRIC POPULATION

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Introduction: Pediatric sleep disordered breathing (SDB) can co-exist with asthma, affecting its control and severity, adding to the overall health care burden. Our aim was to determine the association of SDB with control and severity of asthma, and to evaluate any concomitant risk factors associated with both.
Methods: Based on the Sleep-Related Breathing Disorder scale extracted from the Pediatric Sleep Questionnaire (SDBS-PSQ), children (5 – 15 years) with persistent asthma were classified as: with SDB (SDBS-PSQ ≥ 0.33) and without SDB, in a cross – sectional study. Characteristics like age, gender, body mass index and spirometry were compared. Control of asthma was categorized into well-controlled, not-well, and poorly controlled using childhood – asthma control test (c-ACT ≥20, 12-19 and ≤12, respectively). Correlation between SDBS-PSQ and c-ACT was analysed. Correlation of risk factors like adeno-tonsillar hypertrophy, gastroesophageal reflux disease, obesity and allergic rhinitis (AR) with presence of SDB in asthma was also assessed.
Results: Among sixty asthmatics, mild, moderate, and severe persistent asthma was observed in 26.67%, 40% and 33.33%, respectively. 18.33% asthmatics had risk for SDB (mean SDBS-PSQ of 0.45 ± 0.11 vs 0.07 ± 0.07 in those without SDB, $p<0.001$). Baseline and spirometric characteristics were similar in both groups. Asthmatics with SDB had higher rates of severe persistent (63.6% vs 26.5%, $p = 0.018$) and uncontrolled asthma (100% vs 30.6%, $p<0.001$), and a lower mean c–ACT score (14.45 ± 3.20 vs 20.04 ± 4.56, $p<0.001$) compared to asthmatics without SDB. Amongst asthmatics with SDB, mean SDBS-PSQ score was higher in not-well and poorly controlled asthmatics (0.41 ± 0.07 vs 0.12 ± 0.08, $p <0.001$ and 0.58 ± 0.08 vs 0.01 ± 0.07, $p<0.001$; respectively), compared to those without SDB. Negative correlation was confirmed between c-ACT and SDBS-PSQ scores ($p<0.001$, $r2 = 0.36$). Only AR was associated with SDB ($p = 0.001$, correlation coefficient <0.001).
Conclusion: Control and severity of asthma is adversely affected by SDB, independent of other risk factors. AR can increase the risk of SDB in asthmatic children, further affecting the control. Therefore, children with severe and difficult-to-control asthma should be screened for SDB using objective questionnaires like SDBS-PSQ.
Support (If Any): Nil

0521

PREVALENCE AND CHARACTERISTICS OF SLEEP DISORDERED BREATHING IN 12-24 MONTH OLD CHILDREN: A SINGLE CENTER STUDY

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Introduction: To evaluate the prevalence and characteristics of obstructive sleep apnea (OSA) in children with ages between 12 to 24 months.

Methods: This was a single center, retrospective study that included children with ages 12-24 months who were evaluated for suspected sleep disordered breathing and underwent a full overnight polysomnography in an academic sleep disorders center over a period of 7 years. An apnea hypopnea index (AHI) >1 was used to define OSA, >5 was used to define moderate OSA, and >10 was used to define severe OSA.

Results: A total of 232 children with ages between 12-24 months were included in this study. The majority (66.4%) were noted to be males, and 56.9% were Caucasian. Snoring (90.1%) and witnessed apnea (53.3%) were the most common presenting symptoms for sleep evaluation. History of prematurity (18.2%) and gastroesophageal reflux (20.2%) were common co-morbidities. OSA was diagnosed in about 79% of the children and it was categorized as mild in 53.5%, moderate in 16.4 % and severe in 30.1%, respectively. There were no statistically significant differences in total sleep time, sleep efficiency, or the stages among these groups. However, statistical significant differences among the groups were noted in median REM% (Q1-Q3) (normal 19.3 (15-22.2) vs. mild 22.2 (18-26.6) vs. moderate 23.1(16-28) vs. severe 21(15-24.6) p=0.013), median REM AHI (normal 1.6 (1-2.8) vs. mild 7.5 (5-10.8) vs. moderate19.4 (12-23.6) vs. severe 51.2 (37-73.4) p<0.001), median OAHI (normal 0.3 (0-0.5) vs. mild 1.1 (1-2.6) vs. moderate 5.5 (4-7.5) vs. severe 20.7 (13-31.9) p<0.001), median supine AHI (normal-0.3 (0.0.6) vs. mild 1.7 (1-3.4) vs. moderate 6.3 (3-8.1) vs. severe 24.3(12-40.4) p<0.001), median SaO2 nadir (normal 94 (90-96) vs. mild 89 (84-91) vs. moderate 86.5 (82-91) vs. severe 80 (73-84) p<0.001), median arousal index (normal 8.9 (7-11.8) vs. mild 11.3 (9-13.5) vs. moderate 13.2 (11-18.6) vs. severe 16.8 (14-23.6) p<0.0001). Surgical treatment was performed in 98 children (53.5% of the children diagnosed with OSA) of which 76 surgeries were adenotonsillectomy.

Conclusion: In children with ages 12-24 months with suspected sleep disordered breathing, OSA was diagnosed in 79% with moderate to severe OSA in 46.5%.

Support (If Any):

0522

LEVEL II HOME SLEEP APNEA TESTING COMPARED TO IN-LAB POLYSOMNOGRAPHY FOR THE EVALUATION OF OBSTRUCTIVE SLEEP APNEA IN YOUTH WITH DOWN SYNDROME

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Children's Hospital of Philadelphia [1]

Introduction: In-laboratory polysomnography (PSG) is recommended for obstructive sleep apnea (OSA) diagnosis in children. However, cost, insufficient facilities, and disruption to families challenge PSG completion, particularly for youth with disabilities such as Down syndrome (DS) in whom OSA is common. By providing sleep architecture and arousal-associated hypopnea data, level II home sleep apnea testing (HSAT) with EEG has the potential to be accessible and accurate. We hypothesized that compared to PSG, HSAT would be accurate in detecting moderate-severe OSA in youth with DS and preferred by families.

Methods: Prospective comparative effectiveness study. Youth <18 years old with DS underwent in-laboratory PSG and level II HSAT at home. Parents completed questionnaires assessing feasibility, acceptability, and test preference. HSAT, scored using AASM criteria blinded to PSG result, were compared to reference PSG. OSA was defined as obstructive apnea hypopnea index (OAHI) greater than 5 events per hour on either test.

Results: Thirty-five (17 female) youth aged [median (IQR)] 10.0 (6.1, 16.9) years completed testing. Total sleep time for HSAT was 7.9 (6.9, 8.9) hours versus 6.8 (5.9, 7.0) hours for PSG (p=0.002). PSG OAHI was 12.7/hr (5.3, 21.5). Twenty-six (74.3%) participants had OSA by PSG, 20 of whom were correctly identified by HSAT; one participant with OSA diagnosed by HSAT (OAHI=6.2/hr) was not identified by PSG (OAHI=3.9/hr). Accuracy of HSAT for identifying OSA was 80.0%, sensitivity 76.9%, and specificity 88.9% compared to PSG. Signal quality was good except for pulse oximetry, with median (IQR) adequate signal for 79.5% (57.5%, 86.3%) of the study. Compared to PSG, 83.3% of parents reported that youth had a more normal night's sleep with HSAT, 70.0% of parents found HSAT easier, and 90.0% of youth preferred HSAT.

Conclusion: In youth with DS, HSAT has good accuracy for detecting moderate-severe OSA. Limitations may include night-to-night variability, differences in environment, or loss of oximetry signal. Youth slept more during HSAT than in-lab PSG and the majority of families preferred level II HSAT. Level II HSAT could provide a means for expanding the evaluation of OSA in youth with DS.

Support (If Any): NIH R21HD101003 (Tapia/Kelly)

0523

PREVALENCE AND SEVERITY OF SLEEP DISORDERED BREATHING IN ASTHMATIC CHILDREN

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Introduction: Children with severe and poorly controlled asthma have a higher predisposition for sleep disordered breathing (SDB). It can lead to cardiovascular, neurocognitive, and behavioral problems. Variable data exists currently whether demographic factors like age, sex, obesity, adeno-tonsillar hypertrophy tend to increase the risk of SDB in asthmatics. Our objective was to evaluate the risk factors and prevalence of SDB in asthmatics as compared to non - asthmatics and describe the polysomnographic parameters in asthmatics with SDB.

Methods: Asthmatic and non - asthmatic children aged 5 – 15 years, were recruited in this case – control study. Parameters like age, gender, body mass index, adeno-tonsillar hypertrophy, and the history of snoring were compared. All participants completed the Sleep-Related Breathing Disorder scale, extracted from the Pediatric Sleep Questionnaire (SDBS-PSQ) and prevalence of risk of SDB (defined as SDBS - PSQ ≥ 0.33) was calculated. A subset

of asthmatics with risk of SDB underwent polysomnography, and subjects were classified into no, mild, moderate, and severe SDB [based on apnea-hypopnea index (AHI) ≤1, 1-5, 5-10, and ≥10, respectively].

Results: 120 children, with 60 asthmatics were included. Amongst asthmatic group, 61.7% were male and mean age was 9.51 ± 2.50 years. Risk of SDB was significantly higher in asthmatics compared to non - asthmatics (18.33% vs 1.67%, p = 0.001; with mean SDBS-PSQ score 0.14 ± 0.17 vs 0.05 ± 0.08, p = 0.001). History of snoring was reported in 25% of asthmatic children versus 11.7% in non – asthmatics (p> 0.05). Other parameters were similar in both the groups (p> 0.05). Of the 11 asthmatics with risk of SDB, 10 underwent polysomnography. 9 patients (15% of asthmatics) were diagnosed with SDB, with a mean AHI of 4.21 ± 3.28, mean total sleep time of 279.23 ± 57.69 minutes and mean arousal index of 10.23 ± 8.67. In this subset, 60% had mild SDB.

Conclusion: Prevalence of SDB is higher in asthmatics, compared to general population. SDBS-PSQ is a useful screening tool for diagnosing SDB and should be incorporated in the daily practice, the gold standard being polysomnography. Further studies would help in a better understanding of SDB spectrum in children.

Support (If Any): Nil

0524

POLYSOMNOGRAPHIC CHARACTERISTICS OF ADOLESCENT PATIENTS WITH CLASS III OBESITY AND SEVERE OSA (AHI ≥30)

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Introduction: Adolescents with obesity are at increased risk for obstructive sleep apnea (OSA). Polysomnographic characteristics of pediatric patients with severe OSA (defined as AHI ≥30 events/hour) have not been frequently described. This study aims to describe clinical characteristics and polysomnographic data from a cohort of adolescents with both severe (class III, BMI ≥40 kg/m2) obesity and severe OSA.

Methods: This IRB-approved, retrospective review examines clinical and polysomnographic data from pediatric patients (ages 8-18) at Nemours Children's Hospital, Wilmington, Delaware, who had initial baseline diagnostic polysomnogram performed from December 2012-September 2021. Subgroup analysis and descriptive statistics were performed in patients with severe OSA (AHI ≥30 events/hour).

Results: 259 (mean age 15.2 years, range 8 – 18 years, 64.4% female, 40.2% white, 46.7% black, mean BMI 50.3 kg/m2) pediatric patients with severe obesity completed initial baseline diagnostic polysomnogram in the study period. Of these patients, 41/259 (15.8%) met criteria for severe OSA (mean age mean age 15.4 years, range 12 – 18 years, 43.9% female, 46.3% white, 43.9% black, mean BMI 53.7 kg/m2). Of these studies, the mean total AHI was 65.2 (range 31.4-159.4) events/hr, obstructive apnea index (OAI) of 11.4 (range 0 – 69.4) events/hr and hypopnea index of 47.8 (range 12.9 – 108.8) events/hour. Mean SpO2 nadir was 78.9 (range 52 – 98)% with peak ETCO2 of 53.2 (range 39 – 69) mmHg. 12/41 (29.2%) of patients met polysomnographic criteria for hypoventilation (EtCO2 >50 mmHg for >25% of TST). Sleep architecture was notable for decreased mean sleep efficiency at 62.8% and elevated arousal index (mean 62.4 arousals/hour).

Conclusion: Adolescents with both severe OSA and obesity demonstrated a high frequency of hypopneas compared to apneic events and disrupted sleep architecture with high arousal index and decreased sleep efficiency. Interestingly, even among those with severe OSA, ventilation was acceptable in a majority of the patients. Further analysis will be completed to correlate patient clinical characteristics, including co-morbidities and lung function measurements, to help identify which patients with severe obesity are at risk for the most severe OSA.

Support (If Any): None

0525

THE EFFECTS OF THE COVID-19 PANDEMIC ON CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) ADHERENCE IN PEDIATRIC PATIENTS WITH OBSTRUCTIVE SLEEP APNEA (OSA)

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Introduction: CPAP Adherence in children with OSA is often sub-optimal and there is concern for worsening during the COVID-19 pandemic. Although telehealth has been used in sleep clinics during the pandemic, there is little known about telemedicine's effectiveness in specialized care. The purpose of this study is to compare CPAP adherence and related outcome metrics in pediatric OSA patients seen before and during the COVID-19 pandemic and between those seen in person and by telemedicine.

Methods: This retrospective cohort consisted of patients who were diagnosed with OSA, prescribed CPAP, and were seen in a CPAP clinic between 1/1/2018 and 9/31/2021. CPAP adherence data and outcome metrics including the Epworth Sleepiness Scale (ESS), Michigan Sleep-disordered Breathing (PSQ) and Pediatric Quality of Life questionnaires (Ped-QOL) were collected. Only patients with one pre-pandemic and at least one post-pandemic visit were included. All variables were reported as mean± SD. Statistical comparison was performed using the mixed-effects model.

Results: 147 patients met criteria with 353 total visits. 147 were before the pandemic (pre) and 206 were during the pandemic (post). Demographic data indicated 57% male, 82% white, and 63% 12 years and older. Post-pandemic visits consisted of 78% telemedicine. Comparison between pre and post pandemic data demonstrated no statistically significant differences in % CPAP usage>4hrs (71±31% [pre] vs 73±33% [post], p=0.95), ESS (6.4±5.5 [pre] vs 5.9±5.8 [post], p=0.27), or PSQ (0.38±0.22 [pre] vs 0.36±0.22 [post] p=0.90). However, there was a significant difference in Psychosocial Health domain of Ped-QOL (68.6±19.4 [pre] vs 74.5±17.9 [post], p=0.012). Comparison between telemedicine and in-person visits during the pandemic showed no differences

in %CPAP usage>4hrs (73±31% [Tele] vs 73±37%, p=0.73), ESS, PSQ, or Ped-QOL.
Conclusion: In our cohort, children with OSA had no significant changes in CPAP adherence, sleepiness, or OSA symptoms during the COVID-19 pandemic. CPAP telehealth visits provided the same effectiveness as in-person visits, as evidenced by similar adherences and outcome metrics. Interestingly, patients reported higher psychosocial health during the pandemic despite no difference in CPAP adherence. Factors not related to OSA management may contribute to the improvement of quality of life in this population.
Support (If Any): Cincinnati Children's Research Fund

0526

UTILITY OF POLYSOMNOGRAPHY IN TRACHEOSTOMY DECANNULATION PROCESS IN CHILDREN.

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Introduction: Different approaches have been used to assess decannulation readiness including clinical observation with gradual tracheostomy downsizing, capping, and microlaryngoscopy and bronchoscopy. Polysomnograms with tracheostomy capping are being used at some centers prior to decannulation. We have previously shown that polysomnography is an important additional tool to predict successful decannulation. However, this study was based on a relatively small number of children. Thus the aim of this study is to review the polysomnographic features that predict decannulation outcomes in a large cohort of children with various conditions.
Methods: A retrospective chart review of polysomnography and medical records was performed for children 0-18 years of age preparing for tracheostomy decannulation from Feb. 2005 to June 2019 at Cincinnati Children's Hospital Medical Center. Subjects with less than four hours of sleep time were excluded from the study.
Results: A total of 128 subjects were included in the study with 74 in the successful decannulation group (SD), 48 in the no decannulation group (ND) and 6 in the unsuccessful decannulation group. Underlying diagnosis included history of prematurity 41 (32%), genetic disorders 39 (30.5%), neurological disorders 17 (13.3%), airway abnormalities 108 (84.4%), and cardiac disease 24 (18.8%). Average age at the time of tracheostomy was 1.8±3.4 years and at decannulation was 5.7±3.6 years in the SD group. Favorable microlaryngoscopy/bronchoscopy (MLB) was significantly higher in SD group 73.8% vs. ND group 26.2% ($p<0.001$). Comparing polysomnographic respiratory sleep parameters showed significant differences between ND and SD groups for apnea hypopnea index (AHI)>10/h (88% [ND] vs. 12% [SD]; $p<0.001$) and obstructive apnea hypopnea index (OAHI)> 5/h (75.6% [ND] vs. 24.4% [SD]; $p<0.001$). Alveolar hypoventilation ($CO_2>50$ for >25% of TST) was also significantly higher in the ND group (70.6%) vs. SD group (29.4%) ($p<0.009$).
Conclusion: In our large cohort of children undergoing decannulation, there were several differences in polysomnographic characteristics including AHI, obstructive AHI and CO_2 parameters between those who were and were not successfully decannulated. In addition to unfavorable findings on airway evaluation, children who did not undergo decannulation were more likely to have moderate to severe degree of sleep disordered breathing and alveolar hypoventilation.
Support (If Any): This study was supported by Cincinnati Children's Hospital Research Fund.

0527

REASONS FOR EARLY POLYSOMNOGRAPHY TERMINATION IN PEDIATRIC PATIENTS WITH SLEEP-DISORDERED BREATHING

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Introduction: Many children with possible obstructive sleep apnea remain unidentified due to low referral rate. Out of the patients who successfully get referred, scheduled, and show up to their polysomnography (PSG), a proportion fail to complete the study. Our focus is to explore what factors can lead to early PSG termination in hopes of proactively identifying the at-risk groups and implementing strategies in the future to help bridge the gap between scheduled and completed studies.
Methods: The sleep lab at the Pediatric Sleep Center at UT Southwestern Medical Center includes 20 pediatric beds across two sites, with >4000 pediatric sleep studies run per year. We retrospectively reviewed all studies from January 1, 2017 through December 31, 2019 that were terminated before study completion. We investigated reasons for early termination in each case and gathered patient characteristics such as age, gender, presence of neurocognitive impairment, payor status to identify predictors of unsuccessful studies. We also looked at variability in time of year and testing sites in early study termination.
Results: From the data review of 138 patients, we identified the 3 main reasons for termination to be intolerance to equipment (n=65), acute illness (n=45), or refusal by parent (n=28). There was a greater proportion of patients who terminated due to illness, relative to the other two reasons, in the winter ($p = 0.01$ refusal by parent; $p = 0.02$ intolerance to equipment) and a lesser percentage in the summer ($p = 0.003$ refusal by parent; $p < 0.001$ intolerance to equipment). There was a greater proportion of subjects who were neurocognitively impaired that terminated due to intolerance to equipment relative to those that terminated due to illness ($p = 0.002$).
Conclusion: In our retrospective analysis of the three main reasons for early PSG termination, we did not notice any difference between location sites, age groups, or payor status. In the future, efforts to prevent underutilization of the lab should focus on illness screening especially in the summer and winter as well as development of tools to assess tolerance especially in the neurologically impaired.
Support (If Any):

0528

DEVELOPMENT OF PEDIATRIC OSA HEALTH COMMUNICATION MESSAGING FOR AND WITH PARENTS

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Introduction: Pediatric obstructive sleep apnea (OSA) is often undetected, due in part to gaps in parental awareness of OSA symptoms. To activate parents to talk to their child's provider about OSA symptoms, there is a need for effective OSA health communication messaging.

Methods: We developed a health communication message in the form of an infographic, designed to help parents recognize the link between nighttime and daytime OSA symptoms. The message encouraged parents who saw these symptoms in their child to speak with their child's provider. The infographic was iteratively reviewed, rated, and refined through a series of twelve virtual focus groups with three types of stakeholder: parents of children with OSA symptoms (n=24), primary care providers (n=9), and sleep medicine specialists (n=4). During groups, we elicited reactions and asked participants to rate various aspects of the message.

Results: Stakeholder feedback (semi-structured sessions and anonymous ratings) was elicited for the initial draft and two subsequent iterations of the message that incorporated prior feedback. Anonymous stakeholder ratings were measured on a scale from 1-5, with 5 denoting stronger endorsement of the construct. Parents rated the message positively for content (M=4.77; SD=0.44), literacy demand (M=4.92, SD=0.28), graphics/design (M=4.69, SD=0.63), and activation (M=4.77, SD=0.44). Sleep medicine providers perceived the message as accurate (M=5.0, SD=0) and primary care providers rated it as acceptable (M=4.67, SD=0.58) and feasible (M=4.33, SD=0.58) for display and dissemination in primary care settings.

Conclusion: We developed a pediatric OSA health communication message that was rated highly by parents, primary care providers, and sleep medicine specialists. Next steps are to disseminate and evaluate the impact of the message on pediatric OSA detection.

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0529

AVERAGE VOLUME-ASSURED PRESSURE SUPPORT AS RESCUE THERAPY AFTER CPAP FAILURE IN PEDIATRIC OBSTRUCTIVE SLEEP APNEA

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Introduction: Average volume-assured pressure support with autotitrating EPAP (AVAPS-AE) is an automatically titrating mode of noninvasive ventilation (NIV) which provides a targeted tidal volume through adjustment of inspiratory pressures within a set range. In pediatric obstructive sleep apnea (OSA), adenotonsillectomy (AT) is often the first-line treatment and CPAP is often poorly tolerated as an alternative. We aimed to evaluate the efficacy of AVAPS as a potential option for children in whom CPAP titration is unsuccessful.

Methods: Retrospective review of records of children diagnosed with OSA with failed CPAP titration and in whom an in-laboratory AVAPS titration was performed.

Results: A total of 9 patients with OSA (8 male, age (95% CI) = 6.7 ± 2.6, BMI percentile (95% CI) = 81.0 ± 18.9) were identified. Of these patients, 6 had prior AT. All 9 patients had failed CPAP titration prior to AVAPS titration: 3 failed due to inability to control the apnea-hypopnea index (AHI, events/hour), 2 due to persistent hypercapnia, 2 due to treatment-emergent central sleep apneas, and 2 due to pressure intolerance. All 9 patients showed improvement in AHI following AVAPS titration (mean change = -17.9, 95% CI = 17.9 ± 9.5) as well as improvement in AHI from initial PSG to AVAPS titration (mean change = -42.5, 95% CI = 42.5 ±24.6). 7 patients had reduction in total sleep time with oximetry recording below 90% (T<90) from CPAP to AVAPS titration (mean change = -4.7 minutes, 95% CI = 4.7 ± 14.7), while 8 patients had reduction in T<90 from initial PSG to AVAPS titration (mean change = -14.0 minutes, 95% CI = 14.0 ±24.5). 7 patients had increase in REM sleep from CPAP to AVAPS titration (mean change = +15.9 minutes, 95% CI = 15.9 ±18.3), while 6 patients had increase in REM sleep from initial PSG to AVAPS titration (mean change = +7.7 minutes, 95% CI = 7.7 ±26.6).

Conclusion: In this case series of children with OSA and with failed CPAP titration, AVAPS is an effective treatment modality.

Support (If Any):

0530

A STUDY OF PEDIATRIC PAP COMPLIANCE IN LONGITUDINAL AND SINGLE-VISIT PATIENTS

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Introduction: PAP compliance is difficult to attain and maintain, but important for treatment efficacy in obstructive sleep apnea. This study sought to identify patterns of compliance by age, stratified by gender and device type in patients who followed up only once after treatment initiation (single-visit patients) and those who were seen more than once (longitudinal patients).
Methods: Charts for approximately 10 months from 10/2018 to 7/2019 were retrospectively reviewed for 1177 patient visits, representing 521 patients with 246 single-visit and 275 longitudinal patients. Some longitudinal patients had visits dating back to 2002. Data analyzed included: age at visit versus compliance measured by percentage of days used and percentage of days used over 4 hours during their compliance period. Data was analyzed for single visit and longitudinal patients stratified by gender and device type. Age was categorized as 0 to 24 months, then years 3.0 to 5.9, 6.0 to 12.9, 13.0 to 18.9 and 19.0 to 21.9.
Results: Patient demographics: 47.2% single-visit, 52.8% longitudinal; 60% male; Approximately 80% between 6 and 18.9-years-old; 80.8% used CPAP. Statistically significant results:Seen for different age groups among females (p=0.012): Females 19 to 21.9-years-old had 45.8% lower compliance for percentage of days used over 4 hours compared to 3 to 18.9-years-old.Longitudinal patients showed 7.5% and 2.4% better compliance for percentage of days used (p=0.0006) and for days used over 4 hours (p=0.002), respectively, compared to single-visit patients after adjusting for sex and age group. Using a BPAP device was associated with 8.9% better compliance for use over 4 hours (p=0.002) compared to CPAP after adjusting for sex, age and visit groups. Longitudinal patients had 7.7% higher compliance for % days used over 4 hours compared to single visit patients (p=0.0016) after adjusting for sex, age group and device.
Conclusion: Statistically significant positive factors for compliance were longitudinal patients versus single-visit patients and those using BPAP.Among females, 19 to 21.9-year-olds were least compliant, otherwise no differences between age or gender were identified.
Support (If Any):

0531

CHARACTERIZATION OF SLEEP-DISORDERED BREATHING AMONG NEWBORN INFANTS WITH MYELOMENINGOCELE

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Introduction: Myelomeningocele (MMC) is a neural tube defect associated with hindbrain herniation (Chiari II malformation) and respiratory center dysfunction. Prior cross-sectional polysomnographic studies indicated that older children with MMC have an elevated risk of sleep-disordered breathing (SDB), a risk factor for sudden death. Most infants with MMC (78%) had abnormal pneumograms, reported predominantly as central sleep apnea (CSA) and sleep-related hypoventilation (SRH). Pneumograms, however, have significant limitations compared with full polysomnography (PSG).
Methods: The North-American Fetal Therapy Network (NAFTNet) with nine participating sites has collaborated in a prospective study of SDB among infants with MMC. Bedside PSGs were conducted among infants >35 weeks post-menstrual age without supplemental oxygen or respiratory support. PSGs were scored by a pediatric-experienced RPSGT using the American Academy of Sleep Medicine infant sleep staging and pediatric scoring criteria for respiratory events. PSGs were reviewed independently by two board-certified pediatric sleep faculty who then reached diagnostic consensus.
Results: Twenty-eight PSGs were evaluated as an interim analysis from 4 of 9 participating sites. Many (11/28, 39.3%) infants had predominantly frequent hypopneas, which could not be distinguished confidently as central vs. obstructive by two experienced pediatric physicians. The proportions of neonates with CSA (3/28, 10.7%), OSA (6/28, 21.4%) and SRH (1/28, 3.6%) were small by comparison. Only 10/28 infants (35.7%) did not display significant SDB and 14/28 had PSG abnormalities considered clinically concerning. Across all subjects the median [IQR] hypopnea index was 18 [10, 33], central apnea index was 4 [1,7]) and obstructive apnea index was 1.0 [0, 6]. The median [IQR] apnea-hypopnea index was 28 [15, 46].
Conclusion: This ongoing study already provides the largest available cohort of neonates with MMC and PSG data. Predominant hypopneas were far more common than any other classified expression of SDB and were challenging to distinguish as central or obstructive. These data confirm the high frequency of SDB in MMC (64%), suggest that PSG may be an important consideration in neonates with MMC, but highlight that current scoring criteria may not always allow confident separation of central from obstructive SDB processes.
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0532

DEFINING SLEEP ARCHITECTURE IN PEDIATRIC PATIENTS WITH PRADER WILLI SYNDROME

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Introduction: Prader Willi Syndrome (PWS) is a rare genetic disorder characterized by infantile hypotonia, hyperphagia leading to early childhood obesity, and short stature. PWS patients are at risk for multiple sleep abnormalities including increased risk of obstructive sleep apnea, central sleep apnea, and excessive daytime sleepiness. The limited studies reviewing PSGs in pediatric PWS patients showed varying results. Our study aim is to characterize sleep characteristics in pediatric patients with PWS.
Methods: We conducted a retrospective chart review of pediatric patients with a genetically confirmed diagnosis of Prader Willi Syndrome from 2007 to 2015. In lab polysomnograms were scored using the AASM criteria for pediatric sleep studies. Data was collected on sleep architecture parameters and compared to normative data available for pediatric polysomnography. Given large variability in sleep architecture during infancy, subjects were divided into two age groups (< 1 years old, 1-19 years old).
Results: Fifty-one PSGs were reviewed of which 31 (60.7%) belong to males and 20 (39.3%) belong to females. Forty-one PSGs

were initial studies and 11 were repeat studies. Age at the time of sleep study ranged from 11 days to 19 years old. 8 (15%) subjects were less than 1 years old and 44 (84%) were 1 year and older. For subjects less than one year old, mean sleep onset latency (min) was 21±33.4, REM onset latency (min) 35±27.2, SWS(%) 43.3±10.2, REM(%) 35.3±7.35, arousal index 9.7±11.9, wake after sleep onset (WASO) (min) 59.5±11.4 and sleep efficiency 82.4±9.4. For the 1-19 year age group, mean sleep onset latency (min) was 24.5±23.1, REM onset latency (min) 104± 59.9, SWS (%) 21.4±7.11, REM (%) 21.3±6.9, arousal index 7.3±5.4, WASO (min) 46.5±36.10 and sleep efficiency was 85.7±9.0.
Conclusion: In our population of PWS patients, REM onset latency was not decreased as shown in previous studies. Sleep efficiency was decreased. Other sleep parameters fell within normal range. Additional data on signs of excessive daytime sleepiness and sleep disordered breathing in this population is needed to understand if EDS persists with decreased sleep efficiency and otherwise normal sleep parameters and/or with OSA.
Support (If Any):

0533

AGE-RELATED CHANGES IN SLEEP DISORDERED BREATHING IN PEDIATRIC PRADER WILLI SYNDROME PATIENTS

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Introduction: Prader Willi Syndrome (PWS) is a rare genetic disorder characterized by infantile hypotonia, hyperphagia leading to early childhood obesity, and multiple sleep abnormalities including increased risk of obstructive sleep apnea, central sleep apnea, and excessive daytime sleepiness. PWS patients have been reported to have a shorter lifespan with respiratory related causes as a common cause of death. Limited data exists on PSGs in pediatric PWS patients. Our aim was to compare respiratory parameters in different age groups.
Methods: We conducted a retrospective chart review of pediatric patients with a genetically confirmed diagnosis of Prader Willi Syndrome from 2007 to 2015. In lab polysomnograms were scored using the AASM criteria for pediatric sleep studies. As central apneas are more commonly seen in infancy with PWS, we categorized patients into < 1 years old and 1-19 years old for comparison.
Results: Fifty-one PSGs were reviewed of which 31 (60.7%) were males and 20 (39.3%) were females. Forty-one PSGs were initial studies and 11 were repeat studies. Age at time of sleep study ranged from 11 days-19 years old. 8 (15%) subjects were < 1 years old and 44 (84%) were 1-19 years old. For patients < 1 year old, mean obstructive hypopnea index (OAHI) was 5.65±3.7, central index (CI)2.2±2.5, mean SpO2(%) 98±.4, SpO2 nadir 86±5.8, and % of time with SpO2 < 90% .16±.314. For patients 1-19 years old, mean (OAHI) was 8.7±13.4, (CI) 0.8±1.25, mean SpO2 96±3.0, SpO2 nadir 81±.10, and % of time with SpO2 < 90% .03±.10. The OAHI trended up in the 1-19 year old group but results were not significant, CI decreased in the 1-19 year old group 2.2 vs 0.8 p < .04.
Conclusion: Our study demonstrated similar results to prior studies in pediatric PWS with an increase in OAHI and decrease in CI with age. SPO2 nadir decreased in the 1-19 year old group but these results were not significant. Ongoing research at our center is looking at possible contributing factors including BMI percentile, GH therapy, and adenotonsillectomy to better understand our findings.
Support (If Any):

0534

DYSPHAGIA SEVERITY IS ASSOCIATED WITH WORSE SLEEP DISORDERED BREATHING IN INFANTS WITH TRISOMY 21

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Introduction: Hypotonia is common in infants with Trisomy 21. This can cause masticatory and oropharyngeal muscle weakness increasing the risk for dysphagia and sleep disordered breathing. Data describing the occurrence of dysphagia and sleep disordered breathing in infants with Trisomy 21 is limited. This study aims to determine the frequency and severity of dysphagia and its relationship to polysomnogram parameters in infants with Trisomy 21.
Methods: Retrospective chart review of patients with Trisomy 21 <12 months old that underwent polysomnography at Seattle Children's Hospital between October 1, 2015-August 23, 2021. Data collected included: sex, age, presence of dysphagia, recommended thickener type and polysomnographic data.
Results: A total of 526 polysomnograms in patients with Trisomy 21 were performed. Forty-one studies were identified in <12 months old. Results in mean ± SD showed: age 6.5 months + 3, 66% were male and 73% were diagnosed with dysphagia through a video fluoroscopic swallow study. In those with dysphagia, 16% can tolerate thin liquids, 20% prescribed nectar-thick, 7% prescribed honey-thick and 57% were G-tube dependent. In patients with dysphagia compared to those without dysphagia: there was higher total AHI of 43.3 +/- 35.3 vs. 22.6 +/- 10.6 (p=0.006), oAHI of 39.7 +/- 35.5 vs. 17.2 +/- 11.6 (p=0.004), CAI of 3.4 +/- 3.4 vs. 3.4 +/- 1.8 (p=0.11), oxygen saturation nadir of 78.6 +/- 10.6 vs. 83.1 +/- 6.6 (p=0.11) and percentage total sleep time TcCO2 >50 mmHg of 44.6 +/- 42.6 vs. 31 +/- 40.3 (p=0.44). Worse dysphagia was positively correlated with a higher oAHI (r=0.38, p=0.03).
Conclusion: There is a high incidence of dysphagia and sleep disordered breathing in infants with Trisomy 21. Dysphagia severity correlated with oAHI severity. Dysphagia in OSA can be due to the sensory and motor changes of the pharynx with impaired swallow-breathing mechanism. Chronic microaspiration can also result in decreased pulmonary reserve from lower airway inflammation or lung parenchymal disease, which may lead to worse sleep disordered breathing. Current guidelines suggest screening at school age or when there are clinical symptoms of OSA in Trisomy 21. However, results suggest the need to evaluate and intervene earlier especially in infants with dysphagia.
Support (If Any):

0535

PREVALENCE OF VARIOUS FORMS OF SLEEP DISORDERED BREATHING IN INFANTS WITH DOWN SYNDROME.

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Introduction: Children with Down Syndrome (DS) are at high risk of sleep disordered breathing (SDB). Undiagnosed SDB in

younger children may confer further risks of cardiovascular and neurocognitive complications associated with DS. However, there is paucity of studies examining SDB in infants with DS. The purpose of the study was to examine the prevalence of obstructive sleep apnea (OSA), sleep hypoventilation (SH) and hypoxemia in infants with DS.

Methods: Infants (≤12 months old) with DS who underwent first polysomnography (PSG) at Seattle Children's hospital over a 6-year period were included. Data collected included obstructive apnea hypopnea index (oAHI), central apnea hypopnea index (CAHI), time spent with CO2 levels > 50 mmHg, time (minutes) spent with saturations <88% (T88), and saturation nadir (minO2sat). Exclusion criteria: follow up studies, and studies post procedures. Data presented by descriptive statistics and comparison by unpaired t-test.

Results: A total of 526 children with DS underwent PSG during the collection time. Forty two fit criteria (Mean age 6.6 months, male 66%). Diagnostic (n=13), split to oxygen (n=29, 69%). Split studies were more severe when compared with full diagnostic AHI (Mean 44.7 vs. 14.8, p=0.0007), T88 (Mean 12.5 vs. 0.2 p=0.03) and minO2sat (77.6 vs. 85.8%, p=0.01). Overall mean oAHI was 33.7 (S.D. 30) CAI was 3.4 (S.D. 3.1). 5/31 with reliable capnography had SH (16.1%) with no difference in age vs. the non-SH group (6.0 [3.2] vs. 6.6 [3.1], p>0.05). Overall, oAHI was more severe in infants with hypoventilation (58.9 [23.6] vs. 29.3 [63],p>0.05). Ten infants spent >5 min with saturations <88% (21.4%). All infants with hypoxemia had OSA (oAHI Mean 66.5 SD 40). Infants with OSA and hypoxemia had worse oAHI than those without hypoxemia (p<0.05).

Conclusion: Our data shows that a large percent of infants with DS (69%) required a split study due to severe OSA (mean oAHI 66.5) or hypoxemia (21.4%). The overall mean AHI for this age group was 33.7. Hypoventilation was present in 16.1%. This study highlights the high prevalence of SDB in infants with DS and supports early PSG assessment in this patient population.

Support (If Any):

0536

ASSOCIATION OF A NOVEL EEG BIOMARKER OF SLEEP DEPTH WITH SLEEP DISORDERED BREATHING IN ADOLESCENTS

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Introduction: The odds ratio product (ORP) provides a standardized, continuous measure of sleep depth that ranges from 0 (deep sleep) to 2.5 (full wakefulness). ORP has been shown to increase during adolescence, representing the decline in sleep depth that occurs during this developmental period. In adults, higher ORP has been associated with sleep disordered breathing (SDB), including obstructive sleep apnea (OSA), while there have been no studies in youth. We aimed to determine the association of ORP with SDB in adolescents.

Methods: We extracted ORP from the sleep EEG of 261 typically developing adolescents aged 12-23y (median 16y) from the Penn State Child Cohort. Higher ORP during rapid eye movement (REM) and non-REM sleep indicates less deep sleep, while higher ORP-9 (i.e., average ORP in the 9-seconds following non-REM cortical arousals) indicates greater arousability. We used general linear models, adjusted for sex, age and race/ethnicity, to examine mean differences in ORP metrics among clinically meaningful groups of SDB based on the apnea/hypopnea index (AHI) consisting of no SDB (AHI<2 and no snoring, n=100), primary snoring (AHI<2 and snoring, n=75), 2≤AHI<5 (n=64), and AHI≥5 (n=22).

Results: Adolescents with primary snoring or 2≤AHI<5 did not significantly differ in ORP metrics from those without SDB (all p≥0.12). Adolescents with AHI≥5 had higher ORP-NREM compared to those without SDB, with primary snoring or with 2≤AHI<5 (all p≤0.01), while ORP-REM was significantly higher compared to those without SDB (p=0.02). ORP-9 was significantly greater in adolescents with AHI≥5 compared to those with no SDB (p<0.01) and those with primary snoring (p=0.02), but not when compared to those with 2≤AHI<5 (p=0.07).

Conclusion: Our data suggest that adolescents with OSA experience lower REM and non-REM sleep depth/intensity (higher ORP) compared to those without SDB. In addition, these adolescents experience a slower progression back to deep sleep following cortical arousals (higher ORP-9), which suggests they remain in a high arousability state and, thus, are more likely to repeat arousals. Commensurate with previous studies in adults, our data show that ORP is a useful sleep EEG biomarker able to capture decreased sleep depth in adolescents with OSA.

Support (If Any): National Institutes of Health (R01MH118308, UL1TR000127)

0537

SYMPTOM IMPROVEMENT REPORTED WITH SOME PAP USE IN NON-ADHERENT PEDIATRIC PATIENTS WITH OSA

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Introduction: Positive airway pressure (PAP) is commonly used in children to treat obstructive sleep apnea (OSA) when surgery is not an option or is ineffective1-3, but adherence is often poor. Observational studies suggest utilization of PAP improves symptoms, signs, and polysomnogram indices of OSA in at least 85% of children4-9. The Agency for Healthcare Research and Quality released the report "Continuous Positive Airway Pressure Treatment for Obstructive Sleep Apnea"10. Conclusions of this report determined that the published evidence reviewed does not support that PAP affects long term outcomes. No pediatric studies were included in this report. Objectives of this study were to determine if pediatric patients with OSA who are non-adherent to PAP therapy report an improvement in symptoms with some use of PAP.

Methods: A retrospective chart review was performed on patients with OSA on PAP seen in the pediatric sleep clinic. Patients were considered adherent to PAP if usage was longer than 4 hours/night for 70% of nights or more. Follow up visits occurred around 3 months, 6 months, 1 year, and 18 months-2 years. Adherence data and reported improvement in symptoms were documented at each visit, and demographical information was obtained.

Results: 235 patients were included in the analysis (63.9% male, 32.3% female, 3.8% missing), with a mean age (SD) at PAP initiation of 12 years (4.5). The sample was predominately Caucasian (51.5%) or African American (38.3%), 85.9% were non-Hispanic, and 53.2% obese. The mean (SD) apnea-hypopnea index was 24.7(27.6)/hr. At first visit post-initiation, of the 138 patients that had adherence data available, 80.4% reported improvement in symptoms with PAP use. Of these patients, 55.86% were non-adherent but reported symptom improvement with some use of PAP. Visit 4 data was available for 74 patients. At visit 4, 91.9% reported improvement in symptoms. Of these, 48.53% were considered non-adherent but reported symptom improvement with some use of PAP.

Conclusion: Historically, PAP adherence in children has been relatively poor11. Utilizing PAP therapy to treat OSA may result in an improvement in symptoms when used in patients who are considered non-adherent to therapy.
Support (If Any):

0538

"SOMETHING IS WRONG!" A QUALITATIVE STUDY OF RACIAL DISPARITIES IN PARENTAL EXPERIENCES OF OSA DETECTION AMONG THEIR CHILDREN

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Introduction: Blacks are 4-6 times more likely to have obstructive sleep apnea (OSA) than white children. Yet disparities in detection, diagnosis and treatment persist. Our study objective was to examine parents' perceptions and experiences with OSA detection among their children.
Methods: Semi-structured phone interviews were conducted with 30 parents of children (ages 2-12 years) who were referred for overnight polysomnography due to OSA. Parents who identified as Black non-Hispanic (n=19) or White non-Hispanic (n=8) were included in the current analysis. Qualitative thematic analysis was conducted using a grounded theory approach, with themes organized in NVivo 12 software. Twenty-one themes falling into five categories were identified. To examine racial/ethnic disparity in parental experiences, themes were classified as convergent (presented by Black and White parents) or divergent (presented by one racial/ethnic group but not the other).
Results: Participating parents were primarily mothers (92.59%). Children were 51.90% female; aged range from 3 to14 years old (M=7.93 years, SD=3.08). Delayed OSA detection was observed among Black children (M=9.00 years), compared to white children (M=5.78 years). Analysis of themes by race/ethnicity identified both shared experiences and perspectives, as well as those that were specific to or more salient for parents of one race. Convergent themes that overlapped among both groups included "Wanting to Know, Worries, and Child Daytime Symptoms." Divergent themes experienced by White caregivers included "Low threshold for raising concerns with provider, Institutional delays, and Trust in provider." "Misplaced blame, Whatever it Takes, Something is wrong, OSA Awareness, and Missing the day-night connection," were divergent themes named by Black parents/caregivers.
Conclusion: Black and white parents experience different paths to detection and diagnosis for their child's OSA, which may be affected by individual awareness, education, patient-provider interactions and experience with the healthcare system.
Support (If Any): Research is supported by K23HL150290

0539

OBSTRUCTIVE SLEEP APNEA SYMPTOMS AND THEIR IMPROVEMENT WITH PAP IN THE PEDIATRIC POPULATION: A RETROSPECTIVE STUDY IN A PEDIATRIC SLEEP DISORDERS CENTER

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Introduction: Obstructive sleep apnea (OSA) is estimated to occur in 1% to 5% of the pediatric population1. The Agency for Healthcare Research and Quality (2021) recently released a draft report titled, "Continuous Positive Airway Pressure Treatment for Obstructive Sleep Apnea."2 The conclusions of this report determined that the published evidence reviewed by the agency did not support that positive airway pressure (PAP) affects long term, clinically important outcomes. No pediatric studies were included in this report. Pediatric patients who require PAP are held to the same standards as adults regarding adherence and insurance requirements3. However, clinical symptoms to determine improvement of OSA symptoms in adults are not the same in children. Symptoms in the pediatric population such as decreased concentration, hyperactivity, memory impairment, learning disorders, nocturnal enuresis and growth impairment have improved with PAP and are important indicators in this population of improved clinical outcomes4.
Methods: Retrospective chart review was used to examine symptoms reported by pediatric patients initiated on PAP for OSA. Symptom information was extracted before and after initiation of PAP. A chi-Square test was used to determine if there was an association between PAP treatment and improved clinical symptoms.
Results: 235 patient records were reviewed. The distribution of sex was 150 (63.9%) males and 76 (32.3%) females. The mean age at PAP initiation was 12.0 (SD = 4.5), age range from 9 months to 19 years. Most frequent symptoms pre PAP initiation included excessive daytime sleepiness (51%), at least one of the daytime behaviors above (45%), and nocturnal enuresis (14%). Excluding patients with missing data, first and fourth visit post PAP initiation, 78% (221 patients; 66 missing) and 90% (90 patients; 12 missing), respectively, reported improvement in symptoms.
Conclusion: Results indicate that PAP is a beneficial treatment of OSA with improvement in symptoms specific to the pediatric population. Due to the clinically significant outcomes to growth and development that PAP provides to pediatric patients with OSA, we suggest that they should not be held to the same insurance requirements as adults and further studies should be conducted to validate these findings.
Support (If Any):

0540

FIRST YEAR PAP TRAJECTORIES AMONG TREATMENT-NAIVE YOUTH WITH SLEEP DISORDERED BREATHING

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Introduction: Little is known about the time course for youth adjusting to and achieving optimal PAP adherence.
Methods: This retrospective study identified 12-month PAP trajectories and treatment persistence following treatment initiation in youth. Participants were first-time PAP initiators receiving care at Cincinnati Children's Hospital from 07/2017-12/2019. Electronic downloads provided monthly PAP use. Adherence indicators were frequency (percentage of nights PAP used each month) and duration of use (average usage hours on nights used each month). Persistence of group-level adherence (frequency and duration) was measured via descriptive statistics in SPSS. Adherence sub-groups were identified using longitudinal mixed models in MPlus.

Results: The sample was 169 youth ages 2-22yrs started on PAP. Within the first month, 55% of participants were using PAP >50% of nights and 43% were using for >4 hours/night. Adherence (frequency and duration, respectively) decreased by month as follows: month 3 - 48% and 42%; month 6 - 41% and 41%; month 12 - 36% and 32%. Longitudinal mixed models identified 5 trajectories for frequency of use (based on the model of best fit using BIC index): "starts high, stays high" (34% of sample); "starts high, slowly decreasing" (7%); "starts high, rapidly decreasing" (12%); "starts low, slowly increasing" (8%); "starts low, stays low" (39%). Two trajectories were identified for duration (average hours worn on nights used, also based on model of best fit) and included: "starts high, slowly increasing" (40%) and "starts low, stays low" (60%).
Conclusion: At the group level, PAP adherence was sub-optimal in the first month of use (around half of participants using PAP >50% of nights or for >4 hours) and declined over the subsequent 11 months. However, mixed models identified distinct adherence subgroups, with about 40% of the sample falling into subgroups with relatively high adherence by month 12. This suggests acclimation to PAP takes time in a pediatric population. Findings may help clinicians/policy makers set realistic expectations around time to achieve optimal PAP adherence among youth, and highlights the need for further PAP adherence promotion interventions.
Support (If Any): First, and fourth authors' time supported by NIH post-doctoral training grants (T32 DK063929 and T32HD068223, respectively).

0541

AUTO PAP ADHERENCE DETERMINANTS OF CHILDREN DURING THE PANDEMIC: A SINGLE CENTER EXPERIENCE.

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Introduction: Obstructive sleep apnea (OSA) is characterized by episodes of partial or complete upper airway obstruction, associated with gas exchange abnormalities, and sleep disruption resulting in OSA syndrome. OSA in majority of children improves after adenotonsillectomy, but with comorbidities or severe OSA, there is a high risk of residual OSA. Positive airway pressure (PAP) is a more definitive therapy for residual OSA when well tolerated. Reported CPAP adherence in children varies from 11-78%, but data on AutoPAP (APAP) acceptability and adherence has not been described.
Methods: Due to the limitations placed on PAP titration during the SARS-COV-2 pandemic, children (range 2-18 years) diagnosed with OSA at our institution were placed on APAP therapy (Auto CPAP or Auto BiPAP). We performed a retrospective analysis of APAP download data of children who met the criteria (adherence at 90 days>4 hours). Adherent (usage>70%) and non-adherent children were compared using Wilcoxon rank sum test. Logistic regression analyses were performed the effect of covariates including age, PSG AHI, Day 1-7 usage, Day 1-7 residual AHI, Day 1-14 usage, Day 1-14 residual AHI, Day 1-30 usage, Day 1-30 residual AHI or mean pressure at 90 day on compliance at 90 days.
Results: On day 90, 73 out of 90 children (40 boys) were using APAP >4 hours. Age, diagnostic PSG AHI, residual AHI (days 1-7; 1-14, 1-30), APAP median pressure, pressure (95% centile), and pressure (maximum) had no effect on adherence. Adherence at days (1-7; 1-14; 1-30) and day 1-90 residual AHI had a positive effect on adherence at day 90. There was no statistically significant difference in BMI z-score, age, PSG AHI, median pressure between the two groups. However, residual AHI was lower in the compliant group.
Conclusion: APAP was fairly well accepted in our study with the majority of children with usage > 4 hours at day 90. Adherence on (days 1-7 and 1-30) predicted APAP usage at day 90. This mirrors adherence data from adult OSA patients. APAP was effective in the compliant group with lower residual AHI. Further analysis of adherence characteristics such as; family history of PAP, PAP mode, mask, surgery and comorbidities is planned.
Support (If Any):

0542

PEDIATRIC OBSTRUCTIVE SLEEP APNEA AND POOR APPETITE

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Introduction: Obstructive Sleep Apnea (OSA) has many impacts on homeostasis. In pediatrics, there have been links observed between health problems and OSA including failure to thrive, obesity, and behavioral disorders. Existing literature evaluates the links between excess weight, obesity, and OSA. However, there is a lack of research exploring the association between OSA and reduced appetite as a contributor to failure to thrive in the pediatric population. In this study, we hypothesized there is a positive correlation between OSA severity and the presence of poor appetite.
Methods: We analyzed data retrospectively through medical records of 155 pediatric patients (age < 18 years old) who were diagnosed with OSA by pediatric criteria via polysomnography from April through November 2021. Data was collected from a pre-completed questionnaire done by the guardian or child during the sleep study intake. Poor appetite symptoms were ranked on a Likert scale of occurring "never", "rarely", "occasionally", "frequently", "regularly", or "don't know." The presence of poor appetite symptoms was compared to the severity of pediatric OSA diagnosed during the sleep study. Pearson chi-squared test and Spearman's correlation coefficient were calculated on the data sets.
Results: Of 155 patients, 33 (21.3%) were diagnosed with mild OSA, 70 (45.2%) with moderate OSA, and 52 (33.5%) with severe OSA based on pediatric criteria. A total of 53 patients reported poor appetite occasionally, frequently, or regularly. 29.4% of patients with mild OSA reported poor appetite, along with 45.7% of patients with moderate OSA, and 21.2% of patients with severe OSA. Of all patients who reported poor appetite, 60.3% had moderate OSA. However, there was a non-statistically significant correlation between apnea hypopnea index (AHI) and the presence of poor appetite symptoms, Spearman's correlation coefficient of -0.1044 (p-value 0.1960).
Conclusion: Overall our data did not show a significant correlation between OSA severity and poor appetite symptoms. There was an association between poor appetite and moderate OSA, however this data is limited by selection bias as 45.2% of patients were categorized as moderate OSA. Further studies are needed, including analyses with similar size populations of each OSA severity category.
Support (If Any):

0543

THE ASSOCIATION OF SLEEP-DISORDERED BREATHING AND DAYTIME ASTHMA BURDEN AMONG FORMER PREMATURE SCHOOL AGE CHILDREN WITH BRONCHOPULMONARY DYSPLASIA

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Introduction: Sleep-disordered breathing (SDB) and asthma have a bidirectional relationship. Almost half of former premature school age children with bronchopulmonary dysplasia (BPD) have asthma or asthma-like symptoms. Prematurity is a known risk factor for sleep-disordered breathing. However, little is known about the association of SDB and asthma symptoms in former premature school age children with BPD.
Methods: Study sample comprised of participants in an ongoing cohort study, the AERO-BPD study. Participants were 6-12 years old, were born < 32 weeks gestational age and had been diagnosed with BPD. We administered the Pediatric Sleep Questionnaire (PSQ) and asthma symptom questionnaires. The prevalence of SDB was determined based on a PSQ > 0.33. The relationship between SDB and daytime asthma symptoms was assessed by multivariate logistic regression, adjusting for sex, race, BMI, rhinitis, asthma controller medication and days on respiratory support in the NICU.
Results: There were 33 subjects with a mean age of 8.8 years, roughly half were male and one third were overweight/obese. About half (48.5%) had daytime asthma symptoms and 39.4% had SDB. About half were on controller medication (inhaled corticosteroid or leukotriene receptor antagonist) and 39.4% had rhinitis. Among the 13 subjects with SDB, 11 reported daytime asthma symptoms and 5 of the 20 subjects without SDB reported daytime asthma symptoms. Subjects with SDB had over 17 times the odds of daytime asthma symptoms (OR 17.61, 95% CI [1.23, 251.76], p=0.035) compared to subjects without SDB, while adjusting for sex, race, BMI, rhinitis, controller medications and days on respiratory support in the NICU.
Conclusion: Our findings suggest that SDB is highly prevalent among former premature school age children with BPD. The findings suggest a relationship between SDB and daytime respiratory symptom burden among these patients rather than mere co-existence.
Support (If Any):

0544

POLYSOMNOGRAPHY CHARACTERISTICS OF CHILDREN WITH OBESITY: A SINGLE CENTER RETROSPECTIVE STUDY

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Introduction: The constellations of symptoms known as obstructive sleep apnea (OSA) results from either partial or complete airway obstruction during sleep. This affects effective gas exchange and disrupts sleep architecture resulting in sleep fragmentation with downstream immediate and long-term adverse effects. Obesity is a significant risk factor in childhood OSA, especially in postpubertal children. Obese/overweight children have been found to have significantly higher rates of OSA than their normal-weight counterparts, independent of tonsillar size. Polysomnography characteristics (PSG) comparing children with obesity with and without comorbidities (Hypertension, Diabetes or Pre-diabetes) has not been previously described.
Methods: Retrospective analysis of 190 obese children (BMI>95th centile), age between 7-18 years with AHI ≥5/hour met the criteria for the data analysis. Clinical, demographic and PSG parameters of children with obesity with and without co-morbidities were compared using Wilcoxon rank sum test. Correlation (Spearman non-parametric) and regression model was employed to explore associations between demographic and PSG characteristics.
Results: Majority of the obese children (mean BMI 33.2) had mild OSA, with no significant difference in AHI between the two groups. Children with obesity and comorbidities were older with higher BMI. There was no difference in BMI between the two groups after adjusting for BMI z scores. AHI increased with increasing BMI centiles. In our regression model, peak ETCO2 was associated with Black race, AHI, rhinitis and inversely associated with asthma. Peak ETCO2 increased with BMI. Oxygen at baseline, nadir and desaturation duration inversely correlated with BMI-centiles. Older children had lower O2 nadir. Black race was associated with higher desaturation, supine AHI, and arousal index. Supine AHI was higher with rhinitis. Average heart rate when awake, NREM and REM increased with higher BMI.
Conclusion: In our study, majority of the children had mild OSA with no significant difference in AHI between obese children with and without comorbidities. AHI, average heart rate and peak ETCO2 increased with BMI. O2 nadir was lower in older children and with higher BMI. Black race was associated with higher peak ETCO2, higher desaturation and supine AHI. Children with obesity and comorbidities were older with higher BMI suggesting synergistic effect of BMI and duration of obesity.
Support (If Any):

0545

METABOLIC VARIABLES AND THE SEVERITY OF OBSTRUCTIVE SLEEP APNEA IN NON-OBESE CHILDREN

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Introduction: Obstructive sleep apnea (OSA) can be associated with abnormal metabolic variables that may impact the overall health of the child into adulthood. Prior studies have focused on understanding the relationship of obesity, OSA, and metabolic alterations. Understanding the relationship of OSA and metabolic alterations in normal-weight children would improve understanding of the health impact of OSA in and of itself. The Objective of this study was to evaluate the association of OSA and metabolic variables, including lipid levels, blood glucose, and HbA1c in normal-weight children with OSA.
Methods: Prospective, case-control study performed at a tertiary care children's hospital. Normal-weight children, aged 2-12 years, undergoing overnight polysomnography (PSG) for assessment of sleep disordered breathing were selected for participation in the study. Laboratory testing for lipid levels, fasting glucose, HbA1c were completed and analyzed relative to the PSG findings.
Results: A total of 61 patients with a mean age of 4.7±2.5 years were analyzed. Thirty-four (55.7%) patients were male, and 27 (44.3%) were female. The mean body mass index (BMI) z score was 0.5±1.2, and all patients were non-obese (BMI z

score <85th percentile). Total cholesterol, fasting blood glucose, HbA1c levels were significantly higher in patients with OSA when compared to those with No-OSA ($p<0.01$). There was incremental worsening of blood glucose and HbA1c levels with greater severity of OSA. The apnea-hypopnea index (AHI) was positively and significantly correlated with blood glucose and HbA1c ($p<0.001$). Multiple linear regression analysis showed that the AHI was a predictor of blood glucose ($p<0.001$) and HbA1c ($p<0.001$) levels independent of age, gender, total sleep time, and BMI z score.

Conclusion: Increasing severity of OSA in non-obese children was associated with worsening levels of cholesterol, blood glucose, and HbA1c. This points to the importance of addressing the issue of OSA in children given the potential impact of these elevated levels on the overall health of the child.

Support (If Any): None

0546

AN INFORMATICS APPROACH TO ASSESSING QUALITY OF CARE METRICS FOR RESTLESS LEGS SYNDROME/ WILLIS-EKBOM DISEASE

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Introduction: Management of restless legs syndrome (RLS, aka Willis-Ekbom Disease) with dopaminergic agents is often complicated by development of augmentation. Clinical practice guidelines and stepwise algorithms suggest that prior to prescribing dopaminergic agents, clinicians should assess iron stores and consider alpha-2-delta agents (e.g. gabapentin). We developed an informatics approach to assess quality of care metrics for RLS management.
Methods: We used Veterans Affairs (VA) electronic health record data to identify a cohort of patients at a single tertiary care academic VA facility prescribed dopaminergic agents between 01 Jan 2018 to 31 Dec 2019. Patients with any prior codes for Parkinson's disease were excluded. A random sample of charts were manually reviewed to determine if dopaminergic drugs were being prescribed for RLS or other indications. We then assessed for evidence of prior iron store assessments, iron repletion if appropriate, and alpha-2-delta agents (gabapentin, pregabalin).
Results: We identified 1160 patients treated with dopaminergic agents and no prior Parkinson's codes. Chart reviews indicated 95% accuracy of this methodology to identify dopaminergic use for RLS. Evidence of pre-treatment iron storage assessment was missing in 30.2% for ferritin and 33.5% for transferrin saturation. Among those with iron studies present, lack of iron replacement was noted in 34% of those with ferritin <75 mcg/L and 33% of those with transferrin saturation <20%. Prior or concomitant prescriptions of alpha-2-delta agents was present in 59.7% of the cohort.
Conclusion: Our informatics approach provides an accurate and efficient means to quantify RLS care metrics. Results were most notable for a high proportion of dopaminergic-treated RLS patients without iron assessments and without iron repletion when stores were low. This methodology will inform future quality improvement initiatives to improve the delivery of guideline concordant RLS care.
Support (If Any): This material is the result of work supported with resources and the use of facilities at the Minneapolis Veterans Affairs Health Care System, Minneapolis/USA.

0547

RLS PATIENT ODYSSEY SURVEY II

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Introduction: RLS affects 5%-10% of European and North American adults, with 2%-3% experiencing moderate to severe symptoms. RLS patients, often undiagnosed or improperly treated, experience significant depression in addition to loss of sleep.
Methods: ODYSSEY II, an online and in-print self-administered questionnaire (respondents primarily from the United States) included validated questions on RLS diagnosis and severity, associated medical conditions, RLS treatment responses, access to RLS care, and standardized PHQ-9 depression measures. RLS status was confirmed using the Cambridge-Hopkins Questionnaire. Analysis included linkage of PHQ-9 depression scores to EQ-5D Health-Related Quality-of-Life (HRQoL) scores using externally validated methods.
Results: Of 3,003 online or mail-in participants, 2,745 were RLS confirmed, 55% having severe symptoms (IRLS ≥ 21), 86% using medications and 73% reporting histories of dopaminergic augmentation (medication related worsening of symptoms).Of RLS-confirmed respondents, average PHQ-9 depression scores were 8.98 for women (US average 3.72) and 7.22 for men (US average 2.67). Among RLS patients, 29% of males and 40% of females (comparable US averages 11% and 6.5%) had PHQ-9 depression scores ≥ 10 (moderate, moderately severe or severe) a fourfold risk of important (≥ 10 score) depression. Suicidal ideation was reported by 15% of respondents (US average 4.0%). Associated EQ-5D scores show that 37% of all respondents had HRQoL scores below 50% of "full health."Of six drug classes used to treat RLS, three drug classes had patient-reported efficacy above 60%, but all had patient-reported drawbacks, ranging from weaker efficacy for some patients (alpha-2-delta ligands) to augmentation (dopaminergics, almost three-quarters of patients) and difficulties in obtaining prescriptions (opioids) for others.Respondents reported decade-plus delays from time of symptom onset to diagnosis, and still may remain improperly diagnosed or inadequately treated. Respondents managed by RLSF certified providers reported better outcomes.
Conclusion: ODYSSEY II documents that depression, suicidal thinking and HRQoL losses are very significant among many RLS patients. Respondents report troubling delays from symptom onset to correct diagnosis. Survey results demonstrate that RLS related symptoms are best improved when patients use RLSF certified providers. Improved education to both primary care providers and patients may also lead to better patient outcomes.
Support (If Any): Arbor Pharmaceuticals

0548

BEHAVIORAL VALIDATION OF THE UNIVERSITY OF MICHIGAN REM BEHAVIOR DISORDER QUESTIONNAIRE IN THE SYNUCLEINOPATHIES

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Introduction: Questionnaires that inquire about REM sleep behavior disorder are typically validated by reference to polysomnographic findings of REM sleep without atonia. We sought validation for such a questionnaire by examining observed REM-based dream enactment over two nights in a sleep laboratory.
Methods: Participants with alpha-synucleinopathic disease underwent two consecutive nights of polysomnography attended by a single sleep technologist who was instructed to observe for and document any abnormal behaviors occurring out of sleep. We evaluated University of Michigan REM Behavior Disorder Questionnaire responses completed by either the participant or bed-partner prior to polysomnographic recording and analyzed associations between questionnaire responses and observational data in the sleep laboratory. We subsequently cross-validated the technologist's observations with hypnogram tracings from nights when dream enactment was observed to determine whether the timing of observed behavior aligned with the timing of REM sleep.

Results: We studied 92 participants [idiopathic Parkinson's disease, n = 67; Dementia with Lewy bodies, n = 14; Multiple Systems Atrophy, n = 3; Idiopathic REM sleep behavior disorder, n = 8]. Of 92 participants studied, 30 (32.61%) exhibited dream enactment during REM sleep observed on either night of polysomnographic recording (11 on both nights, 19 on one night). There was a statistically significant difference (p = 0.041 by 2-tailed test) in mean questionnaire scores between participants with observed dream enactment during REM sleep (mean score 0.43; [95% CI mean 0.34-0.52]) and those without dream enactment on either night (mean score 0.32; [95% CI mean 0.26-0.38]). When limiting the sample to participants whose questionnaire responses were derived from the bed-partner (n = 74), the difference approached, but did not reach, statistical significance (p = 0.066).
Conclusion: These data provide further validation of the University of Michigan REM Behavior Disorder Questionnaire as a useful tool in evaluating REM-based dream enactment behavior in patients with alpha-synucleinopathic disease.
Support (If Any):

0549

PREVALENCE AND IMPACT OF MUSCLE CRAMPS IN PATIENTS WITH RESTLESS LEGS

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Introduction: Recent studies have shown alterations in Vitamin D binding protein in RLS, and Vitamin D is intimately related to calcium metabolism, while hypocalcemia is a well-known trigger for muscle cramps. The presence and consequences of muscle cramps in RLS has never been systematically studied. Therefore, the aim of this study was to determine the prevalence and impact of muscle cramps in RLS patients.
Methods: An email was sent to 4222 active members of the RLS foundation (RLSF) with a link to survey adult RLS patients. The survey included demographic information, questions on muscle cramps (including a visual analogue scale rating intensity), the Pittsburgh Sleep Quality Index assessing sleep disturbances, the 36-Item Short Form Survey Instrument (SF-36) evaluating health status, the 13-item short-form Cambridge-Hopkins diagnostic questionnaire (CH-RLSq13) for diagnosing RLS, and the International RLS Severity Scale measuring RLS severity. Patients who answered "yes" to the question "In the last 3 months have you experienced muscle cramps (defined as involuntary painful muscle contraction occurring at rest, not associated with exercise)?" were considered to have muscle cramps.
Results: A total of 509 RLSF members completed the whole electronic survey, while 317 participants (Age: 68.9±10.2; 73.1% Women; 97.8% White/Caucasian; BMI: 27.4±5.8) qualified as RLS patients and were included in further analysis. The prevalence of muscle cramps in RLS patients was 60.3%. RLS patients with (versus without) muscle cramps were more overweight (p=0.0119) and had lower scores (more disability) on several SF-36 health concepts including physical functioning (p=0.0093), role limitations due to emotional problems (p=0.0429), social functioning (p=0.0017), and more pain (p=0.0387). In addition, there was a weak (Spearman coefficient ρ=0.253) but significant positive correlation (p=0.0004) between intensity of muscle cramps and severity of RLS symptoms.
Conclusion: Muscle cramps were present in almost two-third of RLS patients and were associated with a negative impact on health status and severity of RLS. Therefore, from a clinical practice point of view, it seems warranted to screen for muscle cramps in RLS patients. RLS and leg cramps may theoretically be related to each other through calcium metabolism and/or through inflammatory mechanisms.
Support (If Any): This study was not funded.

0550

HEALTH-ECONOMIC IMPLICATIONS OF DEFINED IMPROVEMENTS IN RESTLESS LEG SYNDROME SEVERITY: A MODEL-BASED EXPLORATORY ANALYSIS BASED ON PRIOR PUBLICATION DATA

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Introduction: Restless leg syndrome (RLS) is a debilitating condition associated with reduced health-related quality of life (HRQoL) and increased resource utilization. Our objective was to provide model-based estimates of quality-adjusted life year (QALY) gain and reduction in healthcare utilization that might be expected for changes in symptom severity.
Methods: We identified two health-economic studies which reported severity-specific quality-of-life and resource utilization. Happe et al. 2009 reported HRQoL using EQ-5D measurements stratified by International Restless Legs Scale (IRLS) severity (n=519, 63.6% female, 64.2 years) and Durgin et al. 2015 reported healthcare utilization stratified by RLS severity (no/mild/moderate/severe RLS) (n=2,392, 56.9% female, 56.0 years). We fitted regression models to support IRLS-specific estimates of EQ-5D and healthcare resource utilization. These models (polynomial for EQ-5D, linear for resource utilization) were applied to calculate QALY gain, and events avoided for ER visits, hospitalizations, and healthcare provider (HCP) visits over 5 years for IRLS improvement of 1-10 points, from a baseline of 30, 25, and 20.
Results: At five years, a 1, 3, 5, 7, and 10-point IRLS reduction corresponded to a QALY gain of 0.09, 0.25, 0.40, 0.52, and 0.69 for a baseline of 30, 0.07, 0.19, 0.29, 0.37, and 0.47 for a baseline of 25, and 0.04, 0.12, 0.18, 0.22, and 0.26 for a baseline of 20. The events avoided over 5 years with an IRLS reduction of 1, 3, 5, 7, and 10 points respectively were 1.12, 3.37, 5.62, 7.87, and 11.25 HCP visits, 0.09, 0.26, 0.43, 0.61, and 0.87 ER visits, and 0.04, 0.11, 0.18, 0.26, and 0.36 hospitalizations.
Conclusion: This exploratory analysis based on two health-economic studies confirms the substantial quality-of-life and healthcare cost burden associated with RLS. The data provide guidance on the magnitude of potential quality-of-life improvement and cost reduction that might be associated with defined improvement in RLS severity. Further investigation may be warranted for the factors that link change in IRLS and healthcare resource utilization, such as sleep deficits or cardiovascular risks.
Support (If Any): Funding was provided by Noctrix Health

0551

MOVEMENT PARASOMNIAS IN A COMMUNITY SAMPLE: ASSOCIATIONS WITH SLEEP HEALTH AND MENTAL HEALTH

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Introduction: Movement-related parasomnia symptoms are associated with several sleep disorders and are associated with adverse health, mental health, and social outcomes. Current literature lacks data regarding parasomnia prevalence in the general population. This study examined prevalence of these symptoms and correlates in a community-based sample.
Methods: Data were from the Sleep and Healthy Activity, Diet, Environment and Socialization (SHADES) study, consisting of N=1,007 working-age adults. Parasomnia symptoms were assessed with, "I have been told that I walk, talk, eat or act strange or violent while sleeping." Responses were categorized as Never (1/year or less), Sometimes (<1/week), or Often (>=1/week). Sleep health variables included sleep duration, categorized as very short (<=4h), short (5-6h), normal (7-8h, reference group) or long (>=9h), Insomnia Severity Index, Epworth Sleepiness Scale, Fatigue Severity Scale, Brief Index of Sleep Control, frequency of loud snoring, and frequency of sleep medication use. Mental health variables included PHQ9 depression score, GAD7 anxiety score, Perceived Stress Scale, and self-reported survival of severe physical/emotional trauma (None, Possible, Definite). Covariates included age, sex, race/ethnicity, education, income, employment, and body mass index.
Results: Parasomnia symptoms were reported sometimes by 24% and often by 7% of the sample. The following sleep-related variables were associated with more movement-related symptoms sometimes: very short sleep (RRR=2.26), higher ISI (RRR=1.08), ESS (RRR=1.09), and FSS (RRR=1.05), and frequent snoring (RRR=2.84). The following were associated with more symptoms often: very short sleep (RRR-4.40), higher ISI (RRR=1.18), ESS (RRR=1.18), FSS (RRR=1.07), frequent snoring (RRR=7.38) and medication use (RRR=5.99), and less sleep control (RRR=0.43). Regarding mental health, more symptoms sometimes or often was associated with higher depression (RRR=1.11 and 1.16, respectively), anxiety (RRR=1.12 and 1.17, respectively), and stress (RRR=1.06 and 1.10, respectively) scores. Trauma survivors were more likely to report symptoms often (RRR=4.78).
Conclusion: Movement-related parasomnia symptoms are fairly prevalent and may impact nearly one third of community-dwelling working-age adults. Those exhibiting symptoms are more likely to experience shorter sleep duration, poor sleep quality, daytime dysfunction, and worse mental health. Screening efforts for subclinical symptoms should be increased, and further work should explore pathways linking these symptoms to health and functional outcomes.
Support (If Any):

0552

"EYE-MOVEMENT-INTEGRATION THERAPY" (EMI) IN PATIENTS WITH NIGHTMARES - A PILOT STUDY

Introduction: Nightmares are associated with enormous suffering as well as a significant reduction in the quality of life of those affected. Various studies also show a direct correlation between the frequency of nightmares and suicidal tendencies. Nightmares are therefore diseases that must be taken very seriously. Currently, they are treated with costly therapy methods and sometimes with unstable success. In addition, patients must fulfil certain requirements such as suggestibility and the ability to imagine. Consequently, direct and economical treatment methods are needed. Since nightmares often have a traumatic character for those affected, it was obvious to test this therapeutic technique, which was developed especially for the treatment of PTSD.The aim of this study is to test the neurotherapeutic technique "Eye-Movement-Integration Therapy" (EMI) for the treatment of nightmares for its effectiveness.
Methods: Three patients between the ages of 19 and 24 who met the diagnostic criteria for nightmares were treated with EMI.
Results: Just one EMI session was able to reduce nightmare frequency from an average of 5.4 nightmares per week in the post-measurement two weeks after the EMI session to 1.6. This effect improved to 1.3 nightmares per week in the follow-up after 3 months.
Conclusion: EMI may be a way to treat nightmares causally and specifically. Other possible treatment outcomes could be an improvement in comorbid symptoms and a reduction in suicide risk. Larger controlled, randomised clinical trials are needed to test this treatment method for its effectiveness. It would also be desirable to investigate the treatment success of EMI in comorbid mental disorders, especially in post-traumatic stress disorder with nightmares.
Support (If Any):

0553

AT-HOME DETECTION OF REM SLEEP BEHAVIOR DISORDER USING A MACHINE LEARNING APPROACH AND WRIST ACTIGRAPHY

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Introduction: Isolated rapid-eye-movement (REM) sleep behavior disorder (iRBD) affects over 1% of middle-aged and older adults and is in most cases a prodromal stage of alpha-synucleinopathy. However, a small fraction of them is currently diagnosed due to poor access to the gold-standard diagnostic procedure polysomnography (PSG). We aimed to test an ambulatory diagnostic procedure for iRBD based on wrist actigraphy alone and combined with a short questionnaire on nonmotor symptoms.
Methods: A total of 35 PSG-confirmed iRBD and 28 age-matched clinic and community control participants with and without a sleep disorder (1:1 ratio) wore high-frequency (25 Hz) wrist actigraphy for at least 7 nights and completed sleep diaries. Raw accelerometer data recorded during sleep was analyzed by deriving an activity count and extracting movement-related features for each night. Additionally, participants completed the Innsbruck RBD inventory (RBD-I) and a 3-item questionnaire on hyposmia, constipation, and orthostasis. We fitted machine learning models, specifically, boosted decision trees, in a leave-one-out cross-validation framework to classify iRBD patients from controls based on either actigraphy or questionnaire data. For each participant, model predictions from actigraphy were averaged across all available nights.
Results: The boosted decision trees classified iRBD with an area under the receiver-operator-characteristics (ROC) curve (AUC) of 0.972, a sensitivity of 97.1%, and a specificity of 89.3%. Analyses

revealed that performance plateaued after one week of actigraphy. Best single feature "short immobile bursts" achieved an AUC of 0.958, a sensitivity of 94.3%, and a specificity of 78.6%. In this population, RBD-I item 3 best discriminated between groups with an AUC of 0.892, a sensitivity of 91.4%, and a specificity of 85.7%. The combination of a positive RBD-I item 3 and a positive actigraphy-based classification achieved a sensitivity of 88.6% and a specificity of 96.4%.

Conclusion: High-frequency actigraphy using machine learning detects iRBD with high accuracy. Addition of a single RBD question to this procedure increased specificity. These results need to be validated in a larger sample and lay the groundwork for an ambulatory screening paradigm in the general population.

Support (If Any): The Klarman Family Foundation and the Feldman Foundation Ca.

0554

PROTEOMIC APPROACH FOR UNDERSTANDING THE MECHANISMS OF PERIODIC LIMB MOVEMENTS AND RESTLESS LEGS SYNDROME

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Introduction: Periodic limb movements (PLMs) are episodes of involuntary, repetitive muscle movements that are highly associated with restless legs syndrome (RLS). Although PLMs and RLS are reportedly two separate phenomena, both are tightly correlated and may result from a similar pathology. The present study profiled plasma protein biomarkers of PLMs and RLS to contribute to the identification of mechanisms associated with each disorder/trait.

Methods: The SomaScan highly multiplexed aptamer assay was used to profile 5,000 proteins in 24–48-hour old EDTA plasma samples from the Stanford Technology Analytics and Genomics in Sleep (STAGES) study. PLMs per hour (PLMI) were derived from overnight polysomnography and RLS was classified based on affirmative responses to questions of the Alliance Sleep Questionnaire. Three linear regression models were conducted to examine significant protein markers of 1) PLMI in the sample as a whole; 2) PLMI controlling for the presence of RLS; and 3) RLS without PLMs (i.e.,PLMI<5). All models included log2-normalized relative protein expression as the dependent variable and important covariates such as age, gender, BMI, sample storage time, and blood draw period. False discovery rate (FDR) to control for multiple testing was applied with an a-priori p-value of 0.05 for identifying significant associations.

Results: PLMI was significantly associated with 253 proteins (219 positive,34 negative). The inclusion of RLS in the model mitigated the significance of most proteins, and only 8 proteins remained significant. Negatively associated proteins (LEAP-1, Ferritin, SELH, Caspase-8) included functions related to iron storage, absorption, and delivery and negative regulation of inflammatory/immune responses. Positively associated proteins (SFRP4, RANTES, CathepsinA, DKK1) included proteins with functions related to immune response, inflammatory response, bone formation, and protein stability. RLS without PLMs was associated with 7 upregulated proteins (megalin, RUFY1, TADBP, ANGL7, LRTM2, SNAPN, STOM) with functions related to vitamin D metabolism, calcium and zinc binding, circadian rhythm regulation, and calcium-dependent neurotransmitter secretion.

Conclusion: These large proteomic analyses identified independent differential protein expressions for PLMs and RLS that suggest different pathophysiological contributions.

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0555

ISOLATED REM SLEEP WITHOUT ATONIA FOLLOWING COVID-19 INFECTION: A CASE-CONTROL STUDY

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Mayo Clinic Center for Sleep Medicine [1]

Introduction: REM sleep without atonia (RSWA) is the neurophysiological substrate of REM sleep behavior disorder (RBD), a form of prodromal parkinsonism in most older adults. Isolated RSWA (without clinical RBD) elevation was demonstrated recently in older adults following SARS-CoV2 (COVID-19) infection, but comparison to controls was not reported. We aimed to comparatively analyze RSWA between patients with previous COVID-19 infection and COVID-19 negative controls.

Methods: 25 patients with previous COVID-19 infection were compared to 25 age-sex matched controls who tested negative for COVID-19 prior to polysomnography. Patients receiving medications known to increase RSWA were excluded. We reviewed medical records to determine clinical features and quantitatively analyzed RSWA in the submentalis (SM) and anterior tibialis (AT) muscles for phasic, tonic, and "any" muscle activity, phasic burst duration, and the automated REM atonia index. Non-parametric analyses compared clinical and polysomnographic features between groups, with combined SM and AT RSWA as the defined primary outcome. The comparative frequency of COVID-19 positive cases and COVID-19 negative controls who met or exceeded proposed isolated RSWA thresholds was also determined.

Results: COVID-19 patients had significantly greater RSWA than COVID-19 negative controls in the combined SM and AT muscles ($p = 0.00076$). Most other RSWA metrics were also higher in COVID-19 patients than controls ($p<0.03$), except tonic muscle activity, phasic burst durations, and RAI. Isolated RSWA occurred more frequently in COVID-19 (9 patients, 36%) than controls (3, 12%; $p>0.05$). No patients had a clinical history or polysomnographic evidence for parasomnia behavior or a primary neurological condition.

Conclusion: Quantitative RSWA amounts were comparatively greater in COVID-19 patients than in COVID-19 tested-negative controls, suggesting association of previous COVID-19 infection with central nervous system brainstem dysfunction in the region of the dorsal pons and/or ventromedial medulla. Further prospective studies are needed to determine whether RSWA is a predisposing influence to, or consequence of, COVID-19 infection in these patients, and whether COVID-19 survivors might harbor neurodegenerative risk or disease markers.

Support (If Any):

0556

PREVALENCE AND INCIDENCE OF HYPNAGOGIC HALLUCINATIONS IN A LONGITUDINAL STUDY OF THE AMERICAN GENERAL POPULATION

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Introduction: Hypnagogic hallucinations are vivid hallucinations that occur at sleep onset, during the transition between wakefulness and REM sleep. The hallucinations can be visual, auditory, tactile or kinetic and can be terrifying for the individual who experience them. Hypnagogic hallucinations are a common symptom of narcolepsy, a disorder characterized by excessive sleepiness, cataplexy and disturbed sleep. The evolution of hypnagogic hallucinations remains seldomly investigated. There is no data regarding its incidence and its chronicity. This study examines the predictive factors for chronic hypnagogic hallucinations in the general population.
Methods: This longitudinal study had two waves: 12,218 subjects interviewed by phone during wave 1 (W1); 10,931 during wave 2 (W2) three years later. The sample was representative of the general population based on US Census. Analyses included subjects participating to both waves (N=10,931). Logistic regression models were used to determine the predictive variables for persistent hypnagogic hallucinations.
Results: At W1, 11.7% (95% CI:11.1%-12.3%) reported having experienced hypnagogic hallucinations in the previous year. At W2, 9.3% (95% CI: 8.8%-9.8%) reported hypnagogic hallucinations. A total of 22.8% of subjects with hypnagogic hallucinations at W1 still reported these hallucinations at W2 (2.1% of the sample). The 3-year incidence was 5.7% (95% CI: 5.3%-6.1%). After adjusting for age, sex, alcohol intake and medical conditions, persistence of hypnagogic hallucinations (i.e., present at both interviews) was predicted by the following factors: persistent pain (RR: 3.2 [95% CI:1.9-35.3] p<0.0001), persistent hypersomnolence (RR: 5.8 [95% CI:3.8-8.8] p<0.0001); persistent sleep paralysis (RR: 2.4 [95% CI:1.3-4.2] p=0.003); and persistent cataplexy-like symptoms (RR: 11.6 [95% CI:6.5-20.6] p<0.0001).
Conclusion: Hypnagogic hallucinations are frequent in the general population. Its chronicity is predicted mostly by factors associated with narcolepsy such as hypersomnolence, cataplexy and sleep paralysis.
Support (If Any):

0557

DIAGNOSTIC VISUAL AND AUTOMATED POLYSOMNAGRAPHIC REM SLEEP WITHOUT ATONIA THRESHOLDS IN ISOLATED REM SLEEP BEHAVIOR DISORDER 2.0

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Mayo Clinic Center For Sleep Medicine [1]

Introduction: Accurate, early diagnosis of isolated rapid eye movement (REM) sleep behavior disorder (iRBD) is crucial given its injury potential and neurological prognosis. We aimed to analyze visual and automated REM sleep without atonia (RSWA) diagnostic thresholds in a current cohort of iRBD patients using submentalis (SM) and individual four limb electromyography (EMG) recordings, including bilateral flexor digitorum superificialis (FDS) and anterior tibialis (AT) during polysomnography.
Methods: We analyzed RSWA in 20 iRBD patients and 20 age-sex-AHI matched controls who underwent polysomnography between 2017-2021 for phasic burst durations, phasic, tonic, and "any" muscle activity, and automated REM atonia index (RAI). Group RSWA metrics were analyzed with non-parametric comparisons, logistic regression, and receiver operating characteristic (ROC) curves to determine optimal diagnostic cutoff thresholds for iRBD. Correlation explored associative relationships between RSWA metrics, and principal components analysis (PCA) defined determinants of RSWA metric variance.
Results: All mean RSWA metrics were higher in iRBD patients than controls (p<0.05), except for left and bilateral AT phasic density and duration. RSWA(phasic%, AUC; "any"%, AUC) cutoffs were: SM (6.5%, AUC=90.2; 6.5%, AUC=92.5); L FDS (7.3%, AUC=95.8; 7.3%, AUC=95.8%); R FDS (5.4%, AUC=93.5; 5.8%, AUC=93.2%); Bilateral FDS (10.7%, AUC=96; 15.3%, AUC=95.8); L AT (6.7%, AUC=74.5; 6.7%, AUC=74.8%); R AT (4.7%, AUC=76.8; 4.7%, AUC=76.8%); Bilateral AT (7.5%, AUC=77.5; 7.5%, AUC=77.5%), combined SM/FDS (15.0%, AUC=95.5; 15.1%; AUC=95.8), combined SM/AT (16.5%, AUC=85.8; 21.0%; AUC=88.8),tonic (0.5%; AUC=85.9), and RAI (0.90; AUC=91.4). Phasic burst duration cutoffs were: SM=0.7s (AUC=90.2), L FDS=0.5 s (AUC=83.2), R FDS=0.6 (AUC=85.2), L AT=0.3 s (AUC=65.0) and R AT=0.4 s (AUC=77.0). PCA demonstrated that FDS and combined SM/FDS and SM/AT RSWA metrics best explained RSWA variance and differentiated controls from RBD, while SM and AT alone were less explanatory.
Conclusion: This study provides evidence for quantitative RSWA diagnostic thresholds applicable in current iRBD populations, and confirms the key importance of FDS to assure accurate iRBD diagnosis. Interestingly, these RSWA diagnostic thresholds are lower than previously determined thresholds, suggesting secular trends toward earlier iRBD detection and heterogeneous disease duration relative to polysomnography acquisition, underscoring the necessity of future large scale prospective, multicenter polysomnographic analyses to determine definitive iRBD diagnostic RSWA thresholds.
Support (If Any):

0558

EMERGENCE OF RESTLESS LEGS SYNDROME DURING OPIOID WITHDRAWAL

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Introduction: Discontinuation of opioid medications may be associated with emergence of restless legs syndrome (RLS), which may complicate opioid withdrawal. However, this has not been systematically studied. We aimed to prospectively determine the frequency of the occurrence and severity of RLS symptoms in patients undergoing physician supervised opioid tapering during a 3-week interdisciplinary pain rehabilitation program.
Methods: Adult patients undergoing prescription opioid taper were prospectively recruited during their participation in the Mayo Pain Rehabilitation Center from 2016 to 2021. Subjects completed the Cambridge-Hopkins RLS Questionnaire 13 and International Restless Legs Syndrome Study Group Rating Scale (IRLS) at baseline, midpoint, and dismissal from the program as well as 2 weeks, 1 and 3 months after dismissal from the program.

Results: 101 patients participated with 61% being female taking a mean morphine equivalent dose of 46.6 ± 49.0 mg. Baseline prevalence of RLS symptoms was 29% (29/101), increasing to 32% (32/101) at midpoint of treatment and further to 35% (34/97) at dismissal from the program. Frequency of RLS symptoms peaked 2 weeks after dismissal at 38% (30/78) and steadily declined to 35% (28/80) and 31% (21/68) at 1 month and 3 months after dismissal, respectively. Thirty-five percent of patients without baseline RLS symptoms reported de novo RLS symptoms at some point during their opioid taper. RLS severity score followed a similar trend as the presence of symptoms with a baseline of 16.6 ± 10.0. RLS severity score was maximum at 19.1 ± 7.3 one month following dismissal and decreased but remained elevated above baseline at 3 months following dismissal.
Conclusion: Symptoms of RLS occurred in over a third of patients on chronic opioids and increased during opioid withdrawal, appearing to peak in frequency and severity 2-4 weeks after discontinuation and gradually improved 3 months after discontinuation. Over one-third of patients in our cohort developed de novo symptoms of RLS at some point during their opioid withdrawal. Physicians supervising individuals undergoing opioid withdrawal should be aware of the potential development of RLS symptoms which may hinder successful opioid withdrawal.
Support (If Any):

0559

PREVALENCE OF CANNABIS USE IN PATIENTS WITH RESTLESS LEG SYNDROME FOR SYMPTOMATIC RELIEF

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Introduction: Restless leg syndrome (RLS) can be debilitating and have a significant negative impact on sleep. Most patients respond well to dopamine agonists, alpha 2 delta ligands, iron supplementation, and opioids. Some patients report persistent symptoms despite using recommended therapies.
Methods: We investigated the prevalence of cannabis use and its potential therapeutic effects in patients with RLS through a retrospective chart review over a three-year period. All patients with diagnosis of RLS and cannabis/marijuana use listed in the electronic health record were included. Data was collected from each patient's chart pertaining to the prevalence of cannabis use including method of use and frequency, patient demographics, use of certain medications, and whether they found symptom relief when using cannabis.
Results: 41 patients were identified who has a diagnosis of RLS and cannabis use. 25 of 41 (61%) were using medical marijuana and 8 of 41 (20%) were using marijuana recreationally. 12 of 41 (29.3%) patients found overall relief in their sleep while 4 (9.7%) patients did not and 25 (61%) patients we were unable to determine through chart review.Among the patients who were using medial marijuana, 5 patients were using it for pain and insomnia, 4 patients were using it for RLS, and 4 patients were using it for anxiety. 3 out of 4 (75%) patients who were using medical marijuana for RLS reported regular use. 3 of the patients inhaled cannabis while the remaining patient used an ointment containing cannabis. 2 of the 4 (50%) found symptom relief of RLS when using medical marijuana. 1 patient did not find relief with marjiuana but found relief when using Methadone instead. The remaining 3 patients also used Gabapentin and 2 of the 3 (67%) patients found symptom relief with the addition of a dopamine agonist.
Conclusion: Patients with RLS may use Cannabis for symptomatic relief. We believe this association should be recognized by sleep physicians and documented when conducting their patient's history.
Support (If Any):

0560

REST-ACTIVITY RHYTHMS ARE ASSOCIATED WITH PREVALENT CARDIOVASCULAR DISEASE, HYPERTENSION, OBESITY, AND CENTRAL ADIPOSITY IN A NATIONALLY REPRESENTATIVE SAMPLE OF US ADULTS

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Introduction: Prior studies have linked rest-activity rhythms (RAR), a measure of circadian rhythmicity in the free-living setting, to morbidity and mortality. However, evidence is limited on the associations of RAR with adiposity, hypertension, and cardiovascular disease (CVD) in a nationally representative sample of US adults.
Methods: Participants were 4,822 adults (age:≥20y) from the 2013-2014 National Health and Nutrition Examination Survey, who participated in the physical activity monitoring examination. Data from a wrist-worn ActiGraph GT3X+ accelerometer were used to estimate non-parametric 24-h RAR variables. Logistic models adjusted for age, sex, race/ethnicity, education, marital status, smoking, and alcohol use were used to evaluate associations of RARs with prevalent CVD (self-reported), hypertension (blood pressure≥130/80mmHg or medication use), obesity (BMI≥30kg/m2), and central adiposity (waist circumference>102cm for men and >88cm for women).
Results: Participants (mean age: 48y, 53% female, 33% racial/ethnic minority) in the highest vs. lowest tertile of relative amplitude, indicative of more robust RAR, had lower odds of prevalent CVD (OR(95%CI):0.47(0.25-0.87)), hypertension (OR(95%CI):0.63(0.40-0.99)), obesity (OR(95%CI):0.50(0.36-0.69)), and central adiposity (OR(95%CI):0.50(0.36-0.69)). Those in the highest vs. lowest tertile of M10 counts, indicating a more active wake period, had 66%, 54%, and 39% lower odds of CVD, obesity, and central adiposity, respectively. In contrast, participants in the highest vs. lowest tertile of intradaily variability, indicative of more fragmented RARs, had >2-fold (OR(95%CI):2.40(1.23-4.70)) and 40% (OR(95%CI):1.40(95%CI:1.04-1.88)) higher CVD and obesity odds, respectively. Further, those in the highest vs. lowest tertile of L5 midpoint, indicative of a later sleep period, had 68% and 41% higher odds for CVD and hypertension, while those with higher L5 counts, indicative of less efficient sleep, had 72%, 57%, and 79% higher hypertension, obesity, and central adiposity odds, respectively. A statistically significant linear trend was observed across RAR tertiles for all associations (p-trend<0.05).
Conclusion: Robust RAR, an active wake period, and an earlier and more efficient sleep period are associated with lower odds for CVD, hypertension, obesity, and central adiposity, with evidence of a dose-response relationship. The timing, regularity, and periodicity of sleep-wake and rest-activity patterns may represent an important target for reducing cardiovascular risk in adults.
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0561

SLEEP DISTURBANCE AMONG COVID-19 POST-HOSPITALIZED PATIENTS

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Introduction: COVID-19 primarily affects the respiratory system, however, a number of clinical sequela have emerged in patients recovered from COVID-19. Besides the most commonly reported symptoms of fatigue and dyspnea, early studies have found that sleep disturbance is also a common complaint. The aim of this study is to survey for sleep disturbance, degree of fatigue and daytime sleepiness in a group of post-hospitalized COVID-19 patients.
Methods: Patients who were discharged from Mayo Clinic hospitals after COVID-19 hospitalization were recruited in this study. Patients who have an existing diagnosis of sleep apnea or other sleep disorders were excluded from this study. Mayo Clinic patients who never had COVID-19 infection, nor a history of sleep disorders or other sleep disorders were also recruited as controls. Patients completed Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), and Fatigue Severity Scale (FSS) questionnaires via REDCap. Wilcoxon rank sum test was used to evaluate the difference between cases and controls in continuous variables and Fisher's exact test was used to compare categorical variables. Multivariable linear regression model was used to evaluate the difference in sleep and fatigue scores between cases and controls with baseline characters adjusted. All tests were two-sided with p value <0.05 considered statistically significant.
Results: A total of 62 patients who completed the questionnaires were included in the analysis. Among them, 33 had COVID-19. Cases were significantly older with higher BMI compared to controls. Global PSQI score (median=10 vs 6, p=0.015), ESS total score (median=8 vs 5, p=0.018) and FSS total score (median=30 vs 22, p=0.009) were all significantly higher for cases compared to control patients. After adjusting for age and BMI, the difference stayed statistically significant. The mean difference between cases vs controls was found to be 2.7 (95%CI:0.2-5.2, p=0.038), 2.93 (95% CI: 0.66-5.2, p=0.014), and 12.62 (95% CI:5.22-20.03, p=0.001) for PSQI, ESS, and FSS scores, respectively.
Conclusion: Preliminary results showed that sleep disturbance (PSQI) and daytime symptoms (measured by ESS and FSS) are found to be significantly higher among post COVID-19 hospitalized patients compared to controls.
Support (If Any): This work is supported by the Mayo Clinic in Florida Department of Medicine Catalyst for Advancing in Academics award and the Mayo Clinic in Florida Research Accelerator for Clinicians Engaged in Research Program.

0562

ASSOCIATIONS OF INSOMNIA SYMPTOMS AND UNHEALTHY ALCOHOL USE WITH POST-OPERATIVE HEALTHCARE UTILIZATION IN VETERANS UNDERGOING DECOMPRESSIVE LAMINECTOMY FOR LUMBAR SPINAL STENOSIS

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Introduction: Lumbar spinal stenosis (LSS) affects 11-39% of adults and contributes to significant pain and disability. Decompressive laminectomy (DL) is a common surgical intervention for LSS but many with medical and psychosocial comorbidities may not

improve. Insomnia and unhealthy alcohol use, for example, are common among people living with chronic pain and may affect key laminectomy outcomes, such as healthcare utilization rates. We examined associations of self-reported rates of post-DL healthcare utilization in Veterans with insomnia symptoms and alcohol use.
Methods: We analyzed data from a multi-site prospective cohort study of Veterans with LSS undergoing DL. Participants (N=200) self-reported prior 12-month alcohol use behavior (Short Michigan Alcohol Screening Test; SMAST) and prior two-week insomnia symptoms (Insomnia Severity Index; ISI) prior to surgery; 12-months of post DL healthcare office visits, ER visits, hospitalizations, and mental health visits were reported over the telephone monthly. Negative binomial regression models via incident rate ratios (IRR) compared healthcare utilization rates between individuals reporting alcohol-related problems only (SMAST >2), insomnia symptoms only (ISI ≥ 8), and both to those reporting neither.
Results: Approximately 52% of participants reported insomnia symptoms, 75% unhealthy alcohol use, and 39% both. Rates of office, ER, and hospital visits were descriptively highest in those reporting insomnia only; mental health visits were highest in those with both insomnia and unhealthy alcohol use. Those with insomnia only had more ER (IRR=2.39, p=.04) and mental health visits (IRR=4.32, p=.03) than those with neither insomnia nor unhealthy alcohol use; individuals with both insomnia and unhealthy alcohol use also had more mental health visits (IRR=4.22, p=.01). Adjusting for covariates rendered IRRs attenuated and statistically nonsignificant, but magnitudes remained high.
Conclusion: Most Veterans with LSS reported insomnia symptoms and/or unhealthy alcohol use. Those with insomnia symptoms reported the highest rates of healthcare utilization, including higher rates of ER and mental health visits. Insomnia symptoms may contribute to post-operative healthcare utilization, lending support for assessment and intervention of sleep-related problems pre-laminectomy.
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0563

ASSOCIATION BETWEEN ACTIGRAPHIC SLEEP MEASURES AND LYMPHOCYTE SUBSETS IN PEOPLE WITH CHRONIC HIV INFECTION

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Introduction: While inadequate sleep is known to increase inflammation in immunocompetent individuals, it is unknown if poor sleep worsens inflammation in people living with HIV. The ratio of CD4+/CD8+ T cells is a readily derived measure of chronic inflammation in people living with HIV. We sought to investigate the association between lymphocyte subsets and actigraphy-derived sleep measures in a cohort of HIV seropositive men.
Methods: HIV seropositive men on antiretroviral therapy for > 1 year and with undetectable (< 20 copies/mL) plasma HIV-1 RNA participating in the Multicenter AIDS Cohort Study underwent a sleep evaluation with 1 week of wrist actigraphy. Data from 287 participants with ≥ 5 days of actigraphy were analyzed. We evaluated three dimensions of sleep: mean nocturnal sleep duration, sleep onset latency, and sleep maintenance efficiency. Linear regression was used to assess the association between each sleep dimension with CD4+ and CD8+ T-cell counts. Because of a U-shaped association, nocturnal sleep duration was also modelled dichotomously as a normal (6-8 hrs) vs. abnormal duration (<6 or >8 hrs).
Results: Participants had a mean (±SD) age of 55 ± 12 years, mean CD4+ count of 723 ± 293 cells/ml, and 7.0 ± 1.7 days of actigraphy data. None of the sleep measures were associated with CD4+ counts. However, participants with abnormal sleep duration had 129 ± 31 cells/mL higher CD8+ counts compared to those with normal sleep duration (p=0.01). There were also nonsignificant trends whereby every 30-minute increase in sleep latency was associated with a 138 cells/ml increase in CD8+ count (p=0.07) while every 10% reduction in sleep efficiency was associated with a 56 cells/ml increase in CD8+ count (p=0.12). These findings were unchanged after adjusting for age and body mass index.
Conclusion: Among men with treated HIV infection, abnormal sleep duration (both short and long) is associated with increased circulating CD8+ T cell count, suggesting increased chronic inflammation.
Support (If Any): NIH AI0355041, HL082610 and American Thoracic Society ASPIRE Fellowship

0564

SLEEP PATTERNS OF PATIENTS ON HOME PARENTERAL NUTRITION: A HOME-BASED OBSERVATIONAL STUDY

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Introduction: Whereas home parenteral nutrition (HPN), a form of nutrition administered through a central venous catheter for patients with intestinal failure, is necessary for survival, the current standard practice for HPN is to administer infusions for approximately 12-hour periods overnight, coinciding with nighttime sleep. Patients supported with HPN often report poor sleep, however limited research has been conducted to objectively measure sleep patterns of HPN-dependent patients.
Methods: We aimed to characterize the sleep patterns of patients on HPN through 7-day actigraphy in a remote, home-based observational study. Sleep measures of clinical importance were derived from actigraphy including sleep duration, sleep efficiency, sleep onset latency, and wake after sleep onset. Participants also completed validated sleep surveys electronically.

Results: 20 participants completed all study procedures [mean (standard deviation): age =51.6 (13.9), BMI =21.4 kg/m2 (4.6), 80% female]. The population median (interquartile range) for sleep duration, sleep efficiency, sleep onset latency, and wake after sleep onset was 6.9 (1.1) hours, 83.3 (7.8) %, 11.8 (7.1) minutes and 57.2 (39.9) minutes, respectively, and 55%, 60%, 35%, and 100% of participants did not meet the recommendations for these measures from the National Sleep Foundation. 65% of participants reported napping at least once during the 7-day period. Based on the Insomnia Severity Index, 70% of participants were classified as having sub-threshold or more severe insomnia. Based on the Pittsburgh sleep quality index, 85% were classified as having significant sleep disturbance.
Conclusion: Most HPN-dependent patients likely have disrupted sleep largely driven by difficulty maintaining sleep. The extent to which overnight HPN infusions contributed to poor sleep cannot be elucidated from this observational study. Addressing known factors that contribute to poor sleep and encouraging sleep hygiene and sleep interventions are imperative to improve the overall quality of life of patients requiring HPN.
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0565

EXAMINING OBSTRUCTIVE SLEEP APNEA KNOWLEDGE AND ATTITUDES OF PROVIDERS IN SOUTHERN WEST VIRGINIA

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Introduction: Obstructive sleep apnea (OSA) syndrome is a common but underdiagnosed clinical problem with multiple health implications. The rising prevalence of OSA has been linked to increasing obesity. Because the obesity rate of West Virginia (WV) is almost 40%, successful identification and treatment of OSA is essential to improving the health of WV communities. Our previous work demonstrated that OSA is ineffectively managed in our rural communities. This study aimed to evaluate OSA knowledge and attitudes of primary care providers (PCPs) practicing at Federally Qualified Health Centers (FQHC) serving rural communities with significant health disparity in southern WV.
Methods: We assessed OSA knowledge and attitudes of 14 PCPs in southern WV (n=6 physicians and 8 mid-level providers; 53.2 + 12.2 years of age; 78% female) practicing at FQHC. The OSA Knowledge and Attitudes (OSAKA) questionnaire assesses providers' knowledge via 18 true-false statements and importance and attitude via five Likert. OSA attitudes are assessed via two items for importance of OSA and three items for confidence in identifying and treating OSA.
Results: No respondents answered the 18-knowledge portion with 100% accuracy (mean = 14.3). Mann Whitney U tests were then used to compare Physicians' and mid-level providers' years in practice and OSAKA responses. Knowledge scores in physicians (Mdn = 16) significantly differed from mid-level providers scores (Mdn = 13.5) in our sample ($U = 5.5$, $p < 0.05$, $r = -0.66$). OSAKA Importance and Confidence questions revealed that PCPs felt OSA identification was important, but were not confident in their ability to manage OSA.
Conclusion: Our results demonstrate that rural PCPs have fairly good knowledge of OSA in general but lack knowledge in specific domains. Interestingly, providers feel OSA is an important disease and were fairly knowledgeable with the disease, but lacked confidence to manage OSA. Further explanatory studies are warranted to more robustly examine these findings. Our prior work demonstrates sleep apnea is ineffectively managed in the region. Thus, targeted training and further engagement with rural providers may well address disparity in OSA management for Appalachian communities.
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0566

IMPACT OF OBSTRUCTIVE SLEEP APNEA IN PATIENT ADMITTED FOR DIABETIC KETOACIDOSIS. ANALYSIS OF THE NATIONAL INPATIENT SAMPLE.

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Introduction: The prevalence of type 2 diabetes mellitus in patients with obstructive sleep apnea has been estimated to be 15-30%. Studies have shown increased severity of diabetes in patients with underlying OSA independent of other confounders such as age and obesity.We aim to assess the effect of obstructive sleep apnea on patients admitted for diabetic ketoacidosis.
Methods: We queried the National Inpatient Sample (NIS) 2016, 2017, and 2018. We searched the NIS for adult patients hospitalized with DKA as principal diagnosis with exposure of OSA as a secondary diagnosis using ICD-10 codes. The primary outcome was inpatient mortality, while secondary outcomes were length of stay (LOS), total hospital charge, cerebral edema, cardiac arrest, acute respiratory failure (ARF), and health cost utilization defined by total hospitalization costs. Multivariable logistic and linear regression analysis was applied to estimate the clinical outcomes. STATA software was used to analyze the data.
Results: There were about 367,555 adult hospitalizations principally for DKA, of which 2.5% had OSA as a secondary diagnosis. Demographic characteristics based on OSA vs non-OSA cohorts with mean age of 52.3 years (CI 51.6-52.9) vs 40.4 years (CI 40.2-40.5), females (43.2% vs 49.7%), Whites (64.7% vs 57.2%), Black (25.6% vs 26.7%), and Hispanic (7.1% vs 11.6%). A total of 1,440 inpatient mortality (0.39%) occurred in hospitalizations for DKA. After adjusting for age, sex, disease severity and race, hospitalizations for DKA with OSA had similar inpatient mortality [0.59% vs 0.39%, AOR 0.81, 95% CI: 0.423 - 1.565, p=0.538], total hospital charge [$38,790 vs $30,516 P=0.185], LOS [4.19 vs 3.27 days, P=0.064], cerebral edema [0.32% vs 0.1% AOR 1.25, 95% CI: 0.437 - 3.616, p=0.671], cardiac arrest [0.54% vs 0.27% AOR 1.01, 95% CI: 0.493 - 2.105, p=0.959] compared to those without DM. However patient with OSA had an increased odds of ARF [0.55% vs 0.22% AOR 1.48, 95% CI: 1.173 - 1.867, p=0.001].
Conclusion: In conclusion, patients admitted primarily for DKA with co-existing OSA had similar inpatient mortality, LOS, total hospital charges, cerebral edema, and cardiac arrest compared to

those without OSA. However, the OSA group had more odds of ARF.

Support (If Any): 1. Reutrakul S, Mokhlesi B. Obstructive Sleep Apnea and Diabetes: A State of the Art Review. Chest. 2017;152(5):1070-1086. doi:10.1016/j.chest.2017.05.0092. Mahmood K, Akhter N, Eldeirawi K, et al. Prevalence of type 2 diabetes in patients with obstructive sleep apnea in a multi-ethnic sample. J Clin Sleep Med. 2009;5(3):215-221.3. Morgenstern M, Wang J, Beatty N, Batemarco T, Sica AAL, Greenberg H. Obstructive sleep apnea: an unexpected cause of insulin resistance and diabetes. Endocrinol Metab Clin North Am 2014;43:187–204

0567

WHEN LOUD SLEEP AIDS A SILENT KILLER: A PREVALENCE STUDY ON OBSTRUCTIVE SLEEP APNOEA IN TYPE-2 DIABETICS FROM A TERTIARY CARE HOSPITAL IN WESTERN INDIA.

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Introduction: Type-2 diabetes mellitus is a highly prevalent multisystemic disorder having bidirectional association with Obstructive sleep apnoea. These disorders, when present as co-morbidities, can lead to life-threatening cardiovascular complications. The current prevalence of Obstructive sleep apnoea in Type-2 diabetics is largely unknown, especially in developing nations like India. This study was aimed at determining its prevalence and other risk factors in Type-2 diabetics visiting a tertiary-care hospital in Western India.

Methods: Adult patients with Type 2 diabetes mellitus visiting the Departments of Pulmonary medicine and Non-communicable diseases on an out-patient basis at a tertiary-care hospital were recruited for the study. Those with unstable medical illnesses or other forms of diabetes were excluded. Participants were interviewed and examined based on a case-study form, including Epworth Sleepiness Scale, STOP-BANG and OSA-50 questionnaires, followed by a Home Sleep Apnoea Test. Apnoea-Hypopnoea Index(AHI) was used to evaluate for Obstructive sleep apnoea.

Results: A sample of 62 diabetics (median age: 61(16) years; 34 males; 28 females) was analysed. Obstructive sleep apnoea(Apnea-Hypopnea Index [AHI] ≥ 5.0/h) was diagnosed in 55 subjects(88.7%, median AHI – 20.95/h). 62.9% had moderate-to severe Obstructive sleep apnoea(OSA)(AHI ≥ 15/h), 21% had positional OSA and 48.4% had OSA syndrome(OSAS). AHI had significant positive correlation with waist circumference(rho-0.318, p- 0.012), neck circumference(rho-0.363, p-0.004), Modified Mallampati score(rho-0.372, p-0.003) and Epworth Sleepiness Scale(rho-0.403, p-0.001). No significant association of glycaemic control, duration of Type-2 diabetes and Random Blood Sugar level with AHI was identified. Sensitivity and specificity of STOP-BANG questionnaire for diagnosing OSA was 69.1% and 71.4% and that of OSA-50 questionnaire was 94.5% and 14.3%, respectively.

Conclusion: Obstructive sleep apnoea(OSA) is more prevalent in adult population with Type-2 diabetes mellitus(T2DM) than in the general population. A high index of suspicion for OSA in patients with T2DM is warranted, because they may not have overt daytime sleepiness or presence of high-risk predictors. Waist and neck circumferences are better predictors of OSA syndrome than body mass index(BMI). Home Sleep Apnoea Test is a more reliable test for OSA detection compared to screening questionnaires and hence can be a useful tool for diagnosis and management planning of OSA in high-burden, low-resource settings.

Support (If Any):

0568

MULTIDIMENSIONAL SLEEP HEALTH AND MORTALITY: THE MULTI-ETHNIC STUDY OF ATHEROSCLEROSIS

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Introduction: Prior research on the association of sleep with mortality has tended to focus on single sleep dimensions such as insufficiency. However, sleep health is conceptualized to consist of multiple interrelated dimensions: prior work suggests that simultaneous consideration of multiple sleep dimensions may better predict health outcomes than individual sleep measures considered in isolation. We tested the hypothesis that better multidimensional sleep health is associated with lower mortality in the Multi-Ethnic Study of Atherosclerosis, an ethnically-diverse prospective cohort study.

Methods: At baseline (2010-2013), sleep was measured objectively by at-home polysomnography and 7-day wrist actigraphy, additionally by validated questionnaires. A composite sleep score was constructed in a prior project by summary index whose interpretation is the sum/count of 13 sleep attributes, selected a priori, which met clinical criteria for favorability. We used proportional hazards models to estimate the association between sleep health scores and all-cause mortality, adjusting for socio-demographics, and lifestyle/behavioral factors such as smoking status, alcohol consumption, and Body Mass Index.

Results: 1,757 participants were followed for a median of 5.9 years (Q1-Q3, 5.4–6.4 years) until death or last contact (128 deaths). After adjustment, each unit increase in composite sleep health scores (indicating healthier sleep) were associated with a 12% lower mortality risk (HRsummary_index: 0.88; 95% CI: 0.80, 0.96). This result was further supported by a similar association with mortality of a sleep score constructed by Principal Components Analysis. In post-hoc analyses, achievement of favorable actigraphic-estimated sleep regularity (midpoint sd <30 minutes; duration sd <90 minutes), sleep duration (6-8 hours), and Apnea-Hypopnea Index (≤15 events/hour) were significantly associated with lower mortality. Associations with mortality were in the expected direction for % N3, % R, and sleep fragmentation.

Conclusion: More favorable multidimensional sleep is associated with reduced mortality risk. Of specific sleep dimensions, sleep regularity, duration, and obstructive sleep apnea are suggested to be public health targets to potentially reduce risk of premature mortality.

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0569

COVID-19 AND FATIGUE: DOES FATIGUE PERSIST BEYOND DIAGNOSIS?

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Introduction: While it is not surprising that COVID is associated with increased fatigue, there is emerging data that COVID-19 symptoms extend well beyond the acute illness period. This phenomenon, known as "Long COVID", may include fatigue (persistent fatigue post viral infection). The present analysis was undertaken to evaluate fatigue in subjects with and without COVID-19 virus at two time points separated by ~ one year's time.
Methods: The parent study was a large online study of subjects during the COVID lockdown which was designed to evaluate the effects of social distancing on mood and sleep (n=4052; 3,184 women; $\bar{X}$age= 46.0 years). The proband subsample of interest was the subjects that reported having COVID as compared to matched controls (whole sample n=242; 195 women [80.6% female]; 206 identified primarily as white [85.1%]; $\bar{X}$age=42.0 years). Subjects who reported testing positive for COVID-19 provided additional information on COVID-19 symptoms (e.g., severity and duration per symptom). The PROMIS Fatigue scale was administered at time one (T1: April-June 2020) and one year later (T2: January-March 2021). Control subjects were matched based on age, sex, and race to reduce potential confounding or effect modification by these variables.
Results: The mean PROMIS Fatigue scores for the COVID-19 group and Control groups at baseline (T1) were $\bar{X}$=52.9 + 8.2 (n=121) and $\bar{X}$=50.7 + 10.4, (n=121), p<0.06, respectively. The mean PROMIS scores for the COVID-19 group and Control groups at follow-up (T2) were $\bar{X}$=55.3 + 8.7 (n=121) and $\bar{X}$=52.6 + 8.4, (n=121), p<0.017, respectively. Overall, the groups were found to significantly differ at both time points, p<0.001. No group-by-time interaction was observed. Both groups exhibited a small increase in fatigue from T1 to T2, p<0.716.
Conclusion: As expected, there were significant differences in patient reported fatigue between the COVID-19 and the control group. The between group differences were modest. Significant and large scale group differences were not evident for T2 (during follow-up). This suggests that COVID is associated with increased fatigue but we did not detect "Long COVID" effects. This may be due to methodologic considerations. In order to observe "Long COVID" the data will need to be anchored to illness onset and offset.
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0570

DOES CBT-I DOSE EFFECT SLEEP DURATION AND FATIGUE IN BREAST AND PROSTATE CANCER PATIENTS?

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Introduction: Cancer-related fatigue (CRF) is highly prevalent during acute illness and survivorship, with almost 100% of cancer patients experiencing some level of CRF. While CRF commonly co-occurs with sleep disturbance during and/or after cancer treatment, CRF is defined as occurring independent of sleep considerations. The present analysis is based on an ongoing pilot study where CBT-I dose (4 & 8 [Low] vs 10 & 12 [High] sessions) is being assessed for whether improved sleep continuity and/or increased TST can improve CRF in subjects diagnosed with breast and prostate cancer.
Methods: This interim analyses includes seven adult subjects (6 females, mean age=57.1 yrs.; n=3 [Low dose], n=4 [High dose]). CBT-I was provided by a master CBT-I therapist via video conferencing (telehealth CBT-I). Subjects were asked to complete sleep diaries, and weekly measures of fatigue (FACIT) and insomnia severity (ISI) questionnaires.
Results: Subjects in the low dose group exhibited a 9% improvement and subjects in the high dose group had a 21% improvement on the FACIT. This corresponded to a 28% improvement on the ISI (low group) and a 68% improvement on the ISI (high group). With respect to TWT, subjects in the low dose group decreased their wake time by 36% and those in the high dose group decreased their wake time by 43%. Finally, TST decreased by 7% in the low dose group but increased by 12% in the high dose group.
Conclusion: Preliminary results indicate that a higher CBT-I dose may significantly decrease fatigue, stabilize sleep schedules, and improve sleep continuity in patients with CRF, where the high dose group showed more than double the improvement on the FACIT and ISI (as compared to the low dose group). Not surprisingly, TWT was roughly comparable between the groups while TST was more substantially impacted by high dose CBT-I. This study is ongoing.
Support (If Any): Support: 5T32HL00795320;K24AG055602

0571

ASSOCIATIONS BETWEEN SLEEP PROBLEMS AND CARDIOVASCULAR DISEASE AND ALL-CAUSE MORTALITY IN ASTHMA-COPD OVERLAP

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Introduction: Sleep problems (i.e., short and long sleep duration and sleep disorders) are common in persons with either asthma or chronic obstructive pulmonary disease (COPD) and have been linked to increased cardiovascular risk and mortality. This study determined whether sleep problems are associated with increased cardiovascular disease (CVD) prevalence and all-cause mortality in adults with asthma-COPD overlap (ACO).
Methods: Cross-sectional analysis of the 2007-2012 National Health and Nutrition Examination Survey (NHANES) and 2015 National Death Index. Participants (n=7616) were stratified into four groups, using self-report and spirometry data: asthma (n=483), COPD (n=1006), ACO (n=398), and those without asthma or COPD (controls; n=5729). Sleep duration hours were categorized as short (≤5), normal (6-8), and long (≥9). Self-report of physician diagnosis of a sleep disorder (Yes/No) and cardiovascular disease (angina, congestive heart failure, coronary heart disease, hypertension or myocardial infarction) were collected. Logistic and Cox regression models adjusted for covariates were employed.
Results: Prevalence of sleep disorders in ACO (24.7%) was roughly two times higher than rates in the asthma (10.7%) and COPD (13.5%) groups and 5 times higher than controls (4.6%). The ACO group had a higher proportion of short sleepers (27.6%) compared to COPD (19.2%) and controls (11.7%) and higher proportion of long sleepers (6.9%) compared to COPD (5.5%). Short sleepers had higher odds for

CVD (OR=1.70, 95% CI, 1.34–2.15) compared to normal sleepers. Relative to ACO with normal sleep, long sleepers in the other groups had lower odds for CVD (all P-values <0.05). Both short and long sleepers in the control (HR=0.19, 95% CI 0.07–0.47, and HR=0.07, 95% CI 0.02–0.35, respectively) or COPD (HR=0.38, 95% C, 0.19–0.77, and HR=0.24, 95% CI 0.12–0.51, respectively) groups had lower hazards of all-cause mortality compared to ACO with normal sleep. The influence of presence of sleep disorders on CVD and mortality did not vary between groups.
Conclusion: Associations between sleep duration and increased risk of CVD and all-cause mortality were stronger in ACO as compared to COPD and controls. Persons with ACO may represent a high-risk group that should be targeted for assessment and treatment of sleep problems.
Support (If Any):

0572

SLEEP QUALITY PRIOR TO ADMISSION MAY BE LINKED TO LENGTH OF STAY IN OLDER INTENSIVE CARE UNIT SURVIVORS

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Introduction: Older adults who are admitted to an intensive care unit (ICU) often experience daytime sleepiness and inactivity during hospitalization, yet it remains unclear how pre-hospital sleep may influence hospital outcomes. The aim of this study was to explore trends between pre-hospital self-reported nighttime sleep duration, post-ICU daytime sleep duration, and hospital length of stay (LOS) among older ICU survivors.
Methods: Thirty older ICU survivors who were functionally independent prior to hospitalization and were mechanically ventilated while in ICU were enrolled in the present pilot study. Actigraphy was used to estimate post-ICU daytime total sleep time (TST) for a daytime period (06:00-22:00) within 24-48 hours post-ICU discharge. The Pittsburgh Sleep Quality Index was used to estimate self-reported nighttime sleep duration prior to hospital admission, and participants were grouped into three categories: short sleep (5.5-7.5 hours), moderate sleep (7.5-9 hours), and long sleep (9-10.5 hours). Total hospital LOS in days was obtained via chart review. Descriptive statistics were used to explore trends between pre-hospital sleep duration, post-ICU daytime sleep duration, and hospital LOS.
Results: Of the 30 enrolled participants, 29 completed the post-ICU actigraphy observation period; one participant was transferred back to ICU for surgical complications. The mean post-ICU daytime TST among participants who reported short pre-hospital sleep was 6.54 hours, while the means for those who reported moderate and long pre-hospital sleep durations were 7.83 and 8.39 hours, respectively. Participants who reported short pre-hospital sleep had a mean hospital LOS of 14.1 days, while participants who reported moderate and long pre-hospital sleep durations had a mean LOS of 29.1 days and 29.2 days, respectively.
Conclusion: Older ICU survivors who reported shorter sleep at home prior to hospital admission tended to also sleep less during the daytime hours immediately following transition out of ICU, compared to those who reported longer sleep at home. In addition, older ICU survivors who reported shorter sleep at home tended to have shorter LOS, compared to those who reported longer sleep at home. Potential interventions may focus on increasing daytime activity in older ICU survivors who endorse frequent daytime sleepiness and long nighttime sleep at home.
Support (If Any):

0573

DAYTIME AND NIGHTTIME SLEEP AND SYMPTOMS OF DEPRESSION AND ANXIETY IN ADULTS WITH INFLAMMATORY BOWEL DISEASE

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Introduction: Inadequate sleep duration and daytime napping are associated with symptoms of depression and anxiety in the general population. People with autoimmune diseases frequently experience poor sleep and depressive and anxious symptoms; however, little is known about how sleep might contribute to depressive and anxious symptoms in this population. The purpose of this study was to explore the associations between nighttime sleep and naps and depressive and anxious symptoms in adults with inflammatory bowel disease (IBD).
Methods: We conducted a cross-sectional feasibility study of adults with IBD (Crohn's disease and ulcerative colitis) ages 18 to 60 years recruited from a single academic IBD center. We measured depressive and anxious symptoms using the Patient-Reported Outcomes Measurement Information System (PROMIS) measures. We elicited nighttime sleep [sleep duration, efficiency, and wake after sleep onset (WASO)] using wrist-worn actigraphs (Philips Spectrum Plus) and elicited naps and perceived sleep quality (analog scale 0-100) with sleep diaries over 10 days.
Results: We included 35 adults [age M = 37.8 (14.0); female N = 21 (60.0%); Crohn's disease N = 18 (51.4%); clinical remission N= 22 (63.9%)]. Mean depression (51.4 SD= 9.1) and anxiety (52.6 SD = 9.9) were over the population-based cut-offs. Additionally, nightly sleep duration was short (M = 391.9 minutes SD = 52.5). Sleep efficiency (M = 83.0% SD = 5.5) was low, and WASO (M = 41.8 minutes SD = 19.9) was high. Twenty-one (60%) participants reported taking at least one nap (median = 2, range 1-7) over the 10 days. Depressive and anxious symptoms were higher in people who napped than those who did not nap with a moderate effect size (Cohen's d = -.309, -.466 respectively). Sleep quality was correlated with symptoms of depression ($r = .622$, $p < .001$) and anxiety ($r = .638$, $p < .001$). No other sleep characteristics were associated with depressive and anxious symptoms ($r < .1$, $p > .59$).
Conclusion: Health care providers should assess for the presence of depression and anxiety in people with IBD who regularly nap and report poor sleep quality. Future research regarding the treatment of sleep, depression, and anxiety is needed in this population.
Support (If Any): American Nurses Foundation

0574

SLEEP DURATION AND SLEEP QUALITY IN ASSOCIATION WITH RISK OF PROSTATE CANCER IN THE UK BIOBANK

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Introduction: Studies of shift work suggest extreme sleep disruption may increase prostate cancer risk. However, studies evaluating sleep duration and quality are inconsistent due to low ascertainment of cases and whether subdomains of sleep quality were queried. Our objective was to evaluate sleep duration, multiple

sleep quality domains, and prostate cancer incidence among a large, prospective cohort.
Methods: We conducted a secondary analysis among 219399 men aged 40-69 years without prevalent cancer enrolled in the UK Biobank (2006-2010). At baseline participants self-reported their usual sleep duration, difficulties falling or staying asleep, snoring, and falling asleep during the day. We used Cox-proportional hazards models to calculate hazards ratios and 95% confidence intervals for associations with prostate cancer risk. Models were adjusted for confounders. Given potential concerns of reverse causality due to nocturia from undiagnosed prostate cancers increasing sleep disturbances, we restricted the cohort to men with ≥4 years of follow-up in a sensitivity analysis.
Results: Over 6.7 years of follow-up, there were 5829 prostate cancer cases. Sleep duration (vs. 7-8 hours; <5 hours HR: 1.08, 95% CI: 0.95, 1.22; 5-6 hours HR: 0.92, 95% CI: 0.85, 1.00; 6-7 hours HR: 0.97, 95% CI: 0.91, 1.03; 8-9 hours HR: 0.93, 95% CI: 0.84, 1.04; ≥9 hours HR: 1.09, 95% CI: 0.91, 1.31) was not associated with prostate cancer. Participants who reported "sometimes" (HR: 1.09, 95% CI: 1.02, 1.16) or "usual" (HR: 1.17, 95% CI: 1.09, 1.26) difficulties falling or staying asleep had greater prostate cancer risk compared to those who reported "never/rarely." Snoring and falling asleep during the day were not associated with prostate cancer. Results were unchanged when restricting to men who had ≥4 years of follow-up.
Conclusion: In this large, prospective study, sleep duration, snoring, and falling asleep during the day were not associated with prostate cancer. However, men who had greater difficulties falling or staying asleep had greater prostate cancer risk. These results suggest that poor sleep quality rather than sleep duration may be an important consideration for prostate cancer.
Support (If Any): This work was supported by the NIH Intramural Research Program Cancer Research Training Award, NCI.

0575

CHARACTERIZATION OF THE PREVALENCE OF SLEEP DISTURBANCES IN CARDIOVASCULAR AND NEUROLOGICAL PATIENTS FROM THE RUSH HEART CENTER FOR WOMEN

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Introduction: Anecdotally, patients with cardiovascular and neurological medical conditions present with sleep disturbances in duration, efficiency, and timing, or with sleep disorders such as obstructive sleep apnea. The frequency of such disturbances remains unknown as does whether they result from cardiovascular and neurological conditions or contribute to the development of these conditions. Thus, characterizing the prevalence of sleep disturbances in this unique clinical population is a first step to establishing the important role of sufficient, healthy sleep for patient care and treatment.
Methods: We conducted a retrospective electronic chart review of patients from the Rush Heart Center for Women (RHCW) based on the following: age, sex, race, body mass index (BMI), blood pressure (BP), sleep studies, cardiac testing, and neurologic testing. Patients were also characterized based on prevalent disease (cardiac, neurologic, or both) including the following: cardiac—coronary artery disease, ischemic vs. non-ischemic heart disease, atrial fibrillation, heart failure, etc; neurologic—vascular etiology, mild cognitive impairment, dementia, Alzheimer's Disease, etc. We then performed a database search to identify patients who also met the criteria for sleep apnea or for whom a sleep study was ordered due to sleep disturbances.
Results: 103 patients (mean age±SD, 68.71±12.55 years; 78 females; mean BMI±SD, 28.65±5.28; 79 White, 14 African American, 4 Asian, 1 Native Hawaiian, 5 Other; mean BP±SD, 128/72±20/9; mean±SD Mini-Mental State Examination (MMSE), 27.47±3.24) had cardiovascular and/or neurological conditions. Of these, 53 patients (mean age±SD, 68.31±9.35 years; 40 females; mean BMI±SD, 29.91±5.73; 39 White, 7 African American, 2 Asian, 1 Native Hawaiian, 4 Other; mean BP±SD, 129/73±21/9; mean MMSE±SD, 27.67±2.99) also presented with sleep apnea symptoms or sleep disturbances.
Conclusion: A strikingly high percentage (51.5%) of patients at the RHWC who had cardiovascular and/or neurological conditions also presented with sleep apnea or sleep disturbance symptoms. The prevalence of this trifecta of disease (cardiovascular, neurological, and sleep apnea/disturbance) demonstrates the criticality of considering the interplay between these various domains when administering clinical care to patients. Future research capitalizing on the physiological and neurobehavioral benefits of adequate, healthy sleep in this population is warranted.
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0576

IMPACT OF OBSTRUCTIVE SLEEP APNEA ON IN-HOSPITAL MORTALITY DUE TO ACUTE MYOCARDIAL INFARCTION - A LARGE RETROSPECTIVE NATIONAL STUDY OF VETERANS

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Introduction: Ischemic preconditioning (IPC) is a phenomenon that refers to multiple, brief periods of myocardial ischemia followed by reperfusion. This counterintuitive preconditioning is thought to provide cardioprotection from subsequent prolonged ischemic events. Obstructive sleep apnea (OSA) may lead to IPC by frequent, recurrent short episodes of hypoxia and sympathetic stimulation. We hypothesized in patients who were admitted with acute myocardial infarction (MI), the presence of OSA was associated with improved survival during the hospitalization, likely due to IPC.
Methods: This is a retrospective cohort study utilizing national Veterans Health Administration (VHA) records. The cohort

includes patients from 1999-2020 with a hospitalization for MI as the principal diagnosis. We confirm the OSA diagnosis using ICD9/10 codes. The primary outcome was in-hospital mortality during the index admission for acute MI. We reported the odds ratio (OR) of in-hospital mortality between with-OSA and without-OSA using logistic regression. We adjusted the OR (aOR) by age, gender, race, ethnicity, BMI, and Charlson Comorbidity index.

Results: Out of 4,237,444 veterans with any sleep diagnosis, 76,359 patients were hospitalized with a diagnosis of MI. We observed 30,116 with OSA (age, 64±10; BMI, 33±7) and 43,480 without OSA (age, 68±12; BMI, 29±6). The aOR of in-patient mortality was lower in with-OSA (n = 333[1.1%]; aOR, 1.86; 95% CI, 1.63 to 2.12) compared to without-OSA (n = 1,102[2.5%]; aOR, 2.02; 95% CI, 1.78 to 2.30). After stratifying the patients based on previous history of MI, the results remained the same.

Conclusion: We found that in patients admitted with acute MI, the OSA cohort was associated with lower mortality when compared to non-OSA cohort. We speculate that these differences may be attributed to IPC likely due to repetitive, chronic episodes of hypoxia in obstructive sleep apnea. Further research is warranted to elicit the clinical implications of ischemic preconditioning and OSA.

Support (If Any): Culebras, A. Exploring the trail between cerebral ischemic aggravation and ischemic preconditioning. Obstructive sleep apnea leads the way. Sleep Medicine, Volume 67 ,2020, p 276-277Salman LA, Shulman R, Cohen JB. Obstructive sleep apnea, hypertension, and cardiovascular risk: epidemiology, pathophysiology, and management. Curr Cardiol Rep 2020;22(2):6

0577

SLEEP QUALITY AND ITS ASSOCIATION WITH INFLAMMATION OVER TIME IN PATIENTS UNDERGOING RADIATION THERAPY FOR HEAD AND NECK CANCER

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Introduction: Sleep disturbance is a prominent concern in patients with cancer with detrimental effect on health outcomes. Although inflammation has been proposed as a potential mechanism of sleep disturbance, there is a dearth of longitudinal data supporting the relationship between cancer-related sleep disturbance and inflammatory markers. The goal of this prospective longitudinal study was to examine the change in sleep quality and its association with inflammatory markers in patients undergoing radiation therapy for head and neck cancer.

Methods: A total of 176 patients who had head and neck cancer without distant metastases were assessed before, immediately after, and at 3 and 12 months after radiotherapy. Sleep quality was assessed by the Pittsburgh Sleep Quality Index (PSQI). Peripheral blood inflammatory markers were measured using standard techniques at the same four assessment times. Generalized estimating equations with exchangeable within-subject correlation matrix were used to analyze repeated measures.

Results: The participants were mostly middle-aged White (79.5%) men (74.0%) who were married or living with significant others (70.0%) and received concurrent chemoradiotherapy (80.1%). Using the PSQI of 5 as the cut-off, 66.3% of the participants were poor sleepers at baseline, and this rate increased to 82.8% immediately after, then dropped to 56.8% at 3 months and 46.2% 12 months after therapy. Being single (p=0.007), taking antidepressants (p=0.020), and with feeding tube (p=0.01) were identified to be significantly associated with poor sleep quality over time. Controlling for relevant demographic and clinical factors, changes in sleep quality were associated with changes of circulating levels of two inflammatory markers, C-reactive protein (CRP) and interlukin-1 receptor antagonist (IL-1ra). Increased CRP and IL-1ra levels were associated with higher PSQI global scores (beta=0.826, p=0.007 for CRP; beta=1.412, p=0.050 for IL-1ra), indicating worse sleep quality.

Conclusion: Patients with head and neck cancer experienced poor sleep quality, especially immediately after treatment completion and in those who were single, depressed, or with feeding tube. Inflammation is associated with cancer-related sleep disturbance and both sleep and inflammation may be potential targets to promote health outcomes in patients with cancer.

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0578

CLINICAL PATTERNS OF OBSTRUCTIVE SLEEP APNEA PATIENTS IN COVID 19

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Introduction: Recent studies indicate Obstructive Sleep Apnea (OSA) patients have higher severity of respiratory compromise after COVID19 infection due to their sleep related hypoxemic burden. The pro-inflammatory state associated with OSA, sympathetic excitation, and recurrent hypoxemia may predispose to poorer post-COVID19 outcomes. We compared COVID19 infection outcomes in a cohort of hospitalized Veterans with and without OSA.

Methods: We used Jesse Brown Veteran Affairs Medical Center (JBVAMC) Registry for Research on Risk Factors and Outcomes of Veterans Evaluated for COVID19. The registry includes all patients who received a test for COVID19 at JBVAMC through November 8th,2021. Data are from the VA COVID19 Shared Data Resource and chart review, and include demographic data, pharmacological and non-pharmacological interventions, clinical outcomes, and pre-existing conditions. The study was approved by the Institutional review board (IRB). STATA v16 was used for data analysis.

Results: Of the 13,385 patients included in the registry, 1890 patients were found to have a positive COVID19 test, of which 625 were hospitalized and included in our study. The sample was older (mean age of 66.8 years), predominantly men (583, 93.3%) and African Americans (461, 73.8%). 18.7% (117, 18.7%) were European American, and (47, 7.5%) were of other race categories. The group with OSA was 37.8% (n=236) and without OSA was 62.2% (n=389) of the total sample. Elixhauser comorbidity index was higher in OSA group compared to those without OSA (p:0.00001, mean (SD): 16.73(14.6) vs. 12.03 (13.1)). Univariate analysis demonstrated a higher rate of readmission at 60 days (p=0.02, Odds ratio (95% CI): 1.69 (1.1-2.6)) and use of mechanical ventilation (p=0.05, Odds ratio (95% CI): 1.65 (0.99-2.75) in OSA vs. without OSA. These associations were attenuated in multivariate logistic regression models including age, gender, race, Elixhauser index and body mass index. OSA did not affect the length of stay or inpatient mortality.

Conclusion: In hospitalized COVID19 patients, OSA increases the probability of readmission and risk of mechanical ventilation, but this effect is likely due to higher comorbidity and obesity rates in OSA. In the future, we plan to examine larger samples of Veterans hospitalized with COVID19 and assess the effect of positive airway pressure treatment to understand the impact of OSA on COVID19 outcomes.
Support (If Any): no conflicting or financial interests to disclose

0579

THE IMPACT OF INTRACRANIAL EEG ON SLEEP IS INDEPENDENT OF WHETHER A CRANIOTOMY WAS PERFORMED

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Introduction: Patients with refractory epilepsy are often evaluated with intracranial electrodes prior to resection. While depth electrodes can be placed through small burr-holes, grids and strips generally require large craniotomies. We have observed many differences in patient experience between these two populations. As sleep is crucial for many aspects of health and healing, our objective was to quantify whether subjects with craniotomies had different sleep patterns.
Methods: We analyzed data from N=47 patients with refractory epilepsy who underwent intracranial EEG monitoring at the University of Michigan (N = 23 with craniotomies). Sleep stages were scored by a certified sleep technician using simultaneously recorded scalp EEG. To quantify sleep patterns, we computed the fraction and average bout-length of each state of vigilance.
Results: No statistical difference was found between subjects with or without craniotomies for any measure ($p>0.4$, Wilcoxon Rank Sum). The median fraction of time awake for all subjects was 0.70 (0.65-0.74, 95% confidence interval). However, sleep architecture appeared altered, with median fraction of sleep time in NREM 1 being 0.07(0.06-0.09), NREM 2 being 0.16 (0.13-0.17), NREM 3 being only 0.01 (0.0-0.2) and REM being 0.05 (0.04-0.06). The median bout lengths for all stages of sleep was less than 5 minutes.
Conclusion: Intracranial monitoring appears to alter sleep similarly for both subjects who received craniotomies and those who had smaller burr-holes. The impact on sleep is not a significant factor when deciding between grid or depth electrodes.
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0580

SLEEP ATTITUDES AS A PREDICTOR OF RISK FOR METABOLIC SYNDROME IN COLLEGE FRESHMAN

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Introduction: Transitions into adulthood and starting higher education can be a challenge in habit formation of first-year students. Unhealthy habits related to eating, exercise, substance consumption and sleep can lead to rapid weight gain and conditions such as metabolic syndrome. Research has suggested that regardless of sleep knowledge, favorable sleep attitudes predict better sleep. Thus, our aim was to investigate whether sleep attitudes directly predicted risk for metabolic syndrome or indirectly via subjective and objective sleep measures.
Methods: First year college students (N=165) completed self-report measures and were brought into the lab for height, weight, body fat, blood sugar and fats, and blood pressure analyses. Participants wore FitBit Flex wristwatches to collect sleep data for seven consecutive days. Preliminary correlational analyses were conducted on sleep and obesity measures. Two separate path analyses were conducted to investigate whether there was a direct effect of sleep attitude on risk for metabolic syndrome or indirect via subjective sleep (sleep quality, duration and apnea) and objective sleep (sleep efficiency, duration and apnea). Two moderated mediations were conducted to investigate the effects of gender and age.
Results: The average age was 18.66 (SD=3.33) with the majority of the sample being female (63%) and White (55.9%). In our subjective sleep analysis, we found that sleep attitudes predicted quality and duration, but not apnea, and that the overall model yielded significance. In our objective model, only apnea was a significant predictor, as well as the overall model. The indirect relationships were not moderated by gender or age.
Conclusion: Poor sleep attitudes are related to risk for metabolic syndrome in college aged individuals. Future studies should further examine sleep attitudes as a modifiable risk factor to prevent disease.
Support (If Any): NA

0581

SLEEP PATTERNS AND "OFF"-TIME IN PATIENTS WITH PARKINSON'S DISEASE AND MOTOR FLUCTUATIONS

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Introduction: Sleep disruptions in patients with Parkinson's disease (PD) include difficulty falling/staying asleep, which can contribute to daytime sleepiness and overall worsening of health, mood, and quality of life. Although sleep disturbances in PD are multifactorial, nighttime motor symptoms can negatively affect sleep. To better understand how "OFF"-episodes affect sleep, post-hoc analyses were conducted using baseline data from two phase 3 studies of opicapone, an approved once-daily adjunctive treatment to levodopa/carbidopa (LD/CD) in patients with PD experiencing motor fluctuations.
Methods: In BIPARK-1 and BIPARK-2, participants recorded sleep/awake periods, "OFF"-time, and "ON"-time in 24-hour PD diaries. Sleep metrics included sleep duration, awakenings after sleep onset, and percent of sleep time spent awake. "OFF"-times included "OFF" before sleep (OBS), nighttime "OFF" (NTO), and early morning "OFF" (EMO). Data at baseline were pooled across treatment groups and analyzed descriptively. Mean values are presented with standard deviations (±SD).
Results: Baseline data from 1010 participants were pooled for analysis. Among 964 participants with available sleep metrics, mean total sleep duration was 7.6 (±1.5) hours and longest duration of uninterrupted sleep was 7.2 (±1.9) hours. 332/964

(34.4%) participants experienced an "OFF"-episode before going to sleep and the mean duration of this OBS was 1.8±1.2 hours. 158/964 (16.4%) participants awoke after sleep onset; of these, 128/158 (81.0%) awoke in an "OFF"-state and the mean duration of this NTO was 1.0 (±0.5) hours. Among these 128 participants, the mean number of awakenings was 1.3 (±0.7) and percent of sleep time spent awake was 15.4% (±9.6%). 898/1005 (89.4%) participants experienced an "OFF"-episode upon waking up in the morning and the mean duration of this EMO was 1.5 (±0.9) hours.

Conclusion: Results from this pooled analysis indicate that 34.4% of participants experienced an "OFF"-episode before going to sleep. Moreover, 81.0% of participants who woke up during the night were in an "OFF"-state upon awakening. Reducing "OFF"-episodes before and during the nighttime may help improve sleep in patients with PD, in turn potentially improving quality of life and daytime motor performance.

Support (If Any): Neurocrine Biosciences, Inc.

0582

EFFECTS OF NON-MELANOMA SKIN CANCER ON SLEEP AND QUALITY OF LIFE AMONG RENAL TRANSPLANT RECIPIENTS

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Introduction: Non-melanoma skin cancer (NMSC) is highly prevalent in renal transplant recipients (RTR), due to the immunosuppressive effects of anti-rejection therapy after transplantation. Sleep disturbances can impair the immune system and enhance the repercussions of oxidative stress, which may play an important role in the carcinogenesis pathways. This survey aimed to compare data on quality of life and sleep in RTR with and without NMSC in a dermatology service.

Methods: The study comprised 126 individuals, distributed in the following groups: RTR with NMSC (n=42), RTR without NMSC (n=43) and healthy controls (n=41). Participants answered a set of questionnaires, including the WHOQOL-bref, Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), and the Berlin Respiratory Disorder questionnaire (BRD).

Results: The proportion of men were significantly higher among RTR (p=0.034). No statistically significant differences were observed regarding age, body mass index (BMI) and socioeconomic class. Transplantation living donors were statistically more frequent among RTR with NMSC (67% against 37% in the RTR without NMSC group; p=0.005). Among patients of the RTR with NMSC group, 9% had only basal cell carcinoma, 42% had only squamous cell carcinoma and 49% had both types of NMSC. There were no statistically significant differences on the final scores of the sleep questionnaires, except in 3 domains of the PSQI: sleep quality (p<0.001), sleep latency (p=0.01) and daytime dysfunction (p=0.02). Worse sleep quality was seen in the RTR with NMSC and controls, while worse sleep latency and more daytime consequences were found in both RTR clusters. All groups were predominantly composed of subjects with morning-type chronotype, low sleep quality and increased daytime sleepiness. In the WHOQOL, the physical domain was significantly impaired in the RTR groups (p<0.001).

Conclusion: Although all groups were mainly composed of individuals with excessive daytime sleepiness and low sleep quality, there were no differences regarding quality of life and sleep between RTR and controls. Further long-term examination of kidney transplant recipients and their sleep pattern are warranted, as poor sleep may have a link with immunosuppression and organism imbalance, as well as on quality of life of these individuals.

Support (If Any): AFIP, CAPES, CNPq, and FAPESP.

0583

TOLERANCE AND FEASIBILITY OF DAYTIME BRIGHT LIGHT IN MEDICAL INTENSIVE CARE UNIT PATIENTS

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Introduction: Sleep and circadian disruption in critical illness are associated with poor outcomes. Normal circadian entrainment requires bright light exposure during the day and dim or no light during the night. Disruption of this diurnal light pattern can cause circadian abnormalities. To leverage this highly influential circadian entrainment cue, our study investigates the tolerance and feasibility of a daytime bright light (DBL) intervention in the medical ICU (MICU). We hypothesize that DBL is tolerable and has high fidelity and sustainability (i.e., feasibility).

Methods: Here we present the findings of a pilot randomized control trial of DBL in MICU patients. Patients were randomized to receive light for either 4 hours, 8 hours, or no light (usual care). For DBL groups, the light was turned on at 09:00 daily for 4 consecutive days. Metrics of tolerability (percentage of days patient agreed to light), fidelity (percentage of intended hours light was delivered), and sustainability (percentage of days light delivered out of days patients allowed light) were collected.

Results: Sixteen patients were enrolled; 5 were assigned to 8 hours of DBL, 9 were assigned to 4 hours of DBL, and 2 were assigned to usual care. Mean (standard deviation) patient age was 73 (10) and mean severity of illness, as determined by Acute Physiology and Chronic Health Evaluation II score, was 21(5). Patients who received 4 hours of DBL averaged 69% tolerability, 55% fidelity, and 94% sustainability. Patients who received 8 hours of DBL averaged 70% tolerability, 57% fidelity, and 90% sustainability. Further analysis of light delivery data showed that the 8-hour group was subject to a higher number of requests to delay light start or end light early and more care related breaks versus the 4-hour group.

Conclusion: Our study demonstrates the feasibility of a DBL intervention for MICU patients. While fidelity was lower than expected, the findings support that DBL is tolerable and sustainable in critically-ill patients. These findings have influenced the design of our ongoing randomized control trial further evaluating the impact of daytime bright light on circadian phase in critical illness.

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0584

IMPACT OF OBSTRUCTIVE SLEEP APNEA ON CHRONIC OBSTRUCTIVE PULMONARY DISEASE HOSPITALIZATIONS

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Introduction: Obstructive sleep apnea (OSA) is a sleep disorder that has been linked to increase the risk for hypertension, ischemic heart failure, arrhythmia and heart failure. There are multiple similarities between OSA and Chronic Obstructive Pulmonary Disease (COPD); both are associated with hypoxia and hypercapnia, with different mechanisms of hypoxia; in COPD its chronic and slow progression, whereas it is suddenly intermittent hypoxia in OSA. Intermittent hypoxia was hypothesized to enhance the protective effect on subsequent hypoxia resulting in cardioprotective effect [1]. There is little data on rates of in-hospital mortality on patients with OSA and COPD using a nationwide study. In this study, we aim to analyze the impact on mortality and length of hospital stay of obstructive sleep apnea in patients with COPD.
Methods: Adults with principal diagnosis of COPD were selected from the 2019 US National Inpatient Sample, using ICD 10 code primary diagnosis on discharge. We queried the 2019 National Inpatient Sample for OSA, and other secondary diagnoses (hyperlipidemia, hypertension, heart failure, smoking, CKD, electrolytes disturbances). Confounders were adjusted for using multivariable linear regression analysis for other secondary diagnoses.
Results: In a total of 520,624 adult hospitalizations with COPD primary diagnosis on discharge were included from the 2019 national inpatient sample. 73,705 patients had concomitant secondary diagnosis with OSA. On weighted analysis, hospitalizations with primary diagnosis of COPD and secondary diagnosis of OSA had lower in-hospital mortality rates compared to hospitalizations with COPD alone (0.6% vs 1.08%, p= 0.000), .COPD hospitalizations with OSA had statistically significant lower odds for mortality compared to COPD patients without OSA (adjusted OR 0.73, 95% CI 0.57-0.93; p= 0.009).However, COPD hospitalizations with OSA showed increased in the mean length of stay by 0.21 days (95% CI 0.12-0.30, p=0.000) compared to patients without OSA.
Conclusion: Our analysis showed better mortality outcomes for COPD patients with OSA , supporting the protective effect hypothesis of intermittent hypoxia. COPD patients with concomitant secondary OSA diagnosis have increased in-hospital length of stay.
Support (If Any): 1- Murry CE, Jennings RB, Reimer KA (1986) Preconditioning with ischemia: a delay of lethal cell injury in ischemic myocardium. Circulation 74:1124–1136

0585

USE OF A HYBRID CLOSED LOOP INSULIN DELIVERY SYSTEM IMPROVES SLEEP AND GLYCEMIC CONTROL IN ADULTS WITH LONG-STANDING TYPE 1 DIABETES AND HYPOGLYCEMIA UNAWARENESS

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Introduction: Insulin delivery and continuous glucose monitoring systems (CGMs) have been reported to disrupt sleep in individuals with type 1 diabetes (T1D), potentially thwarting the adoption and continued use of diabetes therapeutic technologies. This study assessed changes in actigraphic sleep and glycemic outcomes in individuals at high risk for life threatening nocturnal hypoglycemia after initiating a hybrid closed loop (HCL) insulin delivery system with integrated CGM.
Methods: 10 adults (median age=51y) with long-standing T1D (median duration=34y) and hypoglycemia unawareness participated in an 18-month ongoing clinical trial assessing the effectiveness of a HCL system. Wrist actigraphs and CGMs measured sleep and glycemic control, respectively, at baseline (1 week) and at months 3, 6, 9, 12, 15, and 18 (3 weeks) following HCL initiation. Body mass index and hemoglobin A1c (HbA1c) were also collected at these timepoints. Hypoglycemia awareness was assessed using the Clarke hypoglycemia questionnaire, HYPO score, and glycemic lability index. Paired sample t-tests and Cohen's d effect sizes modeled changes in sleep, glycemic control, and hypoglycemic awareness and the magnitude of these changes from baseline to 18 months.
Results: Sleep improved from baseline to 18 months [shorter sleep latency ($p<0.01$), later sleep offset ($p<0.05$), and less wake after sleep onset (WASO) (<0.01)]. Medium effect sizes were found for later sleep onset (d=0.74) and later sleep midpoints (d=0.77). HCL also improved hypoglycemia awareness from baseline to 18 months [Clarke score ($p<0.01$), HYPO score ($p<0.01$), lability index ($p<0.05$)]. Medium to large effect sizes were found for reduced nocturnal hypoglycemia (percent time glucose was <54mg/dL,<60mg/dL,<70mg/dL; d=0.66 – 0.81), daytime and nocturnal hypoglycemia (percent time glucose was<54mg/dL,<60mg/dL,<70mg/dL; d=0.61 – 0.69), and glucose variability (coefficient of variability; d=0.62).
Conclusion: HCL insulin delivery with CGM improved sleep over time as indicated by shorter sleep onset latency, later sleep offset, and less WASO. HCL insulin delivery also improved hypoglycemia awareness and led to clinically significant reductions in hypoglycemia and glucose variability.
Support (If Any): NIH (R01DK117488 (NG), R01DK091331 (MRR), K99NR017416 (SKM), and UL1TR001878 (University of Pennsylvania Center for Human Phenomic Science)). National Aeronautics and Space Administration (NASA) (NNX14AN49G and 80NSSC20K0243 (NG)) and from the Pennsylvania Department of Health (SAP 4100079750 (IL)).

0586

EXTENDING SLEEP IN SHORT SLEEPING MIDDLE-AGED ADULTS AT RISK FOR THE METABOLIC SYNDROME

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Introduction: Short sleep predicts the metabolic syndrome (MetS). Extending sleep improves certain MetS factors, specifically insulin sensitivity and blood pressure in adults without MetS. The absence of sleep intervention studies in community-dwelling adults with MetS limits progress in advancing sleep extension interventions to this subgroup. This study evaluated the feasibility, acceptability, and impact on End-of-Treatment (EOT) sleep outcomes of a 12-week sleep intervention.
Methods: Middle aged adults who were short sleepers and at risk for METs participated in a single-arm 12-week, 12-session sleep intervention based on cognitive behavioral therapy for insomnia delivered via videoconferencing platform. Feasibility and acceptability were assessed using retention and attendance rates as well as mean sleep diary completions (≥4 diaries/week). Anticipated (baseline) and experienced (EOT) acceptability were assessed using a 16-item survey that estimated self-reported acceptability, feasibility, perceived benefit, satisfaction, and overall satisfaction. Sleep was estimated from baseline and EOT 2-week wrist actigraphy data. Daytime sleepiness was assessed using the Epworth Sleepiness Scale. Paired sample t-tests modeled changes in acceptability, feasibility, perceived benefit, satisfaction, overall satisfaction, sleep and daytime sleepiness from baseline to EOT.
Results: The intent-to-treat sample included 44 adults (mean age 52y, 59% female, 41% Black, 48% White, 11% Other, 82% non-Hispanic). Three participants withdrew leaving N=41 (retention rate=93%). Eighty-six percent attended >80% of sessions and mean sleep diary completion was 6.7 diaries/week. There were statistically significant changes in self-reported anticipated (baseline) and experienced (EOT) acceptability surveys indicating greater EOT acceptability ($p<0.001$), perceived benefit ($p<0.001$), satisfaction ($p<0.001$), and overall evaluation ($p<0.001$). Statistically significant improvements in sleep from baseline to EOT included increased time-in-bed (Mbaseline=6.00h SD= 0.68h – MEOT=7.48, SD= 1.21; $p<0.001$), increased total sleep times (Mbaseline=5.16, SD= 0.63 – MEOT=6.26, SD= 1.23 $p<0.001$), earlier sleep onsets (Mbaseline=12.26am, SD= 0.05 – MEOT=11.53pm, SD= 0.06 $p<0.05$), more regular sleep onsets (Mbaseline=0.06, SD= 0.04 – MEOT=0.04, SD= 0.02 $p<0.01$), a higher sleep regularity index (Mbaseline=44.02, SD= 17.25 – MEOT=55.88, SD= 12.82 $p<0.01$), and reduced daytime sleepiness (Mbaseline=7.26, SD= 4.30 – MEOT=3.15, SD= 2.46, $p<0.001$).
Conclusion: Extending sleep, as well as improving sleep timing and regularity in racially/ethnically diverse middle-aged short sleepers using a videoconferencing platform is acceptable and feasible.
Support (If Any):

0587

SLEEP PROBLEMS ARE ASSOCIATED WITH TREATMENT FOR ANEMIA IN THE US POPULATION

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Introduction: Anemia is characterized as low circulating hemoglobin and is often treated with an increase in iron consumption. Previous studies have linked anemia with Restless Legs Syndrome. Regarding other sleep disorders, Insomnia has been found to be associated with anemia in children, but the relationship has been understudied in adults.
Methods: A multinomial logistic regression was conducted on the data collected from 2017 to March 2020 for the National Health and Nutrition Examination Survey, to explore a relationship between those with self-assessed sleep problems and whether the participant was treated for anemia. Sleep problems were assessed using a item asking participants how often they have been bothered by difficulties "falling asleep, staying asleep, or sleeping too much," categorized as "Never," "Several Days," "More Than Half the Days" and "Nearly Every Day" in the past 2 weeks. Anemia treatment was characterized as "yes" or "no" based on self-report, with any form of treatment in the past 3 months was considered as "yes." Reported results were unweighted; weighted results forthcoming.
Results: Unadjusted results indicate that those being treated for anemia show an increased likelihood of sleep difficulties several days (OR:1.36, [1.07,1.73] p=0.011), more than half the days (OR: 1.59, [1.13,2.25] p=0.008), and nearly every day (OR: 1.85, [1.37,2.50] $p<0.001$), compared to those who report that they never have sleep difficulties. When adjusted for sex, age, race/ethnicity, education, and marital status, those being treated for anemia show significant increased odds of sleep problems several days (OR: 1.29, [1.01,1.65] p=0.041), more than half the days (OR: 1.50, [1.06,2.14] p=0.024), and nearly every day (OR: 1.55, [1.13,2.13] p=0.006), compared to never. Those being treated for anemia also had a higher likelihood of having short sleep (≤ 6 hours) during the week (OR: 1.56, [1.13,2.15], p=0.007) as well as long sleep(≥ 9 hours) (OR: 1.75, [1.30,2.36], $p<0.001$) compared to those that slept a healthy amount, 6.5-8.5 hours a night.
Conclusion: There was a significant relationship between those treated for anemia the presence of sleep difficulties, as well as short and long sleep. Future studies should assess the associations between anemia and specific sleep characteristics, as sleep problems may be a cause, a consequence, or a marker of anemia. Also, the degree to which these sleep difficulties represent overlap with Restless Legs symptoms should be explored at the population level.
Support (If Any):

0588

RELATIONSHIP BETWEEN CONGESTIVE HEART FAILURE AND POOR SLEEP QUALITY IN THE US POPULATION

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Introduction: Few recent, population-level datasets have explored the relationship between congestive heart failure (CHF) and sleep difficulties.
Methods: The 2017 - March 2020 data from the National Health and Nutrition Examination Survey (NHANES) were used. Sleep difficulties were self-reported as difficulties "falling asleep, staying asleep, or sleeping too much" within the previous two weeks, categorized as "never," "less than half the days," "more than half the days," and "nearly every day." Sleep duration was self-reported and categorized as normal (6.5-8.5h), short (<6.5h), and long (>8.5h). A modified STOP-BANG score was created based on NHANES measures of snoring, daytime tiredness, snorting/gasping during sleep, hypertension, body mass index, age, and gender (no measure of neck circumference). Covariates included sex, age, race/ethnicity, education, and relationship status. Analyses were unweighted, with weighted results forthcoming.

Results: Those who reported sleep difficulties more than half the days (OR: 1.78, [1.20,2.65], p=0.004) and nearly every day (OR: 2.76, [2.01,3.78], p<0.001) were more likely to also report a history of CHF, relative to those without sleep difficulties. After adjusting for covariates these relationships were maintained for those who reported sleep difficulties more than half the days (OR: 1.71, [1.14,2.58], p=0.010) and nearly every day (OR: 2.45, [1.76,3.41] p<0.001). When adding sleep duration category as a covariate (normal, short, or long sleep), those diagnosed with CHF were more likely to have sleep problems nearly every day (OR: 2.21, [1.38,3.25], p<0.001). Those diagnosed with CHF are also likely to have a high risk for OSA (OR: 1.67, [1.39,1.95], p<0.001).
Conclusion: Poor sleep quality is associated with history of CHF, independent of sleep duration. CHF is also associated with population-level sleep apnea risk. Screening for sleep disorders (insomnia and/or sleep apnea) in CHF patients may improve outcomes.
Support (If Any):

0589

REM SLEEP BEHAVIOR DISORDER IS ASSOCIATED WITH POOR OUTCOMES IN PULMONARY EMBOLISM HOSPITLIZATIONS

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Introduction: REM Sleep Behavior Disorder (RBD), is a rare sleep behavior disorder, characterized by loss of skeletal muscle atonia during REM sleep, resulting in prominent motor activity with exhibited behavior mirroring the image of the dreams during sleep. Other sleep disorders were studied before in patients with Pulmonary Embolism (PE). Although, REM sleep behavior disorder association with pulmonary embolism has never been described. In this study we aim to study the prevalence of RBD in patients admitted with PE, and to assess the association between RBD and PE.
Methods: Adults with principal diagnosis of Pulmonary Embolism (PE) on discharge were selected from the 2019 US National Inpatient Sample, using ICD 10 code primary diagnosis. We queried the 2019 National Inpatient Sample for secondary diagnosis of RBD, Obstructive Sleep Apnea (OSA) and other secondary diagnoses (hyperlipidemia,history of old myocardial infarction, atrial fibrillation, Chronic obstructive pulmonary disease, hypertension, heart failure, smoking, chronic kidney disease , electrolytes disturbances). Confounders were adjusted for using multivariable linear regression analysis for other secondary diagnoses.
Results: In a total of 188,355 hospitalizations with PE primary diagnosis on discharge were included from the 2019 national inpatient sample, 25 hospitalizations had concomitant secondary diagnosis with RBD. The overall in-hospital mortality for PE was 3.2%. On weighted analysis, Patients with RBD had statistically significant higher odds for mortality compared to patients without [adjusted odds ratio (OR): 17.15; 95% confidence interval (CI): 2.75-106.8, p= 0.002], 20% mortality rate in patients with RBD compared to 0.03% in patients without RBD (p= 0.03). OSA did not show significant result for mortality when compared to without OSA [adjusted odds ratio (OR): 0.83; 95% confidence interval (CI): 0.67-1.04, p= 0.114].
Conclusion: Our analysis showed a low number of patients with secondary diagnosis of RBD in hospitalizations with primary diagnosis of PE on discharge. However significant association between RBD and mortality in patients with PE primary diagnosis on discharge. The identification of patients with RBD in patients admitted with PE may help decrease mortality rate. Furthermore, our analysis showed that OSA is an independant variable for mortality in PE hospitalization.
Support (If Any):

0590

FACTORS ASSOCIATED WITH SLEEP HEALTH IN YOUNG WOMEN AFTER BREAST CANCER TREATMENT

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Introduction: Poor sleep health adversely affects quality of life and prognosis in cancer survivors, yet there is limited evidence on sleep health in young women with breast cancer (YWBC). The purpose of this study was to identify sociodemographic, clinical, and psychosocial factors associated with sleep health.
Methods: We conducted a cross-sectional study. Eligible participants were women diagnosed with stage I-III breast cancer ≤ 50 years of age and within 5 years from primary cancer treatment. Sociodemographic, clinical, and psychosocial data were collected through an online survey. Sleep health and psychosocial data were assessed by the Pittsburgh Sleep Quality Index (PSQI), PROMIS depression and anxiety, and the McMaster Family Device General Functioning subscale. Data were analyzed with logistic regression. A PSQI cut-off score of >8 was used to define poor sleep health based on the study data and the cancer sleep literature.
Results: The sample included 159 YWBC with a mean age of 43.6 years (SD=6.8), the majority of whom were non-Hispanic White (84%) and completed chemotherapy or radiotherapy (>70%). Half of the participants were premenopausal at diagnosis and became peri- or postmenopausal after treatment. The mean global PSQI was 9.3 (SD=3.6) and 55% reported poor sleep health. About half of the participants slept <7 hours per night, 87% spent >15 minutes falling asleep, and 58% reported taking medication to sleep. Non-White underrepresented groups (OR=7.56, p<.01), more severe night sweats (OR=9.00, p<.001), no history of endocrine therapy (OR=2.73, p<.05), more severe anxiety (OR=1.08, p<.01) and depression (OR=1.06, p<.05), and poorer family functioning (OR=3.78, p<.001) were associated with poor sleep health.
Conclusion: The findings suggest that poor sleep health is a significant clinical problem in YWBC. Sleep assessment, education, and appropriate referrals should be part of routine survivorship care. Social determinants of health such as race and ethnicity and family functioning warrant further investigation related to sleep health. Future studies are needed to confirm the relationships of sociodemographic and clinical factors, psychological symptoms, and family functioning with sleep health.
Support (If Any): The Global Korean Nursing Foundation.

0591

USE OF FOSQ TO CHARACTERIZE SLEEP DISTURBANCES IN HOSPITALIZED PATIENTS WITH COPD EXACERBATION

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Introduction: Sleep disturbances are common in COPD. Hospitalization due to COPD exacerbations likely have a negative impact on sleep in these patients and may contribute to their recovery. The aim of this study was to measure the prevalence of sleep disturbances in hospitalized patients with COPD and characterize their impact by use of the Functional outcomes of Sleep questionnaire (FOSQ).

Methods: The study was done at a community hospital. We included all patients who were admitted with a diagnosis of acute COPD exacerbation. Patients were administered the FOSQ on the day of discharge. Standard statistical methods were used to analyze the data

Results: A total of 54 patients - 28 males and 26 females filled out the questionnaire completely and were included in the analysis. The mean age was 66 +/- 14 years. The average FOSQ was 15 +/- 7. 60% of the patients had a FOSQ of <17.9 showing a high prevalence of sleep morbidity. Individual domains of the FOSQ -(mean +/- SD) showed the following values : General productivity of 3 +/- 2, vigilance 2.5 +/- 2.2, activity 7.2 +/- 2.2, and social outcomes 0.6 +/- 0.9 respectively. Vigilance scores and social outcomes domains were seen to be lower than those previously reported in patients with severe sleep apnea while activity domains were seen to be higher.

Conclusion: There is significant sleep-related morbidity in hospitalized patients with COPD exacerbation, with particularly high prevalence of overall sleep disturbances even after recovery and at the time of discharge. Domains related to social outcomes were the most affected, and vigilance domain scores were critically low. These data point to an urgent need for clinicians to include assessment of sleep quality while discharging patients with COPD exacerbations and providing them appropriate counseling. Future studies should focus on the best interventions to improve sleep in the patients and measure its impact on their lung function.

Support (If Any): None

0592

HYBRID CLOSED LOOP INSULIN DELIVERY SYSTEMS REDUCE PERCEIVED HYPOGLYCEMIA DURING SLEEP IN ADULTS WITH LONG-STANDING TYPE 1 DIABETES AND HYPOGLYCEMIA UNAWARENESS

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Introduction: Sleep-associated hypoglycemia is a major concern for individuals with type 1 diabetes (T1D). Hybrid closed loop insulin delivery systems with continuous glucose monitoring (HCL-CGM) may reduce the perceived frequency, severity, and impact of sleep-associated hypoglycemia. This analysis assessed changes in perceived sleep-associated hypoglycemia in individuals with T1D at high risk for hypoglycemia after initiating HCL-CGM.

Methods: Seven adults (median age=53y) with long-standing T1D (median duration=41y) and hypoglycemia unawareness participated in an ongoing 18-month clinical trial assessing effectiveness of HCL-CGM. At baseline and every 6 months thereafter, participants completed the validated Hypoglycemia Awareness Questionnaire (HypoA-Q), a 33-item tool consisting of three subscales (impaired awareness, symptom level, and symptom frequency), and 16 conceptually distinct items, including six items that relate to the frequency, severity, and impact of sleep-associated hypoglycemia, each which is scored and assessed individually. Friedman Tests assessed changes in items over the 18-month interval and Kendall's W determined effect sizes.

Results: HCL-CGM significantly reduced the reported frequency of the following questions: (a) "How often you have had a hypo during your sleep?" ($\chi2(3)=8.4$, $p<0.05$; moderate effect size, W=0.40) and (b) "…and were unable treat yourself when you woke up?" ($\chi2(3)=12.1$, $p<0.05$; large effect size, W=0.57). HCL-CGM also reduced the reported frequency to: (c) "…and someone else gave you sugar by mouth?" ($\chi2(3)=7.2$, $p<0.07$; moderate effect size, W=0.34). By contrast, HCL-CGM did not affect reported frequency to the questions: (d) "…which led to a major problem?" ($p>0.05$; moderate effect size, W=0.26)"; (e) "…and someone else gave you a glucagon injection?" ($p>0.05$; small effect size, W=0.14); and (f) "…where you stayed asleep and only later realized that you had been hypo?" ($p>0.05$; small effect size, W=0.19).

Conclusion: HCL-CGM improved various critical aspects of perceived sleep-associated hypoglycemic events in individuals most at-risk for hypoglycemia. Our results have important implications for self-care and patient treatment in this population.

Support (If Any): NIH R01DK117488 (NG), R01DK091331 (MRR), K99NR017416 (SKM), and UL1TR001878 (University of Pennsylvania Center for Human Phenomic Science); NASA NNX14AN49G and 80NSSC20K0243 (NG); Pennsylvania Department of Health SAP 4100079750 (IL).

0593

MAXILLOMANDIBULAR ADVANCEMENT REFERRALS AND FOLLOW-UP AFTER DRUG INDUCED SLEEP ENDOSCOPY

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Introduction: Several surgical options exist for treating obstructive sleep apnea (OSA), but few correct airway obstruction at multiple levels like maxillomandibular advancement (MMA). MMA has been shown to significantly improve OSA, decrease sleepiness, and also improve quality of life. Despite the accepted success of MMA surgery, it is unclear if patients referred for MMA undergo MMA or are lost to follow-up in real world clinical care. This quality improvement study aims to determine if patients referred for MMA by ENT sleep surgeons then undergo MMA surgery by oral maxillofacial surgeons (OMFS).

Methods: At our academic urban hospital, all drug induced sleep endoscopy (DISE) cases performed on OSA patients by two otolaryngology sleep surgeons were reviewed over a one year period.

Patients who were not recommended for MMA based on DISE findings were excluded. Retrospective chart review included VOTE classification, DISE findings, and referrals for MMA to the OMFS clinic. Other data included age, BMI, past medical history, sleep study data including AHI and oxygen nadir, and if MMA or other OSA treatments were done.

Results: Out of 408 DISE performed, 58 patients (14.2%) were referred to our OMFS for MMA. Patients' demographics were: male (48; 82.8%); average age: 51; average BMI: 32.5; 39 (67.2%) with comorbidities. Sleep studies included: 32 HSATs, 22 PSGs, 4 missing. 41 patients (75.9%) had severe OSA. Average O2 nadir was 75%. On DISE, most patients had some level of obstruction at all anatomic subsites (94.8%). All patients had complete obstruction at the level of the palate or velum. 41 (70.7%) also had additional anatomic abnormalities noted including maxillary constriction, midface hypoplasia, retrognathia or micrognathia. From 58 patients recommended for MMA, 35 (60.3%) followed up in OMFS clinic and 11 (31.4%) underwent MMA surgery. Five patients (14.3%) received OATs. 11 patients (19%) had CPAP re-evaluation. 27 patients (46.6%) were lost to follow-up.

Conclusion: Of patients referred by ENT to OMFS following DISE, only 60% were seen at OMFS clinic and only half of these patients underwent MMA. While some received other treatments, nearly half were lost to follow-up altogether. We propose a revised workflow to improve patient education, acceptance, and coordination of OSA care and follow-up.

Support (If Any):

0594

FUNCTIONAL LIMITATIONS AND WELL-BEING THROUGHOUT THE ADULT LIFESPAN: THE MODERATING ROLE OF SLEEP

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Introduction: Functional limitations represent individuals' difficulty with completing essential activities of daily living, such as sitting, stooping, and walking. Though functional limitations have been linked to lower well-being outcomes, less is known about potential protective factors for well-being in the lived experience of functional limitations. This study aimed to examine the potential moderating effect of sleep quality on the association between functional limitations and life satisfaction, a common indicator of well-being, across the adult lifespan.

Methods: The present study used archival data from the Midlife in the United States Refresher study. Participants included 696 individuals (50.6% female, Mage=51.58 years, SD=13.61 years) who completed measures of functional limitations (Functional Status Questionnaire), global sleep quality (Pittsburg Sleep Quality Index), and life satisfaction (single-item measure). A moderated moderation analysis was conducted to examine the moderating role of sleep quality on the association between functional limitations and life satisfaction. Age was included as a secondary moderator in the analysis to determine differences between age groups (younger, middle-aged, elders). Demographic variables of gender and racial identity were used as covariates in study analyses.

Results: Participants' global sleep score was a significant moderator of the association between functional limitation status and life satisfaction ($B = 0.16$, $p < .001$). Overall better global sleep quality buffered the association between higher functional limitations and worse life satisfaction. A significant three-way interaction between age, global sleep, and functional limitations was detected ($\beta = -0.003$, $\Delta R2 = .02$, $F(1, 686) = 12.25$, $p < .001$). The effect of global sleep on the association between life satisfaction and functional limitation status was significant for younger adults ($B = 0.07$, $p < .001$) and middle-aged adults ($B = 0.02$, $p = .0224$), but not for elders ($B = -0.02$, $p = .2223$). Better global sleep quality buffered the negative association between functional limitations and life satisfaction specifically for younger and middle-aged adults.

Conclusion: The current study provided evidence for the importance of sleep quality in the lived experience of functional limitations, particularly for younger and middle-aged adults. This study contributes to a rapidly growing body of literature that seeks to identify protective factors for individuals experiencing lower functioning. In the future, clinicians should integrate sleep quality screeners in medical and mental health care settings in order to identify at-risk individuals who are experiencing functional limitations, and potentially consider establishing preventative, education-based interventions concerning sleep in the experience of functional limitations.

Support (If Any):

0595

INFLAMMATORY PLASMA BIOMARKER CLUSTER ASSOCIATIONS WITH SLEEP IN PEOPLE WITH AND WITHOUT HIV

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Introduction: Sleep problems are commonly reported in people with HIV (PWH) and may be exacerbated by HIV-induced inflammation. We determined associations between systemic inflammation and objective/subjective sleep measures in PWH and demographically/lifestyle similar HIV-negative controls.

Methods: Objective sleep measures from 7-day actigraphy (e.g. mean/standard deviation (SD) of wake after sleep onset [WASO], sleep duration/efficiency), overnight oximetry (oxygen desaturation index [ODI]), and patient-reported measures (Insomnia Severity Index [ISI] and Patient-Reported Outcomes Measurement Information System [PROMIS] sleep questionnaires) were assessed in participants in the multicenter POPPY-Sleep Study in the UK and Ireland. Principal Component Analysis using 31 plasma inflammatory biomarkers followed by cluster analysis previously identified 3 distinct inflammatory clusters: 1 (low inflammation), 2 (immune activation) and 3 (systemic inflammation). Baseline characteristics and between-cluster differences in sleep outcomes were assessed using Kruskal-Wallis or logistic regression/Chi-squared tests.

Results: The 465 participants (74% PWH, median [interquartile range] age 54 [50-60] years) were mainly male (80%), men having sex with men (71%) and white (88%). Among PWH, most (98%) were on antiretroviral therapy, 92% had viral load ≤50 cps/mL and CD4 cell count was 610 [470-785] cells/mm3. Overall, 18% met ISI criteria for insomnia (ISI≥ 15), and other sleep measures suggested generally good sleep (e.g., ODI 3.1/hr [1.5-6.4]). Clusters 1 (n=209), 2 (n=47) and 3 (n=209) differed significantly for HIV status (73%, 60%, 78%, p=0.03); BMI (24.8, 25.9, 26.2 kg/m2, p=0.002); systolic blood pressure (126, 135, 126 mmHg, p=0.002); cardiovascular

disease (39%, 28%, 53%, p=0.001) and arthritis (8%, 9%,16%, p=0.02) – all factors associated with sleep problems. There were no clinically relevant between-biomarker-cluster differences in the proportions with insomnia (17%, 18%, 20%) either before (p=0.76) or after (p=0.75) adjustment for potential confounders. Few associations were observed among other actigraphy, oximetry and PROMIS measures.

Conclusion: Despite observed differences in clinical factors associated with sleep problems, we found no consistent or strong associations between inflammatory biomarker clusters and a range of sleep outcomes. Although associations could exist with other sleep outcomes (e.g. sleep architecture) or biomarker types (e.g. cerebrospinal fluid) not assessed, our findings do not support a strong association between sleep and plasma inflammatory biomarkers in this population.

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0596

SLEEP DISTURBANCES IN CYSTIC FIBROSIS AND PRIMARY CILIARY DYSKINESIA OVER TIME, BEFORE AND AFTER MODULATOR THERAPY

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Introduction: Prior studies have shown that cystic fibrosis (CF) and primary ciliary dyskinesia (PCD) are associated with sleep disturbances affecting quality of life (QOL).Our aim was to analyze changes in sleep complaints over time in patients with CF and pancreatic insufficiency (CF-PI), pancreatic sufficiency (CF-PS) and PCD, and explore the effect of CFTR modulators.

Methods: Patients completed age-appropriate sleep quality questionnaires (SDSC, PSQI), quality of life questionnaires (PedQL, QOL-BE) and the Epworth sleepiness scale (ESS). They repeated the same questionnaires 3 years later. In addition, medical records were reviewed for clinical data.

Results: Of a total of 50 patients, 27 were children and 23 were adults: 33 CF-PI, 8 CF-PS and 9 PCD. On the 3-year follow up questionnaires the PSQI revealed reduced sleep quality in 11 adult patients (47%), and the SDSC score was pathological, in 5 children (18.5%), suggestive of high rates of disturbed sleep. In children the mean SDSC score had not changed from baseline (41.1±11.5) to follow up (42.5±12.35; p=0.778). In adults the PSQI increased from 3.7±2.5 to 4.5±2.8 (p=0.075), most pronounced in adults that were not on modulators (3.9±2.7 to 4.8±3.4; p=0.027). This effect was driven primarily by changes in sleep initiation and maintenance domains. There were no other differences in the sleep complaints between CF-PI, CF-PS and PCD patients, or between patients on and off modulator therapy during the study period.

Conclusion: Over time, quality of sleep worsened in patients with CF and PCD, particularly the ability to initiate and maintain sleep. Our results may suggest that modulator treatment attenuates the worsening of sleep complaints, however, larger studies are needed to clarify this.

Support (If Any): None

0597

THE RELATIONSHIP BETWEEN SLEEP QUALITY AND FUNCTIONAL OUTCOMES FOLLOWING ACUTE STROKE AND INPATIENT REHABILITATION

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Introduction: There is mounting evidence that sleep plays an important role in the rehabilitation and recovery process following acute stroke. Following acute care, many patients with stroke are admitted to inpatient rehabilitation facilities (IRFs), where they undergo intensive, interdisciplinary therapy to recover or relearn functional skills to minimize long-term disability. The role and impact of sleep in this early stage of stroke rehabilitation, however, is poorly understood. The purpose of this study is to investigate the relationship between sleep quality and clinical outcomes in the IRF setting following acute stroke.

Methods: Patients wore a collection of wearable sensors to measure sleep and wake throughout their IRF stay. Linear mixed-effect models (LMEMs) were built to determine the relationship between functional outcomes and sleep quality. Independent variables were total sleep time (TST) and sleep efficiency (SE) derived from wearable sensors, calculated between two clinical measures. Dependent variables included scores from repeated measures of the 6-Minute Walk Test (6MWT), 10-Meter Walk Test (10MWT), Berg Balance Scale (BBS), and Action Research Arm Test (ARAT). Covariates included demographics such as age and stroke type.

Results: Fifty-three individuals with stroke (age: 58.26±15.57 years; BMI: 28.27±6.16 kg/m2) consented to participate during their IRF program within 7 days of admission. All individuals were recruited from a single-site IRF between July 2020 and August 2021. The average length of stay was 17.85±6.99 days. There were no significant differences in TST between the first three nights and the last three nights (5.1±1.9 hours vs. 5.2±2.0 hours) or SE (67.8±17.7% vs. 69.0±17.8%). The greater standard deviation of TST was associated with lower 6MWT scores (R2=0.77, beta=−0.48, p=0.06), while the greater standard deviation of SE was associated with lower 10MWT scores (R2=0.80, beta=−0.20, p=0.18).

Conclusion: Our preliminary findings indicate that greater variability in TST and SE are associated with walking endurance and mobility recovery. Future analyses will investigate additional measures of sleep and activity in IRF settings and their relationship with patient outcomes. This work can inform novel sleep interventions to optimize post-stroke recovery.

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0598

NOCTURNAL HYPOXIA AND RIGHT VENTRICULAR FUNCTIONAL CHARACTERISTICS IN CONNECTIVE TISSUE DISEASE ASSOCIATED GROUP 1 PULMONARY ARTERIAL HYPERTENSION

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Introduction: We extend our prior findings of nocturnal hypoxia association with right ventricular(RV) dysfunction in World Symposium Pulmonary Hypertension(WSPH) Group 1 Pulmonary Arterial Hypertension(PAH) to connective tissue disease(CTD)-PAH. Due to the autoimmune inflammatory pathophysiology in CTD, we postulate stronger associations with nocturnal hypoxia and RV dysfunction in CTD-PAH with less favorable transplant-free survival than non-CTD-PAH.

Methods: The multicenter PVDOMICS study(NCT02989887) includes Group 1 PAH patients >18 years with mean pulmonary artery pressure≥25mmHg, pulmonary capillary wedge pressure(PCWP) £15mmHg, and pulmonary vascular resistance >3 Woods units who underwent NOX-T3 home sleep study or other sleep testing within one year of enrollment. Linear regression models(beta coefficients,95%CI) were used to examine total recording time<90% SaO2(T90) with right ventricular(RV) functional measures: RV systolic pressure(RVSP,echocardiogram,mmHg), RV ejection fraction(RVEF, cardiac magnetic resonance imaging,%). Time-to-event analysis was performed examining T90 with transplant/death using Cox proportional hazard models in CTD-PAH and non-CTD-PAH. T90 interaction by CTD-PAH group was tested. Models were adjusted for age, sex, race, body mass index, PAH medications and supplemental oxygen/positive airway pressure.

Results: The analytic sample was comprised of CTD-PAH(n=45: 59.3±12.1 years,82.2% female) and non-CTD-PAH patients(n=142: 50.4 + 14.1,68.3% female). For each increase in T90 by 10%, RVSP increased 2.57mmHg(2.57[0.76, 4.38],p=0.006) and RVEF decreased 1.54%(-1.54[-2.58, -0.50],p=0.004) in CTD-PAH. For each increase in T90 by 10% in non-CTD-PAH, RVSP increased 2.34mmHg(2.34[1.30, 3.38],p<0.001) and RVEF decreased 0.72%(-0.72[-1.31,-0.13],p=0.017). The test for statistical interaction was not significant across CTD-PAH and non-CTD-PAH groups. There was similar mortality rates between CTD-PAH(22%) and non-CTD-PAH(24%). However, T90 was only associated with death/transplant in non-CTD-PAH with a 24% increased risk of transplant/death(HR=1.24, 95%CI:1.08-1.43,p=0.003). There was a borderline statistically significant interaction across groups in time-to-event analyses(p=0.092).

Conclusion: We identify that nocturnal hypoxia is associated with RV functional alterations irrespective of CTD contribution in Group 1 PAH after adjustment for confounding factors. Survival analyses demonstrated an association of the degree of nocturnal hypoxia and transplant/death only in the non-CTD-PAH group. Potential explanations for these unanticipated findings may be attributable to lower sample size of the CTD-PAH group or a true stronger hypoxia-mortality relationship driven by underlying pathophysiology of the non-CTD-PAH group.

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0599

SLEEP DURATION ACROSS THE LIFESPAN IN TYPE 1 DIABETES AND ASSOCIATION WITH CARDIOMETABOLIC RISK

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Introduction: Individuals with type 1 diabetes (T1D) are at high risk for morbidity and mortality from cardiovascular disease which begins as early as adolescence. Some studies have reported a high prevalence of insufficient sleep in this population which may be due to behavioral and physiological aspects of T1D and its management. Emerging evidence suggests a link between short sleep duration and increased cardiometabolic risk, but this has not been specifically examined across the lifespan in individuals with T1D.

Methods: Inclusion criteria were T1D duration > 9 months, HbA1c 6.5-10% for adults and ≤ 12% for adolescents, and ages 12-60 years. Participants completed home monitoring for one week with continuous glucose monitoring (CGM) and wrist actigraphy prior to a study visit with anthropometric measurements, fasting autonomic/orthostatic and laboratory testing. Peripheral arterial stiffness was measured by Dynapulse brachial artery distensibility (BAD), and insulin sensitivity was estimated by the validated CACTI equation utilizing waist circumference, fasting triglycerides, adiponectin, and diastolic blood pressure. Sleep variables, glycemic markers and health parameters were examined by age group (adolescent vs. adult) using students t-test for univariate comparisons, and linear regression models for age, sex and diabetes duration-adjusted comparisons by age group.

Results: Forty-two adolescents (mean age 16 ± 3 years, diabetes duration 7.4 ± 5 years, HbA1c 8.4 ± 1.1%) and 42 adults (mean age 41 ± 10 years, diabetes duration 21 ± 13 years, HbA1c 7.4 ± 0.9%) completed the study. Sixty-two percent of adolescents and 74% of adults obtained insufficient sleep (< 7 hours of sleep per night). When examined in linear regression adjusted for age group, sex, diabetes duration and age, insufficient sleep was associated with higher BMI (adults), BMI percentile (adolescents), waist circumference, systolic blood pressure, and lower estimated insulin sensitivity and BAD (all $p < 0.05$).

Conclusion: Most adolescents and adults with T1D obtained insufficient sleep. Objectively-estimated insufficient sleep was associated with worse markers of cardiometabolic risk. Further study examining the impact of sleep health interventions in this population is warranted as sleep may be an important and novel target for improving cardiometabolic health in individuals with T1D.

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0600

THE MODERATING EFFECT OF COMORBID INSOMNIA ON THE ASSOCIATION OF OBSTRUCTIVE SLEEP APNEA WITH MOOD, AND WITH DIABETES-RELATED DISTRESS IN ADULTS WITH TYPE 2 DIABETES

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Introduction: Previous findings showed that insomnia in persons with type 2 diabetes (T2D) may have a greater impact on mood disturbances than obstructive sleep apnea (OSA) and that insomnia contributed to the severity of diabetes-related distress. This study examined insomnia

severity as a moderator of the association between OSA severity with mood, and with diabetes-related distress in adults with OSA and T2D.
Methods: This secondary analysis used pooled baseline data (N=240) from two independent randomized controlled trials that evaluating the efficacy of OSA and insomnia treatment in persons with T2D. OSA (apnea-hypopnea index [AHI] ≥ 5 events per hour) was determined by in-home ApneaLinkPlus®. Insomnia severity was measured by the Insomnia Severity Index, mood by the Profile of Mood States, and diabetes-related distress by the Problem Areas in Diabetes Scale. Possible moderator effect of insomnia severity was examined using hierarchical multiple linear regression analysis, controlling for demographic characteristics and restless leg syndrome (RLS).
Results: Participants were middle-aged (mean age ± SD [years] = 57.80 ± 10.17), White (65%), educated post high school (56.3%), evenly distributed by gender (49.6% female) and marital status (47.9%), with 34.3% reporting financial difficulty. Participants had poorly controlled diabetes (mean HbA1c ± SD [%] = 7.93 ± 1.62) and 15.5% reported symptoms of RLS. Insomnia severity had a moderating effect on the association between OSA severity and mood states (b = -.048, p = .017). Insomnia severity had no significant moderating effect on the relationship between OSA severity and diabetes-related distress (b = -.009, p = .458), but independently increased the level of diabetes-related distress (b =1.133, p < .001).
Conclusion: Insomnia severity moderated the association between OSA severity and mood states in adults with OSA and T2DM. Counterintuitively, as OSA severity increased, the level of mood disturbances decreased depending on insomnia severity. In addition, insomnia was independently associated with diabetes-related distress. These findings suggest that insomnia may be the primary underlying sleep disorder which is associated with psychological factors in persons with T2D. Findings need further investigation because psychological factors are known to be associated with worse glycemic control.
Support (If Any): The NIH funded the parent studies (R01-DK0960281; K24-NR016685) and the CTSI grants (UL1-RR024153; UL1-TR000005)

0601

PREDICTING INCIDENT OUTCOMES FROM THE MICROSTRUCTURE OF SLEEP

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Introduction: Sleep contains rich information about health status, relevant to future health outcomes including dementia, cerebrocardiovascular diseases, psychiatric diseases, and mortality. We hypothesized that the risk of these outcomes is predictable from quantitative analysis of sleep microstructure.
Methods: We included participants who underwent a diagnostic study and age older than 18 years. We excluded participants with missing demographics or PSGs < 2.5 hours in duration. We considered 11 outcomes including dementia, mild cognitive impairment or dementia, ischemic stroke, intracranial hemorrhage, atrial fibrillation, myocardial infarction, type 2 diabetes, hypertension, bipolar disorder, depression, and mortality. The outcomes were determined using ICD codes, brain imaging reports, medications, and/or cognition scores. We extracted 86 spectral and time-domains features from overnight sleep EEG recordings, including 57 features from NREM sleep epochs, 21 from REM, and 8 covariates including age, sex, body mass index, and medication prescriptions including benzodiazepines, antidepressants, sedatives, antiseizure medications, and stimulants. We modeled risk using Cox survival analysis with death as a competing risk. Model calibration was assessed using the difference in 10-year cumulative incidence (10y-CI) between Cox estimate vs. Aalon-Johansen estimate (ground truth).
Results: There were 8673 participants with an average age of 51 years; 51% were female. Participants were partitioned into three groups: poor sleep (hazard > 3rd quartile (Q3)), average sleep (Q1 ≤ hazard ≤ Q3), and good sleep (hazard < Q1). The model was able to predict the 10y-CI not significantly different from the ground truth, except for the risk of intracranial hemorrhage in the poor sleep group. The outcome-wise mean prediction difference in 10y-CI was 2.3% for the poor sleep group, 0.5% for the average sleep group, and 1.3% for the good sleep group. The outcomes with the top three poor-to-average risk ratios (RR) were dementia (RR = 6.2 95% confidence interval [4.5 – 9.3]), mortality (RR = 5.7 [5.0 – 7.5]), and MCI or dementia (RR = 4.0 [3.2 – 4.9]).
Conclusion: Sleep EEGs contain decodable information about the risk for future incidence of mortality, dementia, cerebrocardiovascular and psychiatric diseases. The findings strengthen the concept of sleep as a window into brain and general health.
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0602

RAPID EYE MOVEMENT (REM) SLEEP DURATION IS INVERSELY RELATED TO DAYTIME PRURITUS SEVERITY: PRELIMINARY FINDINGS IN POSTTRAUMATIC STRESS DISORDER (PTSD) PATIENTS

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Introduction: Pruritus (itching) is one of the most distressing symptoms of dermatologic disease. There can be a bidirectional relationship between pruritus severity and sleep. Pruritus during sleep is most frequently encountered during stages N1 and N2 and sleep fragmentation can exacerbate pruritus. Often there are limited effective treatments available for pruritus. In this study we examined REM sleep data obtained from PTSD patients who reported somatic complaints including daytime pruritus. To our knowledge there are no studies of REM sleep and pruritus during wakefulness.
Methods: Seventy-five consenting patients with mild-to-moderate PTSD (all female; mean ±SD age 48.89 ±13.50 years) completed a battery of psychiatric and sleep ratings and underwent ≥ 1 home sleep apnea test (Watch PAT200; Itamar) which provided measures of %REM and REM duration. Exclusion criteria were use of benzodiazepines or narcotics. Pruritus was measured using Item 2 of the Pennebaker Inventory of Limbic Languidness (PILL), which assesses the frequency of common physical symptoms. For PILL Item 2 patients self-rated the frequency with which they experienced "Itchy eyes or skin" with a rating of "1" = ""never or almost never", "2"="less than 3 or 4 times per year", "3"="every month or so", "4"="every week or so', and"5"="more than once every week".
Results: The mean±SD % REM was 21.78 ±7.64 (range 1.76% to 40.69%); and overall duration of REM sleep (mean ±SD) was 91.37±38.20 minutes (range 5.01 to 194.47 minutes). The frequency of pruritus ratings were as follows:: 39.5% endorsed a rating of "5" . The remainder self-endorsed the following frequencies: "4" (15.8%), "3" (21.1%), "2" (15.8%), and "1" (7.9%)..

Pearson product moment correlation between the pruritus rating (item 2 of PILL) and REM sleep parameters were as follows: % REM (Pearson r= -0.172; p=0.144) and REM duration (Pearson r= -0.247; p=0.035).
Conclusion: Daytime pruritus was inversely related to the duration of REM sleep in a sample of PTSD patients. Pruritus can be a difficult condition to manage. Optimization of REM sleep may have a role in the management of pruritus.
Support (If Any): None

0603

CHANGES IN HEALTHCARE VISITS AND EXERCISE HABITS ASSOCIATED WITH POOR SLEEP IN SLEEP MEDICINE PATIENTS DURING THE COVID-19 PANDEMIC

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Introduction: Patients may be experiencing increased stress and sleep disturbance due to healthcare and changes in daily habit during the COVID-19 pandemic. Healthcare changes may include telemedicine visits, delayed or canceled appointments and sleep studies. The purpose of this study was to assess the association between changes in healthcare and daily habits on sleep.
Methods: Sleep medicine clinic patients completed an online survey during the pandemic and again 6 months later (December 2020 - May 2021), where they answered questions about COVID-19 (COVID-19 vaccination and test results, changes in health care visits and habits during the pandemic), PROMIS measures (Sleep Disturbance, Sleep-Related Impairments), and Insomnia Severity Index (ISI). General linear regression model was performed using SAS to determine if changes in healthcare and daily habits predicted poorer sleep.
Results: Among 81 patients who completed baseline survey, 54 (aged 55.2±18.4 y, 61% female, 70% Caucasian) completed the 6-month follow-up survey. Among them, 6% tested positive for COVID-19 and 83% were vaccinated. 30% changed their healthcare office appointments to telephone visits, 50% changed to video visits; whereas 22% cancelled and 30% rescheduled their healthcare appointments. At baseline, changes in health care visits had significant increase on ISI (3.98 ± 1.66, p=0.02). Upon follow-up, changes in health care visits had significant increase on ISI (4.77 ± 2.12, p=0.03) and Sleep Impairments (7.97 ± 3.83, p=0.04). A decrease in exercise predicted lower Sleep Disturbance (6.81 ± 3.31, p=0.04).
Conclusion: Sleep medicine patients who reported changes in health care visits at baseline and 6-month follow up reported higher insomnia severity, and sleep-related impairments. Changes in healthcare had deleterious effects on sleep and should be considered when managing patients' healthcare. Unexpectedly, patients who reported a reduced level of exercise reported improved sleep. Pandemic public policies (e.g., gym closures) may have made it more difficult to exercise but allowed for greater opportunity to sleep.
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0604

DEPRESSION, ANXIETY AND COPING-AVOIDANCE BEHAVIORS ASSOCIATED WITH LONG-TERM INSOMNIA SYMPTOMS DURING THE COVID-19 PANDEMIC

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Introduction: Stressful events, such as the COVID-19 pandemic, can have long-lasting, detrimental effect on sleep. It is important for practitioners to understand how their patients may be stil experiencing residual negative effects of the pandemic to optimize their care. In this study we evaluated how measures of self-reported measures of anxiety and depression during the COVID-19 pandemic predicted measures of sleep disturbnce 6 months later among sleep medicine clinic patients.
Methods: Between June-November 2020, 81 sleep medicine clinic patients (54.8±15.9 y, 44% male, 69% Caucasian) completed an online survey that included PROMIS measures (Sleep Disturbance, Sleep-Related Impairments, Informational Support, Emotional Distress-Anxiety) and Insomnia Severity Index (ISI). Patients were recontacted 6 months later to complete the same surveys. 54 patients (55.2±18.4 y, 39% male, 70% Caucasian) completed the follow-up survey and were included in this present analysis. We conducted multivariate regression analyses to determine how the change in self-reported PROMIS measures from baseline during the pandemic were predictive of post-pandemc 6 month follow-up PROMIS measures and ISI.
Results: PROMIS depression score at baseline was predictive of both sleep disturbance (0.63 ± 0.15; p<.0001) and sleep impairment (0.49 ± 0.18; p=0.01) 6 months later. Baseline brief coping avoidance also predicted 6 month sleep disturbance (0.85 ± 0.33; p<0.009) and sleep impairment (0.85 ± 0.33; p=0.014) as well as ISI (0.52 ± 0.18 units; p=0.006). Baseline anxiety predicted ISI at 6 months (0.25 ± 0.09 units, p=0.009).
Conclusion: Higher levels of self-reported depression, anxiety and coping-avoidance behaviors during the COVID-19 pandemic lead to long-lasting increase in sleep disturbance and impairment as well as insomnia. Addressing depression, anxiety and coping behaviors that occur as result as a stressful event is advised to avoid long-term detrimental effects on sleep.
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0605

LONGITUDINAL ASSESSMENT OF CPAP USE IN SLEEP MEDICINE CLINIC PATIENTS DURING THE COVID-19 PANDEMIC

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Introduction: Due to the COVID-19 pandemic, there may be changes in continuous positive airway pressure (CPAP) adherence. This study aimed to examine the longitudinal effect of using CPAP

as advised and self-reported sleep quality improvements in sleep medicine clinic patients using CPAP early in the pandemic and six months later.

Methods: Between June-November 2020, 81 sleep medicine clinic patients completed an online survey that included questions about CPAP use, using CPAP as advised, and changes in sleep quality associated with CPAP use. Patients were recontacted 6 months later to complete the same survey. Among survey respondents completing both surveys, 27 (50%; aged 58±18.2 y, 48% female, 67% Caucasian) reported using CPAP and were included in the present analysis. We conducted multivariate regression analyses Chi-square Association tests to determine whether self-reported CPAP use, CPAP use as advised, and sleep quality changed from baseline to 6-month follow up during the pandemic.

Results: Among CPAP users, 89% reported no change, 7% reported they use CPAP more, and 4% reported they use CPAP less at 6-month follow up. There was a significant increase in using CPAP as advised at 6-month follow up compared to the baseline survey, p=0.003. Additionally, there was a significant improvement self-reported sleep quality while using CPAP at 6-month follow up compared to the baseline survey, p=0.012.

Conclusion: Patients reported an increase in using CPAP advised and improvements in sleep quality as a result of CPAP use at 6-month follow up compared to a baseline survey administered early in the pandemic. Understanding why patients are more adherent to using CPAP as advised during the pandemic may help in developing interventions to increase CPAP adherence.

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0606

A PARADIGM FOR TESTING THE ACCURACY OF DIGITAL SLEEP STAGING SYSTEMS

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Introduction: Despite evidence showing that agreement between human and some automatic staging systems is generally comparable to agreement between human scorers, automated scoring is rarely used in clinical practice, even though it offers time savings and consistency. We propose a paradigm for testing digital systems that reveals their true accuracy vs. highly experienced academic scorers. As an example of a digital method to be tested, we used Michele Sleep Scoring (abbreviated:Digital).

Methods: 70 PSGs were scored by 6 experienced technologists from 3 academic centers. Staging results were compared to digital staging results using an epoch-by-epoch approach. For each PSG we carried out 6 cycles of comparisons. Each cycle consisted of two steps, one comparing one scorer (tested scorer) with the scoring of the five remaining scorers (judges), and one comparing Digital as the tested scorer with the same 5 judges. Error 1 was assessed when all judges disagreed with the tested scorer but there was disagreement between the judges. Error 2 was assigned when all judges disagreed with the tested scorer but agreed unanimously on the stage. For each PSG the number of epochs with types 1 and 2 errors was counted for each scorer (n=6 scorers) and for Digital. Results of all 70 PSGs were pooled, and percent of types 1 and 2 errors is reported for all scorers and Digital.

Results: 70 PSGs (females aged 51.1 ± 4.2 years) were evaluated. Average times in different sleep stages (manual scoring) were 43±18, 244±47, 30±21, and 81±25 minutes for stages N1, N2, N3 and REM, respectively. TST was 398±52 minutes, and sleep efficiency was 84±8%. There was a total of 65,053 epochs scored by each scorer and Digital. The average percent of type 1 errors made by scorers for all epochs was 6.4% (0-33.2) vs. 7.8% (1.68-26.6) made by Digital. The average percent of type 2 errors made by scorers for all epochs was 3.9% (0-28.6) vs. 4.3% (0-17.3) made by Digital.

Conclusion: This study provides an objective way of testing the accuracy of automated scoring systems and supports evidence that the accuracy of Michele Sleep Scoring is comparable to manual scoring.

Support (If Any): None

0607

PREVALENCE AND CORRELATES OF SLEEP DISORDERS AMONG USERS OF A CONSUMER SLEEP TECHNOLOGY

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Introduction: Sleep disorders constitute a major public health burden yet remain widely undiagnosed and untreated. The prevalence of diagnosed sleep disorders and associations with objectively measured sleep-wake dysfunction vary widely across populations. Here, we examined the self-reported prevalence and objective sleep architectural correlates of four sleep disorders in a large sample of individuals using a consumer sleep technology.

Methods: Data from 33,429 users (mean age: 44.6, 55.1% female) across 1,842,282 nights were included in the analysis from the PSG-validated SleepScore Mobile Application, which uses a non-contact, sonar-based method to objectively capture sleep-related metrics, and questionnaires to capture self-reported data. Subjective sleep disorder information was ascertained by asking users, "Which of the following sleep disorders has a healthcare professional diagnosed you with?" Linear regression was used for analysis, while age and gender were used as confounding variables, with the cohort reporting "None of the above" were used reference group for research purposes.

Results: The prevalence of reported disorders were "None of the above" (n=23,732,71.0%), sleep apnea/SDB (n=5,309, 15.9%), insomnia (n=3,968, 11.9%), RLS/PLM (n=2,295, 6.87%), or narcolepsy (n=266, 0.8%). Narcolepsy was associated with the greatest reduction in TST (ß=-23.6 mins, SE=3.475, p<0.001) while insomnia was associated with smallest (ß=-5.7mins, SE=0.979, p<0.001). Narcolepsy was associated with the greatest increase in WASO (ß=7.0 mins, SE=1.815, p<0.001) while insomnia was associated with smallest (ß=2.2 mins, SE=0.511, p<0.001). RLS/PLM was associated with the greatest increase in SOL (ß=3.9mins, SE=0.302, p<0.001) while sleep apnea/SDB was associated with the smallest (ß=2.171 mins, SE=0.22, p<0.001). Narcolepsy was associated with the greatest decrease in SE (ß=-3.05%, SE=0.5, p<0.001) while insomnia was associated with smallest (ß=-1.42%, SE=0.1, p<0.001).

Conclusion: Self-reported sleep disorders were associated with objectively poor sleep in a big data consumer sleep technology analysis. These findings suggest consumer sleep technologies may have value in

screening for sleep disorders in the general population and may motivate these individuals to seek care in clinical sleep medicine settings.
Support (If Any):

0608

CHARACTERIZATION OF SLEEP IN EMERGING ADULTS WITH CYSTIC FIBROSIS ON CFTR MODULATOR THERAPY

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Introduction: Sleep disturbances are common among youth and adults with cystic fibrosis (CF). However, few CF programs regularly screen for sleep disorders beyond sleep disordered breathing. Emerging adults (18 to 25 years) with CF are a unique population, experiencing changes in sleep and life transitions (e.g., education, work, relationships), while also managing a complex chronic illness. CF transmembrane regulator (CFTR) modulator therapies have significantly improved medical and quality of life outcomes, yet the impact on sleep remains to be determined.
Methods: Emerging adults with CF (EA-CF; n=22, 59.1% female) and without CF (EA-Control; n=17, 76.5% female) completed an online survey that queried (1) symptoms of restless legs syndrome, parasomnias, and daytime sleepiness, and (2) frequency of exogenous sleep aid use (i.e., prescription medications, melatonin, over-the-counter [OTC] sleep aids, and marijuana/CBD). EA-CF were also asked about perceived changes in falling asleep, night waking frequency and duration, and daytime sleepiness since starting CFTR modulator therapy.
Results: Sleep disorder symptoms were more frequently reported by EA-CF compared to EA-Control, including restless legs syndrome (31.8% vs. 23.5%, small effect size), parasomnias (40.9% vs. 29.4%, small effect size), and excessive daytime sleepiness/fatigue (50.0% vs. 23.5%, medium effect size). OTC sleep aid use did not differ by group (EA-CF 31.8% vs. EA-Control 35.3%), but the frequency was significantly greater in EA-CF (>once/month: EA-CF 27.3% vs. EA-Control 0%, <once/month: EA-CF 4.5% vs. EA-Control 35.3%, large effect size). More EA-CF reported CBD/marijuana use compared to EA-Control (36.4% vs. 17.6%, small effect size), with 31.8% of EA-CF reporting use of CBD/marijuana at least several nights a week (vs. 5.9% of EA-Control, small effect size). Since starting CFTR modulatory therapy, 27.3% of EA-CF reported falling asleep faster, 31.8% reported fewer night wakings, 36.4% reported shorter night wakings, and 36.4% reported reduced daytime sleepiness.
Conclusion: This study is one of the first to examine sleep in emerging adults with CF on CFTR modulator therapy, with results highlighting the importance of screening for sleep disorders other than sleep disordered breathing, use of exogenous sleep aids to facilitate sleep, and the benefits of CFTR modulator therapy on sleep. Data collection is ongoing.
Support (If Any): Natalie V. Zucker Award

0609

SLEEP STABILIZATION IN PREHYPERTENSIVE/ HYPERTENSIVE PATIENTS

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Introduction: Variable sleep/wake patterns have been linked to increased cardiometabolic risk. The current project investigates the effects of using sleep hygiene interventions to stabilize sleep timing in prehypertensive/hypertensive patients. Growing evidence supports the importance of regularizing sleep timing in improving cardiovascular health, and we believe that using sleep hygiene techniques to stabilize sleep may reduce these risks.
Methods: As part of a larger study, fifty-three participants (55.5 ± 1.4 years; 51% male) completed sleep diaries during 3 study periods. The first period (S1) was a baseline control, the second period (S2) was a 4-week wait-list control condition, and the third period (S3) was an 8-week randomly assigned intervention that used sleep hygiene approaches and scheduling to stabilize sleep timing or stabilize and lengthen sleep. Currently, we are still blind to condition; however, because both conditions involve sleep stabilization, an analysis using linear mixed models was used to assess change in the variability of total sleep time (SDTST), wake up time (SDWUT), and fall asleep time (SDFAT) across the 3 study periods.
Results: There was a significant decrease in SDTST variability (standard deviation) at post-intervention (S3) compared to S2 ($p<0.01$) and S1 ($p<0.01$). There was also a significant decrease in SDWUT variability at post-intervention (S3) compared to S2 ($p<0.01$) and S1 ($p<0.01$). There was a trend towards a significantly decreased SDFAT at S3 compared to S2 ($p=0.057$), but there was a significant decrease in SDFAT variability during S3 compared to S1 ($p<0.01$).
Conclusion: These data suggest that we were able to utilize sleep hygiene interventions to decrease the variability in total sleep time, wake-up time and fall asleep time. When we unblind we will report on if we were able to increase and lengthen the sleep period for those in the sleep extension condition.
Support (If Any): NIH (R01HL125379 to Dr. Janet Mullington), Harvard Catalyst, Harvard Clinical and Translational Science Center (UL1TR001102)

0610

DEVELOPMENT OF A RULE-BASED TEXT MINING ALGORITHM TO IDENTIFY SLEEP COMPLAINTS IN PRIMARY CARE PROGRESS NOTES

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Introduction: Sleep complaints are among the most common reasons to seek medical attention, yet sleep disorders are largely underdiagnosed in primary care settings. The ability to process large collections of unstructured clinical notes might offer an opportunity to promote screening of patients suffering from significant sleep disorders. The goal of this study was to develop a simple rule-based algorithm to identify sleep complaints in progress notes from primary care encounters and validate the performance of the algorithm against manual chart review.
Methods: De-identified progress notes of a random sample of patients with primary care encounters at the University of Kansas Health System in 2019 were extracted from the institution's clinical research data warehouse (Healthcare Enterprise Repository for Ontological Narration). Review of 163 notes from patients enriched for presence (N=95) or absence (N=68) of sleep disorders based on the International Classification of Disease (ICD)-10 code hierarchy G47 guided the development of a vocabulary of sleep complaints and symptoms, including corresponding negation terms. The vocabulary was used to design a rule-based, regular expression matching algorithm, which was evaluated against manual chart review of the same patient cohort (training dataset). An independent set of notes from another sample of patients with primary care encounters (N=77; testing dataset) was also manually reviewed and used to assess the validation performance of the algorithm.

Results: In the training dataset, the algorithm had a sensitivity=75%; specificity=91%, positive predictive value (PPV)=90%, and a negative predictive value (NPV)=87%. The area under the receiver operating characteristics (AUC) curve in the training set was 0.84. When the algorithm was evaluated in the testing dataset, we found a sensitivity=53%, specificity=91%, PPV=78%, and NPV=77%. The AUC in the testing dataset was 0.78.
Conclusion: A simple pattern matching algorithm designed to identify sleep complaints in primary care progress notes showed good performance in the training set and acceptable performance in the testing set. Further refinement of this algorithm with potential incorporation of natural language processing might offer a feasible approach to screen patients for underdiagnosed sleep disorders using primary care clinical notes.
Support (If Any): NIH CTSA UL1TR002366.

0611

INTRAINDIVIDUAL VARIABILITY IN SUBJECTIVE SLEEP AND AVERAGE FATIGUE IN PARENTS OF CHILDREN ON THE AUTISM SPECTRUM

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Introduction: Fatigue is related to various adverse health outcomes. Mean levels of some common sleep variables, such as total sleep time (TST), sleep onset latency (SOL), and wake after sleep onset (WASO), have been associated with fatigue. However, intraindividual variability (IIV) of sleep parameters might play an independent role in sleep's relationship with fatigue. Understanding fatigue is particularly important for parents of children with autism spectrum disorder (ASD) given fatigue's negative associations with positive parenting and implementation of child interventions. This preliminary study examined linear associations between subjective sleep IIV and mean fatigue levels in parents of children on the autism spectrum.
Methods: The sample included 66 parents who expressed interest in a behavioral treatment sleep study for their school-aged children diagnosed with ASD (6-12 years old; NCT04545606). All parents (Mage=37.03, SD=6.53; 91% female) completed daily electronic diaries over a two-week baseline period. Daily fatigue rating was collected using a visual analog scale (0-100) and averaged within individuals. Within-individual standard deviations of subjective TST, SOL, and WASO were calculated to estimate IIV. Data were analyzed in R (v4.1.2) using multiple linear regression models controlling for participant age, gender, and individual sleep parameter means.
Results: Bivariate correlations between sleep variable IIV and average fatigue indicated a positive association between TST variability and average fatigue, $r(64)=0.33$, $p<0.01$. Multiple regression analyses showed that greater IIV of TST was associated with higher average fatigue ($\beta=0.14$, 95%CI [0.01, 0.27], $sr2=0.06$, $p=0.041$). No significant associations were found between average fatigue level and IIV of WASO or SOL.
Conclusion: Results suggest that greater TST variability may be one factor independently contributing to higher fatigue levels in parents of children on the autism spectrum, which warrants further examination of sleep variability in this population. Future research could explore IIV of additional sleep parameters, fatigue IIV as an outcome, alternative methods of sleep measurement, and study designs that address causation. Increased insight into these connections might inform the importance of considering sleep interventions for both children and parents, and potential subsequent treatment benefits.
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0612

DOES COPING STRATEGY PROTECT SLEEP QUALITY DURING COVID-19? AN EXAMINATION OF RACIAL, ETHNIC, CULTURAL DIFFERENCES

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Introduction: Little has been done to examine within/between group predictors and mediators of race/ethnic differences in sleep health outcomes, due to COVID-19 exposure. We evaluated the effect of COVID-19 exposure on sleep quality in a multiracial/ethnic sample of New York residents.
Methods: We conducted a cross-sectional study among adults exposed to COVID-19 across New York State from September to November of 2020. Comparisons of participant characteristics e.g., mean scores by race/ethnicity status were made using one-way ANOVA for continuous variables, and chi-square tests for categorical variables. Associations between social determinants of health (employment, location), Trauma Coping Self-Efficacy (CES-T), and sleep quality (Pittsburgh Sleep Quality Index-PSQI) were examined using multilinear regression analysis stratified by race/ethnicity.
Results: Of the 541 participants, 373 (68.9%) were female; mean age was 40.9 years (SD=15), 198 (36.6%) identified as Whites, 111 (20.5%) as Black, 97 (17.9%) as Hispanics, and 135(25%) identified as either Asians, Native-Americans, Pacific-Islanders. Sex was the strongest predictor [$\beta = 1.335$; $p < .05$] of sleep quality, but only among Whites. Trauma Coping Self-Efficacy was negatively associated with sleep quality among Asian, Native-American, or Pacific-Islander participants [$\beta = -.114$; $p < .05$]; Black [$\beta = -.099$; $p < .05$] and White participants [$\beta = -0.79$; $p < .05$] but not among Latinos/as [$\beta = -.058$; $p = 0.71$].
Conclusion: Coping Self-Efficacy moderated the effect of COVID-19 on sleep quality among some, but not all, racial/ethnic groups. While CSE-T scores during the first wave of COVID-19 acted as a protective factor for sleep quality among Asians, Native-Americans, and Pacific-Islanders, White and Black participants, this was not the case for Latinos/as/Hispanics residing in New York. Clinical interventions that are tailored for racial/ethnic, community and cultural needs may help to mitigate sleep problems associated with COVID-19 exposure.
Support (If Any): T32HL129953; 7R01HL142066-04; 1R01HL152453-01

0613

COVID-19 IS ASSOCIATED WITH SHORTER SLEEP DURATION AMONG AMERICAN ADULTS

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Introduction: The COVID-19 pandemic has deteriorated sleep health in the United States (U.S.) and worldwide. Most studies that have examined the association between COVID-19 and sleep outcomes have used a non-probability sampling with potential sampling bias and limited generalizability. We examined the association between diagnosed COVID-19 and sleep health in a large representative sample of civilian adults aged ≥18 years in the U.S.
Methods: This study was based on data from the 2020 National Health Interview Survey (NHIS) of adults (n=17,636). Sleep health was captured by self-reported sleep quantity [(very short (≤ 4 hours), short (5-6 hours), healthy (7-8 hours), or long (≥9 hours)] and sleep complaints (trouble falling and staying asleep; with responses ranging from never to every day) in the past 30 days. To account for correlated residuals among the endogenous sleep outcomes, generalized structural equation modeling (GSEM) was conducted with COVID-19 diagnosis as the predictor of interest. Other covariates (age, sex, race/ethnicity, education, employment, poverty level, marital status, birthplace, health insurance, region of residence, metropolitan areas, number of children and adults in the household, obesity, and sleep medication) were included in the models. NHIS complex probability sampling design was accounted for in descriptive and GSEM analyses.
Results: About 4.2% of adults had a positive COVID-19 diagnosis. Among them, 3.1% had very short sleep, 24.2% had short sleep, 59.9% had healthy sleep, and 12.8% had long sleep; 37.0% had trouble falling some days, 10.9% most days, and 6.5% every day; and 33.7% had trouble staying asleep some days, 13.9% most days, and 6.6% every day. Findings from GSEM revealed that a history of COVID-19 almost doubled the odds of having short sleep (OR: 1.9; 95% CI: 1.1-3.4; p=0.032). No significant associations were found between COVID-19 and the other sleep outcomes.
Conclusion: Individuals with a COVID-19 diagnosis were more likely to report very short sleep, although they did not exhibit a greater likelihood of reporting more sleep complaints. Further research using longitudinal national data and examining environmental factors are needed to determine causality.
Support (If Any): NIH R01HL142066, R01HL095799, RO1MD004113, R01HL152453, R25HL105444

0614

POLYSOMNOGRAPHIC MEASURES OF SLEEP ARCHITECTURAL DISRUPTION AND INCIDENT ATRIAL FIBRILLATION AND STROKE IN A LARGE CLINICAL COHORT

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Introduction: Although epidemiologic studies have identified associations of architectural disruptions in sleep and atrial fibrillation (AF), inconsistencies in results limit understanding of longitudinal AF and stroke development in clinic-based cohorts. We hypothesize lower arousal index as a biomarker of prolonged respiratory events and objective measures of sleep disruption increase incident AF and stroke.
Methods: Cleveland Clinic patients (age>18) who underwent polysomnogram (PSG) or split studies 11/27/2004-12/30/2015 were examined. Arousal index, total sleep time (TST,hours), sleep efficiency (SE,%), and wake after sleep onset (WASO,hours) were assessed as predictors of incident AF. Cox proportional hazard models were fit with time from sleep study to AF diagnosis. Secondary analyses were conducted in the subset of patients with baseline AF, with time from sleep study to stroke. Covariates included age, sex, race, body mass index (BMI,kg/m2), cardiovascular risk factors (hypertension, diabetes mellitus, hyperlipidemia), heart failure, coronary artery disease, myocardial infarction, coronary artery bypass grafting, chronic obstructive pulmonary disease, tobacco use, and use of anti-arrhythmic drugs. Data were censored at date of last follow up or the 5-year mark.
Results: The sample comprised 43,634 patients: age 51.7±14.5, 51.9% male, 74.5% White, and 7.1%(n=3,090) with AF. Of those without baseline AF, 1,176(2.9%) developed 5-year incident AF. Incident AF increased by 9% (HR=1.09, 95%CI=1.04-1.13) for each hour of lost TST. For every 10 percentage point decreased SE, incident AF increased by 7% (HR=1.07, 95%CI=1.04-1.11). For every hour increased WASO, incident AF increased by 14% (HR=1.14, 95%CI=1.07-1.21). Arousal index conferred no statistically detectable change of incident AF. In secondary analyses, any association of arousal index and incident stroke was attenuated after accounting for confounding comorbidities (omnibus p=0.055).
Conclusion: Objective measures of disrupted sleep architecture predicted incident AF in this clinical cohort. However, arousal index was not associated with AF development, nor stroke development in secondary analyses. Further investigation is needed to elucidate the role of arousal in SDB, perhaps with hierarchal models to clarify the degree to which confounders attenuate or accentuate any relationship.
Support (If Any): Cleveland Clinic Neurological Institute Center for Outcomes Research & Education Pilot Grant

0615

ASSOCIATION BETWEEN AMBIENT LIGHT EXPOSURE AND SLEEP DURATION AMONG AMERICAN ADULTS FROM VARYING RACE/ETHNICITIES: FINDINGS FROM THE NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY

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Introduction: One in three American adults are sleep deprived in the United States (US). Racial/ethnic minorities are more likely to experience shorter sleep duration than are whites. Light exposure is associated with sleep duration. However, whether this association is independent of individuals' race/ethnicity has not been studied in a nationally representative sample of the US adult population. We examined associations between ambient light exposure and sleep duration and between race/ethnicity and sleep duration. We also assessed whether associations between light exposure and sleep duration are independent of participants' race/ethnicity.

Methods: We used data from the National Health and Nutrition Examination Survey (n=4,277 adults; 2013-2014). Participants (≥ 18 years old) wore an actigraph that collected 24-hour sleep/wake and light data for 7 consecutive days. Objective measurements in our analyses included sleep duration (valid minutes) and light exposure (lux). To determine the associations between light exposure and sleep duration, a weighted mixed-effects linear model was estimated controlling for age, sex, family income to poverty ratio, education, employment, marital status, homeownership status, birthplace, household size, vitamin D, smoking, physical activity, sedentary lifestyle, health status, body mass index, depression, chronic conditions, and time in days. A product term between lux and race/ethnicity was included in a second regression model.
Results: Participants had a mean sleep duration of 468.2 minutes. On average, White adults had the longest sleep duration (mean=478.8), followed by other/multiple races (mean=458.6), Asians (mean=449.1); Blacks (mean=445.0), and Hispanics (mean=444.7). Overall, light exposure was negatively associated with sleep duration (= -0.08 lux; p<0.001). Black slept significantly less than did Whites (= -37.1 p<0.001) followed by Asians (= -26.5; p<0.01) and Hispanics (= -24.6; p<0.01). The association between light exposure and sleep duration did not significantly differ across all race/ethnic groupings, except for Blacks (= -0.05; p<0.01).
Conclusion: To our knowledge, this is the first study that used national data to assess racial/ethnic disparities in objectively measured light exposure. Future research is needed to shed more light on racial/ethnic disparities in the light-exposure-sleep-duration link.
Support (If Any): R01HL142066, R01HL095799, RO1MD004113, R01HL152453, R25HL105444

0616

RETROSPECTIVE PAIN REPORTS IN OBSTRUCTIVE SLEEP APNEA PATIENTS RELATE TO AGE, SEX, BMI, INSOMNIA AND DEPRESSION SCALES, NOT TO POLYSOMNOGRAPHIC MEASURES OF SLEEP AND RESPIRATION

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Introduction: OSA was found to alter pain experience, presumably due to apnea-related hypoxia and sleep disturbance. However, types of pain measures, demographic and subjective variables, such as mood, may influence pain experience in OSA. Presently, retrospective pain reports of patients referred for OSA evaluation were analyzed as a function of PSG measures, demographic variables, and self-reported mood and insomnia symptoms.
Methods: On the evening of a diagnostic in-lab PSG, patients reported pain intensity in the preceding 6 months (PI, rage 0-10, Chronic Pain Grade Scale), symptoms of depression (Center for Epidemiologic Studies Depression Scale-Revised, CESDR) and insomnia (Insomnia Severity Index, ISI). PI was regressed on age, sex, BMI, total sleep time (TST), sleep stage percentages, sleep efficiency, WASO, awakenings, respiratory arousal index, AHI, SpO2% nadir, time below SpO2 90%, desaturation index, CESDR and ISI using a stepwise entry.
Results: A total of 1293 patients with ≥2 hours of PSG-defined sleep completed the questionnaires; 3% Asian, 42% black, 5% Hispanic, 32% white; 62% women; 66% had OSA (AHI≥5); Mage=58.7±13.8, MBMI=33.8±7.3, MPI=3.5±3.1; MISI=12.9±6.9; MCESDR=14.7±13.1, MAHI=17.6±22.9, MSpO2%nadir=84.9±9.0. Higher PI was associated with female sex (p<0.001, R2=2.6%), older age (p<0.001, R2=3.7%), higher BMI (p<0.001, R2=2.5%), higher ISI (p<0.001, R2=4.5%), higher CESDR (p<0.001, R2=2.3%) and longer TST (p=0.028, R2=0.4%). No other sleep or respiratory variables related to PI. No significant interactions with AHI≥5 were present. No differences between OSA (AHI≥5) and no-OSA groups were present on PI, ISI or CESDR after controlling for age, sex and BMI.
Conclusion: Retrospective reports of pain intensity were unrelated to PSG measures of sleep and respiratory disturbance. Female sex, older age and higher BMI related to higher PI regardless of the OSA diagnosis and collectively accounted for 8.8% of the PI variance. Symptoms of insomnia and depression related to higher PI independently of OSA, accounting for 4.5% and 2.3% of the PI variance, respectively. As in prior research OSA was associated with insomnia and depression, these variables may mediate the relationship between OSA and pain.
Support (If Any): None

0617

ASSOCIATION BETWEEN GREEN, BLUE, AND OPEN SPACES AND SLEEP HEALTH IN A BLACK POPULATION: AN ANALYSIS OF THE METSO DATASET

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Introduction: Blacks have a high burden of poor sleep health outcomes. Environmental determinants, such as green space or open environments, represent an underexplored contributor to sleep burden among Blacks. The extent these environmental factors affect sleep health outcomes within this population has not been adequately explored. To fill this gap in the literature, we investigated associations between environmental factors and sleep outcomes among Blacks in a large urban city. Objectives included (1) examine if zip-code derived open spaces (defined as proportion of open space in residential area,) green spaces (defined as open tree coverage of the ground) and blue spaces (proportion of water space) sleep apnea risk, and insomnia symptoms; (2) Examine if open, blue, and green spaces predict sleep outcomes independent of sex, age, and education level.
Methods: Our study used data from the Metabolic Syndrome Cohort Study (2009-2014), a studythat examined behavioral intervention methods to improve sleep apnea outcomes among Blacks. Sleep Apnea was assessed with the ARES (apnea risk) scale and insomnia status was collected through self-report ("Do you have difficulty staying/falling asleep or waking up?") in a subset of 344 participants. Logistic regression analyses were performed to predict the effect green, blue, and open spaces had on sleep outcomes. To account for within zip-code correlation, mixed effects models (unadjusted and adjusted) account for sex, age, and education were considered.
Results: We found that none of the green, blue, or open space variables predicted sleep outcomes in the unadjusted model. In adjusted models, green space predicted sleep apnea risk scores, (OR=1.03, P<.05), but not insomnia.
Conclusion: Our study examined the extent which green, blue, and open spaces predicted insomnia and sleep apnea in urban blacks. We found that only green spaces were associated with sleep apnea, and none of our environmental variables predicted insomnia. Given the large amount of literature detailing a complex and multifactorial process on how environment affects sleep outcomes, our findings suggest that the link between urban environments, green spaces, and sleep outcomes may not be as

definitive as they seem. Further research should explore the differential effect environment has on diverse populations' sleep outcomes.
Support (If Any): NIH R01HL142066, R01HL095799, RO1MD004113, R01HL152453

0618

ASSOCIATION BETWEEN AMBIENT LIGHT EXPOSURE, RACE/ETHNICITY, AND VITAMIN D AMONG ADULTS IN THE UNITED STATES: ANALYSIS OF THE NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY

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Introduction: The prevalence of vitamin D deficiency (VitD) in the United States is 41 percent, with the highest rate among Blacks 82 percent. Vitamin D deficiency has been linked to chronic diseases. The extent to which the association between light exposure and vitamin D serum levels can vary by individual's race/ethnicity of which has not been studied at a national level. We aim to explore the associations of ambient light exposure between race/ethnicity and vitamin D.
Methods: The study used data from the National Health and Nutrition Examination Survey (2013-14). For detection of 25-hydroxyvitamin D3 and 25-hydroxyvitamin D2 nmol/L, ultra-high-performance liquid chromatography-tandem mass spectrometry was performed based on serum samples from adults aged ≥ 18 years. Light levels (lux) data were gathered using 24-hour actigraphic monitoring over /a 7day period. Weighted generalized linear models were fitted examining association between light exposure and VitD adjusting for age, sex, family income/poverty ratio, education, employment, house tenure, marital status, birthplace, number of people in household, smoking, physical activity, and sedentarity. To compare this association across race/ethnicity, a product term between lux and race/ethnicity was included in adjusted models.
Results: Among 4,251 participants, White adults had the highest levels of VitD (mean=76.0; se=1.3), then other/multiple races (mean=65.1; se=2.2), Asians (mean=62.5; se=1.4); Hispanics (mean=57.4 nmol/L; se=1.6), and Blacks (mean=50.1; se=1.4). Regression analysis revealed estimated mean VitD of 64.9 nmol/L and positive association between light exposure and VitD (0.020). Blacks had significantly lower VitD levels (-19.3) followed by Asians (-12.1) and Hispanics (-12.6) (all p-values <0.001). The association between light exposure and VitD depended on participant's race/ethnicity
Conclusion: To our knowledge, this is the first study showing associations between objectively measured light exposure and VitD serum levels using a large representative sample of the US population. Although the study revealed racial/ethnic disparities in VitD levels, light exposure was associated with VitD even when race/ethnicity was adjusted for in the model. Further research on racial/ethnic differences in VitD is warranted.
Support (If Any): R01HL142066, R01HL095799, RO1MD004113, R01HL152453, R25HL105444

0619

THE RELATIONSHIP BETWEEN SLEEP DISTURBANCE AND INFLAMMATORY MARKERS IN INDIVIDUALS WITH 22Q11.2 COPY NUMBER VARIATIONS

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Introduction: The 22q11.2 locus contains genes critical for brain development. Individuals with copy number variations (i.e. a deletion or duplication; CNV) at this locus have greatly increased risk of developmental neuropsychiatric disorders, as well as immune dysfunction and sleep problems. However, it remains unknown if sleep disturbance and immune dysfunction are related to each other in this population, as they are in typically developing individuals.
Methods: We examined the relationship between self-reported sleep disturbance and blood cytokine levels in 22q11.2 deletion (22qDel; n= 40, Mage = 17.5±8.4 years, 45% males) and duplication (22qDup; n=28, Mage =16.8±12.9 years, 45% males) carriers. Blood plasma samples were obtained to measure interlukein-6 (IL-6), interlukein-10 (IL-10), interleukin-8 (IL-8), tumor necrosis factor-alpha (TNF) and interferon-gamma (IFN) using a MesoScale Discovery multiplex immunoassay. We also measured levels of C-reactive protein (CRP) using an ELISA. Subjects were classified as either good or poor sleepers based on the sleep disturbance score on the Structured Interview of Psychosis-Risk Symptoms (SIPS). Linear regression models were used to test the effect of sleep disturbance, subject group (22qDel vs. 22qDup), and a group-by-sleep interaction on each cytokine level while controlling age, sex, body mass index, and collection time. We corrected for multiple comparisons using False Discovery Rate (FDR) correction.
Results: Overall, 22qDup carriers had higher levels of IL-8 ($q<0.001$) and TNF ($q<0.001$) relative to 22qDel. Across CNV groups, poor sleepers had higher levels of IL-8 ($p=0.046$) and IFN ($p=0.028$), but these effects did not survive FDR correction ($q>0.18$). There was a group-by-sleep interaction for IL-8 ($p=0.013$), TNF ($p=0.048$), and IFN ($p=0.034$) such that sleep disturbance had a greater effect on cytokine levels in the 22qDel group, but only the interaction for IL-8 survived as a trend towards significance after FDR correction ($q=0.076$).
Conclusion: Our findings suggest that poor sleep may contribute to immune dysfunction in 22q11.2 CNV carriers. Further, there may be differential impacts of sleep on immune function, depending on gene dosage at the 22q11.2 locus. Future research in larger samples is required to determine if immune disruption and sleep problems are related to elevated psychiatric symptoms in 22q11.2 CNV carriers.
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0620

IS SVI A RISK FACTOR FOR SLEEP AND CARDIOMETABOLIC HEALTH AMONG BLACKS?

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Introduction: The Social Vulnerability Index (SVI) is a novel metric that incorporates a multitude of population factors to predict the susceptibility of communities to deleterious effects of disaster, natural hazards, and environmental insult. Studies show

socioeconomic status (SES), an important component of SVI, is a risk factor for cardiometabolic disease and sleep quality. Objectives: This study examined the effect of SVI on cardiometabolic and sleep health among Blacks.

Methods: We utilized harmonized data extracted from two NIH-funded studies enrolling Blacks (i.e., MetSO and PEERS-ED registries). Participants (N=1,497) included New York residents; 65% were male, with a mean(SD) age of 55(±16.2). Data were collected via self-reports (e.g., ARES questionnaire) for sleep quality/duration and cardiometabolic factors (e.g., weight and diet). SVI components included SES, household composition, minority status, and housing type. Mixed-effect logistic regression models were applied, which assessed the effect of SVI and its many subcomponents on each health-related variable of interest. The model was adjusted for age, sex, and education to account for the effects of these factors overlapping in the SVI subcomponents.

Results: Approximately 81% of the sample population was obese, 37.9% were diabetic, 62.3% had a history of hypertension, and 18.4% with a heart disease. Regarding sleep health, 7.7% suffered from sleep apnea, 66.6% were short sleepers, 6.64% were long sleepers, and 14.2% reported insomnia. They had a mean(SD) sleep time of 5.92(±2.05) hours. "Overall SVI" was associated with hypertension (OR=3.98) and "housing type & transport" was correlated with heart disease (OR=4.44) prior to adjusting the model. Applying the adjusted model, "minority status & language" predicts obesity (OR=5.32). Also, "overall SVI" and "SES" were associated with diabetes (OR=3.26; OR=2.71) and hypertension (OR=4.00; OR=3.95). "Household composition" approaches significance as a predictor for sleep apnea (unadjusted - OR=0.26; adjusted - OR=0.26) despite the relatively low case proportion.

Conclusion: SVI seems to be a good indicator of cardiometabolic health among Blacks. However, it is likely a poor marker for sleep health in that population, although trends were observed suggesting that it might play an important role. Further studies are necessary to elucidate the role of SVI on sleep health among Blacks.

Support (If Any): R01HL142066, R01HL095799, RO1MD004113, R01HL152453

0621

OVERCOMING OBSTACLES TO RECRUITMENT AND COMMUNITY ENGAGEMENT DURING COVID-19 AND DEVELOPMENT OF A DIGITAL COMMUNITY OUTREACH PROGRAM

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Introduction: COVID-19 disrupted traditional research infrastructures and processes most notably in-person community recruitment, especially in underrepresented populations like racial ethnic minorities. To find creative and effective strategies, our group implemented and tested the efficacy of a culturally tailored community outreach plan (COP) developed during the US COVID-19 pandemic.

Methods: In February 2021, we developed an 11 step culturally-tailored community outreach program to support the implementation of three NIH funded community-based sleep studies. The following steps include: (1) description of the situation statement, 2) definition of goals, 3) engagement of audience/stakeholders, 4) tailoring message, 5) defining incentives, 6) choice of outreach methods, 7) identification of spokesperson, 8) choice of tools to assess progress, 9) identification of media outlets, 10) creation of study timeline, and 11) implementation of the plan. The studies leveraged several recruitment channels: 1) community settings (Place of worship, "community recruiter", health fairs, word of mouth, & healthcare providers/doctors' clinics), 2) online platforms (Facebook, Twitter, LinkedIn and Research Match), and 3) preexisting datasets in NYC.

Results: All three studies successfully met recruitment goals. ESSENTIAL [n= 224, 69% females, mean age= 36], MOSAIC [n=109, 61% females; mean age= 64] and Latinx/Hispanics: DORMIR[n=260, 61.3% of female; 32.4]. Among the three NYC cohorts, the most common recruitment channels were: preexisting datasets (74%), community settings (19%), & online platform (7%) for ESSENTIAL; preexisting datasets (85%) & community settings (15%) for MOSAIC, and (71.7%) online platform for DORMIR. However, the Miami cohorts came mostly from community settings 90% for Essential and 97% for MOSAIC.

Conclusion: Overall, the TSCS community outreach plan seems to be an effective tool to engage minoritized populations in greater NY and Miami. Our current field experience indicates that recruitment channels must be adapted to age, and community resources. Limited access to technology, particularly among older Blacks seem to be a major barrier for field staff to successfully engage the disenfranchised communities.

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0622

INFLUENCE OF CANNABIS USE DISORDER ON SLEEP QUALITY AMONG COLLEGE STUDENTS

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Introduction: Poor sleep, which has numerous deleterious effects, is one of the most common health complaints among college students. Both race/ethnicity and sex are associated with poor sleep outcomes, with Black college women potentially having higher risk. The college experience is often associated with an increase in stress, as well as drastic shifts in lifestyle and sleep patterns. Research indicates that college students report cannabis use enables them to cope with life stressors and negative emotions and is often used as a sleep aid. The use of cannabis as a to cope may lead to more chronic cannabis use, and the development of Cannabis Use Disorder (CUD), which is most prevalent in individuals aged 18-25. Therefore, this study examined the influence of CUD symptomatology on sleep among Black female college students.

Methods: Participants included 200 Black/African American women (age range: 18-25 years) attending a Historically Black College/University. Each participant completed an Qualtrics online survey including assessment of DSM-5 CUD criteria, and validated measures of sleep quality (Pittsburgh Sleep Quality Index [PSQI]) and perceived stress (Perceived Stress Scale [PSS]).

Results: 11.5% of the sample met criteria for CUD. There were no significant differences between the CUD and non-CUD groups in perceived stress, however, all participants endorsed moderate stress levels (M=19.51, SD=5.33). Additionally, all participant's PSQI scores met criteria for impaired sleep (score >5). [MOU1] [TAD2] T-test analyses indicate that the CUD subgroup reported poorer sleep quality (M=9.04, SD=3.69 vs M=7.07, SD=3.28), more sleep disturbances (M=1.52, SD=0.59 vs M=1.15, SD=0.74), and longer sleep latency (M=37.70, SD=25.28 vs M=25.92, SD=23.95), than the non-CUD group (all $p<.05$).

Conclusion: Black/African American female college students who met criteria for CUD reported more sleep disturbances, longer sleep latencies, and poorer overall sleep quality. Given the lack of difference in perceived stress, these results suggest that the use of cannabis as a coping aid may exacerbate poor sleep. Previous research indicates that Black women are not only more likely to report poor sleep, but that they also report exploring non-traditional strategies to address their sleep problems. These findings suggest a need to examine these non-traditional coping strategies for possible paradoxical and deleterious effects.

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0623

NEURAL DYNAMICS DURING SLEEP IN PARKINSON'S DISEASE PATIENTS

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Introduction: Parkinson's Disease (PD) is a neurodegenerative disease marked by tremor, body tone changes, and cognitive decline with deficits in motor task learning. Characteristic neural patterns during non-Rapid Eye Movement (NREM) sleep have been correlated with learning procedural motor memory tasks. We seek to understand how the neural dynamics of NREM sleep (e.g., sleep spindles and slow waves) interact with motor learning ability in a neurodegenerative disease process. This information might be used to identify electrical biomarkers that could be therapeutically targeted.
Methods: PD subjects and healthy age-matched controls were identified by physician interview, flyering, and medical chart review. Eligibility requirements for subjects precluded severe cognitive decline and untreated sleep disorders. Baseline sleep characteristics were ascertained via survey data collected prior to and on the day of the sleep study. Subjects were fitted with EEG electrodes prior to an all night polysomnogram. Subjects were also fitted with EMG and EOG electrodes for sleep scoring purposes. Motor tasks were performed prior to and following overnight sleep.
Results: Surveys indicated worse sleep quality among PD subjects compared to age-matched controls prior to their sleep session. Sleep macro-architecture of PD subjects showed a smaller percentage of sleep time in N2/N3 stages, and at the spectral level, there were indications of reduced power for slow waves and spindling. Furthermore, we observed aberrant patterns of coupling between slow waves and spindling in PD subjects.
Conclusion: Our study has implications for sleep as a component of motor skill learning and as a marker for a neurodegenerative movement disorder. NREM sleep rhythms such as sleep spindles and slow waves, and their relationships to one another, are thought to be important in motor learning and memory. Aberrations in these rhythms and their coupling may inform potential therapies to enhance motor learning and mitigate the progression of PD.
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0624

SAMELISANT (SUVN-G3031), BASELINE CHARACTERISTICS FROM A PHASE-2 STUDY EVALUATING EFFICACY AND SAFETY IN PATIENTS WITH NARCOLEPSY

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Introduction: Histamine H3 receptor (H3R) antagonists/inverse agonists increase histaminergic neurotransmission and offer a therapeutic option for the treatment of narcolepsy. Samelisant (SUVN-G3031) is a potent H3R inverse agonist and exhibits very high selectivity over other targets. In orexin knockout mice, samelisant produced wake-promoting and anticataplectic effects suggesting its potential therapeutic utility in the treatment of excessive daytime sleepiness and cataplexy associated with narcolepsy. It showed dose-dependent H3R occupancy at efficacy doses. Safety and tolerability studies in animals and healthy human volunteers suggested a favorable risk/benefit profile for samelisant.Samelisant is being evaluated in a Phase-2, multicenter, double-blind, placebo controlled, parallel-group study in patients with narcolepsy with or without cataplexy (ClinicalTrials.gov Identifier: NCT04072380).
Methods: Eligibility criteria for the study include subjects diagnosed with narcolepsy as per ICSD-3, aged between 18 to 50 years with an Epworth Sleepiness Scale (ESS) score of ≥12 and mean maintenance of Wakefulness Test (MWT) time of <12 min. A total of 171 subjects will be randomized into 3 treatment arms (placebo, samelisant 2 mg and samelisant 4 mg) in a fixed 1:1:1. Further, the randomization will be stratified according to the type of narcolepsy (Type-1 or Type-2). Each subject will receive either placebo or study drug once daily for 2 weeks. The primary efficacy endpoint is change in MWT score from baseline to week 2. Secondary endpoints are change in ESS and Clinical Global Impressions of Severity (CGI-S) from baseline to week 2. Safety will be monitored throughout the study by medical monitor and by an independent data safety monitoring committee. Baseline clinical and demographic data for the currently enrolled study is summarized descriptively. Since the study is blinded, a breakdown of baseline characteristics by treatment group will not be available until after completion.
Results: At the data cutoff date of Nov30, 2021, a total of 108 subjects were randomized in the study. The median age of subjects was 30 years (range: 18-50 years) with mean BMI of 26.4 (range: 18.3- 43.1 kg/m2). Overall, 58% subjects were of narcolepsy type-1, 69% were female and 74% were Caucasian. Mean (SD) baseline values of MWT and ESS were 6.20 (4.53) and 17.17 (2.93), respectively.
Conclusion: Baseline characteristics are consistent with the general narcolepsy population. The study is currently enrolling subjects with narcolepsy and the data readout is expected in Q3 2022.
Support (If Any): None

0625

CHARACTERIZATION OF OBSTRUCTIVE SLEEP APNEA IN ACTIVE-DUTY US MILITARY PERSONNEL RECEIVING INTERDISCIPLINARY CARE AT THE NATIONAL INTREPID CENTER OF EXCELLENCE

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Introduction: Among active-duty service members (ADSMs), obstructive sleep apnea (OSA) is associated with decreased quality of life and military readiness/retention. Limited evidence suggests mild traumatic brain injury (mTBI) patients have increased OSA incidence, but little is known about the underlying physiology. This study aims to characterize OSA in treatment-seeking ADSMs with a history of remote mTBI and/or persistent neurobehavioral symptoms to improve detection and early intervention.
Methods: This is a retrospective analysis of data collected from ADSMs attending the National Intrepid Center of Excellence

Intensive Outpatient Program for persistent symptoms associated with mTBI. Sleep assessment included overnight polysomnography and self-report assessments of sleep quality, somatic and mood symptoms. OSA severity was determined by apnea-hypopnea index (negative: <5, mild: 5-15, moderate/severe: ≥15). Group differences were assessed using analysis of covariance and pairwise least squares regression, controlling for age and body mass index, and corrected for multiple comparisons.

Results: Analyses included 574 ADSMs, mostly male (99%), with a mean age of 39.7. The majority (n=288; 50.2%) were OSA negative (OSA-neg); a third had mild OSA (m-OSA) (n=216; 38%); and a tenth were diagnosed with moderate/severe OSA (mod/s-OSA) (n=70; 12%). Mod/s-OSA patients had increased arousal index ($p<0.01$), hypoxia time ($p<0.001$), reduced total sleep time ($p<0.01$) and sleep efficiency ($p<0.001$) compared to m-OSA and OSA-neg patients. M-OSA patients had an increased arousal index compared to OSA-neg patients ($p<0.01$). Patient groups did not significantly differ on subjective measures of sleep (i.e., quality, sleepiness), post-concussive, or behavioral health symptoms (anxiety, depression, post-traumatic stress symptoms, alcohol misuse).

Conclusion: In our sample of treatment-seeking ADSMs, nearly half presented with OSA according to cut-scores derived for AHI, greater than that expected in the general population. As reported in civilian populations, mod/s-OSA patients demonstrated worse objective sleep measures compared to m-OSA and OSA-neg patients, yet in our sample their self-reported symptom severity did not differ. These findings suggest a low threshold for OSA screening is needed in the symptomatic mTBI population and that multiple factors other than OSA likely contribute to perceived sleep disturbances and neurobehavioral symptoms.

Support (If Any): None.

0626

NOCTURNAL PULSE EVENT FREQUENCY IN MULTIPLE SYSTEM ATROPHY: AN EXPLORATORY PILOT STUDY

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Introduction: Risk of sudden death in multiple system atrophy (SuD-MSA) is greatest during sleep. Mechanisms underlying SuD-MSA may involve impaired brainstem arousal and cardiovascular responses to hypercapnia in MSA patients. We hypothesized that nocturnal arousal-related tachycardia events are reduced in MSA patients. We analyzed whether nocturnal pulse event frequency was altered in patients with MSA compared to patients with sleep disordered breathing without MSA utilizing portable overnight oximetry.

Methods: We retrospectively analyzed 46 probable MSA and 46 age-sex matched patients with sleep disordered breathing (SDB) without MSA, excluding patients receiving cardioactive medications. Nocturnal oxyhemoglobin desaturation indices (ODI) and pulse event indices (PEI) were automatically recorded for all patients using portable overnight oximetry. We calculated a PEI/ODI ratio to determine the relationship between probable breathing-related arousals and pulse rate change. Cardiovagal function was assessed by heart rate to deep breathing and Valsalva ratio in patients with MSA and Composite Autonomic Severity Score was assigned. Group comparisons were made with non-parametric tests. Multivariable regression explored relationships between oximetry variables and clinical characteristics.

Results: Average age at overnight oximetry was 62.9 ± 7.7 years. Total respiratory events between MSA patients compared with OSA controls were similar (95.0 ± 118.6 vs 73.5± 54.2, $p=0.61$). Total pulse events were lower in MSA than OSA controls without MSA (25.5±44.2 vs 111.6±120.2, $p<0.001$), as were pulse events per hour (3.1 ± 5.3 vs. 12.8 ± 10.8, $p<0.001$). The ratio of PEI/ODI was lower in MSA than OSA patients without MSA ($p<0.001$). Twelve (26%) MSA patients had zero pulse rate events, while all OSA patients without MSA had at least 1 pulse rate event ($p<0.001$). The number of pulse events was not associated with severity of cardiovagal dysfunction on daytime autonomic function testing.

Conclusion: Patients with MSA have fewer pulse rate events when compared with SDB patients without MSA, despite similar overall respiratory event frequency. The number of pulse events was not explained by severity of daytime autonomic dysfunction in those with MSA. Whether nocturnal pulse event response to sleep disordered breathing is a marker of disease severity or plays a role in SuD-MSA deserves further study.

Support (If Any):

0627

THE EFFECTS OF INSOMNIA THERAPY ON DEPRESSION, ANXIETY, AND DAILY FUNCTIONING IN INDIVIDUALS WITH INSOMNIA AND MILD COGNITIVE IMPAIRMENT

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Introduction: Insomnia is common in older adults with and without mild cognitive impairment (MCI), and is associated with worse neuropsychiatric symptoms (NPS) and impaired daily functioning. Evidence suggests treating insomnia may resolve some of these difficulties in cognitively normal adults. However, little is known about the effects of improving sleep on these domains in older adults with MCI.

Methods: We examined whether MCI status moderates the improvements of a behavioral intervention for insomnia on NPS and daily functioning. 125 adults (mean age=69.18, 34.4% male) with insomnia (38 with MCI as determined by a Montreal Cognitive Assessment; MoCA score < 26) completed the Insomnia Severity Index (ISI), Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), and five domains (activity, vigilance, intimacy, productivity, and social) of the Functional Outcomes of Sleep Questionnaire (FOSQ) before (BL) and after (ETX) completing either the behavioral, cognitive, or combined components of Cognitive Behavioral Therapy for Insomnia (CBT-I). Linear mixed effects models were used to determine the effect of MCI status, time, and an MCI-by-time interaction on NPS and daily functioning while covarying for sex.

Results: Treatment improved BDI ($p<0.001$), BAI ($p<0.001$), ISI ($p<0.001$), productivity ($p<0.008$), activity ($p<0.001$), social functioning ($p=0.014$), and FOSQ total score ($p=0.015$) regardless of MCI status at ETX compared to BL. Treatment did not significantly improve vigilance ($p=0.154$) or intimacy ($p=0.439$). There was a significant MCI-by-time interaction for the FOSQ social domain ($p=0.041$) with MCI participants showing greater improvements in social functioning compared to non-MCI participants. There were no other significant MCI-by-time interactions.

Conclusion: These findings suggest insomnia therapy can similarly improve aspects of sleep-related daily functioning, insomnia severity, and NPS regardless of MCI. However, insomnia therapy may be more beneficial in improving social functioning for individuals with MCI.

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0628

EPILEPSY CONTROL AND NIGHT SLEEP DURATION AND AFTERNOON SIESTA

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Introduction: The relationship between sleep and epilepsy has long been recognized but understanding the association between seizure control and sleep duration is not well explored. The study aims to describe the sleep habits in people with epilepsy (PwE) and explore the association between sleep habits, particularly afternoon napping and level of seizure control and anti-epileptic drugs (AEDs).
Methods: this is a cross-sectional study of adult epilepsy patients attending neurology clinic. Sleep parameters are measured using actigraphy for one week and home sleep apnea testing to rule out obstructive sleep apnea (OSA).
Results: total of 250 PwE were screened and 129 patients (male & female) completed the study with mean age of 29.75 ± 9.18 years and mean body mass index (BMI) of 27.12 kg/m2. There was significant association between night sleep duration and time of wake up and number of AEDs (adjusted R2=0.026, P=0.03 & P=0.04 respectively). There is also significant association between number of seizures per night and afternoon napping (adjusted R2=0.043, P=0.05). Other sleep parameters did not reveal any significant association with level of epilepsy control neither with number of AEDs (P>0.05).
Conclusion: The study described that PwE with uncontrolled epilepsy on multiple AEDs are practicing sleep habits that involved longer afternoon napping and shorter sleep duration.
Support (If Any): Sultan Qaboos University

0629

METABOLIC SYNDROME IN NARCOLEPTIC CHILDREN

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Introduction: Narcolepsy is a disabling neurological disorder characterized primarily by excessive daytime sleepiness (EDS), cataplexy, hypnagogic hallucinations, sleep paralysis, rapid eye movement (REM) behavior disorder (RBD) and disturbed nocturnal sleep. Over 50% of children with narcolepsy are obese. Metabolic syndrome (MetS), a constellation of disturbances associated with obesity, is increasingly seen in narcolepsy. A higher prevalence of MetS was revealed both in adults and children with narcolepsy. The objective of the present study was to compare clinical and sleep characteristics in children with narcolepsy with different components of MetS to clarify the mechanisms in MetS in these children.
Methods: This retrospective study included 58 children with narcolepsy. Data on blood pressure, High density lipoprotein (HDL) cholesterol, triglyceride, glucose, insulin and anthropometry (height and weight) were collected. MetS was defined when ≥3 of the following criteria were met: (1) Body mass index (BMI) ≥IOTF-30, (2) Blood pressure ≥90th percentile, (3) HDL-C ≤0.4 g/L, (4) Triglycerides ≥1.3 g/L, (5) homeostasis model assessment of insulin resistance (HOMA-IR) ≥75th percentile. Then, clinical and sleep characteristics were compared in groups with different MetS components.
Results: A total of 17 % of children with narcolepsy had MetS including 79% with high HOMA, 26% with high BMI, 24% with low HDL cholesterol and 12% with high triglycerides, but no patient with high blood pressure. 58% of the patients without obesity had at least 1, 2 or ≥3 MetS risk factors (78%, 15% and 6%, respectively). 55% of them were overweight. In children with narcolepsy with at least two MetS risk factors, there was a higher proportion of night eating, a lower percentage of N3 sleep, a higher arousal index, a shorter mean sleep latency and more sleep onset REM periods (SOREMPs) compared to patients with fewer MetS risk factors.
Conclusion: Altered sleep architecture and eating behavior are closely associated with risk factors of MetS in children with narcolepsy, even without obesity. We recommend to evaluate MetS risk in all children with narcolepsy to prevent complications such as type 2 diabetes and cardiovascular outcomes.
Support (If Any):

0630

A 4-WEEK SLEEP INTERVENTION THAT ADVANCES AND STABILIZES SLEEP TIMING LEADS TO MEANINGFUL IMPROVEMENTS IN PAIN AND PHYSICAL FUNCTION IN PEOPLE WITH FIBROMYALGIA

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Introduction: Fibromyalgia is characterized by chronic widespread pain, mood and sleep disturbance, and affects over 20 million Americans. Pharmacological treatments (antidepressants, antiepileptics, opioids) often have small treatment effects and adverse side-effects. Exercise therapy requires significant patient motivation, and psychotherapy requires specialized personnel. Here we report on a randomized clinical trial in which we tested a 4-week sleep-wake scheduling intervention with either a dim or bright daily 1 hour morning light treatment.
Methods: Fifty-four adults (52 females, 18-78 years) meeting ACR 2011 diagnostic criteria for fibromyalgia completed a 5-week protocol. In the first week each participant slept at home, ad lib, on their usual sleep schedule. Thereafter, they followed a fixed sleep schedule and a daily 1-hour morning light treatment (randomized to dim or bright light). The sleep schedule advanced each participant's individual sleep-wake timing by no more than 1 hour, and focused on stabilizing sleep timing. Participants were monitored with wrist actigraphy throughout the study. Outcomes were assessed at baseline, 2 weeks and 4 weeks after the intervention.
Results: The 4-week intervention resulted in an average 36-minute advance in participants' sleep timing in both groups (ps<0.001). Night-to-night variability in sleep timing also significantly decreased in both groups (ps<0.01). Pain and physical function improved equally in both groups (Fibromyalgia Impact Questionnaire-Revised, PROMIS Pain intensity, PROMIS

Physical Function, ps<0.01). Across both groups, a greater shift in morningness (Owl-Lark score) was associated with a greater reduction in depressive symptoms (PHQ-9; r=-0.45, p<0.001). No significant side effects were reported in either group. Treatment expectations were not significantly correlated with symptom improvement (all rs nonsignificant).
Conclusion: Results suggest that 4 weeks of an advanced and stabilized sleep schedule can lead to meaningful improvements in pain and physical function in people with fibromyalgia. The addition of a bright vs. dim morning light treatment did not further increase symptom improvement. A reduction in depressive symptoms during the intervention may have contributed to the improvements in pain and physical function. Sleep-wake scheduling should be further explored as a potentially feasible, acceptable and effective adjunctive non-pharmacological treatment for fibromyalgia.
Support (If Any): Grant awarded from NINR R21 NR016930.

0631

ACTIGRAPHY-BASED AND SELF-REPORTED SLEEP QUALITY AND COGNITIVE FUNCTION IN MIDLIFE

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Introduction: Growing evidence suggests that sleep disturbance might be a risk factor for cognitive impairment in older adults. However, the association between device-based sleep duration, quality and cognitive function in midlife is poorly understood.
Methods: We examined 526 Black and White men and women who completed the sleep examination at baseline from 2003 to 2005 and had cognition evaluated 11 years later from the Coronary Artery Risk Development in Young Adults (CARDIA) study, Sleep duration and quality was assessed objectively using a wrist activity monitor and subjectively by Pittsburgh Sleep Quality Index (PSQI). We evaluated cognitive function using the Digit Symbol Substitution Test (DSST), Stroop test, Rey Auditory Verbal Learning Test (RAVLT), Montreal Cognitive Assessment (MoCA) and Letter Fluency and Category Fluency tests.
Results: This study included 305 (58%) women and 229 (44%) Black people, with a mean age of 40.1±3.6 years at baseline. After adjustment for age, sex, race, education, smoking, body mass index, depression, physical activity, hypertension and diabetes, actigraphy-measured sleep fragmentation index (calculated as the sum of the percentage of time spent moving and the percentage of immobile periods ≤ 1 minute) was significantly associated with all measures of cognition, except for fluency. Every standard deviation increase in sleep fragmentation index was associated with worse executive function [DSST (b=-1.80, 95%CI: -3.20, -0.41) and Stroop (b=-1.23, -0.25, -2.21)], worse verbal learning [RAVLT (b=-0.41, 95%CI: -0.66, -0.82)] and worse global cognition [MOCA (b=-0.41, 95%CI: -0.74, -0.16)]. Poorer sleep maintenance was associated with worse verbal learning (RAVLT) and global cognition (MOCA) of a similar magnitude. We did not find any association between objective sleep duration or subjective sleep quality and cognition.
Conclusion: Poorer actigraphy-measured sleep quality rather than sleep duration was associated with worse executive function, verbal learning and global cognition among middle-aged Black and White men and women. Sleep quality is important for cognitive health in midlife.
Support (If Any):

0632

EARLY SLEEP-DISORDERED BREATHING IN MODERATE-TO-SEVERE TRAUMATIC BRAIN INJURY (TBI) IS LINKED WITH CHRONIC PAIN STATUS AT LONG-TERM FOLLOW-UP: A TBI MODEL SYSTEMS STUDY.

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Introduction: Sleep disorders and chronic pain (pain of >3 months duration) are common after traumatic brain injury (TBI). A recently completed multi-center trial found that two-thirds of adults with moderate-to-severe TBI had sleep apnea diagnosed during polysomnography (PSG) completed during inpatient rehabilitation. Although a bidirectional relationship between sleep and pain exists, attention to sleep apnea as a specific diagnosis and its possible role in chronic pain following TBI has not been explored. We hypothesized that PSG-derived respiratory indices shortly following TBI would be worse among those reporting chronic pain at 1- to 2-year follow-up compared to those without chronic pain.
Methods: Sample (N=66) derived from overlapping cohorts across two separate multicenter studies. Participants with moderate to severe TBI underwent PSG during inpatient rehabilitation and completed a telephone follow-up interview to assess chronic pain status using standardized measures at 1-2 years post-TBI (610-day average). Pairwise comparisons across participants with and without chronic pain were made to determine the magnitude of clinically significant differences on respiratory indices including oxygen desaturation, central and obstructive apneas, and total apnea-hypopnea index (AHI).
Results: Presence of chronic pain at follow-up was associated with elevated central apnea events (2.6) and oxygen desaturation (19.6) relative to those without chronic pain (0.8 and 7.9, respectively). Important differences were also seen between obstructive and total apnea hypopnea index (AHI) using Centers for Medicaid and Medicare Services scoring criteria, with those in the chronic pain cohort being 6.5 and 8.7 points higher than their non-pain counterparts, respectively. Group differences on obstructive and total AHI were considered minor when using the American Academy of Sleep Medicine scoring criteria, although those with current pain experienced categorically worse sleep apnea (total AHI = 19 versus 12.4).
Conclusion: This is the first study to find an association between PSG-derived respiratory indices and long-term chronic pain status following moderate-to-severe TBI. Sleep apnea represents an important modifiable factor following injury that may contribute to long-term pain-related outcomes. Given the prominence of chronic pain several years post injury, future studies should investigate the role of sleep apnea and early intervention among those following moderate-to-severe TBI to determine impact on long-term rehabilitation and pain outcomes.

Support (If Any): PCORI; CER-1511-33005); VA TBI Model Systems Program of Research; GDIT; NIDILRR 90DPTB0008. Clinicaltrial.gov Registration Number: NCT03033901.

0633

THE RELATIONSHIP BETWEEN SLEEP AND PARKINSON'S DISEASE PROGRESSION: A MENDELIAN RANDOMIZATION STUDY

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Introduction: Sleep disturbances and disorders are common in Parkinson's disease and significantly impact quality of life. Often, such sleep disturbances are considered sequelae of neurodegeneration affecting sleep-wake circuitry. However, there is emerging evidence that sleep disturbance may itself play a causal role in neurodegenerative processes via altered clearance of pathological proteins. Whether sleep disturbance affects the pathological progression of Parkinson's disease is unknown. Recently, a several genetic variants have been discovered for sleep-related parameters through genome-wide association studies (GWAS) providing a unique opportunity to examine the evidence for causal relationships through the use of the Mendelian randomization.
Methods: To elucidate the causality between sleep disorders and progression of Parkinson's disease, we performed two sample Mendelian randomization analysis using genetic variants identified from publicly available GWAS data for sleep variables including insomnia, sleep duration, chronotype, napping and daytime sleepiness as exposure variables. Outcome measures were derived from a large collective GWAS of PD progression (N=4093 cases) including the Unified Parkinson's disease rating scale (UPDRS total and UPDRS- III), motor fluctuations, Age of onset of PD (PD-AOO), Mini-mental state examination (MMSE) and Montreal Cognitive Assessment (MOCA). The robustness of results was examined using conventional Mendelian randomization sensitivity analyses.
Results: Genetic liability to increased sleep duration was associated with a lower rate of progression of motor symptoms in PD using UPDRS-III score. Meanwhile insomnia was associated with increased rate of motor progression of PD. Predisposition to daytime sleep was associated with lower rates of progression of cognitive decline in PD measured using MMSE. No robust relationships were determined between markers of progression and chronotype or daytime napping. Statistical measures showed significant pleiotropy for the relationships identified.
Conclusion: Sleep-related variables may have a deterministic role in the clinical progression in Parkinson's disease and may represent a modifiable target for altering the trajectory of neurodegeneration.
Support (If Any):

0634

SYMPTOMS OF INSOMNIA AND DEPRESSION AMONG INDIVIDUALS WITH MULTIPLE SCLEROSIS BEFORE AND DURING THE COVID-19 – RESULTS FROM A PROSPECTIVE LONGITUDINAL STUDY

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Introduction: There is some -- but inconsistent -- evidence that sleep and psychological health have deteriorated in the general population as a result of the COVID-19-pandemic and its related social restrictions. In the present study, we investigated whether and to what extent symptoms of insomnia, depression, fatigue, and paresthesia changed from before to during the COVID-19-pandemic among women diagnosed with multiple sclerosis (MS).
Methods: A total of 90 women with MS (mean age; 37.62 (SD = 8.61) years; EDSS score: median: 2.5 (range: 0-6.50)) completed a series of self-rating scales at two time-points: Nine months before the COVID-19-outbreak in May 2019 (baseline) and during the COVID-19-pandemic (study end; 12 months after baseline: May 2020). Self-rating questionnaires covered sociodemographic and disease-related information, symptoms of insomnia, depression, fatigue, and paresthesia.
Results: Symptoms of depression increased over time (medium effect size: Cohen's d = 0.53), while symptoms of insomnia (small effect size: Cohen's d = 0.43), fatigue (trivial effect size: Cohen's d = 0.19), and paresthesia (trivial effect size: Cohen's d = 0.08) did not. The only predictor for insomnia during the COVID-19-pandemic was insomnia before the COVID-19-pandemic ($\beta = 0.36$; $p = 0.001$); the only predictor for depression during the COVID-19-pandemic was insomnia before the COVID-19-pandemic ($\beta = 0.66$; $p = 0.001$).
Conclusion: Overall, among a sample of female individuals with MS the COVID-19-pandemic and its related social restrictions may have had a modest influence on participants' core concerns of insomnia, depression, fatigue, and paresthesia.
Support (If Any):

0635

VALIDATION OF A CLINICAL SCALE FOR DEFINING RBD SEVERITY IN PARTICIPANTS OF THE NORTH AMERICAN PRODROMAL SYNUCLEINOPATHY (NAPS) CONSORTIUM

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Introduction: The objective of this study is to assess the validity of the REM Sleep Behavior Disorder (RBD) symptom severity scale (RBDSSS) and its correlation to the clinical global impression of severity (CGI-S) in a cohort of participants enrolled in the North American Prodromal Synucleinopathy (NAPS) study. RBD is a prodromal marker of α-synucleinopathies with no standardized tool for assessing severity in clinical or research practice. Development of a reliable scale is essential to understand risk of phenoconversion and to monitor response to treatments, particularly in future neuroprotective clinical trials.

Methods: Participants and their bedpartners enrolled in the NAPS cohort filled out an 8-item questionnaire, developed by the International RBD Study Group, assessing frequency and severity of dreams, vocalizations, movements, and injuries associated with RBD, with higher scores indicating more severe symptoms. The CGI-S is a 7-point scale ranging from normal (1) to most severely ill (7) and was completed by a clinician based on an independent interview with the participant ± their bedpartners. Data was included when patient (RBDSSS-PT) and bedpartner (RBDSSS-BP) responses were both available. Total scores were derived by multiplying assigned point values for frequency and severity (for each question) and summing them for individual RBDSSS-PT scores (total possible=54) and RBDSSS-BP scores (total possible=38).

Results: This cohort (n=212) included in this analysis was predominantly male (n=175) with a mean ± SE age of 65.16 ± 1.46 years. The median (interquartile range) for RBDSSS-PT, RBDSSS-BP and CGI-S was 11 (4-17), 8 (4-14.3) and 3 (3-4), respectively. Non-parametric Spearman's rank correlation coefficients (rs) for each variable pair are as follows: RBDSSS-PT vs. RBDSSS-BP, rs=0.575; RBDSSS-PT vs. CGI-S, rs=0.641; RBDSSS-BP vs. CGI-S, rs=0.463 (P<0.0001).

Conclusion: A moderate correlation was observed between RBDSSS-PT and RBDSSS-BP suggesting good construct validity for the scale. CGI-S correlated moderately with RBDSSS-PT and weakly with RBDSSS-BP. Future, larger studies are needed to explore this as a possible universal and clinically applicable scale for designation of RBD disease burden and prognostication.

Support (If Any):

0636

OBJECTIVE SLEEP AS A PREDICTOR OF COGNITIVE DECLINE AMONG NON-DEMENTED ELDERLY: PRELIMINARY RESULTS FROM THE CRETAN AGING COHORT.

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Introduction: Sleep disturbances have been linked with cognitive decline and previous cross-sectional have shown that long sleep duration is a marker of disease severity in patients Mild Cognitive Impairment (MCI) and Dementia.Our aim was to examine the longitudinal associations between sleep quantity and quality indices and cognitive progression in non-demented community-dwelling elderly.

Methods: A sub-sample of 62 participants (72.6% females) were recruited from a large population-based cohort in the island of Crete, Greece of 3,140 older adults (>60yrs). Participants were followed-up 8 years later (phase III). All participants underwent neuropsychiatric/neuropsychological evaluation (phases II & III) and a 3-day 24h actigraphy (phase II).Participants were diagnosed as CNI(N=38) and MCI(N=24) during phase II, and CNI (N=22), MCI (N=27) and Dementia (N=13) during phase III. On follow-up, 28 participants progressed to a cognitively declined diagnosis compared to phase II (deteriorated group), while 34 did not (non-deteriorated group). Objective sleep variables at phase II were compared between the deteriotated/non-deteriorated groups using ANCOVA controlling for confounders. Also, differences in neuropsychological testing scores (phase II- phase III) were calculated and associations of differences with sleep variables were examined using partial correlation models controlling for confounders.

Results: The deteriorated group compared to non-deteriorated had significantly longer night total sleep time (TST) (442±72.6min vs. 407±53.6min, p=0.033), 24h-TST (484±8.9min vs. 434±66.4min, p=0.008), night time in bed (TMB) (537±78.7min vs. 497±62.7min, p=0.03), and 24h-TMB (603±85min vs. 539±85min, p=0.005). Episodic memory worsening was moderately correlated with night TST (r=.316), night and 24h-TMB (r=.526, and r= .442 respectively), wake time after sleep onset (r=.351), and average duration of night awakenings (r=.405). Immediate episodic memory recall decline was positively correlated with night TMB (r=.338).

Conclusion: Preliminary results from the Cretan aging cohort indicate that almost half of the participants deteriorated cognitively in 8 years and this decline was predicted by objective sleep duration at baseline. Long sleep at baseline may predict deterioration of clinical cognitive status in non-demented elderly at follow-up. It appears that prolonged objective sleep duration and time in bed are novel and clinically useful prognostic factors of cognitive deterioration in elderly with or without cognitive deficits.

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Mild Cognitive Impairment: the Cretan Aging Cohort (CAC)", Grant Cod: HFR1-FM17-4397

0637

ASSOCIATIONS BETWEEN ALZHEIMER'S DISEASE PATHOLOGY AND THE PSYCHOMOTOR VIGILANCE TASK IN COGNITIVELY UNIMPAIRED ADULTS WITH AND WITHOUT OBSTRUCTIVE SLEEP APNEA

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Introduction: Daytime sleepiness is a risk factor for Alzheimer's disease (AD) pathology and is associated with more severe cardiometabolic sequalae in persons with obstructive sleep apnea (OSA). However, limited studies have examined objective measures of decreased alertness in the context of AD. Here, we examined performance on the psychomotor vigilance task (PVT) in relation to AD pathology as indexed by AD biomarkers in cerebrospinal fluid (CSF), among individuals with and without OSA.

Methods: Sixty-one cognitively unimpaired adults (39 women), mean age 66.1±7.5 years, enrolled in the Wisconsin Alzheimer's Disease Research Center completed a multifaceted sleep assessment. WatchPAT at-home overnight recordings characterized OSA severity, defined by the apnea-hypopnea index (AHI). Actigraphy determined habitual sleep-wake characteristics. 10-minute PVT measured neurobehavioral alertness. CSF biomarkers were measured using the Roche NeuroToolKit assays (Roche Diagnostics International Ltd, Rotkreuz, Switzerland), an exploratory panel of immunoassays for neurodegeneration. Generalized linear models examined associations between AD biomarkers, AHI, and PVT performance. Primary AD biomarkers of interest were phosphorylated-tau (p-tau) and amyloid-beta (Ab) 42/40 ratio, measured in CSF. The primary PVT variable of interest was the mean response time of the 10% slowest responses, which is associated with daytime sleepiness and default mode network activity. Log transformed PVT and AHI+1 were utilized for analysis. Covariates included age, sex, body mass index, total sleep time, sleep efficiency, APOEe4 status, years of education, AD parental history, biomarker-to-sleep assessment time interval, and Ab42/40 (for p-tau).

Results: No significant relationship of AHI or PVT was observed for Ab42/40. In fully adjusted models, a significant AHI*PVT interaction was observed for p-tau (p=0.0003). Specifically, among individuals with OSA (AHI>5/hour; n=24), slower PVT was associated with increased p-tau (b=13.2, p=0.006), an association that was not significant among those without OSA.

Conclusion: PVT performance may be an objective measure of sleepiness relevant to AD pathology, particularly among individuals with OSA. Replication and expansion of these findings in larger and longitudinal datasets are indicated.

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0638

CIRCADIAN RHYTHMS AMONG YOUTH WITH CRANIOPHARYNGIOMA

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Introduction: Craniopharyngioma is an intracranial tumor located in the hypothalamic and pituitary region. Despite high survival rates for youth with craniopharyngioma, quality of life is substantially affected. Morbidity includes high rates of sleep disruption, particularly disorders of hypersomnolence. Circadian rhythms may also be affected due to the proximity of the tumor and subsequent treatment to the hypothalamic-pituitary-adrenal axis, though the role of circadian rhythms has been less studied in this patient population. To evaluate circadian rhythms among youth with craniopharyngioma, dim light melatonin onset (DLMO), an established marker of the circadian system, was estimated.

Methods: Fifty-five patients between the ages of 7 and 20 years participated in this study. Data were collected prior to completion of proton therapy (if indicated). Participants provided hourly saliva samples, in their homes, starting 3 hours prior to habitual bedtime until 1 hour following in dim light conditions (<30 lux). DLMO was calculated based on a threshold of 4 pg/ml. Participants also wore actigraphs to measure sleep patterns. We derived bedtime and waketime from actigraphy and calculated phase angles to bedtime and waketime. DLMO timing and phase angles were compared to published norms for healthy youth ages 9 to 17 years.

Results: DLMO could not be estimated for almost half of the sample (n=25), most often due to a melatonin value above the threshold at the first collection time point. Higher grade of hypothalamic involvement and the presence of diabetes insipidus predicted inability to capture DLMO. Subsample analyses of participants with DLMO (n=30) showed later DLMO timing and shorter phase interval to bedtime than the healthy reference sample.

Conclusion: With standard practice for DLMO estimation, we only obtained estimates for slightly more than half our sample. This may reflect circadian rhythm disturbances or advanced circadian phase. Relative to published norms, those with captured DLMO had later DLMO timing and shorter phase angles to bedtime, indicating sleep at an earlier circadian phase. These findings suggest possible circadian rhythm disruption in pediatric craniopharyngioma. Methodological differences among samples may also contribute to findings. Further examination of circadian rhythm disruption and relations with other sleep disturbances is needed.

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0639

POLYSOMNOGRAPHIC BIOMARKERS OF SLEEP DISRUPTION AND SLEEP DISORDERED BREATHING IN MIGRAINE: A LARGE MATCHED CASE CONTROL CLINICAL REGISTRY-BASED STUDY

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Introduction: Sleep disruption and sleep architectural changes in relation to migraine are not well characterized. Disruption in sleep may serve as a risk for migraine or result from migraine. We leveraged a large clinical cohort to examine the hypothesis that those with migraine have greater degrees of sleep architectural alterations and sleep disordered breathing (SDB).
Methods: This was a polysomnogram-based retrospective case (migraine) control (non-migraine) study of patients aged >18 matched 1:3 on age, sex, race, body mass index (BMI), and year of polysomnogram. Two domains were considered: 1)Sleep architecture (arousal index:AI, (primary predictor), total sleep time (TST), percentage of sleep stage time) and 2)SDB (apnea hypopnea index (AHI:primary predictor), mean oxygen saturation) were considered. Comparisons were performed by two-sample t-test or Wilcoxon rank sum test for continuous variables, and chi-square test or Fisher's exact test for categorical variables.
Results: 4,783 migraine cases (47.5 ±13.3 years, 76.4% Caucasian, body mass index:BMI 33.7 ±8.6kg/m2) were matched to 14,287 controls. In migraine patients vs those without, TST was lower (359.0[307.0, 421.0] minutes vs 363.0[306.0, 432.5] minutes,p=0.01), percentage of N2 was higher (67.8%[59.6, 75.6] vs 67.0%[58.4, 74.8],p<0.001), percentage of REM was lower (16.7% [10.0, 22.0] vs 17.0% [11.1, 22.2],p=0.012), AHI was lower (7.4 [2.6, 17.0] vs 9.5 [3.7, 22.1],p<0.001), AI was lower (19.6 [12.8, 30.9] vs 22.6 [14.7, 34.9],p<0.001), and mean oxygen saturation was higher (93.7%±2.4 vs 93.3±2.6,p<0.001).
Conclusion: In this largest study of its kind, we identify novel associations of migraine in relation to curtailed sleep and sleep architectural alterations, i.e. increase in N2 and reduced REM sleep and lower AI compared to contemporaneously matched controls. Directionality of these relationships requires further elucidation given the cross-sectional nature of this study. Interestingly, we observed lower degree of sleep apnea and hypoxia burden in patients with migraine. As Calcitonin Gene-Related Peptide (CGRP), a neuropeptide increased during and between migraine attacks in migraine patients, and serotonin are implicated in arousals due to apnea-related increases in CO2, there is biologic plausibility for migraines patients to exhibit potential protection from SDB. Further investigation is needed to confirm these findings.
Support (If Any):

0640

NORTH AMERICAN PRODROMAL SYNUCLEINOPATHY CONSORTIUM: BASELINE CHARACTERISTICS IN 251 PATIENTS WITH REM SLEEP BEHAVIOR DISORDER

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Introduction: Introduction: Rapid Eye Movement (REM) Sleep Behavior Disorder (RBD) is characterized by a lack of muscle atonia during REM sleep with dream enactment. RBD is regarded as a prodromal synucleinopathy as a high proportion of patients eventually phenoconvert to Parkinson's Disease and related synucleinopathies, suggesting RBD may be an early non-motor symptom of disease. Accordingly, patients with RBD are ideally situated to test potential therapeutic interventions to prevent phenoconversion to synucleinopathy. However, RBD itself, and associated patient registries, are rare. The North American Prodromal Synucleinopathy Consortium (NAPS) establishes a multisite registry of RBD patients with standardized neurological, neuropsychiatric, and neuropsychological assessments and biomarker collection. The present work reports baseline characteristics of this RBD patient database at its current state.
Methods: Methods: Participants >18 years of age with overnight polysomnogram-confirmed RBD by ICSD-3 criteria who did not meet criteria for the diagnosis of PD, dementia, MSA, or narcolepsy were enrolled from 10 sites across North America (8/2018 to 4/2021). Data collection included family and personal history of RBD and related symptoms, as well as standardized assessments related to cognitive, motor, sensory and autonomic function. Additionally, all subjects have contributed blood, and a subset of subjects have contributed cerebrospinal fluid samples to the National Centralized Repository for Alzheimer's Disease and Related Dementias for future analysis.
Results: Results: A total of n=251 participants were enrolled. Outcomes are reported based on sex (n=202 male, n=49 female). Data were further examined based on participants' history of antidepressant use (n=142 with, n=103 without) and based on participants' extent of synucleinopathy burden (n=70 defined as isolated RBD, n=181 defined as RBD+ [i.e., exhibiting ≥1 abnormality]). Any observed sex differences among the data did not persist after correction for antidepressant use.
Conclusion: Conclusions: This prospective, cross-sectional data on history, demographic, cognitive, motor, sensory, and autonomic function in n=251 participants with RBD highlight the lack of sex differences and the high preponderance of concomitant neurological abnormalities with RBD, and provide a valuable registry for future longitudinal studies and neuroprotective clinical trials.
Support (If Any): NIH NIA R34 AG056639 (YJ, BB)

0641

AUTOMATED DETECTION OF ISOLATED REM SLEEP BEHAVIOR DISORDER (IRBD) DURING SINGLE NIGHT IN-LAB VIDEO-POLYSOMNOGRAPHY (PSG) USING COMPUTER VISION

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Introduction: At least 1% of adults aged 45 and above have isolated REM sleep behavior disorder (iRBD), a prodromal stage of a synucleinopathy, however a majority remains undiagnosed until they develop irreversible neuropathology. The gold-standard diagnostic procedure, the in-lab video-polysomnography (PSG), relies on complex rules for sleep staging and electromyography quantification which potentially lead to incorrect diagnoses. We tested a computer vision classifier for RBD versus other sleep conditions based on automated video analysis of body movements during a single-night in-lab PSG.
Methods: Raw PSG video recordings of 60 iRBD patients (mean 67 years, 78% males) and 100 controls (mean 65, 65% males) were selected from the Stanford Sleep Center database. Our pipeline involved three main steps: movement detection, feature extraction, and RBD recognition. The recordings between lights off and lights on were 7 to X hours in duration with some interspersed short movements. For every recording, short video segments that contain movements were first extracted using background subtraction. Additional features, such as sleep-onset time and wake-up time, were used to filter out noisy segments that did not involve patients being asleep. Next, I3D, a state-of-the-art method for action recognition, was used to derive a feature vector of 2048 features from every extracted segment. RBD diagnosis could be considered as an action recognition task in which 'RBD' was the action category to be classified. For every recording, the feature vectors for every segments were averaged, resulting in one feature vector per subject. With 160 PSG video recordings, this resulted in a dataset of 160 feature vectors that were used to train a multi-layer perceptron (MLP) for RBD recognition.
Results: Leave-one-out cross-validation (LOOC) procedure was used for evaluation achieving 91.9% accuracy, with a 78.3% sensitivity and 100% precision.
Conclusion: We tested the feasibility and performance of a new diagnostic paradigm for RBD solely based on single-night video analysis of PSG. Our results suggest that a machine learning model can detect and distinguish the characteristics of movements related to RBD versus other sleep disorders and normal sleep. Larger studies in heterogeneous datasets are needed to validate these findings.
Support (If Any): Google

0642

CHARACTERIZING ACTIGRAPHY-MEASURED SLEEP DISTURBANCE IN VETERANS AND SERVICE MEMBERS WITH POST-TRAUMATIC HEADACHE FOLLOWING MILD TRAUMATIC BRAIN INJURY

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Introduction: Post-traumatic headache (PTH) frequently occur following traumatic brain injury (TBI) is particularly prevalent in Veterans with deployment-related TBI. PTH is associated with a range of physical and mental health symptoms, including post-traumatic stress disorder (PTSD), depression, anxiety, post-concussive symptoms, and subjective sleep complaints. Subjective sleep disturbance is associated with greater pain severity, and headaches (HA) are associated with poorer sleep. Poor sleep may be a mechanism by which PTH exerts both direct and indirect effects on health outcomes Despite the high prevalence of sleep problems in individuals with PTH, we know little about sleep disturbance in Veterans and military personnel with PTH. This study sought to characterize the relationship between objective sleep disturbance and HA in Veterans and military personnel with chronic PTH following mild TBI.
Methods: Veterans and active-duty service members (N=39, Mage= 49.4, 89.7% male) were included from a larger study evaluating prazosin as prophylactic treatment for persistent PTH. Participants completed baseline measures of PTSD symptoms, insomnia, sleep quality, HA frequency and impairment, as well as 7-day actigraphy, sleep diary, and HA logs. Actigraphy-derived sleep parameters include sleep onset latency (SOL), total sleep time (TST), sleep efficiency (SE), and wake after sleep onset (WASO). Daily HA logs were used to assess HA severity and duration. Analyses were conducted in SPSS 26.0 using multilevel modeling, controlling for the effects of time.
Results: Preliminary results suggest number of HA days at baseline was significantly associated with self-reported sleep quality (r=-.398, p= .016), but not with subjective SOL, TST, or WASO. Number of HA days was significantly correlated with actigraphy-measured WASO (r=.178, p=.003). Actigraphy-measured SOL, SE, WASO, and TST were not significantly associated with same-day HA severity and duration.
Conclusion: This preliminary data suggest examination of sleep fragmentation may be important in enhancing our understanding of PTH and related impairment. Findings support the importance of using both subjective and objective measures in the assessment of sleep in Veterans and service members with PTH.
Support (If Any): This project was supported by a VA Career Development Award 5IK2RX001136 from the United States Department of Veterans Affairs Rehabilitation Research and Development Service. The contents of this work do not represent the views of the Department of Veterans Affairs or the United States government.

0643

SLEEP QUANTITY, QUALITY AND SLEEP APNEA RISK FOR INPATIENTS ON A NEUROLOGY UNIT

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Introduction: Sleep disorders frequently complicate neurological disorders such as stroke and epilepsy. Despite these known relationships, sleep disorders screening is insufficient in the inpatient neurology setting. We aimed to assess patient sleep quantity and obstructive sleep apnea (OSA) risk on an inpatient neurology unit.
Methods: From April 2021 to November 2021, patients completed the Epworth Sleepiness Scale, Berlin Questionnaire, and Karolinska Sleep log to assess sleep quality and duration from the previous night. Surveys were administered three times a week to patients oriented, available to participate, and slept on the unit for at least one whole night. T-tests and chi-squared were utilized for analysis of statistical significance.
Results: Of the preliminary sample (n=117), 45% were male with mean age of 53 and mean BMI of 30.3. The top primary diagnoses were seizures (35.0%) and acute strokes (27.4%). Seventeen patients had known OSA, and 30% had an Epworth Sleepiness Scale score greater than 10 prior to admission, indicating daytime sleepiness. 37% screened high-risk for OSA without a known diagnosis - 46.9% of these patients presented with an acute stroke, and 32% with seizures. The mean (SD) total sleep time across 129 completed surveys was 7.02 hours (2.43), with an average sleep efficiency of 83.0% (18%), wake after sleep onset of 52.6 minutes (63.12), and 2.69 (2.66) awakenings a night. Patients with known sleep apnea had significantly increased sleep latency (43 minutes vs. 26 minutes, p=0.04) and increased awakenings (2.8 vs. 1.6, p=0.039). There was no statistical significance in sleep logs between high and low-risk Berlin patients, although there was a trend towards increased sleep latency in high-risk patients (32 minutes vs. 23 minutes, p=0.08).Between high and low-risk patients, there was no statistically significant difference in sleep aid ordering (p=0.48). Sleep aids were more likely to be ordered for patients in shared rooms than private (75% vs. 25%, p= 0.0025).
Conclusion: This study demonstrated that underlying sleep apnea significantly affected sleep latency and awakenings; preliminary data shows that Berlin risk may affect sleep latency. We will continue to review these trends as data collection continues. Future studies should compare objective data with patient-reported sleep logs.
Support (If Any):

0644

LONGITUDINAL SLEEP INSTABILITY CONTRIBUTES TO COGNITIVE DECLINE AND ALZHEIMER'S PATHOLOGY: FINDINGS FROM THE SEATTLE LONGITUDINAL STUDY

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Introduction: Although emerging data suggest a link between sleep duration, aging, and dementia diagnosis, the impact of longitudinal patterns of sleep behavior on Alzheimer's disease-associated pathology and cognitive decline remains unclear.
Methods: Utilizing longitudinal data on self-reported sleep duration collected within the Seattle Longitudinal Study (n=535 subjects, age 75.18 +/- 11.6 years), we first used a Cox proportional hazard (CPH) regression model to evaluate the overall effect of mean sleep duration, longitudinal changes in sleep duration, and variability in sleep duration on the development of cognitive decline, including APOE4 genotype, sex, years of education, and depression as covariates within the model. In a secondary study, within the subset of subjects for whom postmortem histopathological assessment has been conducted (n=105 subjects, age 86.6 +/- 8.0 years), we used supervised machine learning to predict Alzheimer's pathology, measured by CERAD neuritic plaque score and Braak stage.
Results: Multivariable CPH regression analysis demonstrated that there was a significant association between cognitive decline risk and APOE status (hazard ratio 2.28, 95% CI 1.41-3.69, p<0.005), depression (hazard ratio 1.09, 95% CI 1.04-1.14, p<0.005), sleep stability (hazard ratio 2.78, 95% CI 1.43-5.43, p<0.005), and sleep restlessness (hazard ratio 0.70, 95% CI 0.51-0.97, p<0.03). Notably, sleep variability across time and not median sleep duration was significantly associated with cognitive impairment. Adding these sleep parameters to the model improved model performance (base model concordance = 0.66, model including sleep = 0.72). Sleep parameters also improved performance on models predicting Alzheimer's disease-associated pathology.
Conclusion: While these findings support a mixed effect of sleep duration on cognitive decline and the development of Alzheimer's-associated neuropathology, they further suggest that variability in longitudinal sleep duration may exert a previously unappreciated influence on these pathological processes. Future studies should seek to replicate these findings in an independent cohort and to assess whether sleep variability of different time scales (weeks, years, decades) exerts similar effects on these outcomes.
Support (If Any):

0645

ASSOCIATIONS OF OBJECTIVE SLEEP PARAMETERS AND GRAY MATTER MICROSTRUCTURE IN COMMUNITY DWELLING COGNITIVE NORMAL OLDER ADULTS

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Introduction: Disturbed sleep measures differentially alter white-matter microstructure. We examined whether obstructive sleep apnea (OSA)-severity, sleep fragmentation and duration measures were associated with gray-matter diffusion tensor-imaging metrics (DTI) (i.e., fractional anisotropy [FA], mean diffusivities [MD] and kurtoses [MK]) in community-dwelling cognitive-normal older-adults.
Methods: Gray-matter DTI metrics from MRI including mean FA, MD and MK measures of the hippocampus, thalamus, medial prefrontal-cortex (mPC) and Alzheimer's Disease (AD) vulnerable regions (temporal [inferior, middle, and superior], parietal [inferior and superior], entorhinal cortex, and precuneus) were determined from 85 subjects. OSA-severity measures included AHI3a and AHI4%. Other sleep measures included sleep efficiency (SE), non-rapid eye

movement (NREM) slow wave sleep (SWS) duration, percent time spent in SWS (%SWS), slow wave activity (SWA), total sleep time (TST), and wake after sleep onset (WASO). To analyze the data, first, we utilized factor analysis using varimax rotation to account for the DTI metrics as multivariate outcomes. Using factor loadings, we anticipated a two or three-factor model was sufficient to explain the variance of the DTI metrics. Second, we investigated predictive associations between the sleep parameters and the loaded DTI factors, and explored age, sex, BMI, education and APOE4 as covariates underlying any differences.

Results: Of the 85 participants, 60 (70.6%) were women, 67 (78.8%) were non-Hispanic Whites. Mean (SD) age, BMI and education was 66.7 (5.3) years, 27.9 (6.1) kg/m2 and 16.8 (2.4) years respectively. We selected the two primary loadings' factor model based on AIC criteria. FA metrics of the investigated brain regions except thalamus, loaded on one factor, conceptualized as manifest indicators for FA. MD and MK metrics of all the investigated brain regions loaded on the second factor, conceptualized as manifest indicators for MD/MK. SWS, %SWS, TST were predictors of FA ($P \leq 0.01$ for all). AHI3a, AHI4%, and SWA were predictors of MD/MK ($P \leq 0.05$ for all). Additionally, sex, age, APOE4 and education were predictors of FA ($P \leq 0.01$ for all).

Conclusion: In this limited sample of cognitively-normal older-adults, sleep duration measures predicted gray-matter FA, OSA-severity measures predicted gray matter MD and MK. Demographic, genetic and SES factors explained the differences in these relationships.

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0646

SLEEP DISORDERS AND SLEEP MEDICATION USE IN YOUTH WITH PERSISTENT TIC DISORDERS

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Introduction: Sleep disturbance is present in 80% of youth with persistent tic disorders (PTD). However, studies examining rates of sleep disorders in youth with PTD are limited, and reports on sleep medication use in this population are lacking. Such knowledge would inform understanding of assessment and treatment needs of youth with PTD. Therefore, the present study examined rates of sleep disorders and sleep medication use among youth with PTD, and their associations with tic severity and ADHD symptoms.

Methods: Participants were 52 parents of youth with PTD who responded to an internet survey evaluating sleep-wake patterns. Youth were predominantly male (n = 37, 72.5%); and 88.5% (n = 46) were reported to have Tourette's disorder and 11.5% (n = 6) were reported to have persistent motor tic disorder. Parents provided demographics and medical history, including lifetime sleep disorder diagnosis by a health professional and current prescription or over-the-counter sleep medication use. Parents rated youth tic severity (Parent Tic Questionnaire) and ADHD symptom severity (Swanson, Nolan, and Pelham-IV Parent Rating Scale).

Results: Descriptive statistics and independent samples t-tests were performed. Per parent report, 39.2% (n = 20) of youth with PTD had one or more lifetime sleep disorders. Insomnia (n = 9, 17.3%), nightmares (n = 9, 15.7%), sleep walking (n = 5, 10.0%), bruxism (n = 5, 10.0%), and restless leg syndrome (n = 5, 10.0%) were most commonly endorsed. Fifty percent of parents of youth with PTD endorsed youth sleep medication use. The most commonly endorsed sleep medications were melatonin (n = 23, 44.2%), valerian (n = 6, 11.5%), and diphenhydramine (n = 5, 9.6%). There were no significant group differences in tic severity or ADHD symptom severity.

Conclusion: Findings highlight the presence of disorders of sleep initiation and maintenance, parasomnias, and sleep-related movement disorders in youth with PTD. Results indicate that sleep medication use, particularly melatonin, is common in this population. Future research is needed to test the efficacy of melatonin use for addressing sleep problems in youth with PTDs.

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0647

DSM-V DIAGNOSED POST-TRAUMATIC STRESS DISORDER (PTSD) IS ASSOCIATED WITH REPORTED DREAM ENACTMENT INDEPENDENTLY FROM GENDER, RACE OR EDUCATION IN A PSYCHIATRIC OUTPATIENT POPULATION

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Introduction: PTSD has been associated with PSG-derived measurements of REM without atonia suggestive of RBD (Elliott et al, Sleep 2020 Mar 12;43(3):zsz237). Those findings have been reported in men in their mid-50's. In a relatively younger, diverse, help-seeking, psychiatric outpatient population enriched with PTSD, we examined the impact of demographics (self-reported gender, race, education) on the association between primary diagnosis of PTSD and probable RBD assessed with a validated questionnaire.

Methods: Patients (n = 1,658) were enrolled in a non-VA based treatment program for veterans. Patients underwent detailed diagnostic interviews and psychometrics. About 48% (549 men, 251 women; mean age 40.0 [SD = 9.6] years; 381 non-white) met criteria for PTSD. Typical other diagnoses included Axis I defined major depression and various anxiety disorders (without re-experiencing). Dream enactment was assessed with the previously validated University of Michigan RBD Questionnaire (UMRBDQ), completed either by patient or bedpartner. Mean (SD) and 50th% UMRBDQ scores were 0.52 (SD = 0.26) and 0.50. We defined likelihood of RBD by the 90th% of UMRBDQ score (> .80), based on previously published psychometrics, and used multiple logistic regression to define predictors of high vs low UMRBDQ scores. Predictors were diagnosis, self-reported gender (male), race (non-white [vs white]) and education (at least partial college).

Results: PTSD diagnosis was strongly associated with positive UMRBDQ (31.5% vs 22.0%; OR = 1.77; 95% CI 1.40-2.23). Significant predictors were male gender (OR = 1.93, 95% CI 1.45-2.58) and non-white race (OR = 1.81; 95% CI 1.03-1.65) but not education (OR = 0.86; 95% CI 0.68-1.09). Models of 2-way interactions were all non-significant. Linear models employing UMRBDQ as continuous scores yielded similar results.

Conclusion: These results confirmed that PTSD may be associated with higher likelihood of reported dream enactment and that these results were not dependent on self-reported gender, race or education.

Support (If Any): Wounded Warrior Project

0648

DECREASED SLOW-WAVE SLEEP MAY EXACERBATE ANXIETY IN INDIVIDUALS WITH LOW ANXIETY

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Introduction: Evidence suggests that individuals with generalized anxiety disorder exhibit decreases in slow-wave sleep (SWS). Because SWS has been shown to be modifiable, it is imperative to better understand the relationship between symptoms of anxiety and amount of SWS to inform treatment development. This study aimed to explore the relationship between anxiety and SWS, and to investigate the impact of slow-wave sleep disruption on state anxiety.

Methods: Twenty-seven participants' (mean age 30.9) were recruited as part of an ongoing study examining the relationship between SWS and depression. Participants spent two nights in the laboratory: baseline (BL) and slow-wave disruption (SWD), where SWS was disrupted using auditory stimulation. Anxiety was measured using the State-Trait Anxiety Inventory (STAI). Both trait and state anxiety (BL, SWD) measures were collected. Repeated measures ANOVA was used to determine the impact of SWD on state anxiety.

Results: Participants' trait anxiety scores were significantly correlated with percent N3, such that greater anxiety was associated with less N3 ($r = -0.43$; $p<0.05$). Individuals were then categorized as either high-anxiety (HA) or low-anxiety (LA) by median split (M=46.5). Results of the repeated measures showed a significant main effect of group ($F=43.963$; $p<0.001$), with HA individuals showing greater state anxiety than LA individuals. A significant interaction of group*condition was also found ($F(1,24)=4.703$; $p=0.40$). LA participants showed a significant increase in state anxiety following SWD ($t=-2.539$; $p=0.028$), while HA participants showed no change.

Conclusion: The current findings replicate previous research showing that anxious individuals have a reduced amount of SWS and demonstrate that decreases in SWS may exacerbate anxiety in individuals with low anxiety. Further, this work suggests that individuals with high anxiety may be more resilient to changes in anxiety state than individuals with low anxiety when SWS is reduced.

Support (If Any): Goldschmied: K23MH118580 (NIMH)

0649

OBJECTIVE AND SUBJECTIVE SLEEP PATTERNS IN YOUTH WITH OBSESSIVE-COMPULSIVE DISORDER

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Introduction: Sleep disturbance commonly presents in youth with obsessive-compulsive disorder (OCD). However, studies elucidating the nature of sleep problems in OCD are limited and pose discrepant findings. The present study examines objective and subjective sleep disturbance in youth with OCD relative to healthy controls, and investigates the relationship between sleep disturbance and OCD symptom severity.

Methods: Participants were 61 youth aged 8 to 17 years (M = 12.18, SD = 2.64) with OCD (n = 26), and healthy controls (n = 35). An evaluator assessed psychiatric diagnosis through a diagnostic interview and rated OCD symptom severity (Children's Yale-Brown Obsessive-Compulsive Scale). Objective sleep patterns, including sleep onset latency, wake after sleep onset, duration and number of awakenings, total sleep time, and sleep efficiency were assessed through 7-day sleep monitoring using the wActiSleep-BT actigraph. Youth rated sleep using the Sleep Self-Report (SSR), and parents rated youth sleep using the Children's Sleep Habits Questionnaire (CSHQ).

Results: Independent samples t-tests were performed to compare youth with OCD and healthy controls on sleep measures. Findings revealed no significant differences between youth with OCD and healthy controls on the actigraphy measures (i.e., total sleep time, wake after sleep onset, duration and number of awakenings, and

sleep onset latency, sleep efficiency). Youth with OCD had significantly greater self-reported, $t(24) = 3.29$, $p < 0.01$, and parent-reported sleep disturbance, $t(41) = 2.94$, $p < 0.01$, relative to healthy controls. OCD symptom severity was positively correlated with SSR scores, $r = .53$, $p < 0.01$, and CSHQ scores, $r = .47$, $p = 0.03$. There were no significant correlations between actigraphy measures and OCD symptom severity.
Conclusion: Youth with OCD exhibit sleep disturbance on subjective but not objective sleep measures relative to healthy controls. Findings are discrepant from objective-subjective sleep patterns found in other studies of youth with OCD, but consistent with those found in youth with anxiety disorders. Findings may suggest subjective measures capture forms of sleep disturbance (e.g., bedtime resistance, nighttime anxiety, etc.) not measured by actigraphy.
Support (If Any):

0650

DOES PAIN RELATED DISABILITY MODERATE THE RELATIONSHIP BETWEEN SUBJECTIVE INSOMNIA AND ANXIETY IN COMORBID FIBROMYALGIA AND INSOMNIA?

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University of Missouri [1]

Introduction: Fibromyalgia is a chronic widespread pain condition with up to 90% of patients experiencing comorbid sleep disorders (e.g., insomnia) and up to 64% experiencing comorbid anxiety disorders. Past research has shown: 1) a bidirectional relationship between insomnia and anxiety, 2) associations between pain and insomnia and 3) associations between pain and anxiety. However, research has yet to explore the role of pain, specifically pain related disability, in moderating the association between insomnia and anxiety. The present study evaluated the moderating impact of self-reported pain related disability on the relationship between subjective sleep variables and anxiety scores in adults with fibromyalgia and insomnia (FMI).
Methods: Two-hundred and nineteen adults with FMI (Mage=51.53, SD=1.89, 92.8% female) completed daily sleep diaries over fourteen days, the Pain Disability Index (PDI), and the State-Trait Anxiety Inventory Form Y-1 (STAI-Y1) as part of the baseline for a larger randomized clinical trial (SPIN, NCT#02001077). Moderation analyses included STAI-Y1 as the dependent variable, sleep variables averaged over 14 days (Sleep Onset Latency- SOL, Wake After Sleep Onset-WASO, Total Sleep Time-TST, Sleep Efficiency-%SE) as independent variables, PDI as the moderator, and age and years of education as covariates. For moderation at significance levels of $p<0.05$, significance of simple slopes at high (1 SD above), average, and low (1 SD below) PDI scores were examined.
Results: PDI moderated the relationship between SOL and STAI-Y1 (B=0.0052, SE=0.0019, p=0.01, R2=0.04). At high PDI scores (but not average), higher SOL was associated with higher STAI-Y1 scores (B=0.0748, SE=0.0310, p=0.02). At low PDI scores, higher SOL was associated with lower STAI-Y1 scores (B=-0.0844, SE=0.0453, p=0.06; trend).
Conclusion: Results indicate that at higher levels of perceived pain related disability, greater difficulty falling asleep is associated with increased levels of anxiety in FMI. At lower levels of pain related disability though, difficulty falling asleep and anxiety levels may have an inverse relationship. This points to a possible complex interplay between sleep difficulties, pain related disabilities and anxiety in the FMI population. Future research is warranted to examine potential causal relationships between pain, sleep, and anxiety.
Support (If Any): NIAMS-R01AR055160(PI-McCrae)

0651

DAILY ASSOCIATIONS BETWEEN INSOMNIA AND DEPRESSION: EMOTION REGULATION AS A MEDIATOR

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Introduction: Insomnia has been shown to prospectively predict depression in longitudinal studies. The mechanisms underlying this relationship have not been fully elucidated. Emotion regulation (ER) has been proposed as a potential mediating mechanism; however, empirical tests of it are limited. This study aimed to examine the within-individual relationship between insomnia and depressive symptoms in a 14-day daily study. It was hypothesized that insomnia symptoms on a given night would positively predict depressive symptoms in the subsequent day via ER.
Methods: This study was conducted in 60 adults (65% female, age = 18-65 years) with elevated insomnia symptoms (Insomnia Severity Index ≥10). They were asked to fill out morning and evening diaries and wear an actigraph for 14 days. The morning diary measured their sleep parameters in the previous night with the Consensus Sleep Diary. The evening diary measured emotional reactivity with the International Positive and Negative Affect Schedule, ER strategy use with the Emotion Regulation Questionnaire and Cognitive Emotion Regulation Questionnaire, and depression with the Center for Epidemiologic Studies Depression Scale. Multilevel modeling was used to analyze the within-individual associations, controlling for between-individual factors such as age and gender.
Results: Shorter total sleep time on one night predicted greater next-day depressive symptoms ($\beta = -0.063$, $SE = 0.009$, $p = .028$). Sleep quality was negatively associated with next-day depression at the between-individual level ($\beta = -0.387$, $SE = 0.882$, $p = .003$). Negative reactivity partially mediated the relationships between sleep quality and depression ($\beta = -0.463$, $SE = 0.030$, $p = .008$), total sleep time and depression ($\beta = -0.611$, $SE = 4.938$, $p = .011$), and sleep efficiency and depression ($\beta = -0.702$, $SE = 0.007$, $p = .002$), all at the between-individual level.
Conclusion: The findings suggest that total sleep time is associated with depressive symptoms on a daily level. They also suggest that one of the facets of emotion regulations, namely negative reactivity, plays a mediating role in the insomnia-depression relationship. Nonetheless, we did not find evidence for the mediating role of ER at the within-individual level. Emotional reactivity and ER strategy use may not vary substantially across days.
Support (If Any):

0652

ASSOCIATIONS BETWEEN ANHEDONIA AND MALADAPTIVE BELIEFS ABOUT SLEEP IN MIDDLE AGE AND OLDER ADULTS WITH INSOMNIA DISORDER

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Introduction: Comorbid depression often exacerbates dysfunctional beliefs about sleep in those with insomnia disorder. Anhedonia, a core symptom of depression, may be mechanistic in this association. Previous research suggests that, when appraising potential decisions, individuals with anhedonia regularly

overestimate the probability of negatively valenced outcomes and underestimate the likelihood of positive outcomes. This study explores the relationship between anhedonia and sleep-related cognitions in patients with insomnia disorder.
Methods: Adults 50 years and older (N = 241) who met DSM-5 criteria for insomnia disorder were enrolled in a randomized controlled trial assessing the effectiveness of a stepped care approach to delivering Cognitive Behavioral Therapy for Insomnia. At baseline, participants completed the Dysfunctional Beliefs and Attitudes about Sleep Scale, Pre-Sleep Arousal Scale (cognitive subscale), Beliefs about Medications Questionnaire (Subscales assess the belief that hypnotics are necessary and concern regarding consequences of use), and PROMIS sleep-related impairment short form. A t-test was used to compare participants who did and did not endorse anhedonia on the Geriatric Depression Scale (GDS). We also correlated the Patient Health Questionnaire-4 (PHQ-4) anhedonia item with sleep-related cognition measures.
Results: Participants reporting anhedonia (GDS) endorsed greater dysfunctional beliefs about sleep ($p < .001$, $d = 0.44$) and sleep-related impairment ($p < .01$, $d = 0.39$). Groups did not differ significantly regarding belief in the necessity of sleep medications and concern with hypnotic use, nor in pre-sleep arousal. Higher anhedonia (PHQ-4) was correlated with more severe dysfunctional beliefs about sleep ($r = .20$, $p < .01$), belief in the necessity of hypnotics to manage sleep disturbance ($r = .22$, $p < .001$), and greater pre-sleep arousal ($r = .18$, $p < .01$).
Conclusion: Endorsement of anhedonia was associated with stronger dysfunctional beliefs about sleep in this sample of middle age and older adults with insomnia disorder. Participants reporting anhedonia also reported greater sleep-related impairment. Exploring anhedonia as a transdiagnostic symptom that influences interpretation of sleep-related difficulties may elucidate underlying mechanisms that sustain maladaptive cognitions. Prospective, multi-method studies will be essential to clarify predictive interactions between reward system dysfunction and sleep-related beliefs in those with insomnia disorder.
Support (If Any): 1R01AG057500

0653

POOR SLEEP QUALITY IS ASSOCIATED WITH BURNOUT IN EMERGENCY MEDICINE HEALTHCARE WORKERS

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Introduction: Prolonged exposure to stressful environments is associated with adverse psychological outcomes, including sleep disturbance and burnout. Burnout rates have increased substantially during the unprecedented challenges faced by healthcare workers (HCWs) during the COVID-19 pandemic. Since burnout has been associated with significant health risk and adverse organizational outcomes, it is important to identify factors that inform preventive or therapeutic approaches to mitigate adverse outcomes in HCWs.
Methods: Participants were HCWs (physicians, nurses, advanced practice providers, technicians etc.) from 4 emergency departments in New York City who completed a cross-sectional electronic survey (completed at study enrollment between November 2020-October 2021). The Pittsburgh Sleep Quality Index (PSQI) assessed global sleep quality. The Maslach Burnout Inventory (MBI) assessed 3 burnout dimensions: emotional exhaustion (EE; feelings of being emotionally overextended and exhausted by one's work); Feelings of depersonalization (DP; unfeeling and impersonal response towards patients); and reduced personal accomplishment (PA; feelings of competence and successful achievement in one's work). Descriptive statistics were calculated and separate binary logistic regressions were used to predict poor global sleep quality (PSQI >5) from individual MBI subscales (dimensions of burnout), while controlling for age, race, ethnicity, and gender.
Results: Ninety-one participants, studied to date, were included in the analysis (51% non-Hispanic/Latino White, 63% female, mean age: 40 [SD: 9.6] y). Poor global sleep quality was reported by 68%. High EE (score >9), DP (score >6) and reduced PA (score <9) were reported by 44%, 27%, and 18% of participants, respectively. Poor global sleep quality was significantly associated with presence of elevated EE (OR: 3.04, 95% CI: 1.07-8.63, p=0.037), but not with elevated DP (OR: 1.35, 95% CI: 0.44-4.10, p=0.603) or reduced PA (OR: 3.29, 95% CI: 0.65-16.44, p=0.146).
Conclusion: During the COVID-19 pandemic, poor sleep quality was reported by the majority of participants and associated with increased burnout in HCWs. Poor global sleep appears to have the most influence on the burnout dimension EE, thus suggesting new evidence about associations between sleep and emotional regulation in HCW during the pandemic. Future trials should test whether existing (or novel) interventions can improve sleep and thereby support HCWs in high stress periods.
Support (If Any): R01HL146911

0654

SLEEP, MENTAL HEALTH, AND STRESS IN COLLEGE STUDENTS: IMPACT OF COVID-19

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Introduction: The COVID-19 pandemic has had an unparalleled impact on sleep, mental health, and stress globally. This has been particularly true among college students. While Universities recognize the surge in mental health visits and high stress, few have evaluated sleep, even though poor sleep is a known contributor to poor mental health and stress.
Methods: To address this gap, data from 116 college students were examined for sleep disturbance (Pittsburgh Sleep Quality Index (PSQI)), as well as stress, depression, and anxiety scores from the Depression, Anxiety and Stress Scale (DASS-21). Data were collected between May 2020-October 2021.
Results: Participants included N = 10 (8.7%) males and 106 (91.3%) females, Mage = 23.1 (6.5) years. MPSQI scores = 7.8 (2.0) and 7.0 (3.9), for males and females, respectively. As a comparison, pre-pandemic data from 866 undergraduates from Dietch et al (2016) found a MPSQI = 5.64 (SD = 2.79). Examination of individual components indicate that MTST = 7.06 (1.65) hours, with a range of 1-12. Average bedtime = 10:25PM (44.0 minutes) with a range between 9:00PM-5:00AM, and average waketime = 7:45AM (.09 minutes) with a range between 4:30AM – 2:00PM. SOL was high with 48 (41.0%) indicating an average of 16-30 minutes and 41.8% reporting 31+ minutes. Sixty-seven (57.3%) indicated that they had fairly bad or a very

bad time initiating sleep in the past month, while 54 (46.2%) reported difficulty staying asleep at least 2x/week. Medication use at least 3x/week was noted in 20 (17.1%) of the sample and 50 (42.7%) stated that keeping up their enthusiasm was somewhat or a big problem. MDASS-21 scores indicate that this sample was in the moderate to severe range for Depression =14.9 (11.4), Anxiety = 12.9 (10.0), and Stress = 19.1 (9.8). As a comparison, Kia-Keating et al., (2018) assessed 1400+ undergraduates and reported depression (M = 4.1, SD = 4.3), anxiety (M = 3.9, SD = 3.6), and stress (M = 6.0, SD = 4.1).
Conclusion: Regrettably, undergraduates are experiencing "long-haul' impacts on sleep, mental health, and stress. Recognition of the enduring struggles is critical if we intend to mitigate a major health crisis among college students.
Support (If Any):

0655

THE IMPACT OF SLOW-WAVE SLEEP DISRUPTION ON RESPONSE INHIBITION IN INDIVIDUALS WITH DEPRESSION

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Introduction: Individuals with Major Depressive Disorder (MDD) exhibit reductions in slow-wave sleep (SWS) and impairments in neuroplasticity. For example, decreased executive functioning, including poorer response inhibition compared to healthy controls, has been reported. SWS has been implicated in the homeostatic regulation of neuroplasticity, however it is unclear if the cognitive deficits seen in MDD are directly associated with SWS. In this study, we aimed to examine if disrupting SWS, thereby altering neuroplasticity, could improve response inhibition in patients with MDD.
Methods: Participants in this study (n=29) included 19 individuals with depression and 10 healthy controls. Data were collected after two overnight sleep studies separated by one week. During one of the two nights, participants' slow-wave sleep was disrupted via auditory tones. In the morning following each night, participants completed a neurocognitive task battery including an auditory Go/No-Go task. Accuracy scores were calculated as the percentage of trials on which the participant responded correctly to the "Go" or "No-Go" stimulus. Repeated measures ANOVA and paired t-tests were then performed to examine changes from baseline to SWD, assessing the role of SWD on response inhibition.
Results: Following SWD, depressed participants' performance on the Go/No-Go task was significantly more accurate (t=-2.067, p=.027) than following baseline sleep, while healthy controls showed no significant change between nights (t=-.231, p=.411). The interaction between group (MDD vs. healthy control) and condition (baseline vs. SWD) did not reach statistical significance (p=.175).
Conclusion: In a sample of individuals with depression, accuracy on the Go/No-Go task improved significantly after undergoing SWD compared to following baseline sleep, indicating improved response inhibition. However, healthy controls did not exhibit this same improvement in accuracy. These findings highlight a possible disparity in the role that SWS plays in the regulation of neuroplasticity in those with depression and those without.
Support (If Any): Goldschmied: K23MH118580 (NIMH)

0656

DEMOGRAPHIC AND CLINICAL FEATURES OF NOCTURNAL SUICIDE

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Introduction: The risk for suicide is greatest at night after adjusting for population wakefulness, possibly due to sleep- and circadian-dependent changes in neurophysiology to promote sleep. Those who die by suicide at night, however, may differ by demographic and/or clinical characteristics from those who die by suicide during the day.
Methods: An archival analysis of the National Violent Death Reporting System for 2003-2017 identified 77,784 suicide deaths with time of fatal injury. Cases were divided into daytime (5AM to 10:59PM) or nighttime (11PM to 4:59AM) and characterized by age, sex, race, ethnicity, marital status, military service, education, prior diagnosis of an anxiety disorder, bipolar disorder, depression, history of suicidal ideation, PTSD, and schizophrenia, as well as the presence of an opiate or cannabis, and blood alcohol level (BAL) on autopsy. Bidirectional stepwise regression and robust Poisson models characterized significant predictors of nocturnal suicide using incident risk ratios (IRR).
Results: Nocturnal and daytime suicides differed on all sociodemographic variables. Nocturnal suicides were more prevalent among those with bipolar disorder, PTSD, an elevated BAL, and those who tested positive for cannabis. Stepwise models identified a significant age by BAL interaction. Using adults 35-64 with BAL=0mg/dl as the reference, adults 35-64 with a BAL<80mg/dl had a 46% greater risk of suicide at night, and those with a BAL≥80mg/dl had a 78% greater risk. Individuals 15-34 had a nighttime suicide that was 26% greater with BAL=0mg/dl, 84% greater with BAL<80mg/dl, and 298% greater with BAL≥80mg/dl. Conversely, individuals 65 and older were 27% less likely to die at night with BAL=0mg/dl, while those with a BAL>0mg/dl did not differ from those aged 35-64 with BAL=0mg/dl. The risk of nocturnal suicide was also 17% greater among those with a prior history of suicidal ideation, and 13% less likely among those with documented depression.
Conclusion: Nocturnal suicide is more prevalent among intoxicated younger adults and those with previous suicidal ideation. However, suicide victims with depression were less likely to die at night. Further research is needed to target suicide prevention efforts at appropriately times for those with mood, substance, and alcohol use disorders.
Support (If Any):

0657

EVENING CHRONOTYPE MODERATES THE RELATIONSHIP BETWEEN MATERNAL AND OFFSPRING'S DEPRESSIVE SYMPTOMS IN A CLINICAL POPULATION OF ADOLESCENTS

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Introduction: Although depression has shown a strong familial aggregation tendency, there are some moderators between parental and offspring's depression. Meanwhile, it is known that evening chronotype is a risk factor for depression. Therefore, this study aimed to evaluate the moderating role of chronotype in the relationship between maternal and adolescent depressive symptoms in a clinical sample.
Methods: Seventy-five adolescents who visited a sleep or psychiatric clinic with a major complaint of sleep disturbance or emotional problems agreed to participate, 51 adolescents and at least one biological parent who completed questionnaires were included in the current analysis (17 male adolescents, aged 9-17 yrs). Adolescent's chronotype were measured by the reduced Morningness-Eveningness Questionnaire (rMEQ). Depressive symptoms in adolescents and parents were assessed by the Depression Self-Rating Scale for Children (DSRSC) and the Patient Health Questionnaire (PHQ-9), respectively. General linear models were applied to examine the interaction between parental depression and adolescent's chronotype on adolescent's depression, in which age and gender were entered as covariates.
Results: Mothers of adolescents with clinical depression (DSRSC>15, n=38) also reported more depressive symptoms (PHQ-9: 4.81±4.37 vs. 2.69±2.46, t=-2.14, p=0.039). But father's depressive symptoms were not related with adolescent's depression. In the current clinical sample, the prevalence of evening chronotype in adolescents was up to 45.1% (n=23). Adolescents with either non-evening or evening chronotype reported comparable level of depressive symptoms (DSRSC: 20.37±6.26 vs. 19.00±8.42, t=0.66, p=0.513). There was a significant interaction between maternal depressive symptoms and chronotype on offspring's depressive symptoms (F=4.05, p=0.044). Specifically, maternal depressive symptoms were associated with offspring's depressive symptoms only in adolescents with evening chronotype.
Conclusion: Our study suggested that adolescents with evening chronotype might be at an elevated risk of the transgenerational transmission of depression. Hence, our findings supported the need to consider circadian factors and maternal depression in identifying at-risk adolescents.
Support (If Any): This work was supported by the Shanghai Sailing Program awarded to Dr. Wanqi Sun (Shanghai Science and Technology Committee, 19YF1442200).

0658

SLOW-WAVE SLEEP DISRUPTION DECREASES ABILITY TO RECOGNIZE CERTAIN NEGATIVE EMOTIONS

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Introduction: Research has demonstrated that sleep deprivation may alter emotion recognition. Given that emotion recognition is critical for effective human communication, it is essential to understand how sleep is involved in this process. Slow-wave sleep (SWS) has been suggested to be important for the consolidation and processing of emotional memories and neuroplasticity. This study aimed to examine the impact of experimental disruption of SWS on emotion recognition to further understand the contribution of SWS.
Methods: 31 participants (20 individuals diagnosed with Major Depressive Disorder (MDD), 11 healthy controls (HC)) completed two overnight sleep studies spaced one week apart. One night served as baseline (BL) and on the other night participants underwent slow-wave disruption (SWD), where SWS was disrupted using auditory stimulation. In the morning following each overnight visit, participants completed an emotion recognition task. Accuracy scores were computed as the percentage correct in each of 10 categories of emotions (anger, contempt, disgust, embarrassment, fear, joy, neutral, pride, sadness, and surprise). Repeated measures ANOVA was used to assess the impact of SWD on emotion recognition with group (HC, MDD) as the between subjects factor and condition (BL, SWD) as the within subjects factor.
Results: Results revealed a significant main effect of condition for disgust (F=13.72, p< .001), embarrassment (F=6.23, p=.019), and surprise (F=8.06, p=.008), with follow-up t-tests demonstrating that accuracy for the recognition of disgust and embarrassment decreased following SWD and accuracy for surprise increasing following SWD. No significant interactions were found for group*condition (ps>.105).
Conclusion: These results suggest that while SWD decreases the ability to recognize certain negative emotions, it also increases the ability to recognize surprise, which is in line with previous research examining acute total sleep deprivation. Interestingly, there appears to be no difference in the ability to recognize emotions between individuals with and without depression. Slow-wave sleep deficits, common in disorders such as depression and schizophrenia, may therefore contribute to poor communication abilities through decreased ability to recognize emotions, increasing the risk of interpersonal distress and mental health problems.
Support (If Any): Goldschmied: K23MH118580 (NIMH)

0659
WITHDRAWN

0660
ASSOCIATION BETWEEN SLEEP ARCHITECTURE AND ATTENTION AND MEMORY ABNORMALITIES IN PATIENTS WITH INSOMNIA DISORDER COMORBID WITH MAJOR DEPRESSION

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Introduction: Insomnia and major depressive disorder (MDD) are highly comorbid conditions that show a complex bidirectional relationship. The co-occurrence of chronic insomnia disorder (CID) with MDD has been associated with poorer outcomes. Both CID and MDD are independently associated with attention and memory impairments. However, little is known about the relationship between neuropsychological performance and sleep architecture in CID comorbid with MDD. On the basis of this knowledge, we aimed to assess the relationship between PSG parameters and memory and attention performance in patients with CID comorbid with MDD.
Methods: Patients were recruited from the National Institute of Psychiatry at Mexico City. To be included, subjects were required to be females or males, 18 to 60 year-old, with diagnosis of major depressive disorder (MDD) and Insomnia Disorder (DSM 5), without drug/psychological treatment and without comorbidity with other psychiatric or sleep disorders. After giving their signed informed consent, all participants underwent a structured diagnostic interview to confirm diagnoses, two consecutive nights of polysomnographic recording (PSG) and a battery of neuropsychological tests to evaluate different aspects of attention and memory. In addition, the Pittsburgh Sleep Quality Index, the Insomnia Severity Index and the Quick Inventory of depressive symptomatology were applied to assess the severity of insomnia and depression.Statistical Analysis: Descriptive statistics were used for socio-demographic and clinical characteristics; Pearson´s Coefficient Correlation were used for evaluating associations between PSG variables, performance in neuropsychological tests and disorders severity.
Results: Nine men and 10 women with an age range of 21 to 59 years (M= 37.2 SD = 12.9) were included. We found significant associations between total sleep time (TST) and declarative memory ($r = .510$, $p < .05$); visuospatial memory and REM sleep latency ($r = -582$, $p < .01$); procedural memory and WASO and arousals index ($r = -.561$ and $r = -.530$, $p < .05$); sustained attention and NREM stage N1 ($r = -.490$, $p < .05$); errors of commission were negatively related with sleep efficiency ($r = -486$, $p < .05$), and positive related to WASO ($r = .483$, $p < .05$) and total wake time ($r = .486$, $p < .05$). In contrast, no associations were found between the severity of insomnia and depression severity with any cognitive function.
Conclusion: These preliminary findings suggest that changes in sleep continuity in CID comorbid with MDD architecture are significatively associated with attention and memory impairments. In contrast, severity of insomnia and depression seems to have a negligible role in these neuropsychological deficits

Support (If Any): This study is supported by the National Council of Science and Technology (CONACyT), doctoral studies code 751918, scholarship recipient 697300

0661
LIGHTBOX THERAPY FOR SEASONAL AFFECTIVE DISORDER IN COLLEGE STUDENTS

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Introduction: Seasonal affective disorder (SAD) is a mental health issue that can be defined as depressive mood disturbances that align with a seasonal pattern. Research shows that college students are at a higher risk of having SAD leading to poor academic performance and other severe mental disorders. Light therapy can help alleviate the symptoms of SAD. However, few detailed investigations have been conducted on the impacts of light therapy for SAD symptoms and adherence barrier for the therapy. The purpose of this project was to review a light therapy program for college students. Specifically, we aimed to assess the changes in depressive symptoms before and after using a light box and assessed feedback.
Methods: 207 college students (mean age of 22.5 years (SD=5.3); female (80.7%)) participated in the light therapy program. Participants were given user instructions and asked to utilize the lightbox daily. Participants completed the patient health questionnaire (PHQ-9) at baseline and when they returned the lightbox along with their feedback of this therapy. Students also completed the open-ended questions. We used paired sample t-test to assess changes in the total PHQ-9 score.
Results: Participants spent 45 days, on average, using the device. Results showed that there was a significant decrease in PHQ-9 score from pre- to post-therapy [$M(\text{post-pre}) = -2.78$; $p < .0001$]. Most students said the therapy was effective (96.5%) and helped ease SAD symptoms and improve their mood. Some students planned to purchase a light box after the therapy. The major adherence barriers were finding enough time to use it and excessive brightness issue.
Conclusion: The findings suggest that light therapy has positive outcomes in easing college students' SAD symptoms. Future randomized control trials are needed to assess the effectiveness of the intervention. However, to the time and brightness issues need to be assessed when designing the therapy instructions for college students.
Support (If Any): This work was supported by the Alzheimer's Association Research Grant (AARG-19-618403), University of Iowa Institute for Clinical and Translational Science (NIH/ NCATS, UL1 TR002537), and the University of Iowa Center for Advancing Multimorbidity Science (NIH/ NINR P20 NR018081).

0662
COMPARATIVE EFFICACY OF DIGITAL CBT-I VERSUS STEPPED-CARE CBT-I TO PREVENT DEPRESSION

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Introduction: Insomnia is a robust risk factor for depression. Treating insomnia with digital CBT-I (dCBT-I) has been shown to prevent future episodes of depression; however, remission rate of insomnia following dCBT-I is lower compared to face-to-face CBT-I

(fCBT-I), which may reduce the effect on depression prevention. A stepped-care model can optimize care by starting with a least resource intensive intervention (step 1: dCBT-I) and stepping-up non-remitters to specialized treatment (step 2: face-to-face CBT-I). This study examined the efficacy of a stepped-care approach to prevent depression.

Methods: 341 individuals with DSM-5 insomnia and no depression were randomized into two conditions at step 1: dCBT-I (n=161), or an online sleep education control (n=188). Participants in the dCBT-I condition who did not show remission for insomnia (ISI>9) were further randomized to either face-to-face CBT-I (n=40) or sleep education (n=47). Rates of clinically significant depression was assessed post-step 2.

Results: Insomnia remission rates were higher in the dCBT-I group (46%) compared to the control group (22%); however, 54% remained symptomatic after dCBT-I and were rerandomized to step 2 treatments (fCBT-I or sleep education control). Insomnia remission rates following fCBT-I was 70% compared to 23% in the step 2 control.Rate of depression in those who received step 2 control (following non-remission to dCBT-I in step 1; 15%) was not significantly different from the step 1 control group (20%). In contrast, those who received step 2 fCBT-I reported significantly lower rates of depression (5%, OR=.22, $p < .05$) compared to the step 1 control. Those who remitted to dCBT-I in step 1 also reported comparably low rates of depression (8%, OR=.36, $p < .05$)

Conclusion: Preliminary evidence from this study provide supported that a stepped-care approach may produce greater protection against incident depression than dCBT-I alone.

Support (If Any): R01MH122636

0663

ASSOCIATION OF INSOMNIA PHENOTYPES BASED ON OBJECTIVE SLEEP DURATION WITH SUICIDE ATTEMPTS, IDEATION AND COMPLETION

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Introduction: Sleep disturbances, including insomnia and short sleep duration, are known risk factors for suicidal ideation, attempts, and death. Insomnia is a heterogeneous disorder, with phenotypes of short and normal sleep duration based on objective sleep measures showing differential pathophysiology, natural course, cardiometabolic and neurocognitive morbidity. However, little is known about the association of these insomnia phenotypes with suicidality in adults.

Methods: We analyzed data from the Penn State Adult Cohort (N = 1741, M age = 52.46, SD = 13.43, 57.4% female), a randomly selected population-based sample who underwent a thorough clinical history and in-lab polysomnography (PSG). Suicidality was ascertained by a lifetime history of suicide attempts, suicidal ideation or suicide as cause of death by December 31 2018 (n = 102). Insomnia symptoms were defined as a complaint of moderate-to-severe difficulties initiating or maintaining sleep, early morning awakening and non-restorative sleep, or chronic insomnia (n = 719). Short sleep duration was defined as < 6-h of in-lab PSG-measured sleep (n = 879). Binary logistic regression was used to examine the association between insomnia phenotypes with suicidality, while controlling for sex, age, race/ethnicity, and medical and psychiatric comorbidities. Given the low suicidality prevalence in this sample, 1000 bootstrapped samples were drawn to provide stable estimates.

Results: Compared to normal sleepers who slept > 6-h, subjects with insomnia symptoms who slept < 6-h and those who slept > 6-h were associated with 1.96-fold (95%CI = 1.04-4.00) and 2.46-fold (95%CI = 1.30-5.04) increased odds of suicidality, respectively. After further adjusting for substance use, subjects with insomnia symptoms who slept < 6-h and those who slept > 6-h were associated with 1.72-fold (95%CI = 0.90-3.58) and 2.22-fold (95%CI = 1.15-4.60) increased odds of suicidality, respectively. Normal sleepers who slept < 6-h were not associated with significantly increased odds of suicidality (OR = 1.32; 95%CI = 0.56-2.94).

Conclusion: Adults with insomnia, particularly those with normal sleep duration, were associated with increased suicidality. These data further support that objectively-defined insomnia phenotypes may confer risk for differential adverse health outcomes (e.g., cardiometabolic vs. psychopathologic) via distinct mechanistic pathways.

Support (If Any): American Heart Association (14SDG19830018)

0664

TEMPORAL PATTERNS OF SUICIDAL IDEATION IN THE EMERGENCY DEPARTMENT

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Introduction: Nocturnal wakefulness may be dangerous for vulnerable populations: the incident risk for suicide is highest at night after adjusting for population wakefulness, and nocturnal wakefulness is associated with suicidal ideation. These observations support the hypothesis that sleep- and circadian-dependent changes in mood, reward processing, and executive function increase the risk for disinhibited behavior at night (during periods of nocturnal wakefulness). The present study evaluated this hypothesis by using the timing of emergency department encounters for suicidal ideation.

Methods: An archival analysis of data from two emergency departments (EDs) in Tucson, Arizona from 2018 and 2019 yielded 51,370 encounters for any reason across 29,359 individuals with usable data, and the time of initial contact was extracted for each case. Of these, 571 individuals (1.94%) sought care for 763 (1.49%) instances of suicidal ideation (determined by ICD-10 code R45.861). Encounters were characterized by date/time, age, sex, race/ethnicity, blood alcohol level (if tested), homelessness, and prior diagnosis of a psychotic disorder, bipolar disorder, or depressive disorder. Suicidal ideation encounters were analyzed as raw counts and as a proportion of all encounters by clock hour and time-of-day categories (night: 12AM-5:59AM; morning: 6AM-11:59AM; afternoon:12PM-5:59PM; evening: 6PM-11:59PM) using robust Poisson models.

Results: Although most ED encounters occurred between 6PM and midnight (mean: 9:42PM), the greatest number of suicidal ideation encounters occurred between 12AM and 3AM (mean: 12:18AM). After adjusting for the per-hour proportion of ED visits, the incident risk for a suicidal ideation encounter increased between 8AM and 11AM, peaked at 10AM (IRR: 1.95 [1.10-3.44]) and was lowest at 4PM (IRR: 0.54 [0.32-0.91]). Compared to the evening, the incident risk of suicidal ideation was 64% greater in the morning (IRR: 1.64 [1.31-2.06]), 25% greater at night (IRR: 1.25 [1.00-1.56]), but not different for afternoon encounters.

Conclusion: After adjusting for overall encounter rates, ED encounters for suicidal ideation are more likely to occur in the morning. Although the morning peak in incident risk is later than the reported nocturnal risk for incident suicide, this may reflect a delay between when an individual develops suicidal ideation and when they seek or receive treatment.
Support (If Any):

0665

MINDFULNESS AS A PROTECTIVE FACTOR FOR CHRONIC INSOMNIA IN COLLEGE STUDENTS

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Introduction: College students are at high risk for developing insomnia and co-morbid psychological distress. The aim of this research was to assess whether the lack of endogenous mindfulness was a risk factor for insomnia.
Methods: In order to address this issue, an archival analysis was conducted with a data set from MUN where the relationship between chronotype, mental health, sleep quality, and social support was assessed (n=3,160; 2,266 women; $\bar{X}$age=22 years). The proband subsample of interest were subjects that completed the HADS, MEQ, the ISI, and the Mindful Attention Awareness Scale (MAAS). The MAAS is a 15 item self-report measure, where each item is scored on a six-point Likert scale. Scores range from 15-90, higher scores are indicative of greater mindfulness. In order to evaluate the relevance of mindfulness, the overall sample was split into two groups (endogenous mindfulness [average score of ≥4.2]): n=647; $\bar{X}$age=22.4 years; nonendogenous mindfulness [average score of ≥4.2]: n=1,505; $\bar{X}$age=22.04 years).
Results: Subjects (n=2,152) were between the ages of 18-35 ($\bar{X}$=22+/- 3.72) and included primarily Caucasian individuals (86.6 %) and individuals who identified as female (71.7%). The means and ranges for the ISI, MAAS, and HADS were as follows: 9.0 + 5.6 (0-28), 3.7+.98 (1-6), and 5.3 + 3.9 (0-21), respectively. A correlation of -0.27 ($p<0.001$) was found for endogenous mindfulness (scale score range 1-6) and insomnia (scale score range 0-28) and -0.25 ($p<0.001$) for non-endogenous mindfulness (scale score range 1-6) and insomnia. Moderator analyses were conducted, and it was found that depression moderates the relationship between mindfulness and insomnia, (HADS depression, $\Delta R2 = .2$, $\Delta F(3, 643)=57.6$, p=.012, b=-.3, $t(643)=-2.5$ $p< .05$. Results should be interpreted with caution as the effect size was less than 0.1.
Conclusion: There was a relationship found, in both groups, between mindfulness and the ISI, where the scores on the ISI were lower when mindfulness was high. This suggests that there is a moderate linear relationship between mindfulness and insomnia. This association needs to be further evaluated in samples that have a broader range of ISI scores and with analyses that more carefully parse the moderating influence of depression. Analyses are ongoing.
Support (If Any): Support: K24AG055602

0666

SLEEP QUALITY AND DEPRESSION AMONG HIGH-RISK PERINATAL WOMEN: IMPACT OF THE COVID-19 PANDEMIC

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Introduction: The COVID-19 pandemic has negatively impacted sleep and mood on a global scale. To date, a handful of studies have reported on sleep and mood in perinatal women during the pandemic. They suggest that many pregnant women have poor sleep quality and depression. However, since these studies are cross-sectional with no comparison group, it is difficult to determine whether they are suffering more now.
Methods: The current study compared sleep quality and the presence of likely clinical depression in perinatal women from two studies (one prior to the pandemic (~1998)) and one during the pandemic (Aug 2020 – April 2021). All women had a history of MDD/PPD. Sleep quality and depression were ascertained at ~36 weeks and 4 weeks postpartum for both groups. Sleep quality was characterized by the Pittsburgh Sleep Quality Index (PSQI). Depression was ascertained by the Hamilton Depression Rating Scale (HRDS) for the non-pandemic group and the Edinburgh Postnatal Depression Scale (EPDS) for the pandemic group. PSQI scores were analyzed continuously and categorically, while the depression scales were categorized according to published cutoffs.
Results: The Mage = 31.1 (4.2) and did not differ between groups; 84% were White. Sleep quality in late pregnancy did not differ between groups (7.62 (3.5) vs 7.16 (3.8), (ns), pre-pandemic vs pandemic), but they did differ at 1 month PP (7.10 (3.1) vs 8.7 (2.6), $P < .001$). The number of women who met criteria for depression in late pregnancy differed (28(41.1%) vs 7 (7.5%) $X2 = 26.1$, $P < .001$), but not at 1 month PP (9 (13.2%) vs 18(19.3%), $X2 = 1.05$, $P = .31$). Sleep quality in late pregnancy was correlated with whether a woman met criteria for depression during pregnancy ($r = .22$, $P = .005$), but not at 1-month postpartum (ns).
Conclusion: Our findings suggest that the pandemic negatively impacted sleep quality in the first month postpartum, but not the rate of depression. We interpret these findings with caution due to varying methodologies. The pre-pandemic group was a RCT of 4 drug treatment groups in postpartum, and the pandemic group women used the SNOO®, a robotic, responsive bassinet.
Support (If Any): Happiest Baby, Inc

0667

THE EFFECT OF TINNITUS ON SLEEP ARCHITECTURE IN PATIENTS WITH DEPRESSION

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Introduction: There is an established link between tinnitus (an auditory symptom affecting sound in the ear or head, in the absence of auditory stimulus) and depression in adults. However, there is a lack of research into the effect of tinnitus on sleep architecture in this depression.

Methods: Female participants (n=149) with sleep disturbance and temporomandibular joint (TMJD) pain were recruited as part of a treatment trial. Data were used to identify a cohort of participants with clinically significant depressive symptoms (CES-D >16), with and without tinnitus. We examined the pre-randomization polysomnography (PSG) dataset, and calculated sleep architecture, and relative spectral power (Alpha, beta, theta, delta). We compared cohorts using independent t-tests, testing for differences in architectural and spectral sleep parameters, controlling for anxiety symptoms.
Results: 14 females (mean age = 41.76) reporting current tinnitus were age and depression severity matched with 14 females reporting no tinnitus (mean age = 41.27). Groups did not differ significantly in age (p = 0.91), BMI (p = 0.868), race (p = 0.328) or severity of depressive symptoms (CES-D: 23.93 No tinnitus vs 25.07 Tinnitus, p = 0.540), but the tinnitus group reported significantly higher anxiety (GAD-7: 9.43 no tinnitus vs 13.36 Tinnitus, p = 0.016). Data indicated TMJD patients with tinnitus had greater N2 sleep percentage (24.243% no tinnitus vs 57.200% Tinnitus, p = 0.033) compared with controls. There were no significant differences in N1% (4.2% No tinnitus vs 3.7% Tinnitus, p = 0.874), SWS% (23.164% No tinnitus vs 17.236% Tinnitus, p = 0.217) or REM% (26.386% No Tinnitus vs 21.88% Tinnitus, p = 0.238) between groups. Analysis of spectral data showed no significant differences in relative alpha (0.129 No tinnitus, 0.143 Tinnitus, p = 0.099), beta (0.186 No tinnitus vs 0.188 Tinnitus, p = 0.814), theta (0.123 No Tinnitus vs 0.125 Tinnitus, p = 0.069), or delta power (0.360 Tinnitus vs 0.346 Tinnitus, p = 0.399).
Conclusion: Our results indicate an association between tinnitus and increased N2% in TMJD participants reporting sleep disturbance and depressive symptoms. The effect of tinnitus on objective sleep parameters, in the context of depressive symptoms warrants further study.
Support (If Any): This research study was supported financially by the NIH Grant R01 DE019731 (Haythornthwaite, JA and Smith, MT).[MR1] [MR1]Don't include this in the main body, it'll use too many words. If there's a section on the submission portal to include this, add it. If not can just put the grant reference (as one word) in brackets after "treatment trial"

0668

THE EFFECT OF ANTIDEPRESSANT MEDICATIONS ON SLEEP ARCHITECTURE IN A PRIMARILY MIDDLE-AGED SAMPLE OF WOMEN WITH MULTI-MORBIDITIES: CHRONIC INSOMNIA, CHRONIC PAIN, AND DEPRESSION

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Introduction: Depression commonly impacts sleep architecture by increasing REM and decreasing stage 3 sleep. Growing evidence suggests antidepressants may reduce or reverse those effects in depressed individuals but has largely ignored their impact in the context of multi-morbidities. Depression, chronic insomnia, and chronic pain are common in middle-aged women and are thought to share a common neurobiological basis. They often co-occur, and thus, represent a common multi-morbidity triad. Here we examine whether %REM and %stage 3 sleep differ as a function of antidepressant use (yes/no) in a primarily middle-aged sample of women with all three morbidities.
Methods: Female adults (18+ years, n=91, Mage=51, SD=10.16) with comorbid insomnia, chronic pain, and depression (≥17 BDI-II score) completed one night of ambulatory polysomnography and reported antidepressant medication use (yes/no) and type (SSRI/SNRI/SARI/TCA/NDRI) as part of baseline data collection for a RCT (SPIN, NCT02688569). ANCOVA (R v4.1.1) examined group differences (antidepressant use: yes/no) in %REM and %stage3 sleep, controlling for age and sleep medication use.
Results: Only %REM was significantly lower (F=6.213, p=.015) in antidepressant users (n=48, M=14.85, SD=9.38) versus non-users (n=43, M=19.23, SD=6.70). An exploratory follow-up ANCOVA examined whether antidepressant type was important. Two groups were formed based on antidepressant mechanism of action (medications affecting serotonin, i.e., SSRI/SNRI/SARI vs medications affecting other neurotransmitters, i.e., TCA/NDRI), and their means were compared. Only %stage3 sleep was significantly lower (F=7.937, p=.007) in SSRI/SNRI/SARI users (n=37, M=11.18, SD=9.28) versus TCA/NDRI users (n=11, M=19.36, SD=13.04).
Conclusion: Thus, general antidepressant medication use may help decrease REM, but the increase of stage 3 sleep depended on which medications were used (i.e., TCA/NDRI). These findings suggest a neurophysiological functioning difference between types of antidepressants, particularly for this population of women with chronic pain, insomnia, and depression. This difference may be due to SSRI/SNRI/SARIs impacting serotonin, which may have an impact on REM, but not stage 3 sleep. However, the current study only had a small group of people using TCA/NDRIs, limiting generalizability and inferences. Future longitudinal research with a larger sample size is needed to parse out the effects of each antidepressant medication type individually and over time.
Support (If Any): ClinicalTrials-NCT02688569, PI McCrae.

0669

THE ROLE OF HYPERSOMNOLENCE IN DEPRESSION: RESULTS FROM A LONGITUDINAL STUDY OF THE AMERICAN GENERAL POPULATION

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Introduction: Insomnia symptoms have often been pointed out as an important factor for the relapse and/or the maintenance of depression. However, the contribution of hypersomnolence in depression is less studied and the conclusions are unclear. Our aim is to examine the association between hypersomnolence and depression in the US general population.
Methods: This longitudinal study was carried out in eight states in the U.S. A total of 12,218 subjects were interviewed by phone during the first wave (W1) and 10,931 at the second wave (W2) three years apart. The analyses included only the subjects who participated in the 2 waves (N=10,931). Hypersomnolence symptoms and Major Depressive Disorder (MDD) were assessed according to DSM-5 criteria.
Results: At W1, 27.2% (95% CI 26.4%-28.0%) of the sample had at least one hypersomnolence symptoms listed in the DSM5 occurring at least 3 days per week. This prevalence at W2 was 26.4% (95% CI 25.6%-27.2%). The incidence of DSM5 hypersomnolence symptoms was 20.5% which represents a yearly incidence of 5.8%. For MDD, the prevalence was 5.1% (95% CI 4.7%-5.5%) and 4.2% (95% CI 3.8%-4.6%) in W1 and W2, respectively. At W1, 54.2% of participants with a MDD also had hypersomnolence. At W2, 50.7% of MDD subjects also reported hypersomnolence. After adjusting for age, gender and medical conditions, persistent hypersomnolence (i.e., reported at both interviews) predicted incident MDD (i.e., absent at the first interview but present at the follow-up) with a relative risk

of 2.0 (95% CI 1.5-2.8). Similarly, persistent hypersomnolence predicted persistent MDD with a relative risk of 3.8 (95% CI 2.5-5.8). After adjusting for the presence of insomnia, persistent hypersomnolence remained a strong predictor for persistent MDD (RR: 2.4) but not for incident MDD.
Conclusion: Hypersomnolence, especially when it is persistent, is an important contributing factor for persistent MDD. While the presence of insomnia mitigates the predictive value of hypersomnolence in incident MDD, it had little effect on the association between persistent hypersomnolence and persistent MDD.
Support (If Any):

0670

THE ROLE OF SOCIAL VIGILANCE AND HINDRANCE-CHALLENGE STRESS IN PREDICTING NIGHTMARES AMONG NURSES

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Introduction: Increased exposure and reactivity to daytime stressors may heighten the frequency and severity of nightmares. Although research has examined the role of personality traits such as neuroticism in nightmares, it is unknown if other hypervigilance-related characteristics predict nightmares. Social vigilance, or monitoring one's social environment for potential threats, is one factor that may influence stress reactivity and sleep. Nurses are one population who may be particularly susceptible to social vigilance and nightmares given their stressful work environments. The current study had two aims: 1) to examine the association between social vigilance and nightmares (assessed via retrospective questionnaire and via daily sleep diaries), and 2) to examine if perceived job stress strengthened the association between social vigilance and nightmares.
Methods: Participants were 464 nurses (mean age = 39.03 years, SD = 11.07 years, 91% female) recruited from two Dallas-area hospitals. At baseline, nurses completed the Social Vigilance Questionnaire (SVQ), the Nightmare Disorder Index (NDI; a newly validated scale measuring past-month nightmare frequency and severity), and the Challenge- and Hindrance-Related Self-Reported Stress Scale (CHRSS). Nurses then completed 14 days of sleep diaries to assess daily nightmare frequency, which were then summed across the 14 days. Multiple linear regression models were run to assess main effects of social vigilance and hindrance or challenge stress, as well as their interactions, on nightmares.
Results: Greater social vigilance ($\beta = 0.10$, $p = 0.041$) and greater hindrance stress ($\beta = 0.13$, $p = 0.031$) each predicted more nightmare symptoms as measured by the NDI, but not nightmare frequency as measured by the daily surveys. Only greater hindrance stress predicted greater daily nightmare frequency as measured by the daily surveys ($\beta = 0.14$, $p = 0.015$). Social vigilance did not interact with either hindrance or challenge stress to predict nightmares.
Conclusion: Results indicate nurses who report higher levels of social vigilance or hindrance stress at work experience more nightmare symptoms. Although more research is needed, supporting nurses who report high levels of stress and vigilance may help reduce their arousal and improve their sleep.
Support (If Any): 1R01AI128359

0671

NIGHTMARE TYPE AND ITS ASSOCIATION WITH SUICIDE ATTEMPTS AMONG VETERANS

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Introduction: Research has begun to distinguish between idiopathic (no known origin), trauma-related (recurring after a trauma), and complex nightmares (trauma-related nightmares that recur comorbidly with sleep disordered breathing). Nightmare type may impact symptom severity as well as treatment outcomes among various patient groups. Thus, we sought to examine the individual effects of nightmare type on suicide re-attempts and, secondarily, on treatment utilization.
Methods: This is a secondary analysis of electronic medical record data. Data were extracted for all Veterans with a documented suicide attempt (using ICD-10 codes) during FY13-14. A 1:1 case control was then created using age, sex, and prior year behavioral health treatment utilization. The present sample is comprised of all Veterans from that parent dataset who carry an ICD-10 diagnosis of nightmare disorder (n = 3207). Groups were defined as follows: 1) Idiopathic (n = 589; nightmare disorder only); 2) Trauma (n = 3207; nightmare disorder plus ICD-10 diagnosis of PTSD); 3) Complex (n = 576; nightmare disorder + PTSD + ICD-10 diagnosis of a sleep-related breathing disorder).
Results: Multiple logistic regression revealed that only trauma-related nightmares were positively associated with suicide re-attempts ($B = 0.16$, $SE = 0.06$, $p < 0.01$), with an estimated odds ratio of 1.27 (95% CI of 1.02-1.57). Regarding treatment utilization, regression analyses revealed that both complex nightmares ($B = 0.36$, $p < 0.05$) and trauma-related nightmares ($B = 0.31$, $p < 0.05$) were significantly associated with mental healthcare utilization (total days).
Conclusion: Our results revealed that both complex and trauma-related nightmares are associated with mental health treatment utilization. Only trauma-related nightmares were significantly associated with suicide re-attempts. Trauma-related nightmares may be distressing because of their trauma-related content, therefore making them more likely to predict reattempts. Overall, results suggest that nightmares are positively associated with suicide re-attempts and increased treatment utilization.
Support (If Any): This work was supported by the VA Center of Excellence for Suicide Prevention in teh Finger Lakes Healthcare System.

0672

TWENTY-FOUR HOUR ACTIVITY PATTERNS, PAIN, AND MENTAL HEALTH TRAJECTORIES AFTER A TRAUMATIC EVENT

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Introduction: Among those who experience trauma, some individuals develop Adverse Posttraumatic Neuropsychiatric Sequelae (APNS). Identifying biomarkers associated with APNS is critical for predicting trajectories of recovery and informing interventions

to reduce the impact of trauma. In this study, we examined objective 24-hour activity patterns and APNS in the weeks following a traumatic event.

Methods: Participants (n = 2,021) were recruited from emergency departments after experiencing trauma. Over 8 weeks, they wore wrist accelerometry devices to measure 24-hour activity patterns, and completed surveys assessing 10 Research Domain Criteria (RDoC) constructs associated with APNS. We aimed to 1) examine the relationship between 24-hour activity patterns and APNS symptoms, and 2) examine how 24-hour activity patterns changed over time in relation to changes in APNS over the 8-week period. A bivariate linear mixed model approach was used to model the cross-sectional and longitudinal associations with each of the 10 RDoC constructs.

Results: Overall, participants reporting more pain in the weeks following trauma also showed objectively less 24-hour activity variance (Pearson correlation = -0.14, p = 0.001). An improving pain trajectory over the 8 weeks was associated with increases in daily activity (Pearson correlation = -0.14, $p < 0.001$) variability in activity (Pearson correlation = -0.12, $p < 0.001$), and increases in sleep consolidation (Pearson correlation = 0.013, $p < 0.001$). Within subjects, an increasing number of transitions between sleep and wake over the study period was also associated with worsening self-reported anxiety (Pearson correlation = 0.06, p = 0.003) and sleep problems (Pearson correlation = 0.10, p = 0.003)

Conclusion: After a traumatic event, several 24-hour activity biomarkers were associated with APNS. Results suggest pain, activity, and sleep highly influence each other in the weeks following a traumatic event, and 24-hour activity patterns should be considered when making predictions about who is likely to recover from trauma. Targeted interventions for sleep and pain may promote recovery in the other domains.

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0673

SCRIPT-DRIVEN IMAGERY IN PTSD: COMPARING REACTIVITY TO IMAGERY OF TRAUMA MEMORIES TO IMAGERY OF TRAUMA-NIGHTMARE MEMORIES

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Introduction: Prolonged Exposure (PE) therapy produces therapeutic fear extinction via imaginal exposure to trauma memories. However, traumatic events that occurred in the distant past and the associated memories may become distorted or habituated. Posttraumatic nightmares are more recent, potentially salient, and may better support extinction learning. Physiological responses to imagery of a trauma and nightmare related to this trauma were compared to each other and to neutral imagery.

Methods: Twelve participants (mean age=26.16, 11 female) with PTSD (mean CAPS-5=27.83) and frequent trauma-related nightmares wrote accounts of their trauma. Participants then completed a 14-day sleep-monitoring period with diaries, actigraphy and two nights of ambulatory PSG. Participants narrated a nightmare report into an audio recorder when awoken by a nightmare or when recalled upon awakening. Two pairs of short narratives were created from the written account of the trauma and recording of a nightmare most similar to the trauma. These narratives (scripts) were audio-recorded by an investigator. Participants then underwent two script-driven imagery (SDI) sessions, one hour apart, during which they listened to either their two trauma-memory or their two nightmare-memory scripts (counterbalanced across participants) with 3 interspersed neutral scripts. Each script in an SDI session included baseline, listening, and imagery periods (approximately 30 sec apiece). Skin conductance (SC), heart rate (HR), and corrugator electromyography (EMG) biosignals were continuously recorded throughout each SDI session. For each script, HR, SC, and EMG means during the baseline period were subtracted from their respective imagery-period means. These difference scores were square-root transformed and analyzed by ANOVA with Type (trauma vs. nightmare) and Valence (trauma/nightmare vs. neutral) factors.

Results: Biosignals from scripts of both Types (trauma and nightmare) significantly exceeded those from their respective neutral scripts [HR:$F(1,11)=23.42$, $p=0.0005$; SC:$F(1,11)=9.53$, $p=0.01$; EMG:$F(1,10)=8.0$, $p=0.018$]. However, biosignals from trauma and nightmare scripts did not differ ($p's>0.39$) nor did the Type x Valence interactions ($p's>0.10$).

Conclusion: Physiological reactivity during imagery of a trauma memory and a trauma-related nightmare both significantly exceeded reactivity to neutral scenarios. Nightmare-memory and trauma-memory imagery produced similar reactivity. Thus, imagery of nightmares have potential utility as alternative PE stimuli.

Support (If Any): This project was supported by NIMH grant 1R21MH121832-01A1 to E.P.S.

0674

CPAP ADHERENCE AND RESPONSE TO COGNITIVE PROCESSING THERAPY FOR PTSD IN VETERANS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Cognitive processing therapy (CPT) is a recommended first-line psychotherapy treatment for veterans with PTSD. Veterans with PTSD are at higher risk for sleep disorders including obstructive sleep apnea (OSA), and there is evidence that OSA can exacerbate PTSD and vice versa. Several studies have shown that CPAP use is associated with improvement in PTSD symptoms. CPT is an effective, yet time and resource intensive treatment option, making it critical to identify potential health factors impacting its efficacy. This retrospective chart analysis of veterans diagnosed with OSA and PTSD evaluated the effect of CPAP adherence on response to CPT.

Methods: Medical records of patients seen in a VA Health Care System were reviewed to identify veterans diagnosed with OSA and PTSD that received between 1-12 sessions of CPT with documented weekly PTSD Checklist for DSM-5 (PCL-5) scores, Patient Health Questionnaire-9 (PHQ-9) scores, and were issued a CPAP machine for OSA. Data collected included demographics, CPAP adherence (mean CPAP use, % days with greater than 4 hrs./night of CPAP use, mean residual apnea hypopnea index, mask leak), and PTSD symptoms (PCL-5 and PHQ-9 scores). For each outcome, we estimated a linear mixed-effects model; models for PCL-5 allowed heterogeneous residual variances for each veteran.

Results: This study identified 25 veterans receiving CPT for PTSD with access to a CPAP machine for OSA. The median age of patients was 43 years, median BMI was 35.6, and median residual AHI was 2.4. Patients received CPT for a median duration of 11.0 weeks. There was significant improvement in weekly PCL-5 and PHQ-9 scores over the course of CPT (both $p < .001$). CPAP adherence of at least 4 hrs./night for ≥70% of days did not significantly impact PCL-5 and PHQ-9 scores during CPT. Residual AHI and mask leak were not associated with PTSD symptoms during CPT.
Conclusion: While CPAP nonadherence appears to be a potential contributing factor to the reduced effectiveness of evidence-based treatments for veterans with PTSD, our study revealed significant improvement in PTSD symptoms during CPT regardless of CPAP adherence. Given the retrospective nature and small sample size of this study, further research is needed to expand on these findings.
Support (If Any):

0675

VAGAL ACTIVITY IN REM SLEEP IS ASSOCIATED WITH EXTINCTION RECALL IN TRAUMA EXPOSED INDIVIDUALS BUT NOT IN INDIVIDUALS WITH POST-TRAUMATIC STRESS DISORDER

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Introduction: Post-traumatic stress disorder (PTSD) is characterized by impaired fear extinction memory. Sleep, and especially REM sleep, facilitates consolidation of fear extinction. Therefore, it is postulated that abnormal sleep physiology in PTSD may contribute to its persistence. Recent studies suggest that vagal activity may support the memory benefit of sleep. In addition, a separate line of studies shows reduced vagal activity during sleep in PTSD. However, the link between extinction memory and vagal activity during sleep has not been investigated in PTSD. We examined the association of extinction recall with vagal activity, measured as heart rate variability (HRV), during REM sleep, in PTSD and matched controls.
Methods: Participants included individuals with PTSD (n=70) and trauma exposed controls (TEC; n=69). All participants completed 3 nights of ambulatory polysomnography that included ECG. After acclimation and baseline PSG nights, fear conditioning and extinction learning were carried out in the evening after which they completed a third ("consolidation") PSG night. Extinction recall was tested 24h later. During fear conditioning, partial reinforcement with a mild electric shock produced a conditioned skin conductance response (SCR) to the image of a colored lamp, which was immediately extinguished by un-reinforced presentations in a different room. Extinction recall was indexed by the degree to which SCR remained suppressed 24h later. HRV indices were calculated using Kubios software.
Results: Preliminary analyses included 20 individuals with PTSD and 37 TEC participants. In the TEC group, extinction recall was significantly correlated with REM sleep HRV measures that reflect vagal activity, including high frequency (HF) absolute power ($Rs=0.51$, $p=0.009$), HF normalized units ($Rs=0.54$, $p=0.005$) and RMSSD ($Rs=0.40$, $p=0.046$). In hierarchical regression models which included extinction recall as the dependent variable, HF absolute power accounted for a significant proportion of the variance, over and above a model that included %REM sleep, %N3 sleep, REM density and average duration of REM epochs ($R2=0.50$, $F=5.06$, $p=0.04$). These associations were not present in the PTSD group
Conclusion: Our preliminary results suggest that vagal activity during REM sleep is involved in the consolidation of extinction memory and that this mechanism may be impaired in PTSD.
Support (If Any): R01MH109638 K23MH119322

0676

INCREASED DEPRESSION SYMPTOMS ARE ASSOCIATED WITH HIGHER NIGHTMARE FREQUENCY WITHIN THE WISCONSIN SLEEP COHORT

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Introduction: Nightmare frequency has been suggested as a strong clinical indicator of psychiatric disorders. Additionally, frequent nightmares are a possible underrepresented outcome of depression. As nightmares may increase the risk of negative health outcomes, such as suicide attempts, understanding possible sources of nightmare frequency is imperative. This study sought to examine the association between depression and anxiety on the incidence of high frequency of nightmares.
Methods: Using cross-sectional and longitudinal data from the Wisconsin Sleep Cohort, accessed through the National Sleep Research Resource, we conducted an analysis of demographics, co-occurring sleep disturbances, and mental health measures of participants experiencing ordinal frequencies of nightmares. The study sample included 758 Wisconsin state employees with a baseline and follow-up assessment (mean 4.46 years between visits; standard deviation 1.7). All participants were screened for depression and anxiety symptoms using the Zung Depression Scale (SDS), and the State-Trait Anxiety Inventory. Sleep disturbances, medication use, nightmares and insomnia were based on self-report. Nightmare frequency was categorized as high (≥2 per month) and low (<2 per month). Logistic regression was used to determine the association of baseline anxiety and depression scales (in the same model) with incidence of high nightmare frequency at follow-up, adjusted by age, sex, body mass index, hypertension medications, use of narcotics and caffeine.
Results: After adjusting for covariates, SDS scores at baseline were associated with an increased incidence of higher frequency of nightmares at follow-up (OR=1.05; 95%CI=1.01-1.10, $p = 0.026$), while anxiety at baseline was not (OR=1.03; 95%CI=0.99-1.07; $p = 0.165$). An increase in one unit of the SDS was associated with a 5% increase in the odds of presenting higher frequency nightmares at follow-up.
Conclusion: Participants with higher SDS scores had higher incidence of high frequency of nightmares upon follow up, however, those with anxiety did not. Further research should be targeted at gaining better understanding of the role of psychiatric conditions on the onset of nightmares.
Support (If Any): NIH NHLBI (R01HL62252), NIA (R01AG036838, R01AG058680), and National Center for Research Resources (1UL1RR025011). The National Sleep Research Resource was supported by NIH-NHLBI (R24 HL114473, 75N92019R002).

0677

IMPACT OF COGNITIVE BEHAVIORAL THERAPY FOR POST-TRAUMA NIGHTMARES ON SLEEP-EFFICIENCY: EXAMINING DATA ON SLEEP DIARY DATA

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Introduction: Prior research has not examined the impact of cognitive behavioral therapy (CBT) for post-trauma nightmares on aspects of sleep quality as measured by sleep diary data. While self-report measures assessing sleep quality have demonstrated that CBT for post-trauma nightmares is associated with significant improvements in sleep quality pre- to post-treatment, it is important to specifically analyze changes using sleep diary data given that research has demonstrated large discrepancies in self-report measures of sleep behavior and prospective sleep diary data.
Methods: All participants in this study were recruited from the local community as part of ongoing clinical trials studying the efficacy of Exposure, Relaxation, Rescription Therapy (ERRT). Each individual reported a history of a criterion A trauma and at least one nightmare weekly. Sleep diary data was collected at each weekly treatment session and included questions regarding time in bed, sleep-onset latency, time out of bed, wake time after sleep onset so that variables of total sleep time, time in bed, and sleep efficiency could be calculated. Participants were instructed to complete the sleep diary each morning while in treatment. Only participants who completed the full ERRT protocol were included.
Results: Results from 93 individuals were analyzed with a dependent samples t-test. The mean sleep efficacy prior to treatment was .85 (SD = .14) and after treatment was .92 (SD = .07), resulting in a t-value of 3.00 ($p < .01$; Cohen's d = .57; 95% CI .16 -.96).
Conclusion: Results show that there is a significant and meaningful change in sleep efficiency from pre- to post-treatment of a form of CBT for post-trauma nightmares. Given that ERRT does not directly target time in bed or utilize sleep restriction, this is notable that it is associated with such improvements in sleep directly related to time spent in bed. As some research has suggested that aspects of CBT for insomnia may need to be combined with treatment for nightmares to successfully treat trauma-related sleep disturbances, these results indicate that CBT for nightmares alone may be sufficient. Limitations and future directions will be discussed.
Support (If Any):

0678

SLOW WAVE SLEEP RECOVERY CORRELATES WITH BRAIN FUNCTIONAL AND STRUCTURAL CHANGES IN ALCOHOL USE DISORDER

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Introduction: Sleep disturbances are very common in alcohol use disorder (AUD) and contribute to relapse. Recovery of N3 sleep within the first 30 days of abstinence is limited. Brain mechanisms associated with N3 sleep recovery in AUD are still poorly understood.
Methods: We examined brain functional and structural changes associated with inter-individual differences in N3 recovery in 30 AUD patients (9 Females, mean age: 41 years) undergoing a 3-week inpatient detoxification. We measured patients' N3 sleep, resting state functional connectivity (RSFC), grey matter volume (GMV) and negative mood on week 1 and week 3.
Results: AUD patients had shorter N3 sleep than healthy controls on week 1 and showed a trend towards N3 sleep recovery after 3-week detoxification. Inter-individual differences in N3 recovery were observed. Larger increases in N3 sleep were associated with greater improvement in negative mood. Inter-individual variations in N3 recovery were associated with increases in midline default mode network (DMN) RSFC and anterior DMN GMV. Exploratory analyses revealed significant sex effects on N3 sleep and N3 recovery such that AUD females had greater N3 impairments on week 1 and greater N3 recovery after detoxification than AUD males.
Conclusion: We show a significant relationship between N3 recovery and structural and functional changes in DMN in AUD patients during detoxification. Combining nighttime and daytime interventions that target N3 sleep and DMN might have a complementary therapeutic effect on AUD recovery including mood improvement. Future investigations on sex differences with a larger sample and with longitudinal data for a longer period of abstinence are needed.
Support (If Any):

0679

CBT-I FOR PSYCHOSIS LEADS TO REDUCED INSOMNIA SEVERITY AND IMPROVED SLEEP-RELATED FUNCTIONING IN VETERANS WITH PSYCHOSIS AND INSOMNIA: RESULTS FROM A PRELIMINARY RCT

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Introduction: People with psychosis often suffer from insomnia. Even when psychotic symptoms are well-controlled, sleep disturbances persist, which puts these individuals at a higher risk of psychiatric relapse. We have developed guidelines and materials for conducting CBT-I with people living with psychotic disorders so it can be conducted according to their needs and experiences.
Methods: We conducted a preliminary efficacy study comparing CBT-I using novel psychosis-specific guidelines against an active treatment control (Health and Wellness [HW] intervention). Veterans with insomnia and psychosis (N=47) completed the Insomnia Severity Index (ISI), Functional Outcomes of Sleep Questionnaire (FOSQ), and Veterans RAND-36 (VR-36) at baseline, post-treatment, and 3-month follow-up.
Results: Participants (mean age=52 years) were primarily Black (55.3%), male (76.6%), and not married (76.6%). Using a repeated measures model (SAS proc mixed), mean change from baseline was compared between CBT-I for psychosis and HW at post and follow-up. There was a significant group difference on ISI at post (t=-2.07, df=46, p=.044, Cohen's d=-.70), but not follow-up (t=-0.22, df=46, p=.827, Cohen's d=-.10). Similarly, there was a significant group difference on the FOSQ at post (t=2.21, df=46, p=.032, Cohen's d=.46), but not follow-up (t=1.05, df=46, p=.298, Cohen's d=.33). The VR-36 Physical Component Scale showed no group

difference at post (t=-1.43, df=46, p=.159, Cohen's d=-.35), but a difference at follow-up (t=-3.11, df=46, p=.003, Cohen's d=-.67) favoring the HW group, although about 50% were lost to follow-up on this item. For the VR-36 Mental Component Scale, there was no significant group difference at either timepoint (t=.20, df=46, p=.841, Cohen's d=.05; t=.77, df=46, p=.444, Cohen's d=.26).
Conclusion: At both post and follow-up, the CBT-I group surpassed estimated thresholds for clinically important improvements in both insomnia severity and sleep-related functioning, whereas HW did not. CBT-I for psychosis should be investigated with a larger, fully-powered randomized controlled trial, using sleep-specific functioning outcome measures.
Support (If Any): This material is the result of work supported by: resources and facilities at the VA Maryland Health Care System, Baltimore, Maryland; the U.S. Department of Veterans Affairs, Rehabilitation Research and Development Service-1IK2RX001836 (NCT02535923), PI: Elizabeth A. Klingaman. Contents do not represent the views of the U.S. Government or Department of Veterans Affairs.

0680

NOCTURNAL WAKEFULNESS AND SUICIDE RISK IN THE AUSTRALIAN POPULATION

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Introduction: Temporal patterns for suicide over a 24-hour period have shown mixed results among prior studies. However, analyses of 24-hour temporal patterns for wakeful actions including suicidal behavior, should adjust for expected sleep requirements that inherently skew such activities to conventional wakeful times. This study analysed the time-of-day for suicide cases from the Australian population for the year 2017, adjusting for expected sleep patterns. Identification of time-of-day trends using this methodology may reveal risk factors for suicide and potentially modifiable contributors.
Methods: The Australian Coronal database was accessed and data for suicide deaths were extracted for the most recent completed year, 2017. Time of suicidal action is frequently unable to be pinpointed and for this analysis an estimation was performed from time last seen alive and time found subsequently using data extracted from police and coronial reports. Time of suicide was allocated to one of four 6-hourly time bins across 24 hours from the mid position of time last seen alive and time found subsequently. Cases were excluded if allocation to a time bin was not able to be confidently determined if time last seen and time found crossed both boundaries for a given time bin. Prevalence of suicide for each time bin was adjusted for the likelihood of being awake for each bin according to sleep-wake norms published in 2020 from a large Australian community survey of 1966 subjects. Observed prevalence of suicide were compared to expected values predicted from likelihood of being awake across each time bin calculated as a standardised incidence ratio (SIR).
Results: For year 2017 there were 2208 suicides for which 1407 were able to be allocated into one of four 6-hourly time bins. Reasons for exclusion were cases for which allocaton into a time bin was not able to be performed. When adjusted for the likelihood of being awake based from population norms, cases were significantly more likely to enact suicide between the hours of 2301-0500 than predicted (SIR 3.93, P< 0.001). Furthermore, there was a lower-than expected rate of suicide for the time bins, 1101-1700 (SIR 0.86, P=0.002). When subcategories of suicide cases were analsysed, suicide death in asssociation with alcohol consumption demonstrated the strongest for relatoinship to the 2301-0500 time bin (SIR 6.03, P< 0.001).
Conclusion: Higher than expected rates of suicide overnight associated proposes that nocturnal wakefulness may represent a modifiable risk factor for triggering suicide events. Nocturnal wakefulness may be linked to increased rates of loneliness and depair as well as greater tendency toward impusive actions and behaviors. Impusivity may be compounded by alcohol consumption Our findings offer a potential mechanism for which individuals with insomnia have increased suicidal thoughts and behaviors.
Support (If Any): Untied grant provided by Rhinomed LTD

0681

ASSOCIATION OF POOR SLEEP WITH STRESS, ANXIETY, EMOTIONAL SUPPORT, SOCIAL ISOLATION, AND DEPRESSION DURING THE COVID-19 PANDEMIC

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Introduction: The COVID-19 pandemic has impacted multiple facets of daily living: personal finances, physical activity, and mental and physical health. These changes can result in additional stress and negatively affect sleep. It is important for sleep medicine providers to understand how their patients are impacted by these changes to optimize their care. In this study, we evaluated the association of poor sleep with stress, anxiety, emotional support, social isolation, and depression among sleep medicine clinic patients during the COVID-19 pandemic.
Methods: Sleep medicine clinic patients were distributed an online survey at baseline followed by a 6-month follow-up survey (December 2020 - May 2021). Participants answered questions regarding Insomnia Severity Index (ISI), Patient-Reported Outcomes Measurement Information System (PROMIS) measures (sleep disturbance and sleep-related impairments), and COVID-19 testing. Stepwise linear regression was performed using SAS to determine if self-reported poor sleep predicted stress, anxiety, emotional support, social isolation, and depression. This study was approved by Baylor College of Medicine IRB. Informed consent was obtained from all subjects involved in the study.
Results: Eighty-one adults completed baseline survey, and 54 adults (mean age 55.2±18.4 years, 61% female, 70% Caucasian) completed 6-month follow-up survey. At baseline, anxiety had a significant effect on sleep disturbance (0.43±0.11, p=0.0001), sleep-related impairments (0.53±0.12, p=0.0001) and ISI (0.28±0.08, p=0.0004). Upon follow-up, an increase in ISI predicted higher perceived stress (0.18±0.07, p=0.013) and worse anxiety (0.61±0.16, p=0.0003). An increase in sleep disturbance predicted a decrease in emotional support (0.25±0.12, p=0.038). Additionally, an increase in sleep-related impairments predicted an increase in social isolation (0.39±0.11, p=0.0002) and depression (0.57±0.07, p<0.0001). Interestingly, only 3 participants tested positive for COVID-19.
Conclusion: In this study of sleep medicine clinic patients during the COVID-19 pandemic, we observed that poor sleep predicted greater stress, anxiety, social isolation, and depression along with less emotional support. This study illustrates the importance of addressing stress management, mental health (anxiety, depression), and emotional support when treating sleep medicine clinic patients during the COVID-19 pandemic.
Support (If Any): National Institutes of Health (NIH) Grant #R01NR018342 (PI: Nowakowski); Department of Veteran

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0682

COGNITIVE-BEHAVIORAL THERAPY FOR INSOMNIA ALLEVIATES AND PREVENTS SUICIDAL IDEATION.

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Introduction: Patients with insomnia disorder are at increased risk for suicidal thoughts and behaviors. Early evidence suggests that insomnia therapeutics may reduce suicidal ideation (SI). However, the role of digital insomnia therapeutics in both the alleviation and prevention of SI remains unclear.
Methods: A total of 658 community adults with DSM-5 insomnia disorder enrolled into a single-site RCT evaluating the efficacy of digital cognitive behavioral therapy for insomnia (CBTI) relative to attention control. Before treatment, 126 patients endorsed SI, whereas 532 patients denied SI. First, we tested whether CBTI can reduce SI in patients with baseline SI. Second, we tested whether CBTI reduces risk for SI development in those without baseline SI.
Results: Among those with baseline SI, just 30.0% of CBTI patients reported SI after treatment, which was lower than the 54.5% of controls with posttreatment SI (OR=2.81, p=.006). Among those without baseline SI, CBTI did not reduce risk for developing SI after treatment (p=.681). However, a multivariate logit model regression odds for SI onto condition (p=.140) and posttreatment remission status (OR=5.68, p=.007) indicated that patients who remitted from insomnia exhibited a reduction in SI risk. Importantly, CBTI was associated with a 6.29 odds increase of insomnia remission relative to control. PRODCLIN estimation of the indirect effect indicated that CBTI prevents SI, but that the effect is fully mediated by the extent to which CBTI produces insomnia remission ($\alpha\beta$=-3.13=5, 95% CI=-5.28, -0.96).
Conclusion: Digital CBTI reduces risk for SI development in insomnia patients without pretreatment SI. These data support a role for digital insomnia therapeutics in SI prevention in this high-risk patient population. Moreover, digital CBTI reduces SI in insomnia patients with SI. These data indicate that digital CBTI can alleviate SI, but it possible that adjunct treatment directly targeting SI may enhance suicide risk reduction.
Support (If Any): Robert Wood Johnson Foundation

0683

SMOKING AND PERCEIVED STRESS: EXAMINING ASSOCIATIONS WITH SUBJECTIVE SYMPTOMS OF OBSTRUCTIVE SLEEP APNEA THROUGH PARALLEL MEDIATION ANALYSES

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Introduction: Cigarette smoking is known to have a negative effect on individuals' sleep quality. Specifically, evidence shows that smoking can exacerbate sleep disorders such as obstructive sleep apnea (OSA) by increasing irritation and inflammation of the upper respiratory conducts. Furthermore, previous research highlights a complex bidirectional positive association between cigarette smoking and perceived stress. Sleep quality may be an important aspect intervening in the association between smoking and perceived stress, given that individuals who report high stress also report more sleeping issues and increased risk for OSA. Further research is needed to elucidate the impact of smoking and OSA on perceived stress.
Methods: The present cross-sectional survey of N=459 (75.8% female; 60.3% non-Hispanic White) current smokers and non-smokers investigated the associations between smoking status and perceived stress through the indirect effects of subjective OSA symptoms. A parallel mediation analysis using PROCESS Macro Model 4 was conducted with three mediators: risk for OSA based on subjective symptoms (assessed using the STOP portion of the STOP-BANG questionnaire), average sleep propensity (evaluated using the Epworth Sleepiness Scale), and overall subjective sleep quality (assessed with the Pittsburgh Sleep Quality Index). Race, sex, employment, and income were added to the model as covariates.
Results: Analyses supported a significant indirect effect of risk for OSA based on subjective symptoms (B = -0.55, 95% CI [-1.07, -0.09]) and overall subjective sleep quality (B = -1.39, 95% CI [-2.16, -0.74]) on the relationship between smoking status and perceived stress. However, average sleep propensity was not found to mediate this association (B = -0.09, 95% CI [-0.45, 0.21]). The direct effect of smoking status on perceived stress was also not statistically significant (B = 0.06, t = 0.09, p = 0.93).
Conclusion: Findings illustrate that smokers tend to be at greater risk for OSA and overall report worse sleep quality, which in turn increases their reported levels of perceived stress. Further research is necessary to understand possible demographics-based differences behind these findings as well as potential clinical implications.
Support (If Any): This project was financially supported by the National Institute of Drug Abuse (R01DA046096-02S1).

0684

IMPROVING PSYCHOLOGICAL DISTRESS FOR BETTER SLEEP DURING THE COVID-19 PANDEMIC: ANALYSES OF DATA FROM A PILOT RANDOMIZED CONTROLLED TRIAL

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Introduction: Psychological distress has been associated with sleep problems. Emerging evidence suggests positive psychological well-being is associated with better sleep. However, most of these studies are cross-sectional and do not provide information on the effect that changes in psychological outcomes have on sleep. The aim of this secondary analysis was to test whether changes in distress and well-being following a 7-week intervention to improve sleep and mental health were associated with changes in sleep among adults reporting poor sleep quality (Pittsburgh Sleep Quality Index [PSQI]>5) and moderate distress (Perceived Stress Scale [PSS]≥14) during the COVID-19 pandemic.
Methods: Thirty individuals (age 40.7±12.9y, 80% female, 50% racial/ethnic minority) completed a pilot study testing a well-being and sleep hygiene intervention vs. sleep hygiene alone. Questionnaires were administered at baseline and post-intervention to assess distress (PSS and the Symptom Questionnaire), well-being (Psychological Well-Being scales), and sleep (PSQI and Insomnia Severity Index). A sleep diary was administered to collect information on total sleep time (TST), variability in TST, sleep onset latency, wake time after sleep onset, bedtime, and variability in bedtime. Change scores were calculated for each variable as the difference between post-intervention and baseline. Separate linear regression models were estimated with psychological variables as predictors and sleep variables as outcomes. Analyses were adjusted for intervention group, baseline scores of predictors and outcomes, age, and sex.

Results: Reductions in anxiety were associated with improvements in insomnia (B=0.6±0.2 (SE), p=0.008) and TST (B=-10.1±3.5, p=0.009); reductions in depression, somatization, and hostility were each associated with improvements in sleep quality (B=0.2±0.1, p=0.007), TST (B=-10.3±4.5, p=0.03), and earlier bedtime (B=8.8±3.0, p=0.008), respectively; and reductions in perceived stress were associated with improvements in sleep quality (B=0.2±0.1, p=0.005) and insomnia (B=0.3±0.1, p=0.02). No associations were found between changes in well-being and sleep.
Conclusion: Our findings suggest that reductions in distress following well-being and sleep hygiene or sleep hygiene alone interventions predict improvements in sleep. Focusing interventions on improving distress may be relevant to ameliorate sleep quality in the context of psychological distress. The association between well-being and sleep should be further delineated to determine the role of well-being in sleep promotion.
Support (If Any):

0685

SLEEP, MENTAL HEALTH AND SOCIOECONOMIC FACTORS CONCOMITANTLY INFLUENCE THE RISK IN TOBACCO CONSUMPTION

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Introduction: Extensive evidence points that sleep, psychiatric symptoms and sociodemographic factors separately affect the risk involved in substance use. Due to the well-known relationship between these 3 pillars, an investigation of the combined effect of this factors on substance use is necessary. The objective of this study was to build a model including the 3 factors simultaneously and their effect on risk in substance use.
Methods: Volunteers of the EPISONO (2007) study underwent assessment through validated questionnaires concerning their general health and a night of polysomnographic examination. For this study, scores in the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) were evaluated considering responses to questionnaires concerning sleep, psychiatric symptoms, and socioeconomic parameters, as well as polysomnographic findings. A structured equation modelling (SEM) protocol was conducted to build a theoretical model in which variables pertaining to the 3 factors of interest (sleep, mental health and socioeconomic influence) could have their simultaneous effect on substance use measured.
Results: 793 participants of the EPISONO were included (mean age=43.4 years; 452 women). Significant effects were found for the tobacco consumption model. Subjective sleep quality (SSQ), psychiatric symptoms (PS) and socioeconomic status (SES) influenced the ASSIST score for tobacco consumption. Influence of PS on tobacco consumption was also mediated by SSQ. Models for other substances assessed in the ASSIST questionnaire, such as alcohol, did not find any statistically significant effect.
Conclusion: The lack of significance of models for alcohol and other substances may be related to the nature of our sample, in which not many individuals presented a substantial risk of substance involvement that could be detected by the ASSIST questionnaire. However, in the model for tobacco consumption, subjective sleep quality, socioeconomic status and psychiatric symptoms exerted an effect on tobacco consumption risk, with psychiatric symptoms having their influence mediated by self-perceived sleep quality.
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0686

COGNITIVE BEHAVIORAL THERAPY FOR INSOMNIA TO REDUCE CANNABIS USE: RESULTS FROM A PILOT RANDOMIZED CONTROLLED TRIAL

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Introduction: Cannabis use, including use for insomnia, has increased significantly in the United States over the past decade. Cannabis use disorders and/or heavy cannabis use have been linked to numerous negative outcomes, including poor work performance, other substance use, increased risk of psychosis, and neurocognitive deficits. In a pilot randomized controlled trial, we compared telemedicine-delivered CBT for insomnia tailored to individuals regularly using cannabis for sleep (CBT-CB-TM) to sleep hygiene education (SHE-TM) for improving sleep and daytime functioning and for reducing cannabis use.
Methods: Adults with chronic insomnia who reported using cannabis for sleep at least three times weekly were recruited through advertisements and at local cannabis dispensaries and screened for disqualifying sleep, medical, and mental health disorders. Fifty-seven eligible participants (43 women, mean age 37.6 ± 12.8 years) were randomized to 6 sessions of CBT-CB-TM (n=30) or SHE-TM (n=27). Participants completed self-reported measures of insomnia (Insomnia Severity Index, primary outcome), daytime functioning (sleep beliefs, depression, and overall functioning) and cannabis use before and after treatment and at 8-week follow-up.
Results: Mixed models showed that scores improved more on the Insomnia Severity Index (β=-2.83, se=0.62, p<.001) and Dysfunctional Beliefs and Attitudes about Sleep scale (β=-0.73, se=0.25, 9<.006) in the CBT-CB-TM compared to SHE-TM condition. Small pre- to post-treatment reductions in the daily frequency of cannabis use were evident for CBT-CB-TM compared to SHE-TM participants (pre-post change: 0.60 ± 0.94 vs. -0.04 ± 0.35, p<.007). Depression symptoms (PHQ-8: CBT-CB-TM 8.5 ± 0.7 to 6.8 ± 1.0 vs. SHE-TM 9.1 ± 0.7 to 7.0 ± 0.9, p<.004), and overall functioning (SF-12 MCS: CBT-CB-TM 43.3 ± 1.9 to 50.8 ± 2.9 vs. SHE-TM 39.8 ± 2.0 to 51.6 ± 2.5, p<.0005) improved in both conditions from pre-treatment through follow-up.
Conclusion: Telemedicine-delivered CBT for insomnia improved sleep and reduced cannabis use more than a matched behavioral placebo control in this pilot trial of adults using cannabis regularly for insomnia. These preliminary findings support the need for adequately-powered randomized controlled trials with longer follow-up periods to evaluate the efficacy of targeting insomnia to reduce problematic cannabis use.
Support (If Any): R34 DA047466 (MPI: MA Ilgen, JT Arnedt)

0687

THE CIRCADIAN MISALIGNMENT IS ASSOCIATED WITH REDUCED SLOW-WAVE SLEEP IN INDIVIDUALS WITH AUTISM SPECTRUM DISORDER

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Introduction: Sleep disturbances are one of the key features among individuals with autism spectrum disorder (ASD). Many studies have uncovered critical developmental links between cognition, behavior, and sleep. It is suggested that the circadian system desynchronization plays a vital role in the development of ASD. While research on sleep disruption and circadian disturbance has accumulated, only a few studies have investigated a relationship between sleep architecture and circadian rhythm of individuals with ASD to date. We aim to elucidate the relation using the methods of dim light melatonin onset (DLMO) and ambulatory PSG.
Methods: Eleven individuals with autism (3 females, age: 13.07 ± 4.76 years; age range: 8-23 years) were recruited. After a week of systematic desensitization, an ambulatory overnight PSG was conducted in the participant's home. Participants collected saliva samples independently at home on two consecutive days. The first evening sample took place 3 hours before the average sleep onset time and continued each 30-minute interval afterward for a total of 5 evening samples. The DLMO was calculated for each day by plotting melatonin levels against the time of saliva sampling. Linear regression was used to determine the best-fit line equation for each plot to calculate when melatonin levels first reached 4 pg/mL and continued to rise.
Results: The percentage of Stage N3 sleep across the night was significantly negatively associated with phase angle (time between DLMO and sleep onset), revealing that Stage N3 percentage decreases as the phase angle increases. The Phase angle showed a significant positive association with REM percentage across the night. Additionally, a significant difference was found between the mean phase angle for the ASD subjects in this study and the mean phase angle expected from a group of age-matched, typically developing (TD) individuals.
Conclusion: Our data revealed that circadian misalignment in individuals with ASD is associated with sleep architecture characterized by reduced slow-wave sleep and increased REM sleep. Given the importance of slow-wave sleep for memory and cognitive functions, this finding may contribute to understanding the relationship between sleep alterations and brain development in ASD.
Support (If Any):

0688

INSOMNIA SYMPTOM SEVERITY PREDICTS GREATER ALCOHOL USE DURING THE COVID-19 PANDEMIC: A LONGITUDINAL STUDY

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Introduction: Individual stress levels undeniably increased following the start of the COVID-19 pandemic. Not surprisingly, sleep problems, including insomnia, have intensified during the pandemic due to the increase in overall stress levels. The impact that greater insomnia has had on other health outcomes, for example problematic drinking, has yet to be examined. Therefore, the aim of the present study was to assess whether greater insomnia symptom severity predicted future alcohol use patterns (i.e., frequency and severity).
Methods: The study used data from a nationwide sample of 2,979 who were surveyed at two different points during the COVID-19 pandemic (T1 = initial months after the start of the pandemic [April – June 2020]; T2 = 10-12 months later). Of those, 1,971 adults (mean age = 46.0 years; 80% women) reported having had an alcoholic beverage during the past 3 months and were included in the subsequent analyses. Insomnia symptom severity was assessed at both time points using the Insomnia Severity Index (ISI). Self-reported alcohol frequency (i.e., days per week) and severity (i.e., drinks per day) were assessed at T2.
Results: At T2, participants reported drinking alcoholic beverages (mean ± standard deviation) 2.7 ± 2.1 days during a typical week and drinking 1.8 ± 1.1 alcoholic beverages on days they did drink. According to results from separate multiple regression analyses, where T1 ISI scores were entered as the independent variable and alcohol frequency and severity were entered as the dependent variables, total ISI scores at T1 were associated with less frequent (β = -0.075, p = .001) but more severe drinking patterns (β = .088, $p < .001$). These associations remained significant while controlling for current insomnia symptom severity.
Conclusion: Baseline insomnia symptom severity was a predictor of future alcohol use patterns. Specifically, people with greater insomnia at T1 reported, on average, less frequent drinking (i.e., fewer days per week), yet greater consumption on days that they did drink alcohol. These data highlight the importance of assessing the impact that insomnia has had (and continues to have) on other behavioral health outcomes during the ongoing pandemic.
Support (If Any): K23HL141581 (PI: Vargas); R25HL10544 (PI: Jean-Louis); K24AG055602 (PI: Perlis)

0689

SEDATIVE AND STIMULANT MISUSE AND SUICIDE IDEATION IN A COMMUNITY SAMPLE

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Introduction: Previous studies have shown that prescription sleep medications are associated with suicide ideation. In this study we seek to identify the risk of off-label or illicit use of sedatives/hypnotics to predict suicidal ideation.
Methods: Data were from the Sleep and Healthy Activity, Diet, Environment, and Socialization (SHADES) Study, including N=1,003 working-age adults. For the present study, the data on off-label or illicit stimulants and sedatives were examined. Suicide ideation was assessed by whether participant reported any ideation in the past 2 weeks (PHQ, Item #9). Covariates included age, sex, education, race/ethnicity, and smoking. Additional models included adjustment for insomnia severity (ISI), daytime sleepiness (ESS), sleep duration (NHANES), psychiatric health (PHQ4), and general stress (PSS).
Results: In adjusted models examining sedatives/hypnotic use, higher likelihood of suicidal ideation was associated with any use (OR=1.77, 95%CI[1.26,2.47]), recent use (OR=2.71, 95 %CI[1.77,4.15]), desire to use (OR=2.14, 95%CI[2.74,6.26]), problematic use (OR=7.39, 95%CI[3.32,16.47]), role limitations (OR=7.94, 95%CI[3.39,18.59]), others expressing concern (OR=4.38, 95%CI([2.29,8.41]), and inability to control use (OR=7.15, 95%CI[3.60,14.20]). Similarly, models examining stimulant use showed that higher likelihood of suicide ideation was associated with history of use (OR=1.81, 95%CI[2.

01,3.93]), recent use (OR=4.44, 95%CI[2.63,7.49]), desire to use (4.82, 95%CI[2.78,8.34]), problematic use (OR=17.04, 95%CI[5.67,51.24]), role limitations (OR=9.07, 95%CI[3.47,23.68]), others expressing concern (OR=17.26, 95%CI([7.48,39.84]), and inability to control use (OR=6.44, 95%CI[3.26,12.71]). When sleep and mental health variables were added to the model, results were attenuated but remained significant at the p<.05 level.

Conclusion: Illicit use of substances that both promote sleep or arousal are associated with suicidal ideation, over and above contributions of sleep disturbance and mood/stress. It is possible that these behaviors represent self-medication attempts or an adverse effect of these drugs. Further research on these problematic associations is recommended.

Support (If Any):

0690

GREATER VARIABILITY OF SLEEP DISTURBANCE IS ASSOCIATED WITH EXECUTIVE FUNCTIONING AMONG PEOPLE WITH SCHIZOPHRENIA.

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Introduction: Sleep disturbance is common among people with schizophrenia (PwS) and has been found to be related to poorer cognition in both PwS and non-psychiatric comparison participants (NCs). However, previous findings have been inconsistent on which aspects of executive functioning are most impacted by sleep. Additionally, the relationship of sleep variability to cognition in PwS has yet to be explored. This study aims to further understand the link between cognitive dysfunction and disturbed sleep in PwS and inform future sleep interventions to improve functioning and disability in PwS.

Methods: The current sample includes 36 participants (18 PwS, 18 NCs) from the San Diego area who completed executive functioning assessments (Delis-Kaplan Executive Function System, D-KEFS). Participants wore a wrist-worn Fitbit activity tracker for a 7-day period to monitor their sleep and activity. Independent samples t-tests were used to examine differences in mean and variability of sleep measures (total sleep time or TST, wake after sleep onset or WASO, and efficiency) and cognitive function between patients and controls. Spearman correlations were run to identify preliminary relationships between cognitive performance and sleep in both groups.

Results: The PwS and NCs were comparable on sex (50% female, age (mean 53 ± 10 years) and race (majority Caucasian). PwS and NCs were similar in mean sleep and variability of sleep measures. PwS had significantly poorer performance in all cognitive domains ($p < 0.05$). In the PwS, more variable WASO and sleep efficiency were significantly correlated with worse performance on visual-motor sequencing and motor speed tasks (rs = -0.56 to -0.66). Additionally, trending relationships were found between better executive function composite scores with both longer mean TST (rs = 0.43) and higher mean sleep efficiency (rs = 0.30) over the monitoring period. Data collection is ongoing, and updated results will be presented at the conference.

Conclusion: Poor sleep is a prominent problem in PwS and has been associated with deficits in various cognitive domains. The present study examines the relationships of mean and variability of sleep with executive functioning. Preliminary results found strong associations between worse and more variable sleep and cognitive performance that may strengthen as sample size increases.

Support (If Any): National Institutes of Health [NIMH K23MH119375-01 (PI: Ellen E. Lee), NIMH R01MH094151-01 (PI: Dilip Jeste)]

0691

EXAMINING THE ASSOCIATIONS BETWEEN INSOMNIA AND ADULT-ADHD DIAGNOSIS IN ARMY SOLDIERS

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Introduction: Most research on the association between insomnia and attention deficit hyperactivity disorder (ADHD) has been conducted in children. It has been established that insomnia and ADHD are frequently comorbid, but less is known about whether the association extends to individual ADHD symptoms, or any possible moderators of the association. This study aims to understand whether sex plays a key role in the moderation between insomnia and ADHD in adult military servicemembers, as well as to investigate the relationship between insomnia diagnosis and ADHD symptomology.

Methods: Data were obtained from the All Army Study of the Army Study to Assess Risk and Resilience in Servicemembers (STARRS; N=21292; age 18-61, 88.24% male). Participants completed a survey that included items assessing insomnia and ADHD status based on DSM-5 criteria. Chi-squares and logistic regression, including interactions with sex, were used to examine the relationship between insomnia diagnosis and ADHD symptomology.

Results: There is a significant association between insomnia and ADHD diagnoses (r = 0.30; <.0001), consistent with prior literature. There was a small but statistically significant moderation by sex of the relationship between insomnia and ADHD diagnosis (Chi square = 9.43; p = .002). There was also a strong association between insomnia diagnosis and certain symptoms of ADHD: keeping attention on repetitive work (Chi square = 3687.75; <.0001), remembering appointments (Chi square = 3186.735; <.0001), and getting things in order (Chi square = 2756.28; <.0001).

Conclusion: Insomnia diagnosis was associated with both ADHD diagnosis and symptomology in a nationwide sample of army servicemembers, with the relationships being stronger in males compared to females. These findings highlight the importance of assessment and treatment of insomnia in patients with ADHD given their interrelationships.

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0692

PHYSICAL ACTIVITY AND SLEEP PATTERNS BEFORE AND DURING THE COVID-19-PANDEMIC – RESULTS FROM A CROSS-SECTIONAL AND RETROSPECTIVE STUDY

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Introduction: In general, higher physical activity is related to lower symptoms of insomnia, depression, and anxiety. The COVID-19-pandemic and its related restrictions unfavorably impacted both physical activity and sleep patterns. However, it remains unknown how better sleep and physical activity prior to the pandemic confer resilience to psychological and health-related disturbances during the pandemic. We investigated whether people with higher physical activity and lower insomnia scores before the COVID-19-pandemic also reported higher physical activity, lower insomnia scores, and lower symptoms of depression and anxiety during COVID-19-pandemic-related restrictions.
Methods: A total of 826 adults (mean age: 34.58±12.37 years) completed self-rating questionnaires covering physical activity, and symptoms of insomnia, depression, and anxiety during the COVID-19-pandemic. Further, participants retrospectively rated their physical activity and insomnia before the COVID-19-pandemic. Hypotheses were tested using Pearson's correlations and paired t-tests with significance at $p < 0.05$.
Results: Retrospectively assessed higher physical activity levels before the COVID-19-pandemic were associated with lower symptoms of depression ($r = 0.84$, $p = 0.041$), but neither insomnia ($r = 0.02$, $p = 0.67$) nor anxiety scores during the COVID-19-pandemic ($r = 0.05$, $p = 0.20$). Retrospectively assessed lower insomnia scores before the COVID-19-pandemic were associated with lower symptoms of insomnia ($r = 0.57$, $p < 0.001$), depression ($r = 0.30$, $p < 0.001$) and anxiety ($r = 0.31$, $p < 0.001$) during the COVID-19-pandemic. Consistent with other studies both insomnia and physical activity worsened; insomnia scores increased ($p < 0.001$, $d = 0.66$) and physical activity decreased ($p < 0.001$, $d = 0.19$) from before to during the COVID-19 pandemic.
Conclusion: These results suggest that those with lower levels of insomnia prior to the pandemic may be resilient to the psychological and health-related consequences of the COVID-19-pandemic and its related restrictions in everyday life, while those with higher physical activity prior to the pandemic were more resilient specifically to depression during the pandemic).
Support (If Any):

0693

A CHARACTERIZATION OF SOCIAL RHYTHMS IN OBSESSIVE-COMPULSIVE DISORDER

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Introduction: Recent evidence has shown that obsessive-compulsive disorder (OCD) is linked to shifts in biologically driven sleep timing, indicating the role of biological rhythms within the disorder. Specifically, initial evidence suggests that biological disruptions in OCD may play a role in symptom severity and OCD treatment efficacy. Germane to the study of biological rhythmicity is the consideration of social rhythms within OCD. Disruptions in social rhythmicity are found in other psychological disorders associated with biological rhythm vulnerabilities (i.e., Bipolar Spectrum Disorder, Depression, and Post-Traumatic Stress Disorder.) Given the shared features and high rates of comorbidity between OCD and these disorders, it is reasonable that social rhythm disruptions would be found in OCD as well. As no research to date has examined this, we sought to examine the regularity and distribution of social rhythm in individuals with clinically significant obsessive-compulsive symptoms. Further, we examined the role of affect and symptom severity across OCD subtypes.
Methods: 19 adults meeting criteria for a primary diagnosis of obsessive-compulsive disorder completed the Social Rhythm Metric at home for a period of 7 days. As part of a larger study, participants completed measures of sleep (Pittsburgh Sleep Quality Index), affect (Positive and Negative Affect Schedule), and obsessive-compulsive symptom severity and subtype (Obsessive-Compulsive Inventory) following diagnosis.
Results: We found the mean social rhythmicity in those with an OCD diagnosis to be 3.05 (SD=1.14.), similar to means found previously in other psychiatric disorders such as Bipolar Spectrum Disorder and Post-Traumatic Stress Disorder. Individuals with OCD who also reported delayed bedtimes were shown to have significantly lower social rhythmicity ($p=.005$) than those without delayed bedtimes. Additionally, we found that social rhythmicity correlated similarly across OCD subtypes and was not strongly correlated with negative affect.
Conclusion: In the current study, we provide a preliminary characterization of social rhythmicity in those with OCD. Results suggest that social rhythm may play a role in OCD similar to bipolar disorder and further study is warranted. Overall, this study contributes to burgeoning research into the association between biological rhythms and OCD.
Support (If Any):

0694

SAFETY AND EFFICACY OF ASHWAGANDHA FOR SLEEP: A SYSTEMATIC REVIEW

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Introduction: Ashwagandha has been around for about two thousand years. It is known as Indian Ginseng, winter cherry, and poison gooseberry. In recent years, the benefits of Ashwagandha tohave been explored in various studies due to the popularity of alternative therapeutic options in masses worldwide. Sleep is vital to the rejuvenation of the mind and body by replenishing the energy to carry on life activities. Sleep disorder is a major limitation in living life to full potential and Ashwagandha, known as beneficial for reducing stress and anxiety, is proven to improve the quality of sleep in individuals. In this systematic review, we study the efficacy of Ashwagandha in improving sleep and its safety for its users.
Methods: A literature search was conducted using relevant MeSH keywords, "Withania" and "Aswagandha" in the context of "Sleep," "Sleep-Wake Disorders," or "Sleepiness" in PubMed, PubMed Central, Medline, Web of Science, Biosis, and SciELO databases. We identified all published relevant articles from inception until 11/20/2021 and included 8 studies in our final qualitative synthesis review.
Results: Ashwagandha has been shown to have beneficial effects in decreasing time to fallasleep, improving duration, quality of sleep, and

mood upon awakening. Many studies demonstrated these beneficial effects with clinical significance using multiple rating scales of assessment. Most studies explored the safety profile of Ashwagandha for the subjects. In most studies, there were no adverse events reported, and its use is termed safe and beneficial. Few studies reported some minor side effects, such as in a randomized clinical trial, RCT, by Deshpande A. et al. (2020), headaches, fever, acid reflux, and allergic dermatitis were reported.1A randomized clinical trial by Langade D. et al. in 2019 showed that Ashwagandha shortens the sleep onset latency significantly (p,0.019) after 10 weeks of with test [29.00(7.14)] compared to placebo [33.94(7.65)]. There was a significant improvement in sleep efficiency, SE scores at 83.48 (2.83) after 10 weeks 75.63(2.70) for the test at the baseline compared to placebo.2 In another pilot study by Sharma H. et al. (2007), there was a significant improvement in sleep duration, sleep quality (91.67%, $p<0.001$), and mood upon awakening (88.89%, $p<0.001$).3

Conclusion: The findings support the efficacy of Ashwagandha for improving sleep quality. Due to the limited availability of data and well-designed studies warrants further research through cohort studies and clinical trials to determine the exact mechanism of action and benefits for sleep.

Support (If Any): References:1. Deshpande, A., Irani, N., Balkrishnan, R., & Benny, I. R. (2020). A randomized, double-blind, placebo-controlled study to evaluate the effects of Ashwagandha (Withania somnifera) extract on sleep quality in healthy adults. Sleep medicine, 72, 28–36. https://doi.org/10.1016/j.sleep.2020.03.0122. Langade, D., Kanchi, S., Salve, J., Debnath, K., & Ambegaokar, D. (2019). Efficacy and Safety of Ashwagandha (Withania somnifera) Root Extract in Insomnia and Anxiety: A Double-blind, Randomized, Placebo-controlled Study. Cureus, 11(9), e5797. https://doi.org/10.7759/cureus.57973. Sharma, H., Chandola, H. M., Singh, G., & Basisht, G. (2007). Utilization of Ayurveda in health care: an approach for prevention, health promotion, and treatment of disease. Part 2--Ayurveda in primary health care. Journal of alternative and complementary medicine (New York, N.Y.), 13(10), 1135–1150. https://doi.org/10.1089/acm.2007.7017-B

0695

COMPARISON OF A DISPOSABLE HOME SLEEP APNEA TEST TO POLYSOMNOGRAPHY IN PATIENTS REFERRED FOR OBSTRUCTIVE SLEEP APNEA INVESTIGATION.

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Introduction: In an effort to decrease cost and improve healthcare efficiency for the diagnosis of OSA, home sleep apnea tests (HSAT) continue to be developed and improved to enhance diagnostic accuracy. A disposable FDA cleared HSAT capable for multi-night evaluations, that uses peripheral arterial tonometry (PAT) to assess for sleep apnea. The form factor and care pathway have a strong appeal for a patient's experience of the diagnostic journey. The data obtained from the study informs the strengths, weaknesses, and reliability of new HSAT technology in the clinical management of sleep apnea.
Methods: A prospective, open-label, single group study was conducted in a certified PSG sleep lab. Patients underwent a single overnight PSG study with concurrent disposable HSAT (NightOwl Mini, Ectosense) testing. The patient population were adults referred to a sleep lab for investigation of OSA. PSG recorded sleep time of ≥4hrs was required to be evaluable. The primary endpoint was clinical decision agreement for treatment, based on AHI threshold ≥15 events/hour. Pairwise comparisons were performed against PSG, and agreement was assessed using Cohen's Kappa statistic.
Results: A total of 50 participants completed the study. There were 42 participants included in the analysis. The disposable HSAT had a Kappa value of 0.667 (95% CI 0.448, 0.886) for the clinical decision for treatment compared to PSG, which represents substantial agreement. The sensitivity and specificity were 0.769 and 0.938, respectively. For AHI, the disposable HSAT had a Spearman rank correlation of 0.903 with PSG. OSA severity categorization (based on AASM definitions), was also assessed, with disposable HSAT showing a weighted Kappa value of 0.646 (95% CI 0.501, 0.792). A limitation of this study was the single night use since the HSAT recommends multiple nights for a more accurate assessment.
Conclusion: A disposable HSAT was found to have substantial agreement with PSG's clinical decision for treatment based on AHI values, despite the assessment being from a single night as opposed to multiple night usage. The performance and form factor make it an attractive HSAT to assess for sleep apnea and facilitate OSA diagnosis.
Support (If Any): ResMed

0696

THE APPLICATION OF A QTC RISK SCORE IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Evidence suggests that patients with obstructive sleep apnea (OSA) are at risk for QTc prolongation which, is a known risk factor for arrhythmias, sudden cardiac death and all cause mortality. QTc risk scores have been implemented widely to help physicians identify patients at risk for mortality however, these risk scores have not been routinely implemented in patients undergoing sleep studies or those diagnosed with OSA. The goal of this study was to evaluate the distribution of pro-QTc risk scores for patients with and without OSA diagnosed at our facility and its relationship to mortality.
Methods: Medical records of all patients undergoing a sleep study at our sleep center from 2/2012 through 8/2020 were analyzed. Patients were identified with or without OSA based on polysomnography or Type III home sleep study. The pro-QTc risk score was calculated with 1 point assigned for: female sex, QT-prolonging diagnoses and conditions, QT-prolonging electrolyte abnormalities, and QT-prolonging medications defined as medications with known and possible risk of torsades de Pointes based on the CredibleMeds website. Mortality was determined if a death date was noted in the electronic medical record.
Results: A total of 2,834 patient records (54% male, age 58 ± 16 years, n=106 dead) were evaluated. A total of 2,265 patients (age 58 ±15, 54% male, 89 dead) were identified as having OSA and 428 patients (age 54 ± 18, 41% male, 17 dead) did not have OSA. The remaining patients (n=141) had either central sleep apnea or a combination of both obstructive and central sleep apnea. A higher pro-QTc score was associated with greater mortality regardless of presence of OSA (HR 1.3, $p<0.0001$, 95% CI 1.12 -1.46) after adjusting for age. The association of pro-QTc with mortality was not increased in the moderate or severe OSA groups compared to those without OSA or mild OSA ($p=0.36$).
Conclusion: Increased pro-QTc scores were associated with greater mortality in all patients undergoing sleep studies. OSA status did not affect this association.
Support (If Any): American Academy of Sleep Medicine Foundation (203-JF-18), National Institutes of Health (HL126140, 2L30HL154400-023), University of Arizona Health Sciences Career Development Award (5299903), and University of Arizona Faculty Seed Grant (5833261)

0697

IMPROVING DETECTION OF OBSTRUCTIVE SLEEP APNEA IN PREGNANT WOMEN USING A SIX-POINT SCREENING TOOL

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Introduction: Pregnant patients with obstructive sleep apnea (OSA) are at higher risk for adverse outcomes. There are currently no established screening tools for pregnant women. OSA in pregnancy continues to be underdiagnosed resulting in missed opportunities to prevent possible adverse outcomes.
Methods: A screening pilot program was implemented at our general obstetrics and maternal fetal medicine (MFM) clinic to improve diagnosis of OSA among pregnant women. Patients were screened by a nurse for snoring/apneas, BMI > 35, essential hypertension, glucose disorders, neck size > 36 cm, and symptoms of excessive daytime sleepiness. If a patient scored 3/6 or greater, a home sleep apnea test (HSAT), and in some cases an in-lab sleep study (PSG), was recommended to test for OSA after discussion of risks and benefits with an obstetrician.
Results: Since the initiation of the screening program, 302 women screened positive for OSA based on our 6-point screening tool. Average gestational age at the time of screening was 14.34 +/- 7.97 weeks. Of the women who scored ≥3 on the

6-point screening tool, 92 (30.46%) were referred directly to a sleep study and 31 (10.3%) received a referral to see a sleep medicine provider. A total of 78 underwent sleep testing and 58 (74.4%) were diagnosed with OSA with an apnea-hypopnea index (AHI) ≥ 5. Most patient were African American (67.9%) with an average age of 31.49 +/-5.74. The diagnosis of OSA correlated moderately well with the total score of the 6-point screening tool (p<.001), BMI (p=.005), essential hypertension (p=.01), glucose disorders (p=.07), and neck size (p=.039). Only a BMI of >35 was independently associated with a 3.7 increase in odds for OSA (95%CI=1.17, 11.76, p=.026).

Conclusion: A significant increase in screening for obstructive sleep apnea was achieved with implementation of the new screening protocol. Ease of use makes the six-point screening protocol a useful tool in clinic. More research is needed to test the accuracy of the six-point screening as a testing tool in this population. Additional barriers to screening and testing for OSA in pregnancy, including social and lifestyle factors should be explored in more depth.

Support (If Any):

0698

GENETIC SUSCEPTIBILITY TO ELEVATED C-REACTIVE PROTEIN AND RISK OF OBSTRUCTIVE SLEEP APNEA IN US MEN AND WOMEN

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Introduction: Obstructive sleep apnea (OSA) may trigger inflammation. However, growing evidence suggests a role for inflammation in predisposing OSA through increased upper airway size/collapsibility and altered ventilatory control. Inflammation also promotes sleep disturbance and excessive daytime sleepiness (EDS). Genetic analysis may provide further insights into the causal relationship between chronic inflammation and OSA incidence.

Methods: In 33,171 participants of European ancestry from the Nurses' Health Study (NHS), NHS2 and the Health Professionals Follow-up Study, we quantified genetic predisposition to inflammation using a weighted polygenic risk score (PRS) based on 51 loci identified for C-reactive protein (CRP) in a recent genome-wide association meta-analysis. OSA was determined using self-reported diagnoses, which were demonstrated to reliably indicate moderate-to-severe OSA in these cohorts. EDS was defined based on self-reports of disrupted daily activities due to sleepiness ≥4 days/week. Multivariable logistic regression was used to estimate the odds ratio (OR) for OSA risk according to the number of risk alleles, adjusted for age, sex, BMI, genotyping platforms and 10 genetic principal components. Mendelian randomization using individual-level participant data was performed to evaluate the association between genetically determined CRP levels and OSA risk.

Results: A total of 3,163 participants (9.5%) had clinically diagnosed OSA (575 with EDS). While the CRP PRS (explained 5.0% variance in circulating levels) was not associated with OSA risk overall (OR per increment of 5 risk alleles: 1.00; 95% CI: 0.96, 1.04; p=0.96), a significant positive association was observed for OSA with concurrent EDS (Comparable OR: 1.13; 95% CI: 1.04, 1.23; p=0.003). In contrast, among participants without clinically diagnosed OSA, there was no association between the PRS and EDS (Comparable OR for EDS: 1.02; 95% CI: 0.98, 1.06; p=0.28). In Mendelian randomization, each doubling of genetically elevated CRP was associated with 44% higher odds of OSA with EDS (95% CI: 1.13, 1.82).

Conclusion: Chronic inflammation (characterized by elevated CRP levels) may be casually associated with risk of developing symptomatic OSA with EDS, but not OSA or EDS alone. To confirm our findings, future investigations are needed to evaluate the genetic associations with objective measures of OSA severity across diverse populations and elucidate mechanisms driven by specific inflammatory mediators.

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0699

PREDICTORS OF MORTALITY IN OBESITY HYPOVENTILATION SYNDROME: A NATIONAL INPATIENT SAMPLE STUDY

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Introduction: Obesity Hypoventilation Syndrome (OHS) has been linked to adverse cardiovascular outcomes and mortality in multiple observational studies. Few single-center observational studies have reported poor outcomes of inpatient admissions in OHS. Data regarding nationwide outcomes of hospital admissions in OHS is scarce. We conducted a retrospective study to identify predictors associated with mortality using the National Inpatient Sample (NIS) database.

Methods: We reviewed the NIS database to assess the outcomes of all weighted hospitalizations with an ICD 9 or ICD 10 code for OHS from 2007 to 2018. Patients with age <18, BMI <35, and ICD 9 and ICD 10 codes for neuromuscular disorders, chest wall disorders, or miscellaneous disorders of hypoventilation during the index hospitalization were excluded. The primary outcome was in-hospital mortality. We applied multivariable Cox regression modeling for the association of inpatient mortality with the diagnosis of OHS adjusted for age, sex, race, smoking history, BMI, GERD, OSA, renal failure, use of non-invasive and invasive MV, bronchoscopy, urban vs. rural hospital location, academic hospital status, COPD, asthma, acute PE, pulmonary hypertension, pneumonia and dependence on long-term oxygen or invasive or non-invasive mechanical ventilation. Hazard ratios (HR) with 95% confidence intervals (CI) were reported.

Results: A total of 1,115,927 hospitalizations were included in the final analysis. Increasing age, Native American race (compared to White), higher BMI, renal failure, a requirement of invasive and non-invasive mechanical ventilation, acute pulmonary embolism, ILD, and pulmonary hypertension were independently associated with increased risk of mortality during the hospitalization (p-value <0.05). Female sex, academic and urban hospital status, smoking, COPD, asthma, GERD, and OSA were independently associated with reduced risk for inpatient mortality (p-value <0.05). Black, Hispanic, Asian or Pacific Islander races

(compared to White) were also associated with decreased risk of mortality (p-value <0.05). Home ventilator dependence, pneumonia, or oxygen dependence were not significantly associated with the risk of death.
Conclusion: Invasive mechanical ventilation (aHR 3.71, 95%CI 3.62-3.81) acute renal failure (aHR 1.93, 95%CI 1.87-2.00), and BMI > 70 (aHR 1.54, 95%CI 1.46-1.63) were the strongest predictors of inpatient mortality in our review of nationwide hospitalizations in OHS.
Support (If Any):

0700

PROSPECTIVE AND CROSS-SECTIONAL ASSOCIATIONS BETWEEN SLEEP APNEA AND DISEASE IN A PHENOME-WIDE ANALYSIS OF A CLINICAL BIOBANK

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Introduction: The potential contributions of sleep apnea (SA) to the risk of developing many diseases remain unidentified due to survey limits in cohort studies. We aimed to identify novel associations between common comorbidities in participants with SA compared to matched controls in a clinical biobank by leveraging electronic health record (EHR) information informed by natural language processing (NLP)-based phenotyping. We also investigated the relationship between polysomnography (PSG) statistics and these diseases.
Methods: The sample from the Mass General Brigham Biobank was comprised of 4,876 NLP-defined SA adult cases and 12,314 controls matched on age, biological sex, BMI, race/ethnicity, and healthcare utilization with a "data floor" of minimal EHR information. Prospective (>1 year post SA diagnosis) and cross-sectional analyses considered 527 merged PheCode groups of NLP-defined diseases with ≥1% prevalence. Sex-stratified analyses were also performed. Associations with case/control status were further analyzed using rank-normalized Apnea-hypopnea Index (AHI3p) and the percentage of sleep with hypoxemia <88% (Per88) in 4,544 participants, adjusting for age, biological sex, BMI, and race/ethnicity in a smaller single-night clinic sample (57% with AHI3p ≥15).
Results: In prospective analyses, 170 diseases had significant odds ratios (OR) when comparing participants with SA versus controls following Bonferroni adjustment ($p < 3.3 \times 10\text{-}5$), 8 of which were confirmed using PSG. Lead associations included a broad range of pathophysiology (e.g. chronic pulmonary heart disease, tension headache, and chronic fatigue syndrome). Diseases with higher ORs in women compared to men included chronic pulmonary heart disease, chronic renal failure, congestive heart failure not otherwise specified (NOS), and gout (p for sex interaction $\leq 3.2 \times 10\text{-}3$). Significant associations with PSG traits included hypertensive heart disease, fluid overload, and heart failure NOS ($p \leq 7.8 \times 10\text{-}5$). 281 diseases significantly differed in cross-sectional analyses, 41 of which were confirmed using PSG. 37 of these 41 associated diseases had lower p-values for Per88 compared to the AHI3p.
Conclusion: Sleep apnea may contribute to disease risk across a broad range of pathophysiology, with increased sex-specific risks for multiple common comorbidities. Future work should investigate the specific role of hypoxemia in these associations.
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0701

STOP-BANG SCORE, AGE, AND BODY MASS INDEX PREDICT SEVERITY OF SLEEP DISORDERED BREATHING IN WOMEN VETERANS

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Introduction: Despite increasing evidence that sleep disordered breathing (SDB) is common in women veterans, little is known of how to screen for SDB in this population. Some evidence suggests there are sex-related differences in SDB presentation, where women may be more likely to present with fatigue or depression, compared to men who may present with daytime sleepiness. The goal of this study was to evaluate whether commonly used measures predict SDB in women veterans.

Methods: Women veterans (N=179) without treated SDB, but with 1 or more SDB risk factors (identified from electronic medical records) completed baseline assessment as part of an ongoing controlled trial of treatment for SDB. Measures included: age, body mass index (BMI), Epworth Sleepiness Scale (ESS), Flinders Fatigue Scale (FSS), Insomnia Severity Index (ISI), Patient-Health Questionnaire 9-item (PHQ-9), STOP-BANG score, and apnea-hypopnea index (AHI via WatchPAT home sleep apnea testing). Descriptive statistics and bivariate correlations testing the relationship between AHI and other measures were performed.
Results: Mean age was 49.8 [±13.8] years and BMI 29.6 [±6.0] kg/m2. Mean ESS was 8.1, FFS 13.9, ISI 14.0, PHQ-9 7.1, and STOP-BANG score 2.7. Mean AHI was 15.4 [±13.2], where higher AHI correlated with higher BMI (r=0.3, p<0.001), higher STOP-BANG score (r=0.4, p<0.001) and older age (r=0.4, p<0.001).
Conclusion: These findings support the use of the STOP-BANG score to predict SDB severity in women veterans with risk factors for SDB. Age and BMI may be particularly important predictors of SDB in this population. Sleepiness, depression, insomnia, and fatigue questionnaires were not related to SDB severity. Further work is needed to understand the role of patient-reported symptoms in those at-risk for SDB and to inform guidelines for the recognition of SDB in this important and understudied population.
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0702

REAL WORLD CHARACTERISTICS OF CENTRAL SLEEP APNEA: EXPERIENCE AT ONE ACADEMIC MEDICAL CENTER

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Introduction: Despite growing recognition of sleep disordered breathing, the prevalence and clinical characteristics of central sleep apnea (CSA) in real-world sleep referral populations remain poorly understood. We used historical data from the University of Pittsburgh Medical Center (UPMC) to assess the differences in patients with CSA compared to obstructive sleep apnea (OSA).
Methods: We retrospectively reviewed the medical records of 29,803 patients who underwent in-lab diagnostic polysomnography at six UPMC sleep labs between 2004 and 2018. Baseline clinical characteristics and polysomnography results including apnea hypopnea index (AHI), central apnea index (CAI), and obstructive apnea index (OAI) were extracted from the electronic health record. Among those with AHI≥5, patients were categorized as CSA if CAI≥5 and CAI>OAI or OSA if OAI≥5 and OAI>CAI.
Results: CSA and OSA were identified in 2% (583/29,803) and 34% (10,090/29,803) of patients, respectively, while 32% had AHI≥5 but didn't meet either CSA or OSA criteria (CAI and OAI<5 or CAI=OAI) and the remaining 32% had AHI<5. Median AHI was 41 events/hr for CSA vs. 36 events/hr for OSA (p<0.01). The median percentage of apneas being central was 78% for CSA vs. 0% for OSA (p<0.01). Compared to patients with OSA, those with CSA were more likely to be male (78% vs. 66%), older (58 vs. 54 yrs), have lower body mass index (32 vs. 35 kg/m2), have heart failure (23% vs. 13%), atrial fibrillation (19% vs. 8%), stroke (5% vs. 2%), myocardial infarction (7% vs. 2%), diabetes (27% vs. 22%) and have received a prescription for methadone (1.5% vs. 0.3%) [all p<0.01]. In multivariable logistic regression, all factors except stroke remained independently associated with CSA. The strongest predictors of CSA (compared to OSA) were methadone prescription (adjusted odds ratio=4.9, 95% CI [2.3-10.6]) and myocardial infarction (1.9, [1.3-2.8]). In contrast, the prevalence of CSA and OSA were similar across races.
Conclusion: CSA was identified in 2% of patients undergoing polysomnography in everyday clinical practice and independently associated with a variety of clinical characteristics. Recognition of characteristics associated with CSA can lead to more targeted screening and treatment in a broader population beyond just heart failure patients.
Support (If Any): ZOLL Respicardia, Inc.

0703

DEVELOPMENT OF THE OBSTRUCTIVE SLEEP APNEA QUESTIONNAIRE FOR USE IN CLINICAL PRACTICE

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Introduction: An American Academy of Sleep Medicine (AASM) task force identified a need for a valid, reliable, patient-reported outcome measure (PROM) to monitor obstructive sleep apnea (OSA) in adults in clinical practice. Ideally, the PROM should be easy and quick to complete (<5 minutes), available electronically, and accepted by clinicians treating OSA. Development of the Obstructive Sleep Apnea Questionnaire (OSA-Q) was undertaken to meet this need and was guided by the 2009 Food and Drug Administration (FDA) Guidance for Industry on developing PROMs.
Methods: Development of the OSA-Q included interviews with patients with OSA (n=14) to identify important concepts to them, conceptual model and draft questionnaire formulation, and cognitive interviews (n=14) to assess content validity and guide revisions to wording, item comprehension and redundancies, recall period, and response options. Usability of the electronic version of the OSA-Q was then assessed in patients with OSA. Finally, acceptability and utility of the OSA-Q in clinical practice was evaluated by surveying clinicians in ten geographically-dispersed US sleep clinics.
Results: Patient interviews were used to construct a conceptual model for the draft OSA-Q which served as a basis for generating 44 items about daytime/night-time symptoms and OSA impacts. Cognitive interviews identified poorly worded, ambiguous, and redundant items to inform revisions, resulting in a revised draft OSA-Q (3 domains, 28 items). Subsequently, clinicians (n=13) administered the draft OSA-Q to five patients each, obtained patients'

feedback on the OSA-Q, and completed a survey regarding its comprehensiveness, format/content, utility, and acceptability in clinical practice. These clinicians endorsed the OSA-Q for ease of use, language simplicity, convenience of electronic platform, and speed of completion (3-5 min). They also indicated that the OSA-Q would be useful in clinical practice and enhance patient communications (69% and 77%, respectively). The OSA-Q was revised and finalized for psychometric testing, based on clinician comments.
Conclusion: A new AASM-supported PROM to monitor OSA in clinical practice has been developed, including the patients' perspective according to FDA guidance. This OSA-Q shows content validity and is positively perceived by clinicians. Psychometric testing of the OSA-Q is underway to establish its measurement properties and demonstrate its validity, reliability, and sensitivity to change in patients with OSA.
Support (If Any): This work was funded by the American Academy of Sleep Medicine.

0704

ASSOCIATION OF HIGH-RISK OBSTRUCTIVE SLEEP APNEA WITH INFLAMMATORY MARKERS IN ASYMPTOMATIC YOUNG AND MIDDLE-AGED ADULTS IN MIAMI HEART (MIHEART) STUDY AT BAPTIST HEALTH SOUTH FLORIDA

Harneet Walia[1], Anshul Saxena[1], Shozab Ali[1], Javier Valero-Elizondo[2], Miguel Cainzos-Achirica[2], Theodore Feldman[1], Khurram Nasir[2], Jonathan Fialkow[1]
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Introduction: Obstructive Sleep Apnea (OSA) is associated with elevated inflammatory markers in those with cardiovascular disease (CVD). In contrast, there are limited data to support this association in asymptomatic individuals. The Miami Heart Study measured high sensitivity C-reactive protein (hs-CRP), Interleukin 6 (IL-6) and TNF- Alpha in a cohort of asymptomatic individuals from the general population. We hypothesized that there will be significant association of high OSA risk with inflammatory markers in Miami Heart Study cohort free of CVD.
Methods: We analyzed data for 2359 clinical CVD-free participants from the Miami Heart Study, age 40-65 years (May 2015-Sept 2018). High OSA risk included those with an OSA diagnosis and/or those with high risk using the Berlin questionnaire. Poisson regression analyses were utilized to examine the associations between high OSA risk (reference: low risk) and hs-CRP, IL-6 and TNF alpha levels (continuous), in univariate and multivariate models (adjusting for age, sex, race/ethnicity [model 2], and BMI, diabetes, hypertension, high cholesterol and smoking [model 3]).
Results: 800 (34%) participants were categorized as high OSA risk. Those with high OSA risk tended to be Hispanic, male, and with a higher CVD risk factor burden, especially obesity (64% vs 17%, $p < 0.005$) when compared to those with low OSA risk. Patients with high OSA risk had higher median values of hs-CRP (2.1 vs 1.0), IL-6 (2.0 vs 1.4), and TNF-alpha (1.2 vs 1.1) when compared to those with low OSA risk (all $p < 0.001$). When adjusting for age, sex, and race/ethnicity, the mean difference between patients with high and low OSA risk in hs-CRP was 1.86 (95% CI 1.69, 2.02), and 0.85 (95% CI 0.71, 0.99) in IL6. When further adjusting for CVD risk factors, these differences were attenuated, but statistically significant (hs-CRP [0.32, 95% CI 0.16, 0.48]; IL6 [0.37, 95% CI 0.21, 0.53]). In adjusted analyses, TNF-alpha was not statistically different between OSA risk populations.
Conclusion: Individuals at high risk for OSA had significant higher levels of hs-CRP and IL6, signaling to potential role of OSA in mediating the increased inflammatory markers in asymptomatic CVD risk free individuals.
Support (If Any): Baptist Health South Florida

0705

ASSOCIATION OF HIGH RISK OBSTRUCTIVE SLEEP APNEA WITH ATHEROSCLEROTIC PLAQUE, CORONARY STENOSIS AND CORONARY ARTERY CALCIUM SCORE IN ASYMPTOMATIC YOUNG AND MIDDLE-AGED ADULTS IN THE MIAMI HEART (MIHEART) STUDY AT BAPTIST HEALTH SOUTH FLORIDA

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Introduction: Obstructive Sleep Apnea (OSA) is associated with clinical cardiovascular disease (CVD). There are limited data evaluating association with subclinical CVD measured by cardiac computed tomography (CT). We hypothesized there would be significant association between high OSA risk and atherosclerotic plaque, coronary stenosis, and coronary artery calcium (CAC) score in Miami Heart Study cohort free of CVD.
Methods: Data from CVD free 2359 participants, age 40-65 years (May 2015-Sept 2018) from greater Miami were analyzed. Cardiac CT measured CAC, coronary plaque burden and stenosis. High OSA risk was defined as either OSA diagnosis and/or a high risk from Berlin questionnaire. Logistic regression examined association between high OSA risk (reference low OSA risk) and any plaque, coronary stenosis >50%, and CAC (> 0 and > 100 vs 0) in unadjusted models, and after accounting for age, sex, race/ethnicity (model 2), and BMI, diabetes, high cholesterol, and smoking (model 3).
Results: 800 (34%) participants had high OSA risk; were more likely to be male, Hispanic, with higher CVD risk factor burden compared to low OSA risk. High OSA risk had higher prevalence of any plaque (60% vs 44%), coronary stenosis ≥ 50% (8.3% vs 4.8%), CAC scores >0-99 (34% vs 26%), and CAC score ≥ 100 (16% vs 12%), compared to low OSA risk (all $p < 0.05$). High OSA risk was associated with higher odds of any plaque, coronary stenosis ≥ 50%, high-risk plaque features, CAC > 0 and CAC ≥ 100 in univariable models. When adjusting for age, sex and race/ethnicity, these patterns persisted, with 1.58 higher odds of any plaque (95% CI 1.31, 1.91), 1.54 higher odds of coronary stenosis ≥ 50% (95% CI 1.08, 2.20), 1.37 higher odds of having CAC > 0 (95% CI 1.13, 1.66). Associations became non-statistically significant when adjusting for CVD risk factors, except any plaque, which was independently associated after fully adjusted (OR 1.31 (1.05, 1.63).
Conclusion: Individuals with high risk for OSA, significantly prone for CVD risk factor, have higher likelihood for presence of any plaque, significant stenosis and CAC scores > 0, with these associations mostly mediated by CVD risk factors.
Support (If Any): Baptist Health South Florida

0706

OLDER AGE IS A STRONG RISK FACTOR FOR SUPINE-POSITION DEPENDENT OBSTRUCTIVE SLEEP APNEA

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Introduction: Positional obstructive sleep apnea (p-OSA) is commonly defined as a supine-position dependent OSA with the ratio of apnea hypopnea index while supine (s-AHI) to AHI while non-supine (ns-AHI) being greater than 2. Prevalence of p-OSA amongst OSA patients varies from 20 to 75% depending on the study. Previous studies using this definition showed p-OSA being more likely to be in subjects with lower BMI, smaller neck circumference, and milder OSA compared to patients with non-positional OSA (np-OSA). The primary aim of this study is to assess the prevalence of p-OSA using different cutoffs of s-AHI/ ns-AHI ratio and to evaluate the correlation of p-OSA with age, gender, neck circumference (NC), and medical comorbidities of OSA.

Methods: 846 participants aged 18 year or older who underwent diagnostic polysomnography at an academic sleep disorders center from July 2011 to June 2012 were recruited for this study. Inclusion criteria were total sleep time greater than 120 minutes, diagnosis of OSA, sleep time in supine position more than 10 minutes, and sleep time in non-supine position more than 10 minutes. We tested supine position dependency using the ratio of supine AHI to non-supine AHI (s-AHI/ns-AHI) and classified the subjects into p-OSA and np-OSA based on the ratio of s-AHI/ns-AHI at 2, 3, 5, and 10 respectively to assess the prevalence of p-OSA using each cut-off. For the multivariable logistic analysis of p-OSA and its association with independent variables, s-AHI/ns-AHI of 10 and ns-AHI of being less than 5 was used to define p-OSA. Multivariate analysis was conducted to explore correlation with age, gender, neck circumference, and OSA comorbidities (COPD, hypertension, diabetes). Age of 60 was used to define older age group.

Results: Of 356 eligible participants, p-OSA was highly prevalent when conventional s-AHI/ns-AHI ration of 2 was used resulting in p-OSA in 274 subjects (prevalence of 77%). The mean value of s-AHI/ns-AHI in this aggregate group of all 356 subjects was 11.7 (much higher than conventional ratio of 2). Thus, using s-AHI/ns-AHI ratio of 10 as the cut-off for supine-position dependency, 114 subjects were classified to have p-OSA. Logarithmic multivariate analysis demonstrated that there was a statistically significant, correlation between age and s-AHI/ns-AHI after adjusting for gender, NC, diabetes, hypertension, and COPD (p-value < 0.05). In the older group, 44.3% of older patient had s-AHI/ns-AHI > 10 compared to 30% of young patients (p-value < 0.05). 41.8% of the older group met criteria for p-OSA compared to 29.2% of younger group (p-value < 0.05). Being of older age was strong risk factor for p-OSA with odds ratio (OR) of 1.76 (confidence interval 1.01 – 3.09; p< 0.05). This effect of age on p-OSA was further modified by gender and diabetes. Older men had significantly higher OR of 3.23 (CI 1.51-6.89) for p-OSA whereas olde women was with OR of 0.79 (CI 0.33-2.42). Older persons with diabetes showed significantly higher OR than non-diabetic older persons (OR of 6.81 [CI 1.7-26.8] vs OR 1.22 [CI 0.65-2.29] respectively).

Conclusion: Supine-position dependency of obstructive events is much stronger than the conventional ratio of two. Thus, stricter definition is positional OSA is desired for more clinically meaningful use of this subgroup of OSA. Using stricter definition with higher supine-position dependency, an older age is significantly associated with positional OSA, especially in men or in diabetic patients.

Support (If Any):

0707

EFFECTS OF OBSTRUCTIVE SLEEP APNEA ON ANTI-SARS-COV-2 IGG LEVELS IN OLDER ADULTS VACCINATED AGAINST COVID-19

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Introduction: Sleep disorders and sleep deprivation induces decreased antibody response following vaccination for different viral diseases (including H1N1, influenza and hepatitis A). The same has been speculated for COVID-19. This study aimed to assess whether obstructive sleep apnea (OSA) reduces antibody levels after COVID-19 vaccination among older adults.

Methods: This was a convenience-sample study composed of older adults (≥60 years old). Those who underwent polysomnography at the Sleep Institute (São Paulo, Brazil) and received complete COVID-19 vaccination schedule were considered eligible. Individuals with previous diagnosis of COVID-19, less than 15 days between vaccination and IgG testing, or CPAP use in the last 3 months were excluded. Anti-SARS-CoV-2 IgG levels were measured using a chemiluminescence assay. The participants were distributed in the following groups, according to their apnea-hypopnea index (AHI): no/mild OSA (AHI<15), moderate OSA (AHI≥15 and <30) and severe OSA (AHI≥30). The effects of OSA on IgG levels (ANOVA), the correlation between IgG levels and AHI (Spearman's correlation test) and the association between serostatus (positive vs. negative) and OSA severity levels (X2 test) were analysed. Results were considered as statistically significant when p<0.05.

Results: The sample included 122 older adults (median age 72.0 - IQR: 5.7), of whom 35 (28.6%) had AHI no/mild OSA; 31 (25.4%) had moderate OSA, and 56 (45.9%) had severe OSA. Oxford/AstraZeneca was the most referred vaccine (n=111, 91.0%), followed by CoronaVac (n=9, 9.0%). Seropositive status (IgG count ≥50.0 AU/mL) was observed in 90.2% of the participants and the median IgG levels in the complete sample was 273.0 AU/ML (IQR: 744.0). No/mild, moderate and severe OSA groups presented IgG levels of 482.0 (IQR: 677.0), 285 (IQR: 884.0) and 181.0 (IQR: 598.0), respectively, with no statistical difference them (p=0.606). There was no statistically significant correlation between AHI index and IgG levels (Spearman's rho=-0.169, p=0.063) and no significant association between serostatus and OSA severity groups (X2=0.912; p=0.634).

Conclusion: Anti-SARS-CoV-2 IgG levels after vaccination are not significantly affected by OSA among older adults. Thus, despite being at higher risk for severe cases, OSA does not decrease the antibody response following vaccination against COVID-19.

Support (If Any): AFIP, CNPq, CAPES

0708

STAGE-DEPENDENT DIFFERENCES IN CENTRAL SLEEP APNEA (CSA) PREDOMINATE IN REMEDĒ SYSTEM PIVOTAL TRIAL PARTICIPANTS

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Introduction: Differences in neuroventilatory control can impact the type and severity of sleep disordered breathing between non-REM and REM sleep. We examined the distribution of central apneic episodes in polysomnograms from subjects with predominantly central sleep apnea, who received phrenic nerve stimulation.
Methods: Baseline in-lab polysomnograms from patients enrolled in the remedē System Pivotal Trial were scored by a central core laboratory (n=151). Participants with predominantly CSA were enrolled if the apnea-hypopnea index (AHI)≥20/hr, the central apnea index (CAI) exceeded the obstructive apnea index (OAI), and the OAI did not exceed 20% of the total AHI. This post-hoc analysis compared sleep apnea indices in REM and non-REM sleep in those with ≥5 minutes REM sleep (n=131). Within-patient median non-REM - REM differences were calculated and compared.
Results: REM sleep time was 40 [Q1=28, Q3=64] minutes, and non-REM sleep time was 301 [Q1=269,Q3=344] minutes. AHI in REM sleep was 22/hr [Q1=9,Q3=44] and was 46/hr (Q1=33,Q3=60) in non-REM sleep, yielding a within-patient difference between non-REM and REM sleep of 22/hr ([Q1=6, Q3=34], p<.001). CAI in REM was only 4/hr (Q1=0, Q3=11), but in non-REM was 25/hr [Q1=16,Q3=43] with all patients having a CAI≥5/hr during non-REM. In REM, 70% had a CAI>0/hr and 46% had a CAI ≥5/hr. The CAI difference between non-REM and REM sleep was 18/hr [Q1=10, Q3=30; p<.001]. The OAI and mixed apnea index (MAI) differed by <1/hr (p=0.235 and <.001, respectively). Of note, the hypopnea index [HI] did not differ between REM and non-REM sleep (12/hr [Q1=2,Q3=22] vs. 11/hr [Q1=4, Q3=20], respectively, p=0.273), yet hypopneas constituted a greater proportion of total AHI during REM compared to non-REM sleep.
Conclusion: Among subjects with predominantly CSA, the prevalence and severity of CSA was greater in non-REM than REM sleep, yet low-level CSA persisted in REM sleep. Stage-related differences in CAI but not OAI, MAI or HI can be attributed to alterations in ventilatory rather than upper airway control in this CSA cohort. These differences in the type and severity of sleep disordered breathing episodes comprise a key diagnostic signature, for which specific CSA therapeutic strategies are indicated.
Support (If Any): ZOLL Respicardia, Inc. and NIH R01 HL144859

0709

THE EFFICACY OF HOME SLEEP APNEA TESTS ALONE IN DETERMINING OPTIMAL TREATMENT MODALITY FOR SLEEP DISORDERED BREATHING DURING THE HEIGHT OF THE COVID-19 PANDEMIC

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Introduction: Home sleep studies have shown strong accuracy and reliability in diagnosing obstructive sleep apnea compared to PSG. Recent studies have suggested they can accurately detect central sleep apnea as well. The combination of better technology, stricter insurance requirements for in lab polysomnograms, and a rise in telemedicine has seen their utilization rapidly increase. Specifically, at the height of the COVID pandemic many sleep practices had to shut down their labs and rely on HSATs alone to evaluate patients with potential sleep disordered breathing.
Methods: The Albuquerque VA Sleep Center was one of these, which provided an opportunity to reflect on the effectiveness of this diagnostic modality over that timeframe. A total of 780 patients with suspected sleep disordered breathing were studied using ResMed ApneaLink II Machines from 3/16/21 to 7/1/21 while in lab PSGs were unable to be completed due to health and safety guidelines.
Results: Of these 780 patients, only 34 were determined to need further evaluation with an in lab titration study once the lab reopened. Given how few of these patients ended up with titration studies, no additional criteria were used to categorize them other than a provider deciding they needed the study. The charts of these patients were reviewed in detail to identify any common characteristics that could have contributed to them needing a more detailed evaluation with an in lab polysomnogram. This provided further information about the accuracy and reliability of HSATs, as well as traits of patients who would have been ideally studied with an in lab PSG instead.
Conclusion: Overall such a small percentage of patients, only 4%, needing further titration speaks to both the reliability of HSATs as diagnostic studies, and the effectiveness of remote titration through cloud based monitoring systems like AirView.
Support (If Any):

0710

VALIDATION OF THE PREDICTIVE UTILITY OF THE MULTIVARIABLE APNEA INDEX FOR OBSTRUCTIVE SLEEP APNEA IN WOMEN

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Introduction: The Multivariable Apnea Prediction (MAP) index is a commonly used screening tool for obstructive sleep apnea (OSA). Previous analyses have demonstrated higher sensitivity of the MAP in predicting OSA in men versus women and in post-menopausal versus pre-menopausal women with type 2 diabetes (T2DM) and an apnea-hypopnea index (AHI) ≥10. The purpose of this secondary analysis was to validate previous findings by comparing women with and without T2DM across all categories of OSA severity including mild (AHI ≥5).
Methods: The sample (N=386) was comprised of participants from the Diabetes Sleep Treatment Trial who were recruited because of risk for OSA with T2DM (n=279), and the EMPOWER study which examined triggers for lapses or relapse after intentional weight loss in overweight but otherwise healthy participants (n=115). AHI was assessed by in-home sleep study, ApneaLink Plus®. Descriptive statistics and binomial logistic regression and receiver operating characteristic analyses were conducted to evaluate classification of OSA diagnosis, defined as AHI ≥5 or ≥10, by MAP between sexes and by menopause status.
Results: Participants were middle aged (mean 54.09 years + 10.63), obese (mean BMI of 34.79 + 6.52 kg/m2), primarily female (67%), and white (64%). Compared to men, women were younger (52.99 years + 10.15 vs. 56.26 years + 11.25, p=0.004) and had a lower AHI (9.10 + 18.94 vs. 17.25 + 18.94, p<0.001). No significant differences, except for age, were noted between pre- and post-menopausal women. Sensitivity of MAP on OSA diagnosis was higher for men than women (AHI ≥5: 94.7% vs. 76%; AHI ≥10: 84.2% vs 29.6%). Sensitivity of MAP on OSA diagnosis was lower for pre-menopausal than post-menopausal women using AHI ≥5 (74.0% vs. 98.8%) and AHI ≥10 (19.0% vs. 32.1%).
Conclusion: This validation study corroborates previous findings that the MAP index was better at identifying OSA in men than

women, and in post- versus pre-menopausal women using AHI values across all categories of OSA severity. Improved screening methods are needed to detect women at high risk for OSA.
Support (If Any): This study was funded by the National Institutes of Health (R01-DK090628, R01-HL107370).

0711

DO POSTMENOPAUSAL WOMEN WITH INSOMNIA AND OBSTRUCTIVE SLEEP APNEA HAVE DETERIORATION IN SEXUAL FUNCTION?

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Introduction: Sleep problems and sexual dissatisfaction are among the most common complaints during and after the menopause transition. The prevalence of insomnia and obstructive sleep apnea (OSA) reach 31% and 44% of postmenopausal women, respectively. The sexual dissatisfaction is frequently caused by a decline in hormonal levels and urogenital atrophy, resulting in inadequate lubrication and pain during intercourse, with orgasm difficulties and low sexual. Both behaviors – sleep and sexual function - play an important part in women's wellness. The objective of this study was to investigate whether insomnia in association with OSA would increase climacteric and sexual symptoms compared with women with only insomnia or OSA.
Methods: Our sample comprised 47 postmenopausal women distributed into 3 groups: 1) insomnia, 2) OSA, and 3) OSA+insomnia. All participants completed the questionnaires: Insomnia Severity Index, Female Sexual Function Index, and Blatt-Kupperman menopausal index. Of the 47 participants, 34 women undergone polysomnography. The 3 groups were compared in respect of climacteric symptoms, sexual function score, and sleep.
Results: Our results showed that 85.1% of the postmenopausal women were classified with insomnia, 46.8% were diagnosed with OSA, and 82.9% had low sexual function. All groups had sleep efficiency of <80%, wake after sleep onset of >65 min, and a total sleep time of <6h, indicating poor sleep quality. There were no statistically significant differences among the groups in all sexual domains. The group of OSA+insomnia reported more climacteric symptoms (27.1±9.7) when compared to OSA group (15.7±9.6, P=0.03).
Conclusion: In our sample, the presence of insomnia and OSA associated with postmenopause revealed a low score for sexual function. Climacteric symptoms were higher in the groups with insomnia, and the association with low sexual function can lead to worsening of clinical condition.
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0712

CLUSTER ANALYSIS FOR THE ASSOCIATION BETWEEN OBSTRUCTIVE SLEEP APNEA PHENOTYPES: A POPULATION-BASED LONGITUDINAL STUDY

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Introduction: The identification of subgroups of obstructive sleep apnea (OSA) is critical to understand disease causality and ultimately develop optimal care strategies customized for each subgroup. In this sense, we aimed to perform a cluster analysis to identify subgroups of individuals with OSA based on clinical parameters. Furthermore, we aimed to analyze whether subgroups remain after 8 years.
Methods: We used data derived from the São Paulo Epidemiologic Sleep Study (EPISONO) cohort, which was followed over 8 years. All individuals underwent polysomnography, answered questionnaires and had their blood collected for biochemical exams. OSA was defined according to AHI≥ 15 events/hour. Cluster analysis was performed using latent class analysis (LCA).
Results: Of the 1,042 individuals in the EPISONO cohort, 68.3% accepted to participate in the follow-up study (n=712). We were able to replicate the OSA 3-cluster solution observed in previous studies: disturbed sleep, minimally symptomatic and excessively sleepy in both baseline (35.5%, 45.4% and 19.1%, respectively) and follow-up studies (41.9%, 43.3% and 14.8%, respectively). 44.8% of the participants migrated clusters between the two evaluations and the factor associated with this was a greater delta-AHI (B=-0.033, df=1, p=0.003). The optimal cluster solution for our sample based on Bayesian information criterion (BIC) was 2 cluster for baseline (disturbed sleep and excessively sleepy) and 3 clusters for follow-up (disturbed sleep, minimally symptomatic and excessively sleepy).
Conclusion: The results found replicate and confirm previously identified clinical clusters in OSA even in a longitudinal analysis.
Support (If Any): This work was supported by grants from AFIP and FAPESP.

0713

LONGITUDINAL SLEEP POSITION PATTERNS AND BREATHING PARAMETERS IN PREGNANCY

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Introduction: Supine sleep position during pregnancy has been linked to increased risk of stillbirth in retrospective studies. However, existing literature is largely cross-sectional and limited by recall bias and self-reporting of sleep position. This study aims to use objectively-measured sleep position to quantify sleep position change between trimesters and its influence on maternal respiratory health.
Methods: This study is a secondary analysis of data from a study investigating maternal sleep, among women with singleton pregnancies and overweight or obesity. Each participant underwent level III sleep apnea monitoring using Noxturnal T3 devices (Nox Medical, Georgia, US), in the first (0-12 weeks) and third (29-40 weeks) trimester of pregnancy. Using accelerometry, the software differentiated 5 positions including supine, right lateral, left lateral, prone, and upright. The studies were scored using AASM 2012 recommended criteria. The first non-upright position was recorded as going-to-bed position. The number of sleep position changes was calculated using only positions that lasted ≥30 seconds.
Results: A total of 126 women were included. Mean BMI was 34.00±5.14 and mean age was 30.46±5.40 years. Mean number of position changes was similar in early (14.19±7.82) vs. late (14.58±8.25) pregnancy. There was a significant correlation between sleep onset position and predominant sleep position in both early (p=0.001) and late (p<0.01) pregnancy. However, supine going-to-bed position predicted predominant supine sleep in only 47% of women. There was a significant change in sleep

position between early and late pregnancy (p=0.04) with a reduction in supine sleep (51.6% to 30.2%) and an increase in left lateral sleep (24.6% to 37.3%). Only in the third trimester, there was a significant positive correlation between time spent supine and oxygen desaturation index (r=0.22, p=0.01), and a trend toward positive correlation with respiratory event index (r=0.15, p=0.08).
Conclusion: Going-to-bed position predicts predominant sleep position in less than half of women with overweight and obesity. Time spent supine in late pregnancy correlates with measures of sleep-disordered breathing. More prospective studies are needed to evaluate the potential for sleep position changes over time as a potentially modifiable risk factor for maternal and neonatal health outcomes.
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0714

POPULATION-LEVEL SNORING AND PROBABLE SLEEP-DISORDERED BREATHING ASSOCIATED WITH GREATER SEDENTARY ACTIVITY

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Introduction: Increased frequency of snoring can be an indicator of sleep-disordered breathing, which is associated with a myriad of comorbidities, including increased cardiovascular disease risk. Previous studies have shown that sleep-disordered breathing is associated with less physical activity, but few studies examined this at the population lavel, or relative to primary snoring.
Methods: This analysis used a linear regression analysis on the 2017- March 2020 data collected from the National Health and Nutrition Examination Survey (NHANES) to explore the relationship between the minutes of sedentary activity and the frequency of snoring. Participants were asked how often they snored in the last 12 months. Responses were categorized as "Never", "Rarely-- 1-2 nights/week", "Occasionally-- 3-4 nights/week", or "Frequently-- >=5 nights/week." Self-reported sedentary activity was measured in minutes during a typical day. A modified STOP-BANG score was created based on NHANES measures of snoring, daytime tiredness, snorting/gasping during sleep, hypertension, body mass index, age, and gender (no measure of neck circumference). Reported results were unweighted; weighted results forthcoming.
Results: Significant unadjusted results indicate that those who reported snoring frequently had 19.2 minutes more sedentary time ([7.98,30.4], p<0.0001); and those with estimated sleep apnea had 16.2 more minutes of sedentary time than those without sleep apnea ([7.19,25.2], p<0.001). When adjusted for sex, age, race, education level, and marital status, the estimated difference between frequent snorers and those that reported never snoring increased to 35.9 minutes of more sedentary activity ([24.4,47.3], p<0.0001) a day. After adjusting for covariates, those with probable sleep apnea showed 43.9 more minutes of sedentary activity compared to those without sleep apnea ([34.1,53.6], p<0.001).
Conclusion: Overall, those who snore frequently (5 or more nights a week) or have a high risk of sleep apnea show a larger number of sedentary minutes per day then those that don't snore or have probable sleep apnea. These relationships may be bidirectional, and directionality should be addressed in future studies.
Support (If Any):

0715

DIAGNOSIS OF SLEEP DISORDERED BREATHING IN PATIENTS WITH INTERSTITIAL LUNG DISEASE: A RETROSPECTIVE EVALUATION OF POLYSOMNOGRAM AND HOME SLEEP APNEA TESTING USING PERIPHERAL ARTERIAL TONOMETRY

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Introduction: Previous studies have shown that sleep disordered breathing (SDB) is common in patients with Interstitial Lung Disease (ILD), and oximetry is often used for screening prior to further diagnostic testing. Current guidelines recommend polysomnography (PSG) for diagnosis of SDB in patients with significant pulmonary disease, however, home sleep apnea tests (HSAT) are increasingly used in clinical practice for a variety of reasons despite lack of evidence regarding accuracy in this population. In this study, we evaluate the correlation between screening oximetry, a commercial brand HSAT (WatchPAT®) and PSG to examine the diagnostic accuracy of this HSAT technology in patients with ILD.
Methods: The institution electronic medical record was screened for patients with a diagnosis code for ILD who underwent screening oximetry followed by PSG or HSAT using peripheral arterial tonometry from July 1, 2012 to present. Clinical review confirmed presence of ILD according to American Thoracic Society guidelines. Among the respective cohorts, Paired Wilcoxon Test was used to compare the oximetry 4% oxygen desaturation index (ODI) to the HSAT ODI and PSG apnea-hypopnea index (AHI) as well as percent time spent below oxyhemoglobin saturation of 89%. Spearman correlation was used to correlate the oximetry ODI and parameters of SDB on HSAT and PSG.
Results: Data was analyzed for 25 patients who had undergone oximetry/HSAT and for 25 patients who had undergone oximetry/PSG. Oximetry ODI showed no significant difference from PSG AHI (p = 0.2635) or between HSAT ODI (p = 0.0755), and no difference was seen in hypoxic time between oximetry and PSG (p = 0.9789). Hypoxic time on HSAT was significantly longer than that on oximetry (p < 0.001). Using HSAT ODI as the standard, HSAT AHI and respiratory disturbance index (RDI) showed rs of 0.9638 and 0.8913 respectively, while oximetry ODI was 0.3893. Compared to PSG AHI, the PSG RDI and oximetry ODI rs were 0.9759 and 0.7407 respectively.
Conclusion: Among patients with ILD, screening oximetry appears to correlate more strongly with indices of SDB and hypoxic time on PSG rather than HSAT. Further studies are warranted to evaluate efficacy of additional HSAT testing modalities in this patient population.
Support (If Any):

0716

RISK FOR HEART FAILURE WITH PRESERVED EJECTION FRACTION IN PATIENTS WITH OR WITHOUT OBSTRUCTIVE SLEEP APNEA

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Introduction: Approximately two out of three patients with Heart Failure with preserved Ejection Fraction (HFpEF) have co-morbid sleep apnea, but the risk of HFpEF in patients who test positive for obstructive sleep apnea (OSA) is unknown.

Methods: Referred subjects (n=228) over the age of 18 underwent a diagnostic in-lab polysomnogram at the University of Michigan Sleep Laboratories between 1/8/2019-3/11/2020 and an echocardiogram within 12 months of their sleep study. Individuals with a known history of HFpEF were excluded (n=44). OSA was defined as an apnea-hypopnea-index (AHI) ≥ 5/hour. Clinical and echocardiogram variables were abstracted from the electronic medical record and used to determine H2FPEF scores (ordinal scale, range 0-9). The H2FPEF score is a validated predictor of HFpEF risk in patients with dyspnea. In the presence of dyspnea, a H2FPEF score ≥ 3 indicates a >50% risk of HFpEF, though dyspnea was not assessed in this study. HFpEF probability (continuous variable) was determined using the corresponding online calculator. Linear regression was used to predict HFpEF probability based on AHI.
Results: The 184 subjects without a known diagnosis of HFpEF had a median age of 65 years (interquartile range (IQR) 51, 71). Seventy subjects (38%) were male, 150 (82%) had OSA, and the median AHI was 15 (7, 35). The median H2FPEF score was 3 (2, 5). Among 34 participants without OSA, 10 (29%) had an H2FPEF score ≥ 3, whereas among 150 participants with OSA, 59 (39%) had an H2FPEF score ≥ 3. Linear regression indicated that higher AHI is associated with a higher probability of HFpEF ($\beta = 0.39$, p=0.0001).
Conclusion: Many patients referred for polysomnography may be at high risk for HFpEF. Sleep-study-referred subjects without clinically-indicated echocardiograms were not assessed, but patients at sleep disorders centers who test positive for OSA may have a particularly high rate of undiagnosed HFpEF. Sleep physicians should consider a cardiology referral in appropriately screened patients.
Support (If Any):

0717

OBSTRUCTIVE SLEEP APNEA SYMPTOM SUBTYPE TRANSITIONS OVER FIVE YEARS ARE ASSOCIATED WITH INCREASED CARDIOVASCULAR DISEASE INCIDENCE RISK

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Introduction: Efforts to characterize clinical heterogeneity of obstructive sleep apnea (OSA) resulted in the identification and replication of symptom-based subtypes. Individuals with moderate-severe OSA that are excessively sleepy are at increased risk of cardiovascular disease (CVD). There is limited evidence about whether OSA patients that worsen their symptom presentation over time are at increased cardiovascular burden. This study aimed to assess the association between five-year transitions among OSA symptom subtypes and incidence of CVD in a community-based cohort.
Methods: Participants of the Sleep Heart Health Study with complete baseline and 5-year follow-up data on symptom presentation, polysomnographic data and CVD outcomes were included (N=2,643). We used latent transition analysis on 14 symptom items to determine symptom subtype transitions in participants diagnosed with OSA (apnea-hypopnea index [AHI]≥5) across both visits. The primary outcome was incidence of CVD, defined as first occurrence of a composite of coronary heart disease, heart failure or stroke after the follow-up visit (median CV follow-up: 6.7 years). Cox proportional hazards models were used to assess the association between symptom subtype transitions and CVD incidence, adjusted by relevant demographic and cardiovascular risk factors.
Results: Four OSA symptom subtypes were identified at baseline and follow-up visits: minimally symptomatic, disturbed sleep, moderately sleepy and excessively sleepy. When compared to participants without OSA at baseline and follow-up visits, those with OSA that transitioned from moderately sleepy to excessively sleepy had increased CVD incidence risk (HR=2.09; 95%CI=1.27-3.45; p=0.004), independent of other CV risk factors. Increased CVD incidence risk was also observed in participants who transitioned from moderately sleepy to excessively sleepy when compared to those that remained moderately sleepy (HR=2.02; 95%CI=1.20-3.40; p=0.008) and in participants who transitioned from disturbed sleep to excessively sleepy when compared to those that remained with disturbed sleep (HR=3.25; 95%CI=1.03-10.23; p=0.044).
Conclusion: Five-year transitions across OSA symptom subtypes are associated with increased CVD incidence risk when adjusted by other relevant cardiovascular risk factors. Participants that transitioned from moderately sleepy or from disturbed sleep to excessively sleepy were at higher CVD risk. Results of this study might inform the role of symptom progression on CVD risk in OSA.
Support (If Any): American Heart Association (20CDA35310360), National Institutes of Health (U01HL53916, U01HL53931, U01HL53934, U01HL53937, U01HL53938, U01HL53940, U01HL53941, U01HL64360 R24 HL114473, 75N92019R002).

0718

IS THERE A WAY TO PREDICT ABNORMAL POLYSOMNOGRAPHY FOLLOWING A NEGATIVE HOME SLEEP APNEA TEST?

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University of Missouri, Columbia [1]

Introduction: Obstructive sleep apnea (OSA) is characterized by recurrent episodes of obstruction of the upper airway that cause decreased or absent breathing during sleep. An OSA diagnosis is made when the patient experiences recurrent episodes of partial or complete collapse of the upper airway during sleep, which results in apneas or hypopneas, respectively. Polysomnography (PSG) is the gold standard test for diagnosis. HSATs (Home Sleep Apnea Tests) are types of sleep tests that can be conducted in a patient's home to detect obstructive sleep apnea. These tests are becoming increasingly common due to their affordability and convenience. Currently, an in-lab PSG is recommended if the initial HSAT is negative and there is a high clinical suspicion of OSA. Aim of this study is to identify a predictive component of negative HSAT which in turn shows positive PSG.
Methods: We reviewed 50 electronic medical records of patients who underwent an HSAT followed by an in-lab PSG at our Sleep Disorders Center. Patient demographics, comorbidities, HSAT data and PSG data were analyzed. Chi-square test and independent sample t-test were used to compare groups. Predictors of the negative PGA was assessed with Logistic regression. Statistical analysis was performed using Statistical Package of Social Science (SPSS) for Windows, version 15.0 (SPSS Inc, Chicago, IL). A p value <0.05 was considered as statistically significant.
Results: There was no correlation between age, gender, body mass index, comorbidities, and lowest oxygen level in HSAT to predict the result of following PSG.
Conclusion: The results of this study showed no statistically significant predictor in patients who underwent an HSAT followed by an in-lab PSG, although there seems to be a weak correlation between the lowest oxygen levels in HSAT and positive PSG. The

gold standard for diagnosing OSA remains in-laboratory PSG; HSAT is an alternative in a select group of patients. For most patients with suspected mild OSA, in-laboratory PSG is preferred since HSAT may under-detect sleep-related events.
Support (If Any):

0719

THE RISK OF PROGRESSION OF CHRONIC KIDNEY FAILURE IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: To describe the risks of chronic kidney disease (CKD) progression in patients with obstructive sleep apnea (OSA)
Methods: In this retrospective case control study; patients with CKD and OSA compared to patients with CKD without OSA who followed up at Creighton University Hospital Clinic. Data retrieved from Electronic Medical Records: demographics, time of diagnosis severity of OSA , apnea hypopnea index, severity of chronic kidney disease using serum creatinine and CKD -EPI equation for glomerular filtration rate cut offs. Patient's kidney function was followed up for 10 years from their diagnosis of OSA. Worsening kidney function is defined on the basis of laboratory values including estimaed GFR(eGFR) and serum creatinine as well as Kidney Diseases Outcome Quality Initiative (KDOQI) 2002 definition and staging. We calculated the mean and SD when appropriate. P values less than 0.05 were considered statistically significant.
Results: 269 patients without OSA included in the study. 416 patients with mild OSA, 343 with moderate OSA and 225 with severe OSA mean (SD) age 46.6 (16.3), 52.9(13.5), 56.9(14.1) and 55.3(15.1) years respectively; 59.1, 56.5, 39.1 and 35.6% were females respectively. CKD stage 1 42.8, 26.9, 26.5 and 28.9% respectively. Stage 246.5, 56.3, 54.2 and 46.7% respectively. Stage 3 10.7, 16.9, 19.2 and 24.3% respectivelyPatient's renal functions who had CKD stage 2 or 3 with mild., moderate and severe OSA got worse in 21.2,31.5 and 26.7% respectively. compared to 13.1% with no sleep apnea.($p < .001$)) ,There was no significant difference on progression of CKD in late stages(CKD IV/V)
Conclusion: Patients with OSA and CKD are more likely to have worsening renal function compared to patients without OSA and this association may depend on severity of both CKD and OSA.
Support (If Any):

0720

ACCURACY OF WATCHPAT PORTABLE SLEEP MONITORING AND SLEEP ASSESSMENT IN PATIENTS WITH ATRIAL FIBRILLATION

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Introduction: Obstructive sleep apnea(OSA) is an established risk factor for atrial fibrillation(AF), necessitating early diagnosis and management. Home-based sleep-monitoring technology has become a mainstream diagnostic modality. Peripheral arterial tonometry (PAT) device is increasingly being used to screen for OSA in patients with AF. Our study aimed to examine the accuracy of Watch-PAT (WP) in OSA evaluation, and night-to-night variability of sleep characteristics as measured by WP when used during consecutive night sleep studies.
Methods: Patients with history of AF undergoing clinically indicated PSG were prospectively enrolled and had concurrent WP while undergoing PSG. Patients then were studied again using WP over two consecutive days at home. We compared agreement of OSA severity(defined as no OSA[AHI (apnea hypopnea index)<5], mild OSA[15>AHI³5], moderate OSA[30>AHI³15], severe OSA[AHI>30]) and total sleep time(TST) using Cohen's Kappa(K) for categorical and Bland-Altman plots for continuous variables. To further characterize PSG versus WP, the cohort was stratified into paroxysmal versus persistent AF types. 1A/1B hypopnea scoring criteria was defined as per AASM.
Results: Our cohort included 24 patients with AF(80% male, mean age 68y). Most patients had clinically defined OSA(AHI³5). Patients with persistent AF had more severe OSA than those with paroxysmal AF (severe OSA present in 60% vs. 29%). Comparison of PSG to concurrently conducted WP in the lab showed substantial agreement in OSA severity by both 1A(K=0.623) and 1B(0.706) criteria. Percent difference in TST between PSG versus WP in the paroxysmal AF versus persistent groups was not statistically significant(p=0.387). Comparing two consecutive at-home WP tests showed substantial agreement in OSA severity measures(1A=0.872,1B=0.889). Bland-Altman plots for TST and sleep architecture showed ³95% of residuals within 2 standard-deviations, suggesting intertester agreement. Confidence intervals were broad in these plots reflecting our small sample size.
Conclusion: Our findings demonstrate that WP is a reasonable alternative to PSG, particularly if using the 1B criteria to diagnose OSA. Additionally, our results show that persistent versus paroxysmal AF does not seem to affect the results of WP tests. Night to night variability of OSA measures and TST was small. Future studies should verify the results of our study in a larger cohort.
Support (If Any):

0721

CORRELATION BETWEEN OXYGEN DESATURATION INDEX AND APNEA HYPOPNEA INDEX FOR DIAGNOSIS OF OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is diagnosed through polysomnography (PSG) which can be done in lab or outpatient. PSG is conventionally not approved by insurance companies' in-patient which can result in delay in diagnosis and treatment of OSA. High resolution pulse oximetry (HRPO) done inpatient is easy to perform and calculates oxygen desaturation index (ODI) to asses' nocturnal desaturations which solely, is insufficient for diagnoses of OSA according to current treatment guidelines. We hypothesize that there may be a correlation between ODI and apnea hypopnea index (AHI) which can facilitate in earlier diagnosis of OSA.
Methods: We conducted a retrospective chart review to compare patients who underwent HRPO resulting in a sleep medicine consult inpatient followed by polysomnography outpatient over

a 2-year period at a tertiary care academic center. Demographic data, ODI, AHI and oxygen nadir levels were collected.
Results: Sixty-five patients (47 males, 18 females; mean age of 59.1 years) with suspected OSA underwent inpatient HRPO during their hospital stay, followed by a PSG in the outpatient setting. The strength of association between ODI and AHI was determined using a Pearson's analysis after adjusting to a logarithmic scale. There was a statistically significant weakly positive association between ODI and AHI (Pearson correlation=0.33, p=0.008). Linear regression analysis demonstrated a predictive value of 0.419 (p=0.008) between AHI and ODI. However, there was no statistically significant predictive value between ODI and AHI when adjusted for age, sex, body mass index (BMI) and ethnicity (beta =0.169; p=0.330). This may be limited by small sample size. HRPO nadir oxygen saturation (NOS) also correlated with polysomnography NOS with a Pearson correlation coefficient of 0.353 (p=0.006). Linear regression analysis showed a predictive value beta of 0.149 (p=0.006). When adjusted for age, sex, BMI and race, beta was equal to 0.156 (p=0.007).
Conclusion: ODI calculated through HRPO may be correlated with AHI. NOS determined through HRPO is weakly positively predictive of NOS calculated through PSG. To initiate treatment of OSA sooner, HRPO may be considered for screening or diagnostic purposes. The correlation between ODI and AHI needs to establish further in randomized controlled setting.
Support (If Any):

0722

EVALUATION OF HEALTHCARE INSURANCE CLAIMS RECORD BASED ARTIFICIAL INTELLIGENCE SCREENING TOOLS FOR UNDIAGNOSED SLEEP APNEA

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Introduction: Healthcare insurance claims data contain an unrecognized wealth of structured data that can be leveraged to investigate epidemiologic and economic relationships in health and disease. We studied the feasibility for machine learning algorithms to improve upon screening for obstructive and central sleep apnea (SA) at the population health level using existing health insurance claims data.
Methods: A logistic regression model was trained to predict the presence or absence of SA from an aggregated healthcare insurance claims dataset. The dataset was composed of medical and pharmacy claims between the years 2016 and 2020 from the Wisconsin All-Payor claims database which included coverage of >4,000,000 patients, >10,000 ICD codes, and >$50 billion in medical spending. A total of 1,870,000 patients and 39,712 unique federal drug identification codes were included within 91.5 million pharmacy claims in the dataset. Input features were constructed by counting the total number of claims for each unique drug in each subject resulting in a patient-level feature vector of 39,712 drug frequencies. The positive SA population was defined by individuals who had both at least one medical claim for sleep apnea diagnosis (ICD codes G4733/G4731) and an appropriate sleep test (CPT codes 9580*/9581*). The logistic regression model was evaluated using randomized 10-fold cross-validation and performance reported using ROC-AUC statistics and top-10 feature importance analysis.
Results: The logistic regression model detecting SA based solely on observed medication frequencies produced a ROC-AUC of 0.77. In a feature importance analysis, three of the Top-10 most discriminative features were medications for the treatment of diabetes, hypertension, and hyperlipidemia. We hypothesize this drug-frequency based model functions by exploiting the strong correlation of SA with specific clusters of known co-morbid conditions and corresponding medication regimens.
Conclusion: We demonstrate health insurance claims records contain predictive information that can aid in more systematic screening of undiagnosed conditions like SA. Furthermore, in a statistical analysis of feature importance, we observed medications indicative of comorbidities with known association to SA. These findings are useful to clinicians and payers in identifying undiagnosed SA populations, including those responsible for value-based payment models.
Support (If Any):

0723

ELUCIDATION OF OBSTRUCTIVE SLEEP APNEA-RELATED HEART RATE RESPONSE USING A NOVEL CONTINUOUS BEAT TO BEAT BLOOD PRESSURE MONITORING TECHNOLOGY

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Introduction: Obstructive sleep apnea (OSA) episode related sympathetic surge may mediate the association of OSA with cardiovascular disease. Heart rate (HR) response (HRR) to OSA events may reflect magnitude of sympathetic surge but is expected to be variable between individuals. We investigated the variability of HRR to OSA events and its relation to degree of oxygen desaturation.
Methods: We included patients undergoing clinically-indicated polysomnography (PSG). We calculated HRR by deriving interbeat interval (IBI) from a novel continuous beat-to-beat (b-b) blood pressure (BP) monitoring technology (Caretaker™) that was concurrently recorded during PSG.HRR from respiratory (apnea, hypopnea and desaturation alone events) and non-respiratory events (spontaneous or leg movement-related arousals) were compared. We also examined the association of degree of oxygen desaturation with HRR in a given respiratory event combining all events accounting for the counts of the number of events. In the sub-cohort who underwent split night sleep study, we compared the hourly HR surge events (HRR> 20 pm) between diagnostic and CPAP phases.
Results: A total of 17 patients(12 men, mean 52 years old, 9 diagnostic and 8 split night PSGs) were included after excluding one patient with poor signal quality due to excessive movement. The device was well tolerated by patients and IBI and BP data were successfully aligned with PSG data. Mean respiratory HRR ranged from 1.0 to 44.0 (Median [IQR]= 11.00[2.0, 20.0]) mmHg. Mean HRR was more pronounced during the non-respiratory events than respiratory events (12.5[7.2] vs. 11.9[6.6] mmHg, p=0.034). Accounting for the count distribution of desaturation/HRR data pair events, there was a moderately positive correlation between the degree of oxygen desaturation and HRR(R=0.63). Hourly HR surge events were significantly reduced during CPAP phase compared to diagnostic phase (11 events/hr vs 126 events/hr, p=0.032).

Conclusion: We demonstrated highly variable OSA-related HRR patterns between individuals with OSA. There was moderate correlation between degree of oxygen desaturation and HRR to respiratory events. HRR to non- respiratory events was more pronounced than to respiratory events. Future studies should evaluate the clinical implications of the OSA specific HRR.
Support (If Any):

0724

AGE-RELATED AHI CUT-OFFS ASSOCIATED WITH CARDIOVASCULAR AND CEREBROVASCULAR DISORDERS: CLINICAL IMPLICATIONS

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Introduction: Several studies have shown that the association of obstructive sleep apnea (OSA) with clinical outcomes, such as hypertension, weakens in older adults. An apnea hypopnea index (AHI) ≥5 is recommended as the cut-off for initiating treatment without any consideration of possible age differences. We aimed to examine at which cut-off point of AHI, OSA is associated with cardiovascular and/or cerebrovascular diseases (CBVD) in middle-aged adults and in older adults.
Methods: We studied 1,741 adults from the Penn State Adult Cohort (age 20-88 years, 52.3% female, 12.4% racial/ethnic minority), who underwent a 1-night sleep laboratory evaluation, clinical history and physical examination. Hypertension was defined as a diastolic blood pressure ≥90 mmHg or a systolic blood pressure ≥140 mmHg or the use of anti-hypertensive medication. CBVD was defined based on a self-report of a physician diagnosis of heart disease and/or stroke. Logistic regression models examined the odds of having hypertension or CBVD in a step-wise manner starting from an AHI ≥5 up to AHI ≥30 by increments of 5 events, while simultaneously adjusting for sex, race and BMI and stratifying by age.
Results: The odds of hypertension were significantly increased in adults aged <60y (43.2±9.1y) with an AHI≥5 (OR=1.56, 95% CI 1.01-2.41, p=0.045), while the odds of hypertension were not significantly increased in adults aged ≥60y (68.4±6.3y) for any given AHI cut-off. The odds of CBVD were significantly increased in adults aged ≥60y with an AHI≥15 (OR=2.50, 95% 1.24-5.04, p=0.011), while the odds of CBVD were not significantly increased in adults aged <60y for any given AHI cut-off.
Conclusion: These data suggest that AHI cut-offs warranting treatment of OSA should be adjusted based on age and prevalent clinical disorders, consistent with the concept of personalized medicine. These findings are also consistent with the notion that OSA in older adults is a distinctly different phenotype than in young and middle-aged adults.
Support (If Any):

0725

FIVE-YEAR TRANSITIONS OF SYMPTOM SUBTYPES IN UNTREATED OBSTRUCTIVE SLEEP APNEA

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Introduction: Symptom subtypes have been consistently identified in mild and moderate-severe OSA in cross-sectional studies. The objectives of this study were to determine how often participants transition between symptom subtypes over 5 years and whether baseline clinical factors were associated with observed transitions.
Methods: We analyzed demographic, clinical, polysomnographic and symptom data from 2,643 participants of the Sleep Heart Health Study (53.7% women; mean age 62.4 years) with complete baseline and follow-up visits (5.2 years between visits). Latent transition analysis was conducted using 14 daytime and nighttime symptom items in individuals with OSA diagnosis (apnea-hypopnea index [AHI]≥5) to determine symptom subtypes at baseline and follow-up as well as their transition probabilities over time. Individuals without OSA (AHI<5) were incorporated as a known class at each time point. Multinomial logistic regression was conducted to assess the effect of age and sex on class transitions between baseline and follow-up visits.
Results: We identified four OSA symptom subtypes at both baseline and follow-up visits: minimally symptomatic, disturbed sleep, moderately sleepy and excessively sleepy. Most participants did not transition subtypes between visits (55.8%). Of participants whose subtype remained the same between visits, 54.1% had minimal symptoms at baseline; 48.5% were in moderately sleepy; 31.5% were excessively sleepy and 34.6% were in disturbed sleep. A transition to moderately sleepy was the most common. Excessively sleepy participants transitioned most often to moderately sleepy (37.9%). One-year increase in baseline age was associated with a 7% increase in odds to transition from excessively sleepy to disturbed sleep (OR=1.07; 95%CI=1.01-1.15) and about 6% increase in odds to transit from excessively sleepy to moderately sleepy (OR=1.06 (95% CI=1.02-1.12). Women had higher odds to transit from moderately sleepy to minimal symptoms (OR=2.35; 95%CI: 1.27-3.27) and to transit from minimal symptoms to no longer having an OSA diagnosis (OR = 2.30; 95%CI=1.40-3.80).
Conclusion: Approximately half of the participants transitioned their symptom subtypes over a period of 5 years, with most transitioning to minimal symptoms. Increasing age and sex may affect the transitions.
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0726

VISCERAL ADIPOSITY AND DAYTIME SLEEPINESS ARE ASSOCIATED WITH HYPERTENSION IN MILD-TO-MODERATE SLEEP APNEA: AGE-RELATED DIFFERENCES

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Introduction: Mild-to-moderate obstructive sleep apnea (OSA) affects 15-40% of the adult general population and is associated with incident hypertension, particularly in young and middle-aged adults. We examined whether visceral adiposity, a key predictor of OSA, and excessive daytime sleepiness (EDS), a cardinal symptom of OSA, are associated with hypertension in middle-aged and older adult patients with mild-to-moderate OSA.
Methods: A clinical sample of 148 adults (53.79±12.45y, 36.5% female) with mild-to-moderate OSA (5≤AHI<30) underwent 8-hour polysomnography, a clinical history and physical examination, including measures of blood pressure. EDS was defined as an Epworth Sleepiness Scale (ESS) score ≥11. Hypertension was defined as blood pressure ≥140/90mmHg or the use of anti-hypertensive medication. Visceral Adiposity Index (VAI) was calculated within each sex using Amato et al (2010) standardized formulas based on waist, BMI, triglycerides and HDL cholesterol.

Logistic regression models examined the association between VAI, AHI and EDS with hypertension, adjusting for sex and stratifying by age. Under the receiver-operating characteristics (ROC) curves (AUC) with sex, BMI, AHI, VAI and EDS as independent variables examined predictive risk of hypertension.
Results: VAI (OR=1.64, 95%CI=1.23-2.20, p=0.001) and EDS (OR=2.73, 95%CI=1.04-7.17, p=0.042), but not AHI (OR=1.05, 95%CI=0.98-1.13, p=0.165), were associated with significantly increased odds of hypertension in adults aged <60y (46.81±8.83y), while none of these associations were significant in adults aged ≥60y (67.06±5.65y). Adding VAI and EDS to standard clinical factors (age, sex, and BMI) yielded a strong risk model for hypertension in adults aged <60y (AUC= 0.80), and weaker in adults aged ≥60y (AUC=0.62).
Conclusion: These data indicate that the combination of visceral adiposity and subjective sleepiness improves markedly the ability for clinicians to detect cases of mild-to-moderate OSA with increased cardiovascular risk, an association that is strongest in young and middle-aged adults. These findings also further support that OSA in older subjects is a distinctly different phenotype than in young and middle-aged adults.
Support (If Any):

0727

AGE-RELATED ASSOCIATION OF VISCERAL ADIPOSITY WITH CARDIOMETABOLIC DISORDERS IN MILD-TO-MODERATE SLEEP APNEA

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Introduction: Visceral adiposity is a key predictor of both metabolic syndrome and obstructive sleep apnea (OSA). Both metabolic syndrome and OSA are associated with cardiometabolic disorders, however, the association of OSA with these disorders weakens in older adults. We compared the relative strength of the association between visceral adiposity vs. OSA with hypertension and diabetes and whether this association is stronger in middle-aged vs. older adults.
Methods: A clinical sample of 148 adults (53.79±12.45y, 36,5% female) with mild-to-moderate OSA (5≤AHI<30) underwent 8-hour polysomnography, a clinical history and physical examination, including measures of blood pressure and fasting glucose. Hypertension was defined as blood pressure ≥140/90mmHg or use of anti-hypertensive medication. Diabetes was defined as fasting glucose ≥100mg/dL or receiving treatment for diabetes, except insulin. Visceral Adiposity Index (VAI) was calculated within each sex using Amato et al (2010) standardized formulas based on waist, BMI, triglycerides and HDL cholesterol. Logistic regression models examined the association between VAI and AHI with hypertension and diabetes, while simultaneously adjusting for sex and stratifying by age. We also generated under the receiver-operating characteristics (ROC) curves (AUC) having hypertension and diabetes as outcomes and gender, age, BMI, AHI and VAI as independent variables.
Results: VAI was associated with greater odds of having hypertension (OR=1.57, 95%CI=1.20-2.06, P=0.001) and diabetes (OR=1.27, 95%CI=1.02-1.57, p=0.031) compared to AHI (OR=1.05, 95%CI=0.98-1.13, p=0.185; and OR=1.07, 95% CI=1.00-1.14, p=0.690, respectively) in adults aged <60y. There was no association between VAI or AHI with hypertension and diabetes in adults aged ≥60y. Adding VAI to standard clinical factors (age, sex, and BMI) yielded moderately-good risk models for hypertension (AUC=0.73) and diabetes (AUC=0.70) in adults aged <60y, while suboptimal risk models (AUC=0.61 and 0.68, respectively) in adults aged ≥60y.
Conclusion: These data indicate that visceral adiposity, but not AHI, is associated with cardiometabolic disorders in patients with mild-to-moderate OSA, an association that is stronger in middle-aged adults. Visceral obesity should be a priority in preventive/therapeutic interventions in young and middle-aged patients with OSA. These findings also further support that OSA in older adults is a distinctly different phenotype.
Support (If Any):

0728

PHYSICAL AND MENTAL HEALTH AMONG BLACKS WITH OSA AND INSOMNIA: A STAKEHOLDER-ENGAGED COMMUNITY STUDY

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Introduction: Health consequences of co-occurring obstructive sleep apnea (OSA) and insomnia have been well documented. However, little is known about the mental and physical consequences of co-occurring OSA and insomnia among Blacks. We aimed to investigate the rate of OSA risk and insomnia symptoms and potential associations with physical and mental health in a community sample of Blacks.
Methods: Data were collected from an NIH-funded study 'Peer-Enhanced Education to Reduce Sleep Ethnic Disparities, designed to navigate blacks at risk of OSA to receive timely diagnosis and treatment using peer-delivered linguistically and culturally tailored sleep health education. Blacks (n=878) were screened for OSA using the Apnea Risk Evaluation System Questionnaire; a score ≥6 denoted high OSA risk. The Sleep Disorders Questionnaire was used to assess insomnia based on three common insomnia symptoms: trouble falling asleep, difficulty staying asleep, and early morning awakening. Physical Health Composite Score (SF-12PCS) and Mental Health Composite Scores (SF-12MCS) were generated based on how the person answered the SF-12 questions. Scores range from 0 to 100, where 0 indicates the lowest level of health and 100, the highest. Logistic regression models were used to assess associations of physical and mental health among Blacks at risk for OSA, reporting insomnia symptoms, and co-occurring OSA risk and insomnia symptoms. All models adjusted for differences in age, sex, and BMI.#8232;
Results: The prevalence of OSA risk, insomnia symptoms, and co-occurring OSA risk and insomnia symptoms was 47.9%, 73.3%, and 40.2%, respectively. Logistic regression analyses showed lower physical score was positively associated with the odds of reporting insomnia symptoms (OR=1.03, p=0.007) and co-occurring OSA risk and insomnia symptoms (OR=1.02, p=0.001). Lower mental score was positively associated with the odds of OSA risk (OR=1.04, p=0.001), insomnia symptoms (OR=1.04, p=0.001), and co-occurring OSA risk and insomnia symptoms (OR=1.04, p=0.001). Individuals with OSA were less likely to report higher physical scores compared with those with co-occurring OSA risk and insomnia symptoms.
Conclusion: Results demonstrate that blacks with insomnia symptoms are more likely to endorse worse physical and mental health. Future research should investigate further the mechanism underlying co-occurring OSA and insomnia in this population using objective measurements.
Support (If Any): Support: NIH R01MD007716

0729

ASSESSING THE DIAGNOSTIC BENEFIT OF POLYSOMNOGRAPHY WITH ROUTINE CARBON DIOXIDE MEASUREMENTS IN ADOLESCENT AND ADULT OBESE PATIENTS

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Introduction: The diagnosis of obstructive sleep apnea (OSA) and obesity hypoventilation syndrome (OHS) has increased with the increasing prevalence of obesity. Adding routine transcutaneous carbon dioxide (TcCO2) or end-tidal carbon dioxide sensors (EtCO2) to a polysomnogram (PSG) may expand the analytic capabilities of the study. Our study looks at the utility of using CO2 monitoring in obese adolescent (age 13-18 years) and obese adults in increasing the diagnostic yield of the polysomnogram.
Methods: A retrospective chart review was conducted on obese adolescents (13-18 years) and obese adults (body mass index [BMI] > 95 percentile and >30 kg/m2 respectively) undergoing a PSG with EtCO2 monitoring. The CO2 values were documented while supine (awake) and while sleeping. The EtCO2 value was correlated with the BMI but the adults were also compared between Group 1 (BMI 30-40 kg/m2) and Group 2 (BMI >40 kg/m2). Patients with known hypoventilation syndromes or studies that had poor EtCO2 waveforms were excluded.
Results: 72 patients were identified between December 2019 and November 2020 at the Memorial Hermann Sleep Disorders Center. Amongst the adults, 52% were men, with an average age of 55 years (range 26-77) and an average BMI 40.5 kg/m2 (SD +/- 8.8). The average AHI on the diagnostic study (CMS criteria) was 31 events/hour (SD +/- 34.1) and the average oxygen saturation nadir was 80%. Twenty patients (28%) met the diagnostic criteria for OHS based on the baseline awake EtCO2. The mean EtCO2 was 40.1 mmHg in patients with a BMI between 30 and 40 kg/m2 (Group 1) versus 45.1 mmHg in patients with BMI >40 kg/m2 (Group 2) with a statistically significant p-value of 0.0002. Additionally, we identified 18 patients between the ages of 13-18 years with obesity amongst which, 4 patients also had a baseline EtCO2 of >45 torr (22%) with a potential diagnosis of OHS.
Conclusion: Patients diagnosed with OHS are reported to have a higher overall greater mortality. Our study suggests a higher diagnostic yield of OHS in adults and adolescents with the use of CO2 monitoring especially in the morbidly obese. This evidence would advocate for the routine use of CO2 monitoring in the obese patient population.
Support (If Any):

0730

VALIDATION STUDIES FOR SCORING POLYSOMNOGRAMS AND HOME SLEEP APNEA TESTS WITH ARTIFICIAL INTELLIGENCE: SLEEP STAGE PROBABILITIES (HYPNODENSITY) DERIVED FROM NEUROLOGICAL OR CARDIORESPIRATORY SIGNALS

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Introduction: There have been significant advances in machine learning in recent years. This means that powerful methods are now available for classification problems, such as scoring sleep stages from neurological or cardiorespiratory signals. In the present work, validation studies for both applications are presented.
Methods: To determine the 5 sleep stages from the neurological signals, 54 sleep-wake-related features were calculated and classified by a bidirectional long short-term memory (LSTM) network which had been trained on 1956 manual scorings of 588 PSGs from 294 subjects (supervised deep learning). To determine the 4 stages (wake, light sleep, deep sleep, REM) from cardiorespiratory signals, a convolutional neural network combined with LSTM layers was used for feature extraction and classification. This network had been trained on 685 PSGs from 391 subjects (Bakker et al. JCSM 2021). The networks obtained were validated in 428 PSGs with one and 10 PSGs with 12 manual scorings (neurological staging) as well as in 2 two datasets, each containing 296 ambulatory recordings (cardiorespiratory staging).
Results: Cohen's kappa between autoscoring based on neurological signals and manual scoring was 0.74 (95%-confidence interval: 0.74-0.74) for the 428 PSGs. The intraclass correlation coefficient (ICC) for absolute agreement between autoscoring and manual scoring was for the AHI 0.97 (0.96-0.98), for the arousal index 0.79 (0.67-0.86) and for the PLMSI 0.91 (0.88-0.93). The ICC between the sleep stage probabilities derived from the 12 manual scorings and the artificial intelligence (AI) derived hypnodensity was 0.91 (0.91-0.91). Cohen's kappa values for the cardiorespiratory sleep staging were 0.68 (0.68-0.68) and 0.64 (0.63-0.64) for the 2 datasets with 296 ambulatory recordings each.
Conclusion: All metrics from the PSG validation studies show substantial (Cohen's kappa > 0.6) as well as good to excellent agreement (ICC > 0.75 or > 0.90) compared to manual scorings. As an added value of the AI-supported PSG evaluation, the probabilities of the sleep stages per epoch are determined (hypnodensity graph). The valid estimation of the sleep stages from cardiorespiratory signals by means of AI may result in improved clinical interpretation of home sleep apnea tests, which are increasingly used in the sleep-disordered breathing diagnostic pathway.
Support (If Any):

0731

WHAT IS HSAT MISSING? A COMPARISON OF RESPIRATORY EVENTS AND OSA DIAGNOSIS ACROSS TYPE 2 AND TYPE 3 STUDIES

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Introduction: The need for having in-home sleep testing has grown due to the COVID-19 pandemic. While Type 3 Home Sleep Apnea Tests (HSAT) are frequently used, their accuracy remains questionable. This study aimed to compare respiratory events and diagnosis of obstructive sleep apnea between Type 2 and Type 3 studies.
Methods: 550 participants completed overnight Type 2 sleep studies using the Cerebra Sleep System. Files were autoscored as a type 2 acquisition and were manually edited by a RPSGT. On a second auto-score, mapped file channels were reduced to nasal cannula, chest belt, SpO2, position, heart rate, and audio channels to simulate a Type 3 study. The respiratory disturbance index (RDI) in the Type 2 tests was compared to the apnea-hypopnea

index (AHI) in the simulated Type 3 files using a 4% desaturation threshold. Diagnosis of severity of OSA was classified based on indices of <5 as "None", 5-14.99 as "Mild", 15-29.99 as "Moderate", and above 30 as "Severe".

Results: 5 records were removed for having a TST <4 hours. Type 2 sleep tests detected significantly more respiratory events (21.0±21.2/hr.) compared to Type 3 tests (13.4 ±17.2; t(549) = 26.8, p<.0001). The use of the Type 2 RDI resulted in 104 patients (18.9% of patients; 39.4% of treatable patients) with moderate OSA falling into the mild category under the Type 3 AHI. The number of treatable patients was thus 71% higher with a Type 2 study. Overall, the diagnoses of Type 2 RDI and Type 3 AHI were only in agreement for 263 out of the 550 records, or 47.8% of the time.

Conclusion: The use of a Type 2 study detected more respiratory events than the Type 3 device. Consequentially, 104 patients received a higher severity of obstructive sleep apnea when the EEG information was included. Our results provide support for the use of Type 2 devices for in-home detection of obstructive sleep apnea to provide more accurate diagnostic detection than the more frequently used Type 3 home sleep apnea tests.

Support (If Any):

0732

SONOGRAPHIC PHENOTYPING OF THE UPPER AIRWAY IN OSA USING BACKSCATTERED IMAGING ANALYZED BY MACHINE-LEARNING

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Introduction: Anatomic characterization of the upper airway remains important in directing and monitoring care of patients with obstructive sleep apnea (OSA). Nasopharyngoscopy is routine in clinical practice, but it is invasive, non-reproducible, and only allows subjective assessment. We used machine-learning enabled ultrasonography to correlate upper airway tissue characteristics with OSA severity.

Methods: Sixty-three subjects (14 female) with a mean age of 39.4±12.6 years, BMI of 26.4±4.6 kg/m2, and AHI of 19.0±16.1 were consented from Stanford Sleep Surgery (July 2020 to May 2021). Standardized ultrasound protocol was used to image the soft palate, oropharynx, and tongue-base. Via machine learning, an FDA-cleared backscattered ultrasound imaging (BUI) of the upper airway was performed. Combined with B-mode measurements of airway muscular cross-sections, a logistic regression model was built to correlate with OSA severity.

Results: BUI of subjects with mild OSA was different from moderate-severe (AHI≥15) OSA at the soft palate (p=0.0007). The axial-to-lateral ratio of upper airway length was reduced in the lower soft palate of the moderate-severe group (p =0.0207). The logistic regression model with BUI, axial-to-lateral ratio at the soft palate, and BMI showed an Area Under the Receiver Operating Characteristic (AUROC) curve of 0.84 (95% CI 0.726 to 0.920) in moderate-severe OSA.

Conclusion: A non-invasive yet replicable technique to visualize and phenotype the upper airway is critical in the management of patients with sleep-disordered breathing. Sonographic BUI combined with B-mode airway measurements analyzed by machine learning show promise in characterizing the upper airway in patients with moderate-severe OSA.

Support (If Any):

0733

ELUCIDATING SLEEP-RELATED HEALTH DISPARITIES ACROSS THE SOCIOECONOMIC SPECTRUM LEVERAGING A LARGE-SCALE SLEEP REGISTRY

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Cleveland Clinic Foundation [1]

Introduction: Sleep disparities have been implicated as a contributor to overall health disparities in socially disadvantaged groups. Despite epidemiological studies reporting sleep deprivation and poorer sleep quality among those with low socioeconomic status and group minorities, little is known about the extent to which sleep disorders such as sleep-disordered breathing (SDB), varies across the socioeconomic spectrum.

Methods: A retrospective cohort study was conducted utilizing data from the Cleveland Clinic Sleep Laboratory Registry. All adults who underwent diagnostic or split (baseline diagnostic) polysomnogram (PSG) or home sleep apnea test (HSAT) were included in the study. Area Deprivation Index (ADI), a biomarker of neighborhood socioeconomic disadvantage, was calculated by national rank, i.e. 25th, 50th and 75th percentiles; higher quartiles reflect greater deprivation. Generalized linear models adjusted for age, race, sex, body mass index(kg/m2) and primary payer were used to investigate association of ADI with SDB breathing measures (apnea hypopnea index, (AHI) and sleep-related hypoxemia (percentage of total sleep time <90%SaO2, [TST<90]).

Results: The analytic sample included 81,212 sleep studies; 60,013(74%) were PSG and 21,199(26%) HSAT with age: 52.0[41.0, 62.3], 49% females, 19% black race, with BMI=34.5±8.5 kg/m2, 44% with Medicaid and Medicare. Median ADI National Rank 59.0[39.0, 81.0] with higher 4th quartiles in PSG versus HSAT:29.1% vs 16.3%,p<0.001. In the PSG group, ADI was associated with hypoxia measures: TST<90(coefficient p<0.0001), model R2=0.171; mean SaO2(p<0.0001), R2=0.189; minimum SaO2(p<0.0001), R2=0.169; all measures were higher with higher ADI quartiles. In the HSAT group, ADI was associated with mean SaO2(p<0.0001), R2=0.188 and minimum SaO2(p<0.0001), R2=0.181 with all measures being higher with higher ADI quartiles. AHI was associated with ADI(p=0.0032), R2=0.239; but least squares mean AHI did not differ among ADI quartiles in PSG and HSAT groups. Interactions were observed between ADI and age, BMI and male sex (p<0.05), but not race.

Conclusion: Sleep-related hypoxia was greater among patients living in areas of higher deprivation when considering rankings of neighborhoods by socioeconomic disadvantage. Further understanding of the reason for this sleep disorder-related disparity is needed, i.e. further characterizing theoretical domains and social and geographic determinants of income, education, employment, and housing quality with the overarching goal to improve disparities in health.

Support (If Any):

0734

EXAMINING THE DIAGNOSTIC VALIDITY OF THE WATCHPAT IN A PRELIMINARY SAMPLE OF COGNITIVE NORMAL BLACK/AFRICAN-AMERICAN OLDER ADULTS

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Introduction: The WatchPAT® is an innovative Home Sleep Apnea Device (HSAT) that utilizes the peripheral arterial signal (PAT®)

for OSA diagnosis. We examined the diagnostic validity of the WatchPAT and assessed the correlation between its sleep indices and those measured by PSG in a cognitive normal predominantly older Black/African-American sample.
Methods: Preliminary data analysis on a limited sample of 26 participants without a prior diagnosis of OSA who underwent HSAT and 2-nights of nocturnal polysomnography (NPSG). An apnea-hypopnea index (AHI) ≥ 15 events/h characterized moderate to severe OSA. Pearson correlation statistics (Fisher's z Transformation) for PAT/NPSG indices including respiratory disturbance index (RDI), oxygen desaturation index (ODI), mean oxygen saturation (Spo2), REM Latency (min), awake period during sleep (WASO), and sleep onset latency (SOL) were determined.
Results: Of the 26 participants, 17 (65.4%) were Black/African-American, 9 (34.6%) were non-Hispanic White, and 19 (73.1% [13/19 (68.4%) Black/African-American]) were female. Mean (SD) age, BMI and education was 66.3 (4.5) vs. 69.9 (3.7) years, 29.6 (6.4) vs. 26.6 (5.5) kg/m2 and 15.6 (3.1) vs. 17.6 (1.3) years for Black/African-American vs. non-Hispanic White, respectively. 35.3% vs. 33.3% and 17.7% vs. 22.2% of participants met criteria for moderate to severe OSA based on HSAT and NPSG, for Black/African-American vs. non-Hispanic White, respectively. The HSAT had a sensitivity and negative predictive value of 100% for both races, specificity of 78.6% vs. 85.7%, and positive predictive value (PPV) of 50% vs. 66.7%, for Black/African-American vs. non-Hispanic White, respectively. Analyses stratified by sex suggested that the WatchPAT had better diagnostic validity in Black/African-American women than men, with specificity of 83.3% vs. 75.0%. Among Blacks/African-Americans, the correlation for PAT/NPSG AHI, ODI and RDI were modest ranging from r = 0.65 to 0.70 P = .004, and mild for Spo2 and Nadir oxygen desaturation (r = 0.53 [95%CI, 0.04-0.79]; P = .03 for both). WASO, REM Latency and SOL showed no significant correlations.
Conclusion: Our preliminary data show HSAT having lower specificity, PPV, insights on sleep architecture for OSA diagnosis, and respiratory indices' correlations with those from PSG, in Blacks/African-Americans compared to general population samples. The measure performed better among women.
Support (If Any): AASM 231-BS-20, AARGD-21-8488397, NIH/NIA/NHLBI (K23AG068534, L30-AG064670, CIRAD P30AG059303 Pilot, NYU ADRC P30AG066512 Developmental Grant, R25HL105444 SRG, R01AG12101, R01AG022374, R01AG13616, RF1AG057570, R01HL118624, R01AG056031)

0735

SLEEP DISTURBANCES IN POST-ACUTE SEQUELAE OF COVID-19 (PASC)

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Cleveland Clinic Foundation [1]

Introduction: Sleep difficulties and fatigue are highly prevalent, pervasive symptoms reported in patients with Post-Acute Sequelae of COVID-19 (PASC). As little is known of the predictors and severity of PASC-related sleep disturbance and intersection with fatigue, we leverage systematic data collected from the Cleveland Clinic ReCOVer Clinic for further elucidation
Methods: Analysis of data collected from Cleveland Clinic ReCOVer Clinic patients (February-November 2021) who completed the Patient-Reported Outcomes Measurement (PROMIS) Sleep Disturbance and PROMIS Fatigue questionnaires was performed. Data were extracted from the Cleveland Clinic COVID-19 registry and the electronic health record.PROMIS scores are standardized to the general U.S. adult population on a T-scale with mean 50±10. PROMIS sleep disturbance and fatigue T-scores ≥60 indicates at least moderate disturbance and ≥70 indicate severe disturbance. T-test and Chi-square tests were used to examine cross-group differences. Multivariable logistic regression adjusted for age, race, sex, and body mass index(kg/m2) was performed to investigate factors associated with sleep disturbance severity.
Results: Out of 1321, 682 patients completed the PROMIS Sleep Disturbance questionnaire with age 49.8±13.6, 75.2% female and 12.3% black race. Average T-scores were 57.7±8.3, 281 (41.2%) patients reported at least moderate sleep disturbance and 50 (7.3%) reported severe sleep disturbances. Average PROMIS Fatigue T-score was 63.0±9.2; 68.6% patients reported at least moderate fatigue, 22.6% reported severe fatigue. Patients with moderate-severe compared to normal-to-mild sleep disturbances respectively had higher BMI (32.3±8.7 vs 30.9±7.5, p=0.049), were more likely of black race (40.0±10.0 vs 41.0±15.7,p=0.010), had worse eneral Anxiety Disorder (GAD)-2 questionnaires scores (2.8±2.1 vs 1.6±1.7,p<0.001), Patient Health Questionnaire (PHQ)-2 scores (2.8±2.0 vs 1.6±1.7,p<0.001) and PROMIS fatigue scores (66.7±7.8 vs 60.4±9.1,p<0.001) with no difference in age, sex, or hospitalization due to COVID-19. In the adjusted model, black race was associated with moderate-severe sleep disturbance (OR=3.42, 95%CI:1.64-7.13).
Conclusion: The prevalence of moderate to severe sleep disturbances reported by patients presenting for PASC was very high i.e.>40% and associated with obesity, black race and mood symptoms. Notably, after adjustment for demographics, black race conferred a 3-fold higher odds of moderate-severe sleep disturbance emphasizing the need to characterize race-specific determinants and disparities in COVID-19 survivors.
Support (If Any):

0736

MANDIBULAR MOVEMENTS ARE A RELIABLE NONINVASIVE ALTERNATIVE TO ESOPHAGEAL PRESSURE FOR MEASURING RESPIRATORY EFFORT IN PATIENTS WITH SLEEP APNEA SYNDROME

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Introduction: Differentiation between obstructive and central apneas and hypopneas requires quantitative measurement of respiratory effort (RE) using esophageal pressure (PES), which is rarely implemented. This study investigated whether the sleep mandibular movements (MM) signal recorded with a tri-axial chin sensor (Sunrise, Namur, Belgium) is a reliable surrogate of PES in patients with suspected obstructive sleep apnea (OSA).
Methods: In-laboratory polysomnography (PSG) with PES and concurrent MM monitoring was performed. PSGs were scored manually using AASM 2012 rules. Data blocks (n=8042) were randomly sampled during normal breathing (NB), obstructive or central apnea/hypopnea (OA/OH/CA/CH), respiratory effort-related arousal (RERA), and mixed apnea (MxA). Analyses were: evaluation of the similarity and linear correlation between PES and MM using the longest common subsequence (LCSS) algorithm and Pearson's coefficient; description of signal amplitudes; estimation of the marginal effect for crossing from NB to a

respiratory disturbance for a given change in MM signal using a mixed linear-regression.
Results: Participants (n=38) had mild to severe OSA (median AH index 28.9/h; median arousal index 23.2/h). MM showed a high level of synchronization with concurrent PES signals. Distribution of gyroscope MM signal amplitude differed significantly between event types: median (95% confidence interval) values of 0.60 (0.17–2.43) for CA, 0.83 (0.23–4.71) for CH, 1.93 (0.54–5.57) for MxA, 3.23 (0.72–18.09) for OH, and 6.42 (0.88–26.81) units for OA. Mixed regression indicated that crossing from NB to central events would decrease gyroscope MM signal amplitude by –1.23 (CH) and –2.04 (CA) units, while obstructive events would increase gyroscope MM signal amplitude by +3.27 (OH) and +6.79 (OA) units (all p<10-6).
Conclusion: In OSA patients, MM signals facilitated the measurement of specific levels of RE associated with obstructive, central or mixed apneas and/or hypopneas. A high degree of similarity was observed with the PES gold-standard signal.
Support (If Any):

0737

FACTORS INFLUENCING AROUSAL THRESHOLDS

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Introduction: Obstructive Sleep Apnoea (OSA) is the most common sleep-related breathing disorder with an estimated prevalence of approximately 15-30 percent in males and 10-15 percent in females. A low respiratory arousal threshold (ArTH) is one of several traits involved in OSA pathogenesis. This has been shown to be reliably predicted using an Arousal Score which is calculated using the patients overall Apnoea-Hypopnoea Index (AHI), nadir SpO2 and Hypopnoea:Apnoea ratio where a score of 2 or more predicts a low arousal threshold, and a score of 1 indicates a high arousal threshold. Our objective was to describe factors associated with high arousal thresholds in patients with OSA as determined by the Arousal Score in a metropolitan population.
Methods: 208 unselected, consecutive, adult, overnight polysomnography with prospectively calculated arousal scores were assessed from 2019 – 2020. Demographic and anthropometric data including Age, Sex, BMI, Epworth Sleepiness Score (ESS), AHI, SpO2 nadir, Hypopnoea:Apnoea ratio and arousal index was recorded. The arousal score was calculated by assigning one point for meeting each of the following requirements: AHI <30; SpO2 nadir > 82.8%; Hypopnoea:Apnoea ratio > 58.3, with a score <2 considered low. Spearmann correlation was performed to determine the factors associated with the Arousal Score.
Results: 208 patients were included in the study. 35.6% of patients had mild sleep apnoea, 23.1% moderate sleep apnoea, 22.6% severe sleep apnoea with 18.8% of patients with no sleep apnoea. Mean arousal score was 2.47 (Std Dev 0.839). Spearman correlation indicated that disease severity, BMI (rs -.374, p-value < 0.01) and STOP-BANG (r2 -0.419, p-value < 0.01) had a statistically significant relationship with Arousal Score. That is, a higher AHI, BMI and STOP-BANG was associated with a low arousal score. Moreover, Gender and Epworth Sleepiness Score exhibited an insignificant association with arousal score. We found increasing severity of disease was associated with lower arousal score and therefore a higher arousal threshold
Conclusion: Our study demonstrates that worsening sleep apnoea severity, higher BMI and higher STOP-BANG are associated with a lower arousal score and therefore higher arousal threshold. Gender and ESS do not appear to be significantly associated.
Support (If Any):

0738

CLINICAL AND PHYSIOLOGICAL RELEVANCE OF COMPUTATIONAL STUDIES OF OBSTRUCTIVE SLEEP APNEA: A SYSTEMATIC LITERATURE REVIEW

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Introduction: Structural interventions for obstructive sleep apnea (OSA) have unpredictable success rates. Anatomically accurate computer simulations of airflow and soft tissue dynamics may be used in future virtual intervention planning tools to identify the optimal patient interventions. The objective of this study is to review the existing literature on the correlation between computer-derived biomechanical variables and clinical measures of OSA severity.
Methods: Scientific papers written in English that correlated the apnea-hypopnea index (AHI) with computer-derived biomechanical variables were identified by searching on the PubMed and SCOPUS databases the search phrase “sleep apnea” AND “computational fluid dynamics” OR "finite element" OR “fluid structure interaction”.
Results: A total of 19 articles were identified that reported correlations between computer-derived biomechanical variables and AHI, which was the metric of OSA severity reported in most studies. These studies demonstrated that several anatomic and physiologic variables correlate with OSA severity, including airspace cross-sectional areas, airspace volumes, and airflow resistance. No studies were found that correlated computer-derived dynamic measures of upper airway mechanical stability, such as tissue compliance, to OSA severity.
Conclusion: Computer-derived anatomic and physiologic variables may serve as useful predictors of surgical outcome or mandibular device treatment response in OSA patients. Further research is needed to test the hypothesis that virtual surgery planning based on computer-derived measures of upper airway stability can improve outcomes of OSA interventions.
Support (If Any): This project was funded in part by the Advancing a Healthier Wisconsin Endowment.

0739

CEREBROVASCULAR RESPONSE TO INTERMITTENT HYPOXIA DURING SLEEP IN OSA PATIENTS

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Introduction: Obstructive sleep apnea (OSA) is associated with increased risks of cerebrovascular accidents, but it remains unclear how OSA impacts the cerebral vasculature. Intermittent hypoxia is a hallmark feature of OSA and recurs throughout sleep. In awake humans, the cerebrovascular response to intermittent hypoxia has been well characterized, as an increase of blood perfusion that begins at least a few seconds after the start of hypoxia. Functional magnetic resonance imaging (fMRI) that measures the blood oxygen level dependent (BOLD) signal has revealed significant differences between the cerebrovascular responses in awake humans with and without OSA. However, intermittent hypoxia occurs primarily during sleep in OSA, yet the cerebrovascular response to intermittent hypoxia has not been studied during sleep.

Methods: Eight adult patients with severe OSA were recruited to this study. Each subject first underwent an acclimatization session in which they tried to sleep in the MRI scanner while listening to sound recordings of the fMRI. Each acclimatized subject then underwent an overnight study in which T2*-weighed BOLD fMRI of the whole brain was conducted for 1.5-3 hours in total (TE: 35 ms, TR: 2.0 s, 35 sagittal slices, 3.5 mm isotropic). Oxygen saturation (SaO2), chest movement, end-tidal carbon dioxide and scalp encephalography (EEG) were simultaneously recorded with the fMRI. After rigid-body motion correction and removal of artifacts, the temporal correlation between BOLD signal and the SaO2 signal was analyzed on a voxel-by-voxel basis.
Results: Four subjects (50%) were acclimatized to sleep in the MRI scanner and completed this study. In all subjects, the BOLD fMRI signal showed an initial decrease corresponding to the decrease of SaO2, followed by a delayed increase corresponding to the hyperperfusion, throughout the gray matter of cerebral cortex. The time course of BOLD fMRI signal was significantly advanced in time, by 2-4 seconds, in the visual cortex compared to the rest of cerebral cortex in all subjects. This phenomenon was also observed in some other brain regions, but not consistently across subjects.
Conclusion: This study is, to our knowledge, the first study of the cerebrovascular response to intermittent hypoxia during sleep in humans. In patients with OSA, we observed spatiotemporal heterogeneity of the cerebrovascular response, such that the response in the visual cortex was significantly advanced in time than other brain regions. This phenomenon has not been reported before, and future studies are needed to understand how this heterogeneity is associated with OSA.
Support (If Any): AASM Foundation

0740

CORRELATION OF PHARYNGEAL CRITICAL PRESSURE WITH UPPER AIRWAY ANATOMY IN OBSTRUCTIVE SLEEP APNEA: A SYSTEMATIC REVIEW

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Introduction: Obstructive sleep apnea (OSA) is a disease characterized by multiple episodes of upper airway collapse during sleep that causes oxygen desaturation and waking, leading to multiple comorbidities. The gold standard objective measure of upper airway collapsibility is the pharyngeal critical pressure (Pcrit), the nasal pressure at which inspiratory airflow is abolished. The objective of this systematic literature review is to summarize the current understanding of the anatomical factors that determine upper airway collapsibility.
Methods: A search using the PRISMA methodology was performed on PubMed for English language scientific papers that correlated Pcrit to anatomic measurements (such as airway length, airspace cross-sectional area, airway compliance, lung volumes, BMI, neck circumference, and waist circumference). In addition, papers reporting a correlation between Pcrit and the apnea-hypopnea index (AHI) were reviewed.
Results: 751 papers were retrieved, and a total of 29 papers that matched eligibility criteria were included in the quantitative synthesis. The literature review confirmed that Pcrit has a significant correlation with the AHI. Pcrit also correlated with multiple anatomic measurements, including airway length, tongue dimensions, lung volume, and measures of obesity including BMI, neck circumference, and waist circumference.
Conclusion: The pharyngeal critical pressure is a measure of disease severity in OSA, as demonstrated by its correlation with AHI. The primary variables determining Pcrit were found to be airway length and measures of obesity. Surprisingly few studies to date have investigated the correlation between Pcrit and pharyngeal compliance and between Pcrit and airway cross-sectional area. In the future, a better understanding of the biomechanical factors that determine upper airway collapsibility is expected to help identify the optimal intervention of each phenotype of airway collapse for personalized medicine.
Support (If Any): Medical College of Wisconsin Department of Otolaryngology

0741

NASAL AIRFLOW SHAPE ON HOME SLEEP STUDIES PREDICTS EPIGLOTTIC COLLAPSE

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Introduction: Obstructive sleep apnea (OSA) is characterized by collapse of various portions of the pharynx. Epiglottic collapse can be difficult to diagnose and can affect a patient's tolerance to continuous positive airway pressure (CPAP) or oral appliances (OA). Previous research shows a distinct nasal airflow pattern during periods of epiglottic obstruction. We sought to determine if primary epiglottic collapse noted on drug induced sleep endoscopy (DISE) would correlate with nasal airflow signals seen on home sleep studies.
Methods: We retrospectively analyzed the home sleep studies and DISE of 13 patients being considered for surgical therapies due to intolerance to CPAP. Characterization of nasal airflow signals as epiglottic collapse and non-epiglottic collapse was based on previously published data.[1] Airflow signals were individually scored as either epiglottic type collapse (type 1) and non-epiglottic type collapse (type 2). Total number of breaths and number of flow limited breaths were calculated by the algorithm in the home study device.
Results: Patients included had either complete (n=6) or no epiglottic collapse (n=7). The mean AHI 18 and 19.6, respectively. There was no difference in the fraction of type 1 breaths over total flow limited breaths between the two groups (1.1% for each group). When comparing type 1 breaths to the total number of type 1 and type 2 breaths counted, patients with complete epiglottic collapse on DISE showed a higher percentage of type 1 breaths (33%) compared to those without epiglottic collapse (23%)
Conclusion: Nasal airflow signal shape on home sleep studies can suggest the presence of epiglottic collapse. This type of analysis can provide a noninvasive assessment of physiology and improve treatment decisions.
Support (If Any): Azarbarzin, A., et al., Predicting epiglottic collapse in patients with obstructive sleep apnoea. Eur Respir J, 2017. 50(3).

0742

CHARACTERISTICS OF THE LOW ARTH PHENOTYPE IN PATIENTS WITH OSA

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Introduction: Obstructive sleep apnea (OSA) is a heterogenous disease with both anatomic and nonanatomic factors contributing to the pathophysiology. Recently low arousal threshold (ArTH) has

been described in some patients with sleep apnea and there is early evidence emerging that it could be a clinical phenotype. The aim of this study was to characterize this phenotype in a large cohort of patients with sleep apnea confirmed by overnight polysomnography
Methods: The setting was a community sleep center. We performed a retrospective review of patient charts. We included patients who underwent full-night diagnostic PSG. OSA was defined as an apnea hypopnea index (AHI) of > 5. Epworth score, body mass index (BMI), neck circumference, and upper airway size using Modified Friedman (MF) were recorded. Low ArTH was calculated using AHI, fraction of hypopneas and O2 nadir.Abnormal airway narrowing was defined by MF >2. Large neck was defined by neck circumference ≥ 17 inches in males or ≥ 16 in females. Obesity was defined by BMI>30 kg/m2.
Results: 652 patients were included - 421(65%) were male, and 230 (35%) female. 299 (46%) of patients had a low ArTH phenotype. Mean age was similar in both groups 54 +/- 14 vs 55 +/- 13 years. Male % was less pronounced in the low ArTH group (57% of patients with low ArTH male vs 71% of without low ArTH; p<0.05). Patients with a low ArTH had lower percentage of abnormal airway narrowing (53.5 vs 62.6%, p<0.001), large neck circumference (64.6 vs 78.8%, p<0.001) and obesity (65.6 vs 77.9%, p<0.001). Average BMI was lower in the low ArTH group (34.8 +/- 8 vs 36.9 +/- 8; p < 0.005), and neck circumference was also lower in low ArTH group (NC 16.5 +/- 1.8 vs 17.4 +/- 1.8 respectively). Epworth sleepiness scale was lower in low ArTh group (10 +/- 8 vs 11 +/- 9; p 0.007)
Conclusion: We describe the phenotypic characteristics of low ArTH phenotype in a large cohort of patients with OSA. Patients with low ArTH have lower BMI, lower neck circumference, and lower Modified Friedman. Further research studies should focus on whether there are differences in therapeutic responses to this phenotype, and what clinical characteristics might help clinicians more effectively detect this phenotype.
Support (If Any): NA

0743

SHOULD WE USE AHI OR RDI TO DIAGNOSE OBSTRUCTIVE SLEEP APNEA?

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Introduction: Sleep disordered breathing (SDB) is defined based on clinical complaints and polysomnography events. Obstructive sleep apnea (OSA) was initially diagnosed based on the apnea hypopnea index (AHI), but the ICSD-3 has defined the respiratory disturbance index (RDI) as the actual diagnostic criteria. This study aimed to evaluate and compare clinical outcomes related to daytime function in OSA patients defined by AHI and RDI.
Methods: This study was derived from the São Paulo Epidemiological Sleep Study (EPISONO), in its 3rd edition (2007) and follow up edition (2015). A total of 557 individuals had polysomnographies evaluated according to the 2012 American Academy of Sleep Medicine Scoring Manual in both editions. The scores of the Epworth Sleepiness Scale (ESS), Chalder Fatigue Scale (CFS), Pittsburgh Sleep Quality Index (PSQI), Beck Anxiety and Depression Inventories (BAI and BDI) and Insomnia Severity Index (ISI) were compared between individuals who sustained the same AHI level in both editions (either AHI<15 or AHI≥15). We did the same comparison between individuals who had either RDI<15 or RDI≥15.
Results: The grouping by AHI included 348 participants with AHI<15 and 107 with AHI≥15; while the grouping by RDI was composed by 335 with RDI<15 and 118 with RDI≥15. Considering the AHI grouping, there was no statistically significant differences in ESS, PSQI, BDI and ISI scores after 8 years of follow up (p=0.2, p=0.3, p=0.09 and p=0.7 respectively), but a significant increase in the CFS and BAI scores (p=0.05 and p=0.01, respectively) was observed. Considering the RDI grouping, there was no statistically significant difference on ESS, PSQI and ISI scores after 8 years of follow up (p=0.3, p=0.1 and p=0.4 respectively), but there was a significant increased on CFS, BAI and BDI.
Conclusion: OSA diagnosed by either AHI or RDI is associated with increase in fatigue levels. However, when OSA is diagnosed according to RDI, a worse depression score is observed. Depression complaints can significantly impair quality of life and should be consider an important SDB outcome.
Support (If Any): AFIP, CNPq, CAPES.

0744

A COMPARISON OF VISUAL AND PHYSIOLOGIC ASSESSMENTS OF UPPER AIRWAY COLLAPSE DURING DRUG-INDUCED SLEEP ENDOSCOPY (DISE)

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Introduction: The VOTE score, critical closing pressure (Pcrit), and therapeutic CPAP levels are assessments that quantify upper airway collapse by either subjective visual scoring or objective pressure-flow analysis. We hypothesized that there would be an association between collapse severity and physiologic metrics (VOTE versus Pcrit and PAP levels, respectively) acquired during drug-induced sleep endoscopy (DISE).
Methods: This prospective cohort study evaluated 100 consecutive patients with obstructive sleep apnea (OSA) who underwent DISE with application of nasal positive airway pressure between June 3rd, 2020 and June 11th, 2021. Patients were assigned a VOTE score of 0, 1, or 2 indicating no collapse, partial collapse, or complete collapse at the velum, oropharynx, tongue base, and epiglottis, respectively. We assessed two metrics of pharyngeal collapsibility with progressive increases in nasal pressure: (1) the pressure at which inspiratory airflow commences (critical pressure, Pcrit), and (2) the pressure at which inspiratory flow limitation is abolished (pharyngeal opening pressure, PhOP). Our analysis examined the association between the composite VOTE score [0-8 units] and collapsibility metrics.
Results: Ninety-one patients met inclusion criteria for VOTE scoring; of these, 87 were included for PhOP analysis and 79 for Pcrit analysis. The cohort was 76% male, mean (SD) age was 54.7 (14.1) years, body-mass index was 29.7 (4.9), and AHI was 30.3 (20.9). Composite VOTE score was positively associated with Pcrit ($\beta = 0.88 \pm 0.38$ cm H2O per unit, standardized estimate = 0.26, p=0.023). We found no significant association between the composite VOTE score and PhOP ($\beta = 0.57 \pm 0.40$ cm H2O per unit, standardized estimate = 0.15, p=0.162).
Conclusion: Our findings suggest that visual and physiological assessments of upper airway collapsibility provide both overlapping and complementary information in characterizing upper airway mechanics. Measures of pharyngeal collapsibility during DISE can be used to model the ultimate impact of therapeutic maneuvers on OSA. Future studies investigating the utility of each assessment both in isolation and in combination for predicting OSA therapy outcomes are indicated.
Support (If Any): National Institutes of Health: 1R01HL144859

0745

SLEEP-RELATED HYPOXEMIA ASSOCIATION WITH INCIDENT ATRIAL FIBRILLATION IN A CLINIC-BASED COHORT

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Introduction: Sleep disordered breathing (SDB) has been implicated in atrial fibrillation (AF) in population-based studies, however, its role remains unclear and inconsistent. We hypothesize greater risk of 5-year incident AF with SDB and sleep-related hypoxia in a clinic-based cohort.
Methods: Cleveland Clinic patients (age>18) who underwent polysomnogram (PSG) or split studies 11/27/2004-12/30/2015 with >3 hours diagnostic time were examined. Predictors include AHI, % sleep time oxygen saturation<90% (T90), and minimum and mean oxygen saturation(minSaO2 and meanSaO2, respectively). Cox proportional hazard models were fit with time from sleep study to AF diagnosis as the dependent variable. Covariates included age, sex, race, body mass index(BMI), cardiovascular risk factors (hypertension, diabetes mellitus, hyperlipidemia), heart failure, coronary artery disease, myocardial infarction, history of coronary artery bypass grafting, chronic obstructive pulmonary disease, tobacco use, and use of anti-arrhythmic drugs. Data were censored at date of last follow up or at 5-years.
Results: The sample was comprised of 43,634 patients: age 51.7±14.5, 51.9% male, 74.5% White, and 7.1%(n=3,090) with AF. Of those without AF, 1,176(2.9%) developed 5-year incident AF. For each 10% increase in T90, incident AF increased by 7% (HR=1.07, 95%CI=1.05-1.10). Compared to reference, patients with 25.01-50%, 50.01-75%, and 75.01-100% time T90 had 22% (HR=1.22, 95%CI=1.01-1.46), 49% (HR=1.49, 95%CI=1.20-1.85), and 65% (HR=1.65, 95%CI=1.26-2.15) higher incident AF, respectively. For every 10-unit increase in minSaO2 and meanSaO2, incident AF decreased by 11%(HR=0.89, 95%CI=0.83-0.95) and 23% (HR=0.77, 95%CI=0.68-0.86), respectively. AHI did not demonstrate a statistically significant relationship with incident AF at a significance level of 0.05.
Conclusion: Sleep-related hypoxemia, defined by cumulative burden below 90% SaO2, demonstrated an association with incident AF in this large clinic-based cohort, even considering confounding factors. On the other hand, SDB severity as defined by AHI did not demonstrate this relationship. These findings are consistent with experimental models that identify intermittent hypoxia and oxidative stress leading to alterations of the cardiac substrate, thus implicating sleep-related hypoxemic mechanisms as a salient driver in the evolution of atrial arrhythmogenesis.
Support (If Any): Cleveland Clinic Neurological Institute Center for Outcomes Research & Education Pilot Grant, Neuroscience Transformative Research Resource Development Award

0746

MEDIATION OF BIOMARKERS OF INFLAMMATION IN SLEEP-RELATED HYPOXIA AND COVID-19 CLINICAL OUTCOMES

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Introduction: Central to the pathophysiology of SARS-CoV-2 is immune dysregulation and systemic inflammation, however, it is yet unknown whether sleep-related hypoxemia--which we have recently noted to be associated with worse COVID-19 clinical outcomes--is mediated by these biomarkers and pathways.
Methods: Data from patients who tested positive for SARS-CoV-2 and part of the integrated Cleveland Clinic COVID-19 and sleep laboratory registries from March-November 2020 were included. To assess the mediation effect of biomarkers, the relationship between sleep-related hypoxia measures (% sleep time<90%SaO2,T90) and moderate/severe WHO-7 COVID-19 score (use of supplemental oxygen, non-invasive ventilation, mechanical ventilation/ECMO or death) was first tested. The mediation effect, or natural indirect effect, of biomarkers of inflammation (C-Reactive Protein (CRP), white blood cell (WBC) count (with a focus on lymphocyte count) and lactate) was then estimated by logistic regression models adjusted for demographics, comorbidities, smoking pack year and site location using PROC CAUSALMED statement in SAS software (version 9.4, Cary, NC).
Results: The analytic sample included 446 patients hospitalized due to COVID-19: age:63.3.±13.8 years,51.3% female,39% African American with body mass index(BMI)=36.1±9.3kg/m2. Thirty-six percent used supplemental oxygen, 4% used high-flow or non-invasive ventilation,5% required ECMO or mechanical ventilation and 2% died. Hypoxic measures were associated with moderate/severe WHO-7 COVID-19 outcome: T90 median (>1.8%vs.≤1.8%) (OR=2.04, 95%CI:1.28-3.23,p=0.003), 5% increases in both mean SaO2 (OR=0.43, 95%CI: 0.26-0.70,p=<0.001) and minimum SaO2 (OR=0.84, 95%CI: 0.72-0.99,p=0.03). CRP was associated with mean SaO2 (p=0.040) and minimum SaO2 (p=0.029), likewise mediation analysis showed that there was a significant natural indirect effect of CRP in both hypoxia measures (OR=0.86,95%CI 0.73-0.99,p=0.036;OR=0.95,95%CI 0.90-1.00,p=0.034 respectively). WBC count, but not lymphocyte count subset, was associated with mean SaO2 (p=0.044), but the natural indirect effect was not significant (p=0.23. Lactate was associated with minimum SaO2 (p=0.044), but the natural indirect effect was not significant (p=0.23). T90 median was not associated with CRP(p=0.13), WBC count(p=0.87) or lactate(p=0.28).
Conclusion: CRP appears to represent a relevant mediator of sleep-related hypoxia and WHO-7 clinical outcomes. Further investigation is needed to elucidate if treatment of sleep-related hypoxia downregulates biomarkers of systemic inflammation to modify disease course.
Support (If Any):

0747

POLYSOMNOGRAM CHARACTERISTICS ASSOCIATED WITH ARTIFICIAL INTELLIGENCE ENABLED ELECTROCARDIOGRAM ALGORITHM PREDICTED PROBABILITY OF ATRIAL FIBRILLATION IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is associated with atrial fibrillation (AF). Several features of OSA are thought to play role in the development of AF. A recently developed artificial intelligence (AI) enabled electrocardiogram (ECG) algorithm predicts the probability of future development of AF from a single ECG. We sought to examine the relationship between polysomnogram (PSG) and clinical features of patients with OSA and the probability of future AF (P-AF).
Methods: Consecutive adults (age ≥ 18) with OSA and with an ECG obtained within 2 years of their attended polysomnograms (PSG)

were examined. We excluded patients with AF, left ventricular ejection fraction < 50%, implanted pacemaker or cardioverter defibrillator. We recorded demographics, apnea-hypopnea index (AHI), respiratory arousal threshold (RAT), percent sleep time with SpO2 < 89%, arousal index, and a comorbidity score composed of presence of coronary artery disease (CAD), hypertension (HTN), diabetes mellitus (DM), stroke, and chronic lung disease. One and two-way ANOVA was used to examine the relationship of OSA severity (mild, moderate, or severe) with P-AF. Multiple linear regression further characterized associations with P-AF.

Results: Mean AI determined P- AF was 0.052±0.012 (mean±SE) in mild, 0.064±0.014 in moderate, and 0.105 + 0.014 in severe OSA, demonstrating a significant association of OSA severity with P-AF ($p = 0.01$). Post-hoc pairwise tests showed a significant difference in P-AF between mild and severe ($p = 0.008$) but not between moderate and severe OSA ($p = 0.083$). Multiple linear regression with all the variables listed above showed the association between OSA severity and P-AF remains significant ($P = 0.044$). Age ($p<0.001$) and comorbidity score ($p<0.001$) were the only other variables significantly associated with P-AF.

Conclusion: OSA severity determined by AHI was significantly associated with P-AF as determined by a novel ECG-based AI algorithm independent of other variables. Given the strength of association with age and the comorbidity score, OSA severity may have been associated as it is known to increase with age and comorbid conditions. Future directions include incorporating AI enabled algorithms to identify individuals with the highest risk of AF in whom the role of OSA treatment in reducing risk of AF may be examined.

Support (If Any):

0748

PROTEOMIC BIOMARKERS OF OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is characterized by recurrent, partial or complete obstructive respiratory events accompanied by interruptions in sleep with frequent arousals, deoxygenation, and/or sleep disturbance. The present study profiled the largest array of plasma proteins, to date, to contribute to the identification of proteomic biomarkers associated with the presence and severity of OSA.

Methods: The SomaScan highly multiplexed aptamer assay was used to profile 5,000 proteins in 24–48-hour old EDTA plasma samples from the Stanford Technology Analytics and Genomics in Sleep (STAGES) study. The apnea-hypopnea index (AHI) was derived from overnight polysomnography and all participants provided a blood sample. OSA severity was classified as moderate-to-severe (AHI>15) and controls/mild OSA (AHI<15). Univariate linear regression analyses included log2-normalized relative protein expression as the dependent variable, AHI/OSA as the independent variable, and important covariates such as age, gender, BMI, BMI2, age x gender x BMI, sample storage time, and blood draw period. False discovery rate (FDR) to control for multiple testing was applied with an a-priori p-value of 0.05 for identifying significance.

Results: Univariate analyses identified 101 (65 upregulated, 36 downregulated) differentially expressed proteins (DEPs) between moderate-to-severe OSA and controls/mild OSA and 120 proteins (69 positive, 51 negative) associated with AHI as a continuous outcome with 70 proteins consistent in both models. Upregulated proteins involved pathways related to complement and coagulation cascades and metabolic processes and downregulated proteins involved pathways related to regulation of insulin-like growth factor, fibrin clot formation, and MAPK signaling. An OSA machine learning classifier (AHI>15 vs AHI<15) trained on relative protein expression performed robustly, achieving 72% accuracy in a validation dataset. Significant contributing features of the classifier included age, BMI, and 134 proteins, including 22 DEPs identified in univariate analyses for OSA categories.

Conclusion: The present study identified differential protein expression patters associated with OSA and AHI, thereby supporting the potential of proteomic biomarkers in OSA and providing new insight into the mechanisms underlying OSA.

Support (If Any): This work was supported, in part, by the National Heart, lung, and Blood institute [T32HL110952] and the Klarman Family Foundation.

0749

DOES PRIOR NASAL SURGERY IMPACT OUTCOMES OF UPPER AIRWAY STIMULATION THERAPY FOR OSA?

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Introduction: Nasal airway obstruction can play an important role in pathogenesis and treatment of obstructive sleep apnea (OSA). Surgery for nasal obstruction can improve patient-reported OSA outcomes, including snoring and daytime sleepiness, as well as adherence and pressure requirements with continuous positive airway pressure (CPAP) therapy. The aim of this study was to examine whether previous nasal surgery was associated with UAS treatment efficacy.

Methods: From the ADHERE Registry, propensity score matching generated a cohort of UAS patients with prior nasal surgery including septoplasty, turbinate reduction, polyp removal (NS) and a comparable cohort of UAS patients without prior nasal surgery (WNS). Patients were matched based on demographic variables including pre-operative oral appliance use, prior CPAP use, gender, age, baseline apnea hypopnea index (AHI) and baseline Epworth Sleepiness Score (ESS). Data included demographic variables, therapy outcome measures including AHI, ESS, therapy use, and responder rate. Student's t-test was used to compare normally distributed numeric data and Fisher's exact test to compare categorical data. One sided t-tests with non-inferiority margin of 7.5 events/hr for AHI, 2 points for ESS, and 0.5 hr/night for Therapy Use were performed to determine non-inferiority.

Results: The ADHERE dataset from October 2021 included 169 patients from each cohort were matched for comparison. Reduction in AHI was 21.01 ±17.94 in WNS cohort and 18.39 ± 16.4 after UAS ($p=0.162$) in NS cohort. Reduction in ESS in WNS cohort was 4.85 ± 4.98 and 4.48 ±5.83 ($p=0.528$) in NS cohort.

Therapy use was similar, 5.67 ± 1.95 in WNS and 5.97 ± 2.06 in NS (p=0.181). Responder rate was also similar in WNS (64.5%) and NS (62.1%) (p=0.735).
Conclusion: Retrospective analysis of UAS patients with vs without prior nasal surgery did not identify differences in UAS therapy outcomes or adherence. Furthermore, outcomes for patients with nasal surgery were non-inferior to those without. Future prospective studies of UAS candidates with nasal airway obstruction may better determine the role of adjunctive nasal surgery in this population.
Support (If Any): Inspire Medical Systems

0750

PERFORMANCE TESTING OF A NOVEL ORAL APPLIANCE MATERIAL; A NEW STANDARD FOR OAT

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Introduction: Traditionally, oral appliances for treating obstructive sleep apnea have borrowed from the disciplines of removable prosthetics and orthodontics. The materials, design and manufacturing have evolved little. Today, precision milled devices using innovative materials and designs have leapt past artisanal legacy devices. The use of artificial intelligent design to accurately replicate tooth surface anatomy and robotic manufacturing to insure precision are requiring higher table stakes to 'get in the game'. Millable polymethylmethacrylate, MG6™ Technology materials and printed nylons have replaced cold cured acrylics, Thermacryl, soft liners and suck down platforms. The testing and material standards should also evolve as well.
Methods: Typically, no specific ISO testing is performed on legacy device compositions. This new medical grade class VI (the highest category) material promised to be more robust, safer and to have the highest biocompatibility. ISO testing was performed in the following arenas: ISO tests 10993-4 Hemolysis, 10993-4 in vitro hemocompatibility, 10993-5 cytotoxicity, 10993-6 short-term intramuscular implantation, 10993-10 intracutaneous injection, 10993-11 system toxicity and USP 38 physiochemical testing.Similarly, no specific durability testing is done beyond the safety requirement designs set by the FDA. This material was exposed to all the tradition stress, bend and compression testing as well as the MIL-STD-810H Military Free Fall Drop Test. Finally, stain, biogunk and the ease of keeping a device clean are always a concern with legacy device materials. Milled PMMA has been shown previously to be nearly impervious to stain and bioburden uptake. This material was tested along with predicates and PAP mask materials for comparison.
Results: ISO TestingThe Material passed all the tests as indicated in reports nos. BIO-ATX 1856,1857,1858, and BIO-GNT 8321. 832, 833. Military Drop TestThis material passed the military drop test (40 cases, each dropped 6 times). Method Test 810H section 4.6.5 Procedure IV Table 516.8-X Unpackaged handling. Stain TestingMilled Iterative PMMA DE = 3.06Milled Iterative EVO material DE = 3.20CPAP Mask plastic DE = 7.54Milled PMMA w/ soft Liner/Fulcrum Strap DE = 8.27CPAP Mask silicone DE = 11.60PMMA + Liner Anterior Hook DE = 19.05PMMA with Liner Herbst DE = 32.05Nylon with Airway DE = 90.70Nylon with Straps DE = 96.99
Conclusion: Medical grade class VI material sets new standard for oral appliance material performance
Support (If Any): Data provided by ProSomnus, ISO.org and the DOD.

0751

THE USE OF A DIGITALLY MILLED ORAL APPLIANCE IN THE TREATMENT OF SEVERE OBSTRUCTIVE SLEEP APNEA

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Introduction: Oral appliances (OAs) that advance the mandible are commonly used for the treatment of mild to moderate obstructive sleep apnea (OSA) but are less accepted as a therapy for severe OSA, likely due to their supposed lower rate of therapeutic success in that population. However, the preference for OAT over CPAP and relative lack of other non-surgical treatment options highlights the need for acceptance of OAT for all severities of OSA. Data from two prospective studies that collected data on OAT efficacy were analyzed retrospectively to evaluate the success rate of OAT in severe OSA using a digitally milled OA.
Methods: Data from the severe OSA cohorts of two studies conducted for the validation of an in-home auto-titration test were evaluated. Study participants (n = 41 with severe OSA) received a precision iterative advancement OA (ProSomnus Sleep Technologies, Pleasanton, CA). The OAs used in the studies were CAD/CAM generated from digital intraoral scans and precision milled from control cured grade PMMA. The OAs consisted of sets of upper and lower trays that, when interfaced together, allowed for advancement of the mandible to a treated position. Oral appliances were set to the target protrusion provided by an in-home auto-titration test that predicts response to OAT (MATRx plus; Zephyr Sleep Technologies, Calgary, Alberta, Canada). Participants not predicted to respond to OAT were assigned a sham mandibular protrusion. Oral appliance therapy was initiated at the target protrusive position, sham position, or highest tolerated position for individuals who were unable to have their OA inserted at target. Once participants were habituated to OAT, a 2-night home sleep apnea test (HSAT) was conducted to assess treatment efficaciousness, and the mandible was advanced as necessary to lower the respiratory event index (REI).
Results: The study population included 36 male and 5 female participants with a mean age of 50.6 ± 8.4 years (range: 32-74 years), mean BMI of 32.1 ± 5.5 kg/m2 (range: 19.8-45.4 kg/m2), mean baseline REI of 49.5 ± 17.1 h-1 (range: 30.3-101.8 h-1), and median Epworth Sleepiness Scale (ESS) score of 10 (range: 0-23). Oral appliance therapy was well-tolerated in the study population. The majority of study participants achieved some level of therapeutic success, with 73.2% of participants achieving a decrease in REI from baseline of at least 50% and 68.3% achieving an REI < 15 h-1. Of the study participants who achieved an REI < 15 h-1, the average protrusive position of the OA was 86.7±15.3% (range: 54.8-100%).
Conclusion: The OAs used in the studies provided efficacious treatment for the majority of individuals with severe OSA, indicating that oral appliance therapy could be a suitable alternative to CPAP. The rate of therapeutic success was higher than that reported previously in the literature and might be a result of the precision of appliances generated from digital intraoral scans using a CAD/CAM approach.
Support (If Any): Study data were collected by and used with the permission of Zephyr Sleep Technologies. ProSomnus Sleep Technologies provided the OAs used in the studies.

0752

PRELIMINARY EFFICACY OF A NOVEL ITERATIVE DEVICE AND MATERIAL

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Introduction: Launching a new device design or use of a new material with optimistic expectations should always be undertaken with caution and an ounce of skepticism. When this novel device and material was first described in an IRB Abstract derivative report at the AASM, it was under the umbrella of a patient and provider preference survey. In April 2020, the broader availability post FDA clearance is providing strong early indications of excellent efficacy.
Methods: An analysis of data from four treatment centers using this novel device and material was undertaken. Patients were to be included if they had a diagnosis of mild, moderate, or severe OSA confirmed by a physician, and an AHI score >5 and a follow up study resulting in treatment success or failure. Results would be grouped as Complete Success = AHI <5, Clinical Success = 50% reduction and <10. All patients were to be treated with the Novel ProSomnus EVO Iterative advancement device.
Results: 55 total consecutive patients were treated at four centers for dental sleep medicine. 37 male and 18 female patients with an average age of 53.3 ranging from 30 to 78 with pre and post data were included and treated with a ProSomnus EVO. The initial AHIs ranged from 6.0 to 116.0 with an average of AHI pretreatment of 26.4 (15 mild, 23 moderate and 17 severe). Follow up testing for this group revealed an average overall reduction in AHI of 75%, from 26.4 to 6.6. Overall, 62% resolved to below an AHI of 5 (100% of mild, 65% of moderate and 24% of severe patients). Similarly, 85% resolved to below an AHI of 10 and a 50% reduction (100% of mild, 96% of moderate and 59% of severe patients)
Conclusion: This novel interactive device and material combination appear, after early analysis, appear to yield significantly better results that previous data has demonstrated. The literature suggests that legacy oral appliance efficacies range from 50%-62% and other AADSM poster/abstracts have reported similar precision milled, control cure PMMA appliances in the 74% - 76% range. These results suggest a need for further investigation of exceptional efficacy for this device design and material.
Support (If Any): No support was provided for this abstract

0753

PREDICTORS OF RESIDUAL SLEEP APNEA IN OSA PATIENTS ON PAP

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Introduction: Positive airway pressure (PAP) is the first line therapy for patients with obstructive sleep apnea (OSA). However, clinical OSA may have multiple disease drivers beyond upper airway collapse, such as high loop gain and a low arousal threshold. The burden of residual sleep apnea in patients treated with PAP and it's predictors remained to be fully defined.
Methods: Adult patients who were diagnosed with OSA through a split-night polysomnography (PSG) in the AASM accredited sleep center at the Beth Israel Deaconess Medical Center, Harvard Medical School and followed using the EncoreAnywhereTM system were prospectively included. Monthly visual/manual scoring of residual events was done. The ratio of patients with residual sleep apnea (defined as a manually-scored respiratory event index (REI) ≥ 15 times/hour in the 3rd month and 12th month were calculated. A linear regression model was used to explore the predictors of residual sleep apnea on PAP.
Results: One hundred and ninety five patients were included. In the 3rd month, there were 166 patients still on PAP. There were 74 (44.58%) with a residual AHI ≥ 15 times/h. In the 12th month, there were 93 patients still on PAP and 41 (44.09%) had residual AHI ≥ 15. In the short term, treatment CAHI (β= 0.511, SE=0.123, p=0.001), age (β= 0.123, SE=0.054, p=0.025), and hypertension (β= 3.627, SE=1.536, p=0.019) were the predictors for residual sleep apnea. In the long term, treatment CAHI (β= 0.598, SE=0.163, p=0.001), male gender (β= -5.117, SE=2.005, p=0.013) and baseline mean arousal duration (β= -0.601, SE=0.184, p=0.002) were predictors for residual sleep apnea.
Conclusion: There was a high percentage of patients with OSA on PAP who have residual sleep apnea. Treatment CAHI is a strong predictor, and may reflect high loop gain effects.
Support (If Any): Category-I Strategic Research Award from the AASM Foundation to R. J. Thomas

0754

EFFECTS OF ATOMOXETINE PLUS A HYPNOTIC ON OBSTRUCTIVE SLEEP APNEA (OSA) SEVERITY IN PATIENTS WITH A MODERATELY COLLAPSIBLE PHARYNGEAL AIRWAY

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Introduction: The combination of atomoxetine and oxybutynin has demonstrated efficacy in the treatment of OSA. Oxybutynin may play a role as an upper airway dilator muscle activator and/or a hypnotic to improve sleep quality. We assessed the effectiveness of atomoxetine when combined with one of two hypnotics. Trazodone is a known hypnotic with possible effects on pharyngeal muscle activity. The other is lemborexant, an orexin antagonist. The effects of both combinations were assessed in patients with OSA and a moderately collapsible pharyngeal airway.
Methods: Recruited patients were 18 – 65 years of age, with an AHI 4 (4% desaturation criteria) of 10 – 55 and a BMI < 40 kg/m2. Each had to have a moderately collapsible pharyngeal airway using previously defined criteria based on the average percent desaturation during obstructive events (< 8%) and the ratio of hypopneas to total events (> 50%). After a qualifying PSG, each patient spent three nights in the sleep laboratory with approximately one week between studies. Nights were randomized to placebo, atomoxetine 80 mg plus trazodone 100 mg, and atomoxetine 80 mg plus lemborexant 10 mg. Primary outcomes were AHI 4 and the sleep apnea specific hypoxic burden (HB), the area under the SpO2 curve associated with disordered breathing events.
Results: Fifteen patients completed the trial (median [interquartile range] age was 52 [48-55] and BMI was 33.6 [30 – 35.1] kg/m2. Atomoxetine plus trazodone showed a strong trend for AHI 4 reduction from placebo (from 18.2 [11.8 – 31.3] to 7.4 [5.4 – 16.1] events/h, p=0.064), a significant reduction in HB from placebo (from 48.2 [31.2 – 79.6] to 18.7 [14.9 – 43.5] % min/h) and a trend for a reduction in HB with atomoxetine plus lemborexant (from 34.1 [12.1 – 128.8] to 18.7 [14.9 – 43.5] % min/h, p=0.055). There was no change in total sleep time or arousal index between treatment arms. Mild adverse events were reported on atomoxetine plus trazodone (2/15 sinusitis, 1/15 heartburn).

Conclusion: In OSA patients with a moderately collapsible upper airway, the combination of atomoxetine plus trazodone yielded clinically meaningful improvements in measures of sleep disordered breathing and oxygenation while atomoxetine plus lemborexant produced smaller effects.
Support (If Any): This study was supported by Apnimed.

0755

COMPARISON OF CLINICAL PATHWAYS FOR UPPER AIRWAY STIMULATION MANAGEMENT: IN-LABORATORY TITRATION POLYSOMNOGRAPHY VERSUS HOME-BASED EFFICACY SLEEP TESTING

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Introduction: Upper airway stimulation (UAS) therapy is an alternative treatment option for select CPAP-intolerant patients with obstructive sleep apnea. Current standard-of-care management uses in-laboratory polysomnography for titration of UAS stimulation amplitude (tPSG) after 3 months of patient self-titration at home. This home monitoring study was designed to evaluate whether tPSG or efficacy home sleep test (eHST) with tPSG by exception for eHST non-responders would have non-inferior apnea-hypopnea index (AHI) outcomes.
Methods: Enrolled patients underwent UAS implantation as part of regular clinical care and were randomized at the activation visit 1:1 between tPSG or eHST for the 3-month post-activation visit. If eHST results were suboptimal (AHI > 15 events/h or < 50% reduction from baseline AHI) patients underwent tPSG titration at 5 months. Both groups had 2-night eHSTs at 6 months post-activation. The primary endpoint was 6-month AHI equivalence between arms (defined as ± 15 events/h). Secondary endpoints were equivalence of Epworth Sleepiness Score (ESS; ± 2), oxygen desaturation index (ODI; ± 15 events/h), and nightly UAS device usage (± 0.5 h).
Results: The study randomized 60 patients from August 2020 through September 2021, who were primarily middle aged (57 ± 10 years), male (67%), Caucasian (98%), and overweight (BMI 29 ± 3 kg/m2), with severe OSA (AHI 35 ± 16). Eleven patients withdrew from the study early. As of December 2021, 41 and 36 patients have completed 3- and 6-month follow-up visits, respectively. Six-month visit AHI, ESS, ODI, and device usage data between arms is currently blinded and is expected to be complete by Q2 2021 prior to SLEEP 2022.
Conclusion: If the study demonstrates equivalent 6-month AHI, ESS, ODI, and usage outcomes, the use of eHST to ascertain therapy efficacy prior to tPSG could be a non-inferior alternative management option to tPSG.
Support (If Any): Sponsored by Inspire Medical Systems, Inc.

0756

PRECLINICAL PHARMACOLOGY OF SOLRIAMFETOL: POTENTIAL MECHANISMS FOR WAKE PROMOTION

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Introduction: Solriamfetol is a wake-promoting agent (WPA) approved for the treatment of excessive daytime sleepiness associated with narcolepsy and obstructive sleep apnea. The wake-promoting mechanism of solriamfetol may result from dopamine and norepinephrine reuptake inhibition. Preclinical pharmacology studies were conducted to further elucidate the molecular targets activated by solriamfetol and compare them to that of known WPAs and traditional stimulants.
Methods: In vitro binding and functional studies were conducted in a panel of cell lines or membrane preparations expressing transmembrane receptors and monoamine transporters to measure the activity of solriamfetol, comparator WPAs, and traditional stimulants. Electrophysiology studies were conducted in slice preparations from mouse ventral tegmental area (VTA). Studies to measure locomotor activity and wake-promoting effects were conducted in mice.
Results: In vitro functional studies showed agonist activity of solriamfetol at human, mouse, and rat TAAR1 receptors. hTAAR1 EC50 values (10–16 µM) were within the clinically observed therapeutic solriamfetol plasma concentration range and overlapped with the observed DAT/NET inhibitory potencies of solriamfetol in vitro. TAAR1 agonist activity was unique to solriamfetol; neither the WPA modafinil nor the DAT/NET inhibitor bupropion had TAAR1 agonist activity. Solriamfetol (1–10 µM) dose-dependently inhibited the firing frequency of dopaminergic VTA neurons in mouse brain slices, similar to known TAAR1 agonists; however, these effects were inhibited by a D2 antagonist, suggesting a DAT-mediated effect. Unlike traditional stimulants, solriamfetol did not increase locomotor activity in naive mice, but inhibited the increase in locomotor activity in DAT knockout mice.
Conclusion: Preclinical studies have identified agonist activity at the TAAR1 receptor and, possibly, lower potency agonist activity at 5-HT1A receptors as potential pharmacological targets for solriamfetol, in addition to its activity as a DAT/NET inhibitor. Given the current understanding of TAAR1 agonists as modulators of monoamine transmission with potential wake-promoting effects in multiple preclinical species, agonist activity at the hTAAR1 receptor may represent an additional pharmacological target underlying the wake-promoting effects for solriamfetol, in addition to its DNRI activity.
Support (If Any): Jazz Pharmaceuticals

0757

CLUSTER ANALYSIS FOR IDENTIFYING GOOD CPAP ADHERENCE USING THE PSG PARAMETERS AND PATIENT CHARACTERISTICS

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Introduction: CPAP is the standard treatment for obstructive sleep apnea (OSA). One of the important clinical issues to be solved is poor CPAP adherence. A growing body of studies has identified predictive factors for CPAP adherence including AHI, BMI, age, gender, symptoms, etc. When our sleep physicians prescribe CPAP, we would consider these known factors in multiple ways. One may want to know factors' combinations rather than each factor. In this case, cluster analysis might be useful since it is a

powerful data-mining tool to sort various factors into meaningful groups. Recently, cluster analysis has been adopted for research of sleep breathing disorders. However, no one has adopted to predict CPAP adherence. In this study, we aimed to explore the usefulness of cluster analysis to predict CPAP adherence using the diagnostic PSG parameters and patients' characteristics.

Methods: The study design was a retrospective observational multi-center study including 5 certified sleep centers in Japan. For 2 years from 2017, 1133 patients who were diagnosed with OSA with in-lab PSG and newly initiated CPAP therapy were enrolled. We performed cluster analysis using the K-means clustering. Variables for clustering were determined by several sleep physicians among PSG parameters and patients' characteristics. We assessed CPAP adherence for 90 days and 365 days after CPAP initiation in each created cluster. We adopted CMS criteria for good CPAP adherence, which is, more than four hours of use on 70% of nights.

Results: Cluster analysis classified 5 clusters. A significant difference in CPAP adherence for 90 days and 365 days was seen among 5 clusters with a test of independence (p=0.001, p=0.005, respectively). The cluster presenting moderate obese, very high AHI and ODI, and apnea predominant indicated good adherence, whereas the cluster presenting morbid obese, very high AHI and ODI, sustained severe hypoxia, younger age, and daytime sleepiness indicated poor adherence according to the post-hoc Chi-square test.

Conclusion: Cluster analysis successfully distinguished the different CPAP adherence and identified a combination of OSA patients' profiles. Thus, cluster analysis would be a useful tool for predicting long-term CPAP adherence.

Support (If Any):

0758

BEHAVIORAL DETERMINANTS OF PAP USE IN VETERANS WITH COMISA: RESULTS OF A RANDOMIZED TRIAL

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Introduction: Nonadherence to positive airway pressure (PAP) therapy is common in comorbid insomnia and obstructive sleep apnea (COMISA). We previously reported a novel behavioral treatment for COMISA which improves both PAP adherence and sleep. Our current goal was to assess whether improvements in PAP self-efficacy, knowledge, and decisional balance (targets of treatment) are associated with improvements in PAP use and sleep quality. We also collected participants' perceptions of benefits and challenges of PAP during intervention.

Methods: 125 veterans (96% men, 39% non-Hispanic white, 24% Black, 17% Hispanic/Latino) with COMISA were randomized to a 5-week intervention integrating behavioral insomnia therapy with a PAP adherence program versus general sleep education (control). Objective PAP use data and Pittsburgh Sleep Quality Index (PSQI) were collected over 6 months. Three behavior change subscales (PAP Self-Efficacy [PAP-SE], Decisional Balance Index [DBI], Knowledge [KNOW]) were administered at 6-months. Weekly self-report of participant-perceived benefits and challenges of PAP use were collected among intervention participants. Subscale scores, PAP use and PSQI were compared between intervention and control, and associations were tested. Change in mean number of benefits and challenges of PAP use were also tested (all analyses intent-to-treat).

Results: At 6-months, compared to controls, intervention participants had higher scores on all three subscales: PAP-SE (4.1 intervention versus 3.5 control, respectively), DBI (8.3, 0.9) and KNOW (10.5, 9.6, all p<.05). Intervention participants had more PAP use and lower (better) PSQI scores at 6-months (all p<.05). In the total sample, PAP use and PSQI correlated with PAP-SE (r=.52 PAP use, r=-.27 PSQI, respectively), DBI (r=.49, -.35) and KNOW (r=.43, -.21; all p<.05). Among intervention participants, perceived benefits of PAP increased over time (4.3 at week 2, 5.8 at week 4, respectively), and challenges decreased (3.7, 2.3; all p<.05).

Conclusion: Behavioral treatment for COMISA improves behavioral determinants of PAP use, which is associated with improvements in PAP use and sleep quality. In addition, with treatment, perceived benefits of PAP increase and challenges decrease. These findings suggest improvements in self-efficacy, knowledge and perceived benefits of PAP are important mechanisms through which behavioral interventions improve PAP use in older adults with COMISA.

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0759

A REAL WORLD STUDY ASSESSING PATIENT SATISFACTION IN THE PRIMARY CARE SETTING IN RELATION TO EXCESSIVE DAYTIME SLEEPINESS IN PARTICIPANTS WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Excessive daytime sleepiness (EDS) is common in obstructive sleep apnea (OSA), despite positive airway pressure (PAP) therapy. These analyses evaluated EDS prevalence and its relationship with satisfaction with care in participants with OSA receiving OSA care in a primary care setting.

Methods: US residents (aged ≥18 years, self-reported physician OSA diagnosis [1/1/2015–3/31/2020]) completed a survey in Evidation Health's Achievement app assessing Epworth Sleepiness Scale (ESS), specialties of healthcare providers (HCPs) treating OSA, PAP usage, and satisfaction with HCPs and overall OSA care. Self-reported PAP use was categorized: nonuse, nonadherent (<4 h/night, <5 d/wk), intermediate (4–6 h/night, ≥5 d/wk), or highly-adherent (≥6 h/night, ≥5 d/wk) (PAP-adherent=intermediate+highly-adherent groups). Linear modeling assessed the relationship between PAP use and ESS score; logistic regression assessed impacts of PAP adherence and EDS on satisfaction with care. P-values are uncontrolled for multiplicity.

Results: Participants (N=2289) were 50.3% female; 82.5% White; 44.8±11.1 years old (mean±SD); with BMI 35.4±8.7 kg/m2; 42.5% had EDS (ESS>10). OSA was primarily managed by sleep specialists (43.5%), general practitioners (GPs) (42.5% [28.9% saw a GP only; 13.6% saw a GP and a specialist/pulmonologist]), and/or pulmonologists (18.0%). Among participants with OSA

managed by a GP only (n=662), proportions (95% CI) with EDS were: PAP nonuse (49% [42.8–54.9]), nonadherent (47% [31.5–63.2]), intermediate (47% [33.4–60.8]), and highly-adherent (35% [29.3–39.9]). Linear modeling (PAP users; n=398) showed an additional h/night of PAP use was associated with lower ESS scores (estimate [SE], –0.26 [0.13]; P<0.05); logistic regression showed association between PAP adherence and higher satisfaction with HCPs (adjOR=2.26; 95% CI=1.09–4.70; P<0.05) and OSA care (adjOR=1.58; 95% CI=0.75–3.36; P>0.05). There was an association between presence of EDS and lower satisfaction with their HCPs (adjOR=0.62; 95% CI=0.39–0.99; P<0.05) and OSA care (adjOR=0.49; 95% CI=0.31–0.79; P<0.05).
Conclusion: In a real-world population of participants with OSA receiving OSA care from GPs, EDS was common, even among highly-adherent PAP users. ESS scores were generally lower with increasing PAP adherence. PAP adherence was associated with increased satisfaction with their HCPs; EDS was associated with lower satisfaction with HCPs and overall OSA care.
Support (If Any): Jazz Pharmaceuticals

0760

EXCESSIVE DAYTIME SLEEPINESS, POSITIVE AIRWAY PRESSURE, AND PATIENT SATISFACTION WITH MULTIPLE ASPECTS OF CARE IN A REAL-WORLD POPULATION WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Excessive daytime sleepiness (EDS) is common in patients with obstructive sleep apnea (OSA) and can persist despite use of positive airway pressure (PAP) therapy. These analyses assessed relationships between EDS, PAP use, and patient satisfaction across several aspects of OSA care in a real-world population with OSA.
Methods: US residents (aged ≥18 years, self-reported physician OSA diagnosis [1/1/2015–3/31/2020]) completed a survey in Evidation Health's Achievement app assessing Epworth Sleepiness Scale (ESS), PAP usage, and satisfaction with care. Self-reported PAP use was categorized as nonuse, nonadherent (<4 h/night; <5 d/wk), intermediate (4–6 h/night, ≥5 d/wk), or highly adherent (≥6 h/night, ≥5 d/wk) (PAP-adherent=intermediate and highly adherent groups). Logistic regression models assessed impacts of PAP adherence and EDS on satisfaction with care across 7 domains. P-values are uncontrolled for multiplicity (nominal).
Results: Among all participants (N=2289; 50.3% female, 82.5% White, 44.8±11.1 years old [mean±SD], 35.4±8.7 kg/m2 body mass index [mean±SD]), 42.5% had EDS (ESS>10). PAP use was: nonuse (n=700), nonadherent (n=153), or adherent (n=1436; intermediate n=225, high n=1211). Within these subgroups, the proportions (95% CI) with EDS were: nonuse (47% [43.7–51.1]), nonadherent (52% [44.4–60.2]), intermediate (53% [46.4–59.4]), and highly adherent (36% [33.7–39.1]). Logistic regression (using data from PAP users) showed a positive association of PAP adherence with satisfaction with PAP (OR [95% CI]: 5.43 [3.73–7.90]); OSA treatment effectiveness (3.56 [2.48–5.12]); OSA symptom management (3.15 [2.17–4.57]); coordination of OSA care (2.60 [1.82–3.72]); and education from their healthcare provider on the impact of OSA on cardiovascular health (1.62 [1.13–2.35]), importance of using PAP (1.7 [1.15–2.52]), or availability of prescription drugs to treat OSA symptoms (1.55 [1.06–2.26]). The presence of EDS was associated with lower patient satisfaction in nearly all domains examined (ORs ranged from 0.44–0.62 across 6 of 7 domains).
Conclusion: EDS was common in this real-world population with OSA, even among participants who were highly adherent PAP users. PAP adherence was associated with higher patient satisfaction across all care domains; the presence of EDS was associated with lower patient satisfaction across 6 of 7 domains.
Support (If Any): Jazz Pharmaceuticals

0761

ADAPTABILITY OF THE TREATING OBSTRUCTIVE SLEEP APNEA USING TARGETED HYPOGLOSSAL NERVE STIMULATION (OSPREY) TRIAL

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Introduction: With few exceptions, clinical trials of hypoglossal nerve stimulation (HGNS) for obstructive sleep apnea (OSA) are single-arm, open-label studies sometimes followed by short-term, unblinded, randomized withdrawal. By contrast, the THN3 study was a parallel-arm, randomized, controlled trial (RCT) of targeted HGNS (THN) in moderate to severe OSA, and provided higher-level evidence of HGNS safety and efficacy.Despite generating strong evidence, conventional RCTs are risky due to their inherent inflexible designs. We therefore launched a confirmatory THN RCT (OSPREY) with an adaptive, Bayesian "Goldilocks" design that optimize its sample size dynamically, yet achieve high-confidence results.
Methods: Four scenarios were simulated within the OSPREY design framework (randomized 2:1 Treatment:Control) for the primary endpoint of apnea-hypopnea index (AHI) response rate (RR): nominal with results equal to those of THN3 (Treatment AHI RR 52%/Control AHI RR 20%), improved Treatment RR (63%/20%), worsened Treatment RR (41%/20%) and null [Treatment RR=Control RR] (20%/20%). Each scenario was simulated 10 times with 10,000 simulations of each interim analysis. Subject outcomes were determined by randomly drawing from a binomial distribution with the relevant AHI RR.Interim analyses in OSPREY begin at 50 randomized subjects and repeat every 20 additional subjects to the maximum sample size of 150, with opportunities for early success and futility at each milestone to generate high-confidence results from an optimal sample size. OSPREY assesses secondary endpoints including quality of life inventories (Epworth Sleepiness Scale; Functional Outcomes of Sleep Questionnaire; EQ-5D, SF-6D and PROMIS sleep questionnaires) and oximetry metrics (Oxygen Desaturation Index, %sleep time below 90% oxygen saturation). Previous results suggest secondary endpoints will be adequately powered at the final sample size determined by AHI RR.
Results: Simulations produced the following outcomes formatted as [scenario: randomized sample size, overall success rate, probability of early success, mean success probability]: null: 150, 0%, 0%, 2.47%; nominal: 130-150, 100%, 80%, 95.3%; improved: 90-130, 100%, 100%, 98.9%; worsened: 150, 100%, 0%, 68.6%.
Conclusion: OSPREY is uniquely able to adapt to various Treatment/Control response scenarios and should provide high-confidence confirmation of the safety and efficacy of THN therapy in moderate to severe OSA.
Support (If Any): LivaNova

0762

BASELINE CHARACTERISTICS: SOLRIAMFETOL'S EFFECT ON COGNITIVE HEALTH IN APNEA PARTICIPANTS DURING A RANDOMIZED PLACEBO-CONTROLLED STUDY (SHARP)

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Introduction: Patients with excessive daytime sleepiness (EDS) associated with obstructive sleep apnea (OSA) may experience cognitive impairment. Solriamfetol (Sunosi®) is a dopamine/norepinephrine reuptake inhibitor approved in the US and EU to treat EDS associated with OSA. The objective of this study is to assess whether solriamfetol reduces cognitive impairment in patients with EDS associated with OSA.
Methods: This phase 4, randomized, double-blind, placebo-controlled, crossover trial (NCT04789174) is enrolling adults with OSA and associated EDS (Epworth Sleepiness Scale score >10) and impaired cognitive function defined by an age-adjusted scaled score ≤8 on the Wechsler Adult Intelligence Scale, Fourth Edition (WAIS-IV) Coding subtest and a score ≥9 on the British Columbia–Cognitive Complaints Inventory (BC-CCI). Participants are randomized (1:1) to 2 weeks of placebo or solriamfetol (75 mg/day for 3 days, then 150 mg/day) during treatment period 1. After a 1-week washout, participants crossover to receive 2 weeks of the opposite treatment during treatment period 2. Assessments at baseline and after each treatment period include Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) Coding administered 2, 4, 6, and 8 hours post-dose and the BC-CCI. The primary endpoint is change from baseline after each treatment period in the average of 2- and 4-hour post-dose RBANS Coding scores. A secondary endpoint is change from baseline after each treatment period in BC-CCI score. Target enrollment range is 116–164 participants, pending interim analysis. Enrollment is ongoing; baseline characteristics to date are reported.
Results: As of October 20th, 2021, 33 participants have been randomized across 20 study sites in North America and Europe. In the intent-to-treat population to date (n=33), mean±SD age is 53.0±10.4, mean±SD BMI is 31.6±4.5, 64% are male, 70% are White (Black or African American, 24%; Asian, 6%), and most (91%) are not Hispanic or Latino. The mean±SD WAIS-IV Coding subtest age-correct scaled score is 6.7±1.3 at baseline, which is below previously observed scores in healthy individuals.
Conclusion: This ongoing study is the first to examine solriamfetol's impact on cognitive impairment in participants with OSA. Participants enrolled to date reflect the typical demographics of patients with OSA and demonstrate substantial cognitive impairment.
Support (If Any): Jazz Pharmaceuticals

0763

COUPLES-BASED TREATMENT FOR OSA: QUALITATIVE ANALYSIS OF PATIENT, BEDPARTNER AND PROVIDER PERSPECTIVES

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Introduction: Obstructive sleep apnea (OSA) and its treatment (positive airway pressure; PAP) impacts both patient and bedpartner health and their respective quality of life. Despite the effectiveness of PAP at treating OSA and evidence that PAP adherence benefits both patient and partner, over half of OSA patients are not adherent. Thus, non-adherence to OSA treatment is a couple-level problem, with significant health impacts for both parties. However, bedpartners are rarely integrated into OSA treatments. The current study presents a qualitative analysis of patients, bedpartners, and provider perspectives to inform a novel, couples-based intervention to promote adherence to PAP and sleep health for the couple.
Methods: We conducted 3 focus group discussions with patients and their partners, and 3 focus group discussions with sleep medicine providers. Focus groups utilized a standardized interview guide to examine: 1) impact of OSA and PAP treatment on the couple, 2) interdependence of sleep and 3) feasibility of a couples-based sleep health and PAP adherence intervention. Transcripts were transcribed and analyzed using thematic analysis using Dedoose. A thematic analysis process coded for emerging themes across a deductive framework.
Results: Participants included 7 heterosexual couples, 2 patients who participated without their partners and 9 sleep medicine providers (1 nurse practitioner, 3 PSG techs and 5 sleep medicine physicians). Results demonstrated awareness of how sleep impacts patient and partner mood, next day functioning, and relationship quality. Patients and partners reported working together using a variety of strategies to overcome challenges to OSA treatment. Couple-level barriers to treatment were discussed, including sleep disruptions from PAP and the impacts of treatment on intimacy. Providers reported the utility of involving partners in the sleep evaluation and during equipment set up. Couples-based treatment was viewed as helpful for facilitating adjustment and adherence to PAP, particularly to help patients trouble-shoot common challenges, such as adjusting to the mask. However, providers expressed some concerns about couples-based treatment among couples with poor relationship quality.
Conclusion: Results demonstrate the impact of OSA on the couple and awareness of the importance of including partners in the adjustment to PAP treatment. Findings will be discussed in the context of developing novel behavioral interventions for older adults who face a variety of sleep health issues, in addition to sleep apnea, and in recognition of the dyadic nature of sleep for most adults.
Support (If Any): 1 R21 AG067183-01A1

0764

EVALUATION OF CLOUD-CONNECTED HOME SENSORS OF APNEA-HYPOPNEA INDEX VERSUS POLYSOMNOGRAPHY AND HOME SLEEP TEST DURING UPPER AIRWAY STIMULATION HOME TITRATION

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Introduction: A growing number of cloud-connected sensors can longitudinally record apnea hypopnea index (AHI) at home. The Ectosense NightOwl is an FDA-approved peripheral arterial tomography device; the Withings Sleep Analyzer mat is an undermattress sensor with AHI data for retrospective research use (CE marked, not FDA approved). We used these sensors to monitor patients with upper airway stimulation (UAS) therapy during therapy acclimatization and post-titration follow-up and compared sensor AHI to polysomnography (PSG) and home sleep test (HST) AHIs.

Methods: Enrolled patients underwent UAS implantation as part of regular clinical care and were required to have a smartphone. The Ectosense and Withings sensors were distributed at UAS device activation. Patients were asked to use NightOwl weekly, and Withings provided nightly AHI. Sleep studies (PSG & HST) occurred at 3 and 6-mo post implant. Ectosense & Withings AHI were averaged and correlated against the nearest 3- and 6-month sleep study AHIs.
Results: Patients were 67% male, aged 57 ± 10 years. Smartphone platforms were 59% Apple iOS, 24% Google Android, and 17% Unknown. As of October 2021, 45 patients have had near-simultaneous Withings and PSG/HST AHI, 35 have had near-simultaneous NightOwl and PSG/HST AHI. The Withings AHI was fairly linear against PSG/HST AHI, adjusted R2 = 0.47, p < 0.0001, (y=10 + 0.82x). Withings AHI < 15 (n=18) had a 90% positive predictive value for a PSG/HST AHI less than 15 (n=20). Ectosense data was less linear and more scattered, adjusted R2 = 0.15, p=0.01, (y=14 + 0.47x). Ectosense AHI < 15 (n=12) had an 80% positive predictive value of a PSG/HST AHI less than 15 (n=15).
Conclusion: Home-based sensors provide longitudinal SDB data in a home setting and may adequately classify patients with mild sleep apnea, and may have utility for home-based management of UAS patients in the post-implantation period.
Support (If Any): Inspire Medical Systems

0765

ENHANCED RESPONSE TO TARGETED HYPOGLOSSAL NERVE STIMULATION IN PATIENTS WITH NORMAL SLEEP EFFICIENCY: A THN3 POST-HOC ANALYSIS

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Introduction: THN3 was the first reported parallel-arm, randomized controlled trial of hypoglossal nerve stimulation (HGNS), wherein targeted HGNS (THN) was shown to be safe and efficacious at ameliorating sleep disordered breathing in selected patients with moderate to severe OSA and BMI≤35kg/m2 without screening with drug-induced sleep endoscopy. A secondary THN3 objective was to identify baseline characteristics which enhance therapeutic response.
Methods: Predictors of long-term (Month 12/15) apnea-hypopnea index (AHI) response (reduction ≥50% to ≤20/hr) were identified in stages. Baseline characteristics, including polysomnography parameters, were screened one at a time using univariate logistic regression. Variables significant at α=0.25 were further selected using stepwise multivariate logistic regression. Candidate predictors were then optimized by manual, incremental threshold adjustment to maximize AHI response rate (RR). Optimized predictors were ranked according to the AHI RR and size of the corresponding subpopulation, with a goal of capturing at least 40% of the overall THN3 cohort.
Results: Baseline sleep efficiency (SE) in the normal range (>85%) achieved the highest AHI RR while retaining 42% (58/138) of the THN3 cohort. Similar to the overall study population, subgroup subjects were predominantly middle-aged (age 54±7 years), male (83%), Caucasian (86%) and overweight/obese (BMI 30±3 kg/m2). Short-term (Month 4) AHI RRs in the Treatment and Control groups were 59.5% and 20.0%, respectively, with long-term AHI RR at 50.9%. Median AHI was reduced from 35.1 to 16.0, as compared to 29.3 to 9.0 in the STAR trial of distal HGNS. ODI RRs (reduction ≥25%) for Treatment and Control were respectively 73.0% and 30.0% at Month 4 and 64.9% at Month12/15. Enhanced response carried through to larger point estimates for improvement in secondary variables, including the Epworth Sleepiness Scale and the Functional Outcomes of Sleep Questionnaire, exceeding minimum clinically important differences thresholds of 2-3 and 1.7-2.0, respectively.
Conclusion: Normal SE at Baseline was associated with enhanced AHI and ODI RR as well as patient-reported outcome measures for patients receiving THN therapy, providing results similar to those obtained with distal HGNS. Future studies, including the ongoing OSPREY trial, will be needed to prospectively validate these findings.
Support (If Any): LivaNova

0766

GROUP TRAJECTORIES DEMONSTRATE ROBUST EFFECTS OF TARGETED HYPOGLOSSAL NERVE STIMULATION IN THE THN3 RANDOMIZED, CONTROLLED TRIAL

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Introduction: THN3 was the first reported parallel-arm, randomized controlled trial (RCT) of hypoglossal nerve stimulation (HGNS), wherein targeted HGNS (THN) was shown to be safe and efficacious at ameliorating sleep disordered breathing in patients with moderate to severe OSA and BMI≤35kg/m2 without screening with drug-induced sleep endoscopy. Unique among reported HGNS trials, separate cohorts of patients receiving early and late THN were followed longitudinally.

Methods: Measurements of apnea-hypopnea index (AHI) were available Pre-enrollment, Baseline (2 nights), Month 4 and Month 12/15. Except for Pre-enrollment, AHI values were calculated by an independent core laboratory from polysomnographic recordings. All subjects with complete data were included for analysis. AHI trajectories were constructed for early and late THN activation (Treatment[T], N=83, Month 1 and Control[C], N=45, Month 4, respectively) by computing median values. Confidence intervals were calculated by bootstrapping each median (N=30,000). Patient-reported outcome measures (PROMs) were treated similarly.
Results: AHI (Median (95% CI)) trajectories demonstrated a consistent pattern of pre-implant alignment (Pre-enrollment T:39.1 (36.0-45.0), C:38.0 (32.0-41.0); Baseline 1 T:36.1 (33.0-39.9), C:31.3 (27.2-38.6); Baseline 2 T:37.0 (34.3-41.0), C:35.2 (32.3-38.2)), divergence at the conclusion of the randomization period (Month 4 T:15.6 (11.9-25.3), C:30.6 (23.7-38.6)) and reconvergence following 11 months of treatment (Month 12/15 T:20.7 (16.0-26.4), C:18.1 (16.3-23.3)). Non-standardized Pre-enrollment AHI was slightly higher than Baseline values. Trajectories were similar for oxygen desaturation index (Baseline 1 T:35.3 (31.9-38.0),C:34.3 (27.5-40.3); Baseline 2 T:37.1 (33.4-39.3),C:36.8 (33.9-38.3); Month 4 T:19.5 (16.2-28.5), C:33.8 (25.4-41.1); Month 12/15 T:19.5 (16.0-25.6), C:19.7 (16.3-26.0)), the Epworth Sleepiness Scale (Baseline T:11.0 (10.0-13.0),C:11.5 (8.5-14.0); Month 4 T:6.0 (5.0-7.0), C:11.5 (8.0-12.5); Month 12/15 T:6.0 (4.0-7.0), C:5.5 (4.5-6.0)), the Functional Outcomes of Sleep Questionnaire (Baseline T:15.3 (14.0-16.5),C:14.7 (13.3-16.6); Month 4 T:18.3 (17.7-18.8), C:16.7 (14.9-17.7); Month 12/15 T:18.8 (18.3-19.3), C:18.5 (17.5-19.5)) and the Snore Outcomes Survey (Baseline T:26.6 (21.9-31.3),C:21.9 (18.8-31.3); Month 4 T:60.9 (56.3-67.9), C:29.7 (23.4-42.9); Month 12/15 T:62.5 (59.4-68.8), C:68.8 (62.5-71.9)).
Conclusion: Group trajectories of sleep-disordered breathing and PROMs further demonstrate the robust effects of THN in patients with moderate to severe OSA and the value of parallel-arm RCTs. Similar results may be expected in the ongoing OSPREY confirmatory trial of THN.
Support (If Any): LivaNova

0767

CLINICAL IMPLEMENTATION OF A PROGRAM TO IMPROVE PAP ACCEPTANCE AND ADHERENCE FOR SLEEP DISORDERED BREATHING AMONG VETERANS: PRELIMINARY RESULTS

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Introduction: Positive airway pressure (PAP) is the gold standard in treating sleep disordered breathing (SDB); however, consistent use of this therapy has challenges such as comfort and equipment optimization. Despite various educational, technological, psychosocial and pharmacological strategies, the average adherence rate of 34% have changed very little over the past 20 years. A recent study of 3013 US veterans determined a baseline average PAP adherence rate of 50%. We developed and implemented a novel PAP readiness education program (PREP) for veterans newly diagnosed with SDB in a Veterans Administration sleep clinic to promote greater PAP acceptance and adherence.
Methods: Patients (N=63, Mean age 62.2±12.4 years) with newly diagnosed SDB were offered a 1-hour telehealth session prior to initiating PAP therapy that included psychoeducation about SDB and PAP treatment expectations, with troubleshooting techniques (i.e. scheduled practice, mindfulness). A 1-week follow-up call was conducted to communicate PAP data and address treatment barriers. PAP use reports were downloaded and analyzed at 1-7 days (first week), 1-30 days (first month), and 31-60 days (60-days) post-PAP initiation. PAP acceptance was defined as ≥1 day of use and adherence as ≥4 hours of use at each timepoint.
Results: Among 63 Veterans offered PREP, 66.6% (n=42) participated in PREP. Among participants, acceptance of PAP was as follows: 57.1% used ≥1 day in the first week, 64.3% used ≥1 day in the first month, and 45.2% used ≥1 day at 60-days post-PAP initiation. Percent of days with use ≥4 hours was 28.9% ±30.4 in the first week and 24.9% ±30.0 in the first month. PAP adherence at 60-days post-PAP initiation was 34.3% ±38.5 at 60-days.
Conclusion: Implementation of a 1-session plus 1-week follow-up call PAP readiness education program within a sleep medicine clinic was well received by patients and resulted in PAP acceptance by 2/3 of veterans in the first month post-PAP initiation. PAP adherence results may have reflected the impact of a nationwide PAP device recall that occurred during the study period. Further work is needed to test this intervention in a clinical population and to identify predictors of PAP acceptance and adherence in real-world clinical settings.
Support (If Any): AASM Foundation #211-FP-19, VAGLAHS GRECC and CSHIIP

0768

A MILLION DREAMS: IMPROVING COMPLIANCE AND TREATMENT OF OBSTRUCTIVE SLEEP APNEA VIA UPPER AIRWAY STIMULATION THERAPY. REAL-WORLD OUTCOMES.

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Introduction: Patient compliance to continuous positive airway pressure (CPAP) has been about 50% at 4-years despite numerous improvements in mask design, flow algorithms, education, and monitoring software. Compliance, however, is not equivalent to efficacy. Upper Airway Stimulation (UAS) is an alternative for select CPAP intolerant patients. We used a patient management platform to track UAS compliance and efficacy.
Methods: Anonymized, aggregated device usage and outcomes data was analyzed from a HIPAA compliant patient management platform (Inspire Cloud, Inspire Medical Systems, Golden Valley MN) through October 2021. Demographic data is not collected. We used this database to understand therapy outcomes. Data are presented as mean and standard deviation, unless otherwise noted.
Results: There were 1.74 million usage nights for 5,709 patients across 550 clinics. Patients increased median stimulation amplitude from 1.4 to 2.2 volts between activation to 90 days after activation. Typical therapy was activated at 11:44pm, and turned off at 5:51am, with one 13-minute pause per night, and therapy was on 89% of nights.Usage was 5.5 ± 1.8 hours per nights overall, and 6.0 ± 1.9 hours per night used. At 90 days, 90% of patients had usage > 4 hours per nights overall, and 96% had usage > 4 hours per night used.Average pre-implant AHI was reduced from 35 ± 15 events/hour (n=2760), to 9 ± 12 (n=1609) after therapy. ESS was reduced from 11 ± 5 (n=1254) to 7 ± 5 (n=1164).

Conclusion: This data represents the first big-data reporting of UAS therapy usage in general clinical practice including nightly data. It demonstrates high nightly usage with minimal pauses and marked improvement in symptoms. It demonstrates the potential that CPAP intolerant patients with can be fully adherent with alternative therapy.
Support (If Any): Statistical support provided by Inspire Medical systems.

0769

COMPARISON OF EXPIRATORY PRESSURES GENERATED BY ULTEPAP, PROVENT, BONGO RX, AND THERAVENT EPAP DEVICES: A LABORATORY BENCH TESTING

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Introduction: Expiratory positive airway pressure (EPAP) has been a treatment option for patients with obstructive sleep apnea (OSA). Among devices like Provent, Theravent, and Bongo, ULTepap is a new FDA-cleared EPAP device that seals around the nares with a nasal pillow interface. Comparisons among the expiratory pressures that these devices might generate are not available. Research Question: Are expiratory threshold therapy devices equivalent in generating backpressure in an expiratory direction?
Methods: A test rig was designed and fabricated to test the pressures generated by ULTepap, Provent, Theravent, and Bongo Rx. Airflow was generated by a linear actuator-driven piston in a syringe, and a range of flow rates was provided by varying the voltage input to the actuator. The resulting pressures were measured in an expiratory and inspiratory direction.
Results: The backpressures produced by ULTepap and Provent were comparable at flow rates of 99/142/212 ml/sec (average 3.5/7.5/13.8 cmH2O for ULTepap vs 4.5/8.5/14.5 cmH2O for Provent, p=0.7918). Bongo Rx and Theravent devices produced substantially lower backpressures than ULTepap devices (average 0.8/1.8/3.5 cmH2O for Bongo Rx and 0.9/2.2/5.3 cmH2O for Theravent at flow rates of 99/142/212 ml/sec, p=0.0138 and 0.0404, respectively). In comparison, all four devices presented very low inspiratory flow resistance, with all generating 0.5 cmH2O or less at all flow rates.
Conclusion: Not all FDA-cleared EPAP devices produce similar expiratory pressure profiles. ULTepap generated backpressures closest to that of Provent. Clinical trials comparing the efficacy, tolerance, and role of these EPAP devices in patients with OSA are warranted.
Support (If Any):

0770

THE EFFECT, COMPLIANCE, AND SIDE EFFECT OF ACETAZOLAMIDE IN OBSTRUCTIVE SLEEP APNEA PATIENTS WITH HIGH LOOP GAIN: A RETROSPECTIVE STUDY

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Introduction: Acetazolamide (AZT) has beneficial effects on central, high altitude sleep apnea, or residual apnea on CPAP, high loop gain obstructive sleep apnea (HLGSA is general). Data on intermediate and long-term real world effectiveness of AZT is lacking.
Methods: Patients with HLGSA (mostly HLG OSA) and using AZT were included. The auto-machine estimated (aREIFLOW) and manually scored respiratory events(mREIFLOW), compliance to PAP, and excessive sleepiness scale were compared prior to, and after 3 months of AZT.
Results: The total study sample size of Diamox users was 325 patients; 43 stopped AZT in one month. Automated and/or manual efficacy parameters were available in 109 for before-after comparison, but not available in the rest of them due lack of waveforms (manufacturer limitation) or not using PAP before AZT (i.e., started simultaneously). AZT reduced aREIFLOW (2.60 [1.70-5.35] vs. 5.10[2.90-10.25], p<0.001). and the percentage of patients whose aREI-FLOW >5 times/hour (50.5% vs. 27.5%, p<0.001). AZT did not influence mean daily usage of PAP (372.53 [295.26-444.22] vs. 368.50 [273.00-438.87] minutes, p=0.275) or the percentage of the day using the machine >4 hours (87.50[75.00-100.00] vs. 87.50 [62.50-100.00], p=0. 999). In the 75 patients with manually scored waveform data, AZT reduced the mREIFLOW (21.11[15.07-28.14] vs. 28.55[21.92-35.45], p<0.001), and the percentage of patients whose mREIFLOW >20 times/hour (78.7% % vs. 52.0%, p<0.001). AZT decreased the Epworth sleepiness scale (5[4-8] vs. 6.5[4-12], p=0.009). Among 282 patients who used AZT long term, 60 reported side effects. The most common side effect was paresthesia (7.09%). .
Conclusion: Chronic use of AZT can reduce the REIFLOW in HLG sleep apnea (HLGSA, predominantly obstructive) treated by PAP. Adherence to AZT was good, and the most common side effect even at low doses was distal paresthesia.
Support (If Any): This study was supported by American Academy of Sleep Medicine Foundation, category-I award to RJT

0771

ARTIFICIAL INTELLIGENCE BASED MASK FIT ALGORITHM APPLICATION IN THE PITTSBURGH VETERAN POPULATION

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Introduction: Positive airway pressure (PAP) therapy has been used for obstructive sleep apnea (OSA) since 1980 and remains the treatment of choice for moderate to severe OSA. Proper mask fitting for patient comfort is essential to continued success on PAP therapy, as early adherence rates are strong predictors of future use. Mask selection continues to be challenging given the significant heterogeneity in craniofacial phenotypes and the rapidly growing mask options. Artificial intelligence software has combined survey data and digital photography to algorithmically predict PAP masks for best fit. This study aimed to describe mask failure rates in the Pittsburgh Veteran population with OSA following mask selection utilizing this specialized software.
Methods: Retrospective chart review was performed on 124 patients who underwent mask fitting with AI software May through November 2021. The primary outcome was to determine the rate of mask success within 1-3 months of fitting as defined by absence of mask switching. Mask switch was identified when patients underwent re-evaluation for new mask selection either by the AI software or had evidence of new mask selection from supply orders.

Results: Of the 124 patients who underwent evaluation with AI mask fit software, 96% were male with an average AHI 35/hr, BMI 34 and average age of 58 years. Of the 65 patients who were new to PAP therapy, 14 patients required refitting, yielding an initial mask acceptance rate of 78%. Of the 59 patients established on PAP, 8 required subsequent mask switches, yielding a refit mask acceptance rate of 86%. Overall mask acceptance rate after first exposure to fitting software across both groups was 82%.
Conclusion: AI software appears to result in successful mask fitting in a high proportion of VA patients. Higher mask acceptance rate was noted in the refit group, suggesting a particular use-case for this software. Most importantly, this software allows for remote mask fitting. This is ideal given recent telehealth growth and can save time and visits, leading to expedited therapy and increased access.
Support (If Any):

0772

CLUSTERS OF UPPER AIRWAY STIMULATION ADHERENCE PATTERNS IN THE FIRST 90 DAYS

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Introduction: Upper airway stimulation (UAS) therapy is effective for a subset of obstructive sleep apnea (OSA) patients with CPAP intolerance. While overall adherence is high, some patients have suboptimal adherence to UAS, which limits effectiveness. Our goal was to identify UAS therapy usage patterns during the first three months of therapy that affect adherence.
Methods: We retrieved anonymized UAS therapy usage data from 2,091 individuals stored in a cloud-based monitoring system during the first three months after device activation. We aggregated adherence data including mean and standard deviation (SD) of nightly hours of use, therapy pauses, hours from midnight when the therapy was turned ON and OFF, and percentage of missing days. We computed the difference of the stimulation amplitude between the first and last day. We performed cluster analysis with Gaussian mixture models and computed the centroids of each cluster highlighting their main differences.
Results: We identified six distinct clusters of UAS usage patterns. Clusters 1A (34% of the total cohort) and 1B (23%) had excellent therapy usage with 7.23h and 7.14h on days of use, respectively; with 1B distinguished by increased night-to-night variability. Clusters 2A (16%) and 2B (12%) had good mean therapy use of 6.63h and 6.21h, respectively, but their usage patterns were distinguished by a higher percentage of missing days (8% missing days in 2A and 23% in 2B) and less favorable therapy timing with an average therapy ON time after midnight. Clusters 3A (8%) and 3B (7%) were characterized by the lowest nightly use at 6.16h and 5.50h, respectively, and the highest night-to-night variability. 3A was further distinguished by the highest percentage of missing days (34%) while 3B was characterized by the frequent therapy pauses (mean 4.1 pauses per night) and the least increase in stimulation amplitude across the first 90 days.
Conclusion: Cluster analysis of UAS usage patterns identified six distinct groups that may enable custom interventions for improved long-term management. Differentiation of these groups may have clinical implications on conditions (e.g. therapy discomfort, comorbid insomnia, poor sleep hygiene) that impact adherence.
Support (If Any):

0773

WHEN CPAPS ARE IN SHORT SUPPLY: A REVIEW OF OTHER FDA APPROVED OSA INTERVENTIONS

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Introduction: The CPAP recall of 2021 has highlighted an inherent problem that occurs when a field of medicine is overly dependent on a single class of medical devices to treat a condition. The global shortage of CPAP devices has led to numerous individuals with OSA being unable to obtain a CPAP machine to treat their condition, including those with severe OSA. CPAP is well known to be efficacious in treating OSA, but has limited effectiveness, particularly for mild-to-moderate cases. It has been reported that there are nearly 200 different medical devices approved by the FDA to treat OSA. The goal of this project was to search the FDA databases to investigate the number of devices currently on file with the FDA. A secondary goal was to examine the range of FDA product categories for the treatment of OSA.
Methods: An FDA database (AccessGUDID; https://accessgudid.nlm.nih.gov) with a release date of December 1, 2021 was searched for devices that are approved for the treatment of sleep apnea. The text string "sleep apnea" was used for the search. Diagnostic devices, duplicate versions of the same treatment devices, and device accessories were excluded from the total counts. The FDA classifies medical devices into three categories (I, II, III), with a higher classification level indicating greater risk to patients.
Results: The FDA AccessGUDID database search returned 166 results, which resulted in 72 unique devices across 10 product code categories. 9 of the 10 product codes in the FDA database were class II (medium risk) and 1/10 was classified as III (high risk). 65 of the devices were reported to be in commercial distribution at the time of the search and 7 were not.
Conclusion: This analysis found that a relatively large number of FDA-approved devices exist for the treatment of OSA across a range of product categories. The field is encouraged to develop a better understanding of which subgroups of OSA patients could benefit from alternative forms of treatment in an effort to diversify treatment options and reduce the field's reliance on a single type of device, particularly for patients with mild-to-moderate OSA.
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0774

POSITIVE AIRWAY PRESSURE UTILIZATION, MAJOR ADVERSE CARDIOVASCULAR EVENTS INCIDENCE RISK AND MORTALITY IN MEDICARE BENEFICIARIES WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Positive airway pressure (PAP) is the first line treatment for moderate-severe or symptomatic obstructive sleep apnea (OSA). Randomized controlled trials have established that PAP therapy has beneficial impact on cardiovascular and metabolic functions. However, evidence on the benefits of PAP for preventing major adverse cardiovascular events (MACE) is limited. We aimed to determine the association between PAP utilization and incidence of MACE and all-cause mortality in a large sample of Medicare beneficiaries.
Methods: Medicare beneficiaries (>65 years) with at least 5 years of consecutive enrollment to part A and B and ≥2 distinct OSA

claims were collected from multi-state (Kansas, Missouri, Iowa, Wisconsin, Nebraska, Minnesota, Texas, Utah, North Dakota, South Dakota and Indiana), multi-year (2011-2017) Medicare fee-for-service claims data. We further required at least 1-year enrollment before the first OSA claim. Evidence of PAP utilization and index date was defined based on the first Healthcare Common Procedure Coding System PAP initiation codes (E0601, E0470, E0471) after first OSA diagnosis. MACE was defined as the first occurrence of myocardial infarction, coronary revascularization, stroke, or heart failure (identified by diagnostic and procedure code claims) after PAP initiation. Analyses were adjusted by age at initial OSA diagnosis, sex, race and presence of hypertension, type 2 diabetes, obesity, and evidence of MACE prior to the index date.

Results: Our sample included 212,445 eligible Medicare beneficiaries with evidence of OSA diagnosis (mean [SD] age 75 [5.7] years; 45.2% women; median [Q1, Q3] follow-up 4 [2.0, 4.9] years at censoring). Five-year MACE cumulative incidence rate was 59.3% and the mortality rate was 17.8%. In adjusted analyses, OSA patients with evidence of PAP utilization (50.8%) had significantly lower MACE incidence risk (HR=0.812; 95%CI=0.803-0.822; p<0.0001) when compared to those without evidence of using PAP. OSA patients with evidence of PAP utilization also had significantly lower mortality risk (HR=0.575; 95%CI=0.560-0.591; p<0.0001). Pre-existing hypertension, type II diabetes and obesity were also significantly associated with increased mortality and MACE risk.

Conclusion: PAP utilization based on device initiation derived from claims data is associated with lower MACE incidence and mortality in older adults that are Medicare beneficiaries.

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0775

IMPACT OF INSOMNIA, DEPRESSION AND ANXIETY ON ADHERENCE TO UPPER AIRWAY STIMULATION FOR OBSTRUCTIVE SLEEP APNEA: ADHERE REGISTRY UPDATE

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Introduction: Insomnia, depression and anxiety are common comorbid conditions in patients with obstructive sleep apnea (OSA) and can negatively impact positive airway pressure (PAP) therapy adherence. Subsequent intolerance to PAP may lead to surgical treatment such as upper airway stimulation (UAS). We sought to determine the impact of baseline insomnia, anxiety or depression on UAS therapy adherence using data from a large multi-center registry.

Methods: The ADHERE registry collects information on patients undergoing UAS (Inspire Medical, Golden Valley, MN) including baseline history of insomnia, depression, anxiety and the Insomnia Severity Index (ISI) questionnaire. We determined overall prevalence of insomnia, depression and/or anxiety, as well as UAS adherence after 6 months of therapy in groups with insomnia, depression, anxiety or none of these conditions. Using ISI to quantify insomnia, adherence in patients with no/mild insomnia (ISI < 15) was compared to those with moderate/severe insomnia (ISI ≥ 15).

Results: 1639 patients were included; 10% reported a history of insomnia, 23% depression and 16% anxiety. There was no difference in UAS adherence between groups with or without a history of insomnia, depression, or anxiety. A baseline ISI score was available in 470 patients with no history of insomnia, and in 81 patients with a history of insomnia. In patients with no history of insomnia, 59% had ISI scores ≥15, while in those with a history of insomnia, 85% had ISI scores ≥15 (p < 0.001). There was no difference in therapy usage between patients with ISI scores <15 and ≥15 (6.7 ± 2.2 hours/night versus 6.4 ± 2.5 hours/night, p = 0.5).

Conclusion: This study examined the impact of insomnia, depression or anxiety on adherence to UAS therapy for OSA. Patients with and without these conditions had similar UAS adherence. We found that insomnia as objectively based on the ISI score may be underdiagnosed in UAS patients who have no subjective history of insomnia at baseline. Despite this, ISI severity did not impact UAS adherence. Longer term follow-up with serial ISI scores and adherence data is needed to further understand how insomnia severity impacts UAS therapy outcomes and usage.

Support (If Any):

0776

THE 2021 CPAP RECALL. A REPORT FROM A SINGLE PRACTITIONER'S EXPERIENCE

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Introduction: CPAP is the gold standard in the treatment of OSA. While CPAP has been characterized as cumbersome, patients derive benefit from this therapy and many report inability to sleep without the use of CPAP. In this context, the 2021 CPAP recall has represented a major challenge for all stakeholders in the delivery and management of OSA. Patients have been the most affected by the uncertainties triggered by the recall. The purpose of this report is to evaluate continued therapy among patients who have been able to replace their PAP equipment.

Methods: Consecutive patients seen in follow-up visit following replacement of the recalled unit are included. At the time of writing, the cohort includes 49 patients (age 64+/- 10; BMI: 34 +/- 9; AHI: 35+/-26; male: 27). Prior to the unit replacement (T1), 20 were on Auto-PAP, 2 on Auto-BiPAP, and 23 on CPAP. Only 6 units have been replaced by the manufacturer with the remaining patients opting to have their units replaced with the other main brand available in the US. At follow-up (T2), only 4 continued CPAP, 2 on Auto-VPAP and the remaining on Auto-PAP. Replacement units were prescribed based on the previous settings with modifications based on the clinical assessment. For those on Auto-PAP (or bilevel settings), their pressures were not significantly different from baseline to follow-up (T1: minimum pressure 7.2+/-3; maximum pressure 10.8+/-4. T2: minimum pressure: 7.1+/-3; maximum pressure 11.5+/-3). For those on CPAP who have continued therapy with Auto-PAP, the T1 pressure was 8.8+/-3 and their 90-95% pressure at T2 was 9+/-3 cwp (p<0.01).

Results: The cohort showed adherence of 442+/-79 min at T1, which was increased at T2 (455+/-69, p<.05). 4-hr adherence was comparable at 94+/-9 and 96+/-9, respectively. The Epworth Sleepiness Scale (ESS) was comparable at T1 (4.3+/-3) and T2 (4.6+/-3). Of interest, the unit's estimated AHI was improved at T2 1.9+/-2 when compared to T1 at 3.7+/-4 (p<0.01), which was not explained by type or brand of therapy. An unexpected

finding was the differential improvement in the level of adherence between males and females where the change in adherence from T1 to T2 for males was 24+/-39 min, and for females 0.5+/-42.
Conclusion: Patients on CPAP therapy have faced significant challenges due to the 2021 recall from one of the main producing brands. The results of the study illustrate the slow response in the replacement of the recalled units. Only 12% of the units in the present cohort were replaced within the recall program. The results document the resilience of this cohort in maintaining a high therapeutic adherence despite the uncertainties created by the recent recall.
Support (If Any):

0777

THE OHS PATHWAY: AN EMR-INTEGRATED CLINICAL PATHWAY TO FACILITATE BIPAP ON DISCHARGE FOR HOSPITALIZED PATIENTS WITH OBESITY HYPOVENTILATION SYNDROME

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Introduction: With the rise of severe obesity, obesity hypoventilation syndrome (OHS) is increasingly recognized as a cause of sleep disordered breathing and hypercapnic respiratory failure. OHS is often diagnosed in the inpatient setting when patients present with acute respiratory failure, at which point 18-month mortality approaches 23%. Positive airway pressure (PAP) is a highly effective treatment for OHS. Clinical responses to PAP therapy include improvement in symptoms, gas exchange, hospitalization rates, and mortality. The American Thoracic Society published guidelines in 2019 recommending patients hospitalized with acute respiratory failure suspected of having OHS be discharged on nocturnal NIV therapy. Insurance criteria significantly limit access to home NIV/PAP without a sleep study, and inpatient providers seldom have success prescribing this treatment on discharge.
Methods: We first surveyed providers from a large academic hospitalist group to assess for knowledge gaps and challenges in OHS management. We then recruited inpatient respiratory therapists, providers, and care coordinators to design an EMR-integrated clinical pathway. The pathway begins with diagnostic criteria for OHS, then directs providers through the insurance criteria for BiPAP for hypoventilation, which do not require a sleep study. The criteria include wake PaCO2 ≥ 45mmHg, ≥ 7mmg increase in PaCO2 during sleep, and FEV1/FVC ≥ 70%. If these criteria are met, the pathway assists providers in writing BiPAP orders for discharge.
Results: We collected 40 survey responses. 67.5% of respondents reported being slightly familiar with the diagnostic criteria for OHS, and 75% of providers reported never having been successful prescribing BiPAP on discharge. Educational sessions were held to familiarize providers with OHS and the OHS Pathway. After launching in March 2021, the OHS team convened monthly to optimize the pathway. To date, 20 patients have utilized the pathway.
Conclusion: Pre-intervention results confirm gaps in knowledge and treatment challenges regarding BiPAP therapy for OHS patients. Our preliminary data demonstrate that this is a feasible and reproducible pathway to improve the likelihood of successful initiation of BiPAP therapy on discharge for this high-risk population. A close examination of these cases is required to identify barriers to successful qualification for BiPAP.
Support (If Any):

0778

CHARACTERIZING WOMEN WITH OBSTRUCTIVE SLEEP APNEA FROM REAL WORLD DATA

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ResMed [1]

Introduction: Real-world evidence focused on women with obstructive sleep apnea (OSA) is lacking. This retrospective study aimed to characterize and evaluate the impact of age on female patients with OSA and their journey through OSA diagnosis and treatment.
Methods: De-identified US administrative claims data for patients with OSA who had a claim for a sleep test were used for this analysis. Age and insurance coverage were characterized at the time of the first sleep test. Comorbidity status was evaluated in the year prior to the sleep test by assessing ICD-9/10 codes associated with healthcare encounters. This protocol was submitted to an Institutional Review Board and was determined to be exempt from oversight.
Results: The study included 883,902 female OSA patients; mean age of 51.7 years; and 64.9% commercial, 24.7% Medicaid, and 10.3% Medicare Advantage insurance coverage. The most prevalent comorbidities were hypertension (54.9%), hyperlipidemia (46.5%), GERD (31.5%), type 2 diabetes (25.1%), depression (23.2%), and asthma (22.0%). When stratifying by age, the prevalence of all comorbidities increased with age except for affective disorders. Depression and anxiety decreased with age. In terms of the type of sleep test used to diagnose OSA, 58.8% had an in-lab polysomnography (PSG), 38.9% had a home sleep test (HST), and 2.3% had both a PSG and HST. About half (56.6%) of patients received a positive airway pressure (PAP) device in the year after being diagnosed. When stratifying the results by age, in-lab PSG testing was more prevalent in those over 65, while the percentage of those receiving a PAP device increased then slightly decreased with age (18-44y: 47.6%, 45-54y: 58.1%, 55-64y: 62.1%, 65-69y: 61.1%, >70y: 58.8%).
Conclusion: This retrospective study characterized the start of the women's journey with OSA; describing the rates of sleep testing and PAP treatment from a sample of real-world data. These results begin to build an understanding of these patients and their journey to treatment, helping to raise awareness of undiagnosed OSA in women. Further research should be conducted to identify potential real-world impact of adherence to PAP on health outcomes.
Support (If Any): ResMed

0779

DESCRIBING THE OSA PATIENT JOURNEY FROM TESTING TO PAP TREATMENT

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Introduction: Patients diagnosed with obstructive sleep apnea (OSA) and prescribed positive airway pressure (PAP) therapy for treatment may have differences in experience based on insurance provider, sex, age, or comorbidity status. This retrospective, real-world analysis investigated the factors that impact the patient's OSA journey from initial sleep test to starting PAP therapy.
Methods: De-identified US administrative claims data for patients with OSA who had a claim for a sleep test were used for this analysis. Age, sex, and insurance coverage were characterized at the

time of the first sleep test. Comorbidity status was evaluated in the year prior to the sleep test by assessing ICD-9/10 codes associated with healthcare encounters. This protocol was submitted to an Institutional Review Board and was determined to be exempt from oversight.

Results: In a population of 1,912,381 patients, 46.6% were female with mean age of 51.0 years. Insurance coverage was 70.6% commercial, 19.9% Medicaid, and 9.5% Medicare Advantage. Four comorbid cohorts were evaluated including those with hypertension (52.2%), type 2 diabetes (21.7%), COPD (9.7%), and atrial fibrillation (5.9%). Time from sleep test to receiving a PAP device was 7 days longer for females than males (median 49 days vs 42 days). Regardless of type of sleep test (polysomnography (PSG), home sleep test (HST)), those with commercial insurance received a device faster (median 41 days, Medicaid 61 days, Medicare Advantage 50 days). In comparison to those without the respective comorbidity, COPD was the only group with a noticeable increase in time from sleep test to device (median 54 days for those with COPD vs. 43 days for those without). No noticeable differences were observed across age categories. For those that had a titration, it occurred a median of 23 days after PSG or 34 days after HST. Consequently, the two fastest pathways were PSG with split night titration and HST without titration.

Conclusion: This retrospective study identified the length of time it takes in a real-world setting for patients to get a PAP device after a sleep test. Depending on demographic factors this time can vary from 1-2 months, delaying the start of OSA treatment.

Support (If Any): ResMed

0780

CONTINUOUS POSITIVE AIRWAY PRESSURE ADHERENCE AND THE RISK OF 30-DAY HOSPITAL READMISSION IN OLDER ADULTS WITH OBSTRUCTIVE SLEEP APNEA AND CARDIOVASCULAR DISEASE

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Introduction: Obstructive sleep apnea (OSA) negatively impacts outcomes among patients with pre-existing cardiovascular disease (CVD). Evidence suggests treating OSA can prevent additional cardiovascular events and health care utilization, but the benefits of continuous positive airway pressure (CPAP) are strongly related to adherence. We evaluated the effect of adherence to CPAP on 30-day hospital readmissions among Medicare beneficiaries with OSA and pre-existing CVD.

Methods: We conducted a retrospective study of a 5% sample of Medicare beneficiaries aged ≥ 65 years with pre-existing CVD who were newly diagnosed with OSA, initiated CPAP 2009-2013, maintained continuous Medicare coverage for 24 months post-CPAP initiation, and had at least one hospitalization. Monthly indicators of CPAP adherence (charges for machines, masks, or supplies) were summed over 25 months to create a CPAP adherence variable and then beneficiaries categorized as low, partial, or high adherers (i.e., <4, 4-12 and >12 CPAP charges, respectively).The primary outcome was the risk of 30-day readmission. Bivariate associations were assessed between CPAP adherence status, covariates, and potential confounders. Odds ratios (OR) with 95% confidence intervals (CI) were estimated using logistic regression models, controlling for demographic factors, and pre-existing comorbidities. Statistical significance was assessed at $p < 0.05$.

Results: We identified 1,301 beneficiaries meeting study criteria. The mean age was 73±6 years, 87% were White (n=1,137), and 53% were male (n=684). In the 2-year period following CPAP initiation, the overall 30-day readmission rate was 10.2%. Beneficiaries who were readmitted were more likely to be male and with a higher comorbidity burden. In adjusted models and compared to patients with low CPAP use (<4 charges), those with partial use (4-12 charges) and high use (>12 charges) had a lower odds of 30-day readmission (OR = 0.82, 95% CI 0.53-1.23 and OR = 0.41, 95% CI 0.24-0.70).

Conclusion: In this nationally representative sample of older adults with CVD and comorbid OSA, higher CPAP use was associated with decreased odds of 30-day readmission, highlighting the importance of adherence in mitigating negative outcomes.

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0781

NECK CIRCUMFERENCE: A SURROGATE PREDICTIVE VARIABLE OF HYPOGLOSSAL NERVE STIMULATOR THERAPY OUTCOME

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Introduction: Hypoglossal nerve stimulation therapy has strict eligibility requirements including a body mass index < 32kg/m2 for non-Medicare patients and body mass index < 35kg/m2 for Medicare patients. However, there is a wide variability in body fat distribution including variability between the sexes. We theorize that neck circumference may be a better surrogate predictive variable for hypoglossal nerve stimulation outcomes than body mass index.

Methods: A retrospective chart review was conducted at a single tertiary care center on adults who underwent hypoglossal nerve stimulator implantation by a single surgeon from March 2017 to October 2021. Baseline demographic data including neck circumference, diagnostic polysomnography and post-implantation polysomnography titration studies were collected. Patients without neck circumference measurements were excluded. Surgical success was defined by Sher criteria of apnea hypopnea index < 20 and reduction of the apnea hypopnea index by 50%.

Results: 75 patient charts were reviewed. 44 of these patients had neck circumference, body mass index, and AHI at effective voltage (AHI-v) data recorded. These were included in the analysis. Overall, AHI-v positively correlated with neck circumference ($r2=0.20$, $p= 0.0025$). Conversely, no significant association was apparent between AHI-v and BMI ($r2=0.04$, $p=0.18$). AHI-v appeared to worsen at a specific neck circumference of > 15 inches. T-test analysis showed significant difference in AHI-v comparing the groups of neck circumference ≤15in. vs > 15in. ($\bar{x}$=27.58 vs 7.68, respectively, p=<0.001). However, no significant difference was found in mean BMI, age or baseline AHI between the neck circumference groups (p=0.15, 0.26, 0.10, respectively).

Conclusion: Findings suggest that neck circumference correlates to AHI at effective voltage during the post-implantation titration study. Our data indicates that neck circumference may be a better outcome predictor than BMI, baseline AHI or age for hypoglossal nerve stimulator effectiveness.

Support (If Any):

0782

CHANGES IN MARKERS OF VENTRICULAR REPOLARIZATION AND POSITIVE AIRWAY PRESSURE THERAPY: A PILOT STUDY

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Introduction: Positive airway pressure (PAP) therapy is the mainstay treatment for obstructive sleep apnea (OSA). Continuous PAP (CPAP) therapy has been shown to decrease QTc length in electrocardiograms in patients with OSA in small studies. The impact of higher pressures of CPAP and Bilevel PAP (BPAP) on ventricular repolarization—QTc length and QT variability in OSA is unknown. The goal of this pilot study is to explore this relationship.
Methods: 10 consecutive patients who underwent polysomnography during which they had a diagnostic, CPAP titration, and BPAP titration portion were included for analysis. Bazett's heart rate correction was used to calculate QTc. QT variability was measured as short-term interval QT variability (STVQT) and normalized QT interval variance (QTVN). All variables were analyzed for the entire duration of the diagnostic period, on the highest CPAP pressure and highest BPAP pressure delivered.
Results: The patients were 49 ± 15 years of age and 60% women. Median CPAP pressure was 14.5 cm H2O (mean 13.5 ± 5 cm H2O). For BPAP, the median inspiratory PAP was 21.5 cm H2O (mean 20.5 ± 5 cm H2O) and EPAP median was 16 cm H2O (mean 15.9 ± 4 cm H2O). Mean QTc for the diagnostic portion, highest CPAP pressure and highest BPAP pressure were 430 ± 17 ms, 445 ± 15 ms and 441 ± 21 ms, respectively (p=0.141). Mean QTVN for the diagnostic portion, highest CPAP pressure and highest BPAP pressure settings were 0.0011 ± 0.0008 dimensionless units (du), 0.0012± 0.0008 du and 0.002 ± 0.0012 du, respectively (p=0.127). STVQT for the diagnostic portion, highest CPAP pressure and highest BPAP pressure settings were 6.62 ± 4.13 ms, 9.12 ± 4.7271 ms and 12.62 ± 4.99 ms, respectively (P=0.041). Post-hoc pairwise comparisons between BPAP and diagnostic portions of the study were significant for STVQT (P=0.034).
Conclusion: Short-term QT variability, STVQT, was significantly increased on BPAP when compared to the diagnostic portion of the study.
Support (If Any): American Academy of Sleep Medicine Foundation (203-JF-18), National Institutes of Health (HL126140, 2L30HL154400-023) University of Arizona Health Sciences Career Development Award (5299903), and University of Arizona Faculty Seed Grant (5833261)

0783

COMPLIANCE WITH FOLLOW-UP POLYSOMNOGRAM IN PATIENTS PRESCRIBED ORAL APPLIANCE THERAPY FOR TREATMENT OF OBSTRUCTIVE SLEEP APNEA.

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Introduction: Literature supports Oral Appliance Therapy (OAT) for mild-to-moderate obstructive sleep apnea (OSA) with evidence showing clinical benefits. The long-term ease of follow makes these devices attractive options for many though requires upfront provider and patient coordination. After prescription of OAT, a dental professional qualified in fabrication must evaluate the patient, the device must be fabricated and a follow-up polysomnogram (PSG) with the device in place should be obtained to determine treatment efficacy. If this guideline is followed in clinical practice is unknown with limited research. Our study evaluates the frequency of follow-up PSG in patients referred for OAT for treatment of OSA in a combined sleep and dental clinic.
Methods: A retrospective chart review was performed to determine if OSA patients who elected to pursue OAT subsequently underwent a follow up PSG after obtaining their device. Patients who did not have their diagnostic study at our institution were excluded. Patients prescribed OAT for primary snoring were also excluded.
Results: We identified 104 patients who were referred for OAT for treatment of OSA; 90 (86.5%) of which followed up with the dental clinic, 84 (80.8%) of which obtained devices, and 14 (13.5%) of which completed a PSG after obtaining their device. Additional review of the original 104 patients demonstrated: 88 (84.6%) were male, mean BMI was 27.6, mean AHI 15.1/hr, and mean age 38.9 years. Review of the 14 patients who obtained follow up PSGs with OAT showed: all were male, mean BMI 27.0, mean AHI 13.8/hr and mean age 38.6 years. Total sleep time (TST) in patients who had a follow up PSG with OAT (mean = 344.2 min) was significantly less than on their diagnostic PSG (mean = 367.2 min, p= 0.043).
Conclusion: Although the AASM CPG for treatment of OSA with OAT recommends follow-up sleep testing to confirm efficacy, the follow-up PSG rate of 13.5% in a single-center closed system indicates poor patient adherence. Increased communication between the dental providers and sleep clinic is encouraged for proper follow up. Further research will need to be done to elucidate the individual and systemic barriers to appropriate follow-up.
Support (If Any):

0784

COUPLES-BASED TREATMENT FOR OBSTRUCTIVE SLEEP APNEA: PERSPECTIVES FROM PATIENTS WITH MILD COGNITIVE IMPAIRMENT AND THEIR PARTNERS

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Introduction: Patients with Mild Cognitive Impairment (MCI) have an increased risk of Obstructive Sleep Apnea (OSA) which may have implications for their cognitive function. Sleeping is often a shared behavior among couples, and for couples with MCI, partners often assume the role of caregiver. The goal of this study is to examine the role of bedpartners in adherence to treatment for OSA and to determine the feasibility for couples-based adherence interventions in individuals with MCI and their partners.
Methods: This study is ongoing and will include semi-structured interviews with 10 couples. Interviews will be conducted remotely over Zoom, then transcribed and coded using Dedoose software to identify common themes among transcripts. Interviews discussed the impact of OSA and MCI on the couple with regard to CPAP treatment, interdependence of sleep, and feasibility of a couples-based CPAP intervention.
Results: Currently, three out of 10 couples have been interviewed. The participants included three men and three women (mean age= 74 years). Themes from the interviews

include significant involvement of partners in the treatment of OSA (e.g., reminders and ordering supplies). Couples felt that this program would have been helpful when they were beginning CPAP treatment. They provided suggestions for the format of a couples-based treatment in MCI including shorter sessions with more pictures and simplified content so that it could be better understood by the patient and partner.
Conclusion: Data from these interviews demonstrate the critical role of the partner in adherence to CPAP treatment among patients with MCI. While interviews are currently ongoing, both patients and partners view couples-based sleep apnea treatment as feasible and adaptations will be made for this population. Couples-based treatments may be a promising intervention for increasing CPAP adherence in OSA patients with MCI, and further slowing cognitive decline.
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0785

CARDIOVASCULAR OUTCOMES FOR OBSTRUCTIVE SLEEP APNEA WITH HGNS THERAPY

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Introduction: Obstructive sleep apnea (OSA) is linked to cardiovascular disease, particularly when left untreated. Hypoglossal nerve stimulation (HGNS) is a novel and promising PAP alternative as it is well-tolerated and reduces OSA severity; however, its effect on mitigating cardiovascular risk secondary to OSA is unknown. The aim of this study is to evaluate the effect of HGNS on sympathetic and vascular function. Our hypothesis is mean 24-hour systolic blood pressures (SBP) will be improved at "active" levels of HGNS.
Methods: This study is a double-blinded, sham-controlled, randomized controlled therapy crossover trial. Subjects are randomized for four weeks in each arm to either "active" HGNS or "sham" HGNS, with "sham" HGNS being defined as the lowest voltage at which HGNS was sensed by the patient and/or visualized by the principal investigator. Included patients had already been implanted with the Inspire® device. Patients were excluded for active PAP therapy use, recent automobile accidents, a minimum difference (<30%) between "active" and "sham" voltages, and pregnancy.
Results: 53 patients met all inclusion criteria. Overall, the study cohort was older (mean [SD] age 66.8 [10.2]), overweight (BMI 28.8 [4.36]), 60% male, and predominantly of white race. There was no significant difference in mean 24-hour SBP between "active" and "sham" HGNS (122.4 mmHg [12.2] vs. 122.4 mmHg [11.2], respectively). Further, there was no significant difference in mean SBP during sleep between "active" and "sham" HGNS (115.0 mmHg [15.2] vs. 115.2 mmHg [14.4], respectively).
Conclusion: This is a randomized controlled trial evaluating cardiovascular outcomes in patients with OSA using HGNS therapy. The HGNS system permits a unique investigation of the therapy "on/off" effect on measures of the sympathetic nervous system and vascular health. "Active" HGNS levels, compared to "sham" HGNS levels, do not appear to reduce mean systolic blood pressure during wake or sleep periods.
Support (If Any): Raj C. Dedhia, MD, MSCR is supported by the American Heart Association and the American Sleep Medicine Foundation.

0786

ASSESSING THE ADEQUACY OF AUTO TITRATING POSITIVE AIRWAY PRESSURE TREATMENT IN PATIENTS WITH SEVERE OBSTRUCTIVE SLEEP APNEA DIAGNOSED ON HOME SLEEP TESTING

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Introduction: Auto titrating positive airway pressure (Auto-PAP) therapy has been increasingly prescribed to treat obstructive sleep apnea (OSA) without reliance on in-laboratory PAP titration studies. Given the current pandemic and the limited use of in laboratory titrations, Auto-PAPs have been prescribed increasingly. The ability to achieve optimal control of obstructive events with Auto-PAP for patients with severe OSA (respiratory disturbance index (RDI) >30/hour of recording) on home sleep apnea testing (HSAT) has not been systematically investigated. Our study looks at the success of treatment on Auto-PAP in patients diagnosed with severe OSA on HSAT.
Methods: We retrospectively reviewed charts of patients who were diagnosed with severe OSA on HSAT and were prescribed an Auto-PAP at the Memorial Hermann – Texas Medical Center Sleep Disorders Center between September 2019 and May 2020. The usage data, residual AHI and adherence was assessed. Successful treatment was determined as a residual AHI (rAHI) <15. We excluded patients those who were non-adherent to PAP therapy. This study was conducted as a quality improvement initiative at our institution.
Results: We identified 24 patients diagnosed with severe OSA on HSAT and prescribed Auto-PAP. Nine patients were excluded due to non-adherence to Auto-PAP (37%). Of the remaining 15 patients, 80% were male, the average age was 53.7 years (range 36-69) and the average RDI on HSAT was 51.4 events/hour (SD 17.1). The average usage >4 hours was 76% in the adherent patients. The median pressure on Auto-PAP was 9 cm H2O (range 5.3-16.3). The average rAHI of 1.8 events/hour (range 0.3- 6.1). Usage data revealed only 1 patient with rAHI>5 and central apnea index of 3.9, who was then referred for an in-lab PAP titration study.
Conclusion: Sensors in the airway circuit of PAP devices measure airflow, vibration, and flattening of the airflow profile. Auto-adjusting PAP devices use this feedback to make online adjustments in pressure to maintain upper airway patency. Our study suggests that Auto-PAP is an effective initial therapy even for severe OSA, permitting both timely and adequate control of OSA especially when in laboratory titrations are limited. Close monitoring is however recommended to ensure adherence, and also to assess the potential emergence of central events.
Support (If Any):

0787

HEALTHCARE UTILIZATION IN INITIATION OF ORAL APPLIANCE VS POSITIVE AIRWAY PRESSURE THERAPY FOR SLEEP APNEA

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Introduction: The COVID-19 pandemic and related supply chain issues have created shortages in integral components of Positive Airway Pressure (PAP) devices, the gold standard treatment for sleep apnea. Concurrently, patients have delayed care and are

returning in increasing numbers. With these overlapping pressures, alternative treatments are needed. Custom-fabricated Oral Appliances (OA) are uniquely poised as a solution. However, it is unknown if initiation and treatment cost and healthcare utilization are similar to PAP or will create further disruptions at scale.
Methods: Patients who initiated PAP or OA therapy 2018-2020 were included. Matched visits 2017-2021 were referenced. Patients with multiple treatment initiations were excluded. Healthcare utilization quantified number visits, stratified by provider type (Physician, Physician Assistant (PA), American Board of Dental Sleep Medicine (ABDSM) Accredited Dentist, or Registered Polysomnographic Technologist (RPSGT)). Contractual amounts for CPT codes were averaged to estimate cost.
Results: 5172 patients, 374 received OA (7.2%). Prior to initiation, OA therapy utilized more visits on average than PAP (4.5±1.7(±SD) vs 3.5±1.9, p<0.0001). Following initiation, OA therapy utilized fewer visits than PAP (4.1±3.9 vs 5.5±4.6, p<0.0001). Specialized provider visits, i.e. dentist for OA, were lower compared to RPSGT for PAP therapy, both before and after initiation (1.4±0.8 vs 2.0±1.4 before, 1.9±1.2 vs 2.6±1.8 after, both p<0.0001). Further, prior to initiation, Physician and PA utilization was similar between OA and PAP therapies (1.4±0.8 vs 1.5±1.0 Physician, 1.1±0.8 vs 1.2±0.8 PA, both p>0.057). However, following initiation, OA therapy utilized fewer Physician visits than PAP (1.7±1.1 vs 2.1±1.7, p<0.0001) but similar PA visits (1.9±1.5 vs 2.1±1.4, p>0.5). Together, with OA dental visits estimated to be the least expensive associated visit, this analysis estimates that the provider cost of initiation of OA therapy is lower than that of PAP.
Conclusion: Overall, OA therapy requires less healthcare utilization, especially of providers with highest reimbursement rates. While OA requires more initial appointments, PAP therapy requires more follow up visits with specialized providers and physicians, thereby increasing cost for patients. Additional cost burden of these visits could impact patient willingness to initiate treatment. This analysis provides supportive evidence for OA as an alternative to PAP with lower treatment cost and healthcare utilization, which may provide an advantage for the already over-burdened healthcare system.
Support (If Any):

0788

THE EFFECT OF CPAP ON QUALITY OF LIFE IN FEMALES WITH MILD OSA: POST HOC ANALYSIS FROM THE MERGE RANDOMISED TRIAL

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Introduction: The MERGE trial was a multi-centre, randomised, parallel study that showed the beneficial effect of continuous positive airway pressure (CPAP) on quality-of-life in patients with mild obstructive sleep apnea (OSA) (Wimms et al. 2019); findings that have extended the new NICE guidance [Obstructive sleep apnoea/ hypopnoea syndrome and obesity hypoventilation syndrome in over 16s (NG202)].This post-hoc analysis aimed to determine whether differences between the sexes in symptoms and treatment response exist at the mild end of the OSA disease spectrum.
Methods: Patients were recruited (Nov 2016 - Feb 2019) to receive either CPAP plus standard care, or standard care alone. Mild OSA was defined as: apnea-hypopnea index (AHI) >5 to ≤15 events/hr. Symptoms and quality-of-life were measured by a range of generic and disease specific questionnaires at baseline and 3 months post CPAP commencement.
Results: 233 participants (30% female) were included in this analysis. Females were on average older (mean ± SD) (51.9±10.4 vs 49.8±12.2 years) with higher BMI (32.2±5.0 vs 29.4±3.7 kg/m2) and had a lower AHI than males (median(IQR)) (9.60(6.50 -12.40) vs 10.30(7.10-13.20) events/hour).Females were sleepier (Epworth Sleepiness Score (ESS) (mean ± SD) (11.0±4.2 vs 9.5±4.4)), more fatigued (Fatigue Severity Score (FSS) (42±12.8 vs. 34.4±13.5)) and reported higher levels of anxiety, depression and insomnia. Reported quality-of-life was lower in the SF- 36 mental (41.8±13 vs. 47.3±10.9) and physical components (43.0±11.2 vs. 49.7±9.1), as well as in all individual domains. Females also reported worse scores in the Euroqol 5 Dimensions (EQ-5D) and Functional Outcomes of Sleep Questionnaire (FOSQ), compared to males. All symptoms improved with CPAP use for both sexes, however female patients had larger improvements in the ESS (mean difference(95%CI)) (-5.2 (-6.7, -3.6) vs (-2.0 (-3.0, -1.0)) p=0.0035, and SF-36 vitality (11.7 (7.9, 15.5) vs 5.6 (3.1, 8.1)) p=0.0092.
Conclusion: In mild OSA, female patients were more symptomatic and reported worse quality-of-life than males, despite having lower AHIs; all were improved with CPAP treatment.
Support (If Any): Funded by ResMed

0789

MASK MAGNETS MAY INTERACT WITH PACEMAKERS AND IMPLANTABLE CARDIOVERTER-DEFIBRILLATORS

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Introduction: Placing a magnet over a Permanent Pacemaker (PPM) or Implanted Cardioverter-Defibrillator (ICD) may cause the device to pace asynchronously or inhibit tachyarrhythmia detection, respectively, potentially preventing delivery of electrical shocks. Manufacturers for masks used with positive airway pressure devices have started using magnets in place of more traditional headgear clips to connect the headgear to mask. Mask manufactures do not list presence of a PPM/ICD as a contraindication to use of a mask with magnet but do recommend keeping the mask some distance away from PPM/ICD. A published case series describes two patients with magnet response events captured during PPM/ICD interrogation that correlated with nightly use of CPAP. The authors were able to replicate the response by placing the mask with magnet directly over the patient's pulse generate site. Although we advise all patients with implanted device to avoid use of masks with magnets, select patients refuse to stop using mask with magnets regardless of our policy. We, therefore, started offering these patients referral for PPM/ICD interrogation to evaluate for an interaction between mask with magnet and PPM/ICD as next best alternative.
Methods: We retrospectively reviewed all patients (n=10) referred for routine PPM/ICD interrogation to test whether the mask with magnet interacted with PPM/ICD when mask on face as during

normal use (i.e., simulated normal use) or magnetic area of mask placed directly over the PPM/ICD (i.e., direct contact).
Results: Although no interaction was detected in any patient (n=10) with simulated normal use (0 %), one interaction was documented with direct contact (10 %).
Conclusion: Although simulated normal use of masks with magnets did not demonstrate any interactions, it is concerning that one patient (10 % of patients) demonstrated an interaction with direct contact of magnetic area of mask over the PPM/ICD. It is not uncommon for patients to remove a mask during the night while sleeping. This preliminary data along with the published case series calls for further research and increased awareness of this potential interaction for both sleep and cardiac health care providers.
Support (If Any): None

0790

RACIAL DIFFERENCES IN SELF-EFFICACY FOR POSITIVE AIRWAY PRESSURE THERAPY AMONG INDIVIDUALS NEWLY DIAGNOSED WITH OBSTRUCTIVE SLEEP APNEA

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Introduction: Continuous positive airway pressure (CPAP) therapy is the first-line treatment for OSA, yet its effectiveness is limited by poor adherence. Self-efficacy is an individual's belief that they can successfully execute a behavior to achieve a desired outcome. Evidence shows that self-efficacy predicts adherence to and outcomes of CPAP therapy, as do race and ethnicity. Little, however, is known about how self-efficacy may differ between racial and ethnic groups. Accordingly, we aimed to determine whether self-efficacy for CPAP differs by race and ethnicity among individuals newly diagnosed with OSA.
Methods: Adults newly diagnosed with OSA and prescribed CPAP who were enrolled in the NICEPAP Study (n=267, NCT05067088), a prospective, observational cohort study investigating predictors of CPAP adherence were assessed. Those with need for non-CPAP therapy or with unstable medical conditions (e.g., cancer receiving chemotherapy, severe lung, heart or mental health disorders) were excluded. Exposures were race and ethnicity. Outcomes were subscale scores of the Self-Efficacy Measure for Sleep Apnea (SEMSA) completed prior to CPAP initiation: perceived risk, outcome expectancy, and self-efficacy. SEMSA sub-scale scores for race/ethnicity were compared using Kruskal-Wallis test. Medians (Q1, Q3) are reported.
Results: We analyzed data for 52 participants (33 women) enrolled to date who identified as White (n=29), Black (n=14), More than one race (n=5) and Other (N=5). Participants were 51.0 (36.8, 58.8) years old with an apnea-hypopnea index of 17.0/hour (11.1, 26.0) and body-mass-index of 35.0 (31.6, 43.5) kg/m2. Baseline characteristics did not differ by race, except higher poverty (p=0.005) and less completed years of education (p=0.010) for Black participants. The SEMSA scores were not statistically different between each race. However, self-efficacy was significantly lower for Black participants vs. rest of the cohort combined (2.4 (1.9, 3.1) vs. 3.3 (2.7, 3.8) p=0.020). Poverty, but not education, may be a potential mediator of this relationship (mediation analysis p=0.052). There were no differences in SEMSA scores between Hispanic and Non-Hispanic participants.
Conclusion: In our cohort, self-efficacy for OSA therapy was lower for Black participants compared to those of other races. Targeting early interventions to improve CPAP self-efficacy in Black patients may improve OSA therapy outcomes.
Support (If Any):

0791

PERCEIVED RACIAL DISCRIMINATION PREDICTS POOR PAP ADHERENCE: A PILOT STUDY

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Introduction: Although racial and ethnic differences in continuous positive airway pressure (CPAP) adherence for people with obstructive sleep apnea (OSA) are well known, no studies have examined the influence of racial discrimination on CPAP use. The aim of this study was to determine if racial discrimination influenced CPAP use trajectories.
Methods: Participants with OSA initiating CPAP were enrolled from two sleep centers in New York City. Participants completed questionnaires including sociodemographics, perceived discrimination, daytime sleepiness, and depressive symptoms. Racial discrimination was measured via the validated Everyday Discrimination scale (EDS) , Participants endorsed at least one discriminatory experience "at least once a year" and race was the main reason for this treatment. Sociodemographic and questionnaire comparison were performed between participants reporting the presence and absence of racial discrimination. To examine differences in the trajectory of CPAP use based on racial discrimination status (between-subjects factor), we performed a two-factor repeated measures ANOVA with mean hours of daily use at 7, 30 and 90 days serving as the time dependent variable (within-subjects factor). Analyses were adjusted for depressive symptoms.
Results: The sample consisted of 88 participants (40% female; 40% Non-Hispanic Black; mean age of 57 ± 14 yrs). Twenty-two individuals (25% of the cohort) reported racial discrimination. In unadjusted two-factor repeated measures ANOVA, the test statistic for equality of racial discrimination CPAP adherence means over time was highly significant [$F = 9.71$ (1, 68); $p = 0.003$] while the test for interaction between racial discrimination and time was marginally significant [$F = 3.19$ (1.53, 103.8); $p = 0.059$). Main effects for time were significant for participants reporting discrimination (p=0.04) but not for those without racial discrimination experiences (p=0.25). Thus, people reporting racial discrimination experienced greater decrement in CPAP use over time while a more stable CPAP use pattern was observed in those not perceiving racial discrimination.
Conclusion: Racial discrimination status may determine future poor CPAP adherence. Larger studies examining mechanisms of how perceived racial discrimination mediates worse CPAP adherence may assist in mitigating CPAP adherence disparities.
Support (If Any): Natasha Williams was supported by grant from the National Institutes of Health: K23125939

0792

EXPLORING SYMPTOMATIC RELIEF OF PATIENTS WITH CENTRAL SLEEP APNEA WHEN USING CPAP OR BIPAP THERAPY

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Introduction: About 0.9% of peoples over the age of 40 in the United States have Central Sleep Apnea (CSA). The key to treating CSA is to address any underlying health issues causing the condition as there are no clear, established treatment guidelines. For example, approaches will be made to mitigrate congestive heart failure. Often, patients may require the use of CPAP or BiPAP device to decrease cessations in respiration during sleep.
Methods: We investigated those patients diagnosed with CSA who use CPAP or BiPAP therapy and it's potential therapeutic effects through a retrospective chart review over a three-year period. We excluded those who were diagnosed with treatment emergent CSA and those using ASV. Data was collected from each patient's chart about patient demographics, modality of PAP therapy, and information pertaining to symptomatic relief.
Results: 42 patients were identified who had a diagnosis of CSA. 25 of 42 (59.5%) were excluded as they were using alternative therapies. Of the 17 patients, 14 (82.4%) were male with an average age of 70.7 and 3 (17.6%) were females with an average age of 50. 15 of the 17 (88.2%) used CPAP therapy and the 2 (11.8%) patients used BiPAP.Prior to PAP therapy, the average Epworth Sleepiness Scale was 8.08 which improved to 3.79 post therapy. 9 out of the 17 (52.9%) patients reported improvement in nocturnal gasping while 2 (11.8%) did not report relief and 6 (35.3%) patients we were unable to determine through chart review. 9 out of 17 (52.9%) patients reported unrefreshed sleep and later 6 of the 9 (66.7%) patients reported refreshed sleep with initiation of PAP therapy while 1 patient reported no improvement and 2 (22%) we were unable to determine. 15 of the 17 (88.2%) patients complained of waking up multiple times throughout the night before PAP therapy. 5 (33.3%) patients had improvement of the frequency of nighttime awakenings while we were unable to determine the remaining 10 patients.
Conclusion: When central sleep apnea persists despite adequate treatment of the primary cause, CPAP or BiPAP may be used for symptomatic relief.
Support (If Any):

0793

POSTOPERATIVE MONITORING IN CHILDREN LESS THAN 2 YEARS OF AGE UNDERGOING ADENOTONSILLECTOMY FOR OBSTRUCTIVE SLEEP APNEA

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Introduction: To analyze variables associated with postoperative monitoring in children <2 years of age undergoing adenotonsillectomy (T&A) for the management of obstructive sleep apnea (OSA).
Methods: Retrospective case series of children <2 years of age who underwent T&A for the management of OSA between 1/1/08-6/1/18. Postoperative respiratory complications and hospital course were analyzed to determine higher acuity of monitoring in Intensive Care Unit (ICU) versus observation unit was indicated.
Results: A total of 69 children were analyzed. Fifty-two (75.4%) patients were male, and their mean age was 18.8 months. Fifty-six (81.2%) children had severe OSA, 6 (8.7%) had moderate OSA, and 7 (10.1%) children had mild OSA. Thirty-seven (53.6%) children were monitored in the ICU; one (2.7%) child was admitted to the ICU directly from the sleep lab, and3 (8.1%) children were intubated. The average Apnea Hypopnea Index (AHI) for those who were intubated was 64.6 events/hour and low SpO2 average was 66.3%, when compared to an average of 36.2 events/hour and 75.5% respectively for the entire group. Three (8.1%) patients needed >2 liters/minute of O2, and 5 (13.5%) had minor O2 requirements. Only 7/32 (21.9%) patients monitored in the observation unit required supplemental O2.
Conclusion: A greater severity of AHI and low SpO2 nadir were associated with respiratory issues requiring monitoring of children in ICU after T&A for OSA. No specific PSG cut-off values for ICU versus observation unit were noted. Low incidences of respiratory issues were observed, and most children could have been monitored safely outside of the ICU setting.
Support (If Any): None

0794

UNDERSTANDING BARRIERS AND COMMUNICATION BEHAVIORS IMPACTING REFERRAL TO SLEEP SURGERY: QUALITATIVE PATIENT PERSPECTIVES

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Introduction: Shared decision-making is a process when patients, families, and clinicians work together to make optimal, personalized medical choices in the face of more than one reasonable treatment option. These interactions can influence the joint decision and may have lasting impressions for future healthcare encounters. Considering the American Academy of Sleep Medicine's recent clinical practice guideline on the referral of adults with obstructive sleep apnea (OSA) for surgical consultation, we aimed to understand patient experiences, in terms of barriers and communication behaviors in the referral process to sleep surgery consultation.
Methods: We performed a qualitative study consisting of in-depth semi-structured virtual interviews with adult patients (aged ≥18 years) with OSA (apnea-hypopnea index ≥5 events per hour of sleep, scored by AASM-accredited standards) and who were recommended for sleep surgery at a tertiary Sleep Surgery Clinic. Open ended questions focused on patient experiences during healthcare encounters from diagnosis, trials with noninvasive management options and ultimate referral to sleep surgery. The interviews were audio-recorded, transcribed, and analyzed using content analysis to identify themes.
Results: Ten adult patients with OSA who were evaluated in sleep surgery clinic were approached and enrolled from March through April 2021. Barriers to sleep surgery clinic included delays in OSA diagnosis due to limited OSA awareness and perceived inconvenience of sleep study, providers faulting patient for persistent sleep symptoms, patient-reported lack of urgency by providers in troubleshooting noninvasive

management options, scheduling delays and waitlists, and cost. Patients were open to trialing noninvasive treatment options, though opportunities for reevaluation and shared decision-making may address unmet needs, as inadequate improvements led to frustration after multiple encounters. Patients appreciated providers who were empathetic and provided information sharing, in terms of transparent and understandable explanations.

Conclusion: This study focused on experiences of patients with OSA and barriers faced to reach sleep surgery consultation. Improved communication structure to discuss unresolved concerns and remaining management options, as well as vetted resources, would set the foundation for effective shared decision-making and timely referral for sleep surgery consultation.

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0795

ASSOCIATION OF NASAL AND SLEEP APNEA CLINICAL MEASURES

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Introduction: The association between nasal measures and polygsomnography measures is modest. However, nasal treatment can improve sleep quality in people without sleep apnea. The association of nasal and sleep apnea clinical measures in patients with sleep apnea is unknown. Our primary hypothesis is that the subjective nasal obstruction is associated with reduced sleep apnea-specific quality of life at baseline and with sleep apnea treatment after 6 months.

Methods: This prospective cohort study included patients with newly diagnosed sleep apnea who were prescribed CPAP. Data were collected before CPAP and 6 months later, including the validated Nasal Obstruction Symptom Evaluation (NOSE, range 0-100, higher worse) scale and validated Symptoms of Nocturnal Obstruction & Related Events (SNORE-25, range 0-5, higher worse) quality of life instrument. Additional nasal measures, sleep apnea clinical measures, and covariates were collected. We tested the association between nasal and sleep apnea clinical measures with multivariate linear regression, adjusting for important confounding variables.

Results: The cohort (N=242) was middle-aged (47+/-12 years), included both sexes (65% men), and had severe sleep apnea (apnea-hypopnea index 33+/-24 events/hour). The baseline NOSE was strongly associated with SNORE-25, independent of demographics, comorbidity, and sleep apnea severity: beta 18, 95% CI 15-22, $p<0.001$, meaning for every unit of SNORE-25 increase there was an adjusted increase in NOSE score of 18. The 6-month changes in NOSE and SNORE-25 were strongly associated, independent of demographics, comorbidity, sleep apnea severity, and CPAP use: beta 17, 95%CI 13-22, $p<0.001$. Secondary nasal and sleep apnea clinical measures were associated, but nasal and polysomnography measures were not associated.

Conclusion: Nasal clinical measures are associated with sleep apnea clinical measures at baseline and with sleep apnea treatment, while the nasal measures are not associated with polysomnography measure. These data support the importance of the nasal airway on sleep apnea clinical outcomes.

Support (If Any): R01 HL084139 (Weaver), T32 DC000018 (Stone), Seattle Veterans Affairs Medical Center

0796

THE SLEEP INSTABILITY IN CHRONIC RHINOSINUSITIS PATIENTS WITH NASAL POLYPS USING CAP ANALYSES DURING NREM SLEEP

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Introduction: The sleep instability can increase the impact of several sleep disorders. The chronic rhinosinusitis leads to sleep fragmentation, and changes in systemic inflammatory biomarkers followed by upper airway flow limitation or nasal mucosa inflammation near the skull base. To evaluate the effect of sleep dysruption in chronic rhinosinusitis patients with nasal polyps using CAP analyses, this study aimed to analyse these patients before and after the anti-inflammatory effect of intranasal corticosteroids on nasal obstruction.

Methods: After two months of washout, thirty individuals with nasal polyps and sleep-disordered breathing used intranasal budesonide 400 mcg every day for one month. Before and after the treatment, they underwent the same exams: nasal endoscopy, subjective nasal resistance scores, fatigue severity scale, and Epworth sleepiness scale. Besides, T helper-two inflammation was measured by serum levels of eosinophils, interleukin-four and five. Intermittent hypoxia impact was documented using serum levels of IL-6 and tumor necrosis factor-alpha. Type 1 polysomnography was performed. It was scored according to the last manual of AASM and Terzano's rules. The nonparametric Wilcoxon test was used to assess within-group differences before and after exposure to corticosteroids. Correlation between quantitative variables was analyzed by using the Spearman correlation coeficient, and $p< 0.05$ was statistically significant.

Results: All the participants had sleep' fragmentation in non-REM sleep. The treatment decreased the subjective nasal obstruction ($p<0.005$) and IL-5 levels ($p<0.05$), without significant impact on other biomarkers, nasal endoscopy results, fatigue or somnolence scales, and sleep architecture. Interestingly, the subtypes of phase A of CAP weren´t statistically significant ($p>0.05$) decreased compared two groups (before and after treatment).

Conclusion: The anti-inflammatory effects of intranasal corticosteroid decreased the nasal resistance and Th2 systemic inflammation without any changes in sleep fragmentation, highlighting. Terzano's manual quantifies the sleep fragmentation using the cyclic alternating pattern, and it can be a sensitive electroencephalogram analysis of the non-NREM sleep described as a marker of sleep instability, however the analyse of phase A subtypes CAP did not show changes sleep disruption in patients with nasal polyps after their treatment of nasal mucosa inflammation. More studies are need to clarify the sleep complaints in these patients.

Support (If Any):

0797

RECLAIMING HER LIFE: SUCCESSFUL TREATMENT OF KLEINE-LEVIN SYNDROME WITH TRANSDERMAL FLUMAZENIL

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Introduction: Kleine-Levin Syndrome (KLS) is a rare disorder of hypersomnolence with cognitive and behavioral disturbances. Currently, there are no definitive treatment recommendations although stimulants, mood stabilizers, and even electroconvulsive therapy have been utilized with inconsistent results.
Report of Cases: A 23-year-old female with a history of depression, anxiety, obsessive-compulsive disorder, Hashimoto's thyroiditis, lupus, and morbid obesity presented to our facility for management of debilitating episodes of sleepiness due to KLS, diagnosed at the age of 22. She reported good health until a series of viral illnesses at the age of 20. She then began experiencing sleep episodes requiring 20-22 hours of sleep per day, only awakening to eat and use the bathroom. These episodes typically lasted for two weeks and were preceded by periods of hyperphagia and hypersexuality. When she presented to our facility, she was using lithium and modafinil daily along with amantadine and clarithromycin twice daily as needed for episodes of sleepiness. At her initial visit, she was prescribed transdermal flumazenil, a GABA-A receptor/benzodiazepine antagonist, to be used as needed to supplement amantadine and clarithromycin. She was initially requiring flumazenil every other month. After seven months of flumazenil use, the frequency of episodes decreased to every 3-4 months. She would administer two clicks of flumazenil cream on each forearm with the prodrome symptom of fogginess, which would abort the episode. Rarely, she required a second dose 12 hours later. With flumazenil and avoidance of triggers, such as alcohol and sleep deprivation, she reported completing her master's degree and finally maintaining a job. Ultimately, she discontinued lithium, modafinil, amantadine, and clarithromycin use without reoccurrence of her symptoms.
Conclusion: This case demonstrates successful treatment of KLS with the use of a GABA-A receptor/benzodiazepine antagonist, flumazenil. Reduction in episodes of sleepiness with flumazenil ultimately led to discontinuing stimulant, mood stabilizer, and clarithromycin use. Early trials of transdermal flumazenil and continued research regarding the use of this medication for patients with KLS may prove to be a promising intervention.
Support (If Any): None.

0798

DETRIGGERED - A CASE OF TENOSYNOVITIS AMELIORATED BY CPAP

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Introduction: The influence of sleep quality and pain is bidirectional (1). Sleep loss can induce hyperalgesia through upregulated inflammatory mediators such as IL-6 and TNF (2, 3). Obstructive sleep apnea (OSA) is characterized by obstructive respiratory events, hypoxemia, sleep fragmentation, and ultimately poor quality sleep. Here we present a case of how the treatment of OSA with continuous positive airway pressure (CPAP) mitigated hand inflammation and trigger finger symptoms.
Report of Cases: A 60 year old male with prediabetes, hypertension, and BMI 30 presented to primary care with bilateral finger pain and stiffness. Hand orthopedics noted a tender left A1-pully 4th finger with 20 degree flexion contracture and a palpable right 3rd finger flexor tendon nodule causing definite triggering. He was diagnosed with trigger finger and initially treated with steroid injections and again 5 months later due to persistent symptoms. 10 months after the initial orthopedic visit, orthopedics planned for surgical intervention, but patient missed his surgery for unknown reasons. 7 months later, sleep medicine evaluated the patient for snoring and daytime fatigue. He underwent home sleep apnea testing which revealed a respiratory event index (REI) of 36.7 which necessitated CPAP therapy. Unfortunately, the patient was then lost to follow up in sleep medicine clinic. More than a year later, the patient showed to clinic and found to have 100% CPAP compliance with residual REI of 0.7. He enthusiastically noted improvement of daytime fatigue and trigger finger symptoms when using CPAP. When he would forget to use CPAP at night or during naps, he would wake up with returned finger pain and stiffness. Per patient, the symptoms would then resolve after re-initiation of CPAP. This consistent association of CPAP and finger symptom amelioration continued even 8 months later in most recent follow up.
Conclusion: To our knowledge, this is the first report of trigger finger symptoms improving with treatment of OSA. One hypothesis is that through improved sleep quality, there is a dampening of chondrocyte proliferation of the retinacular sheath and allowing unrestricted motion of the flexor tendon (4). More studies are needed to evaluate the musculoskeletal benefits of CPAP for OSA.
Support (If Any): 1. Haack M. Scott Sutherlandj. Et al. Pain sensitivity and modulation in primary insomnia. Eur J Pain. 2012, 16: 522-533.2. Chhangani BS, Roehrs Ta et al. Pain sensitivity in sleepy pain-free normals. Sleep, 209, 32:1011-1017.3. Li, Joule Sarah Appleton. Association of Musculoskeletal Joint Pain with Obstructive Sleep Apena, Daytime Sleepiness, and Poor Sleep Quality in Men. Arthritis Care and Research Vol 69. No 5. May 2017.4. Makkouk Al Hasan et al. Trigger finger: etology, evaluation, and treatment. Curr Rev Musculoskeltal Med 2008. 1:92-96.

0799

PRECIPITATION OF DREAM ENACTMENT BEHAVIOR IN THE SETTING OF B -BLOCKER THERAPY

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UCLA [1]

Introduction: REM sleep behavior disorder (RBD) is defined by dream enactment behavior (DEB) and REM sleep without muscle atonia (RWA). It is proposed that in both isolated and secondary RBD, the loss of REM sleep atonia is related to a failure of spinal motoneuron inhibition in the rostral pons. RBD is most commonly isolated, although it has been attributed to serotonergic antidepressant medication. This is the first report of metoprolol succinate (MS) provoking DEB in patients with RWA which helps shed more light on the mechanism of DEB in RBD.
Report of Cases: A 51-year-old male with a new diagnosis of atrial fibrillation (AF) was referred for evaluation of snoring and hypersomnolence. Polysomnography (PSG) revealed obstructive sleep apnea and RWA. DEB was not observed. Compliance with PAP therapy improved his symptoms. Persistent AF required the use of Metoprolol Succinate (MS), which precipitated

aggressive DEB. Discontinuation of MS resulted in clinical resolution of DEB.

Conclusion: The data sheds more light on the potential role of β- blockers, in general, and MS, in particular, in precipitating DEB in susceptible individuals with RWA. While MS is an uncommon cause of visual hallucinations, the data here indicates that it might increase susceptibility to DEB in those who are at risk (RWA). Potential mechanisms include the following: β-blockers bind to serotonin receptors and precipitate DEB in the setting of RWA. β-blockers may also precipitate DEB by suppressing melatonin release via specific inhibition of central beta-adrenoreceptors culminating in sleep instability and DEB as a consequence. This case illustrates a clinically important role of the β-blocker MS, in precipitating DEB, and the need to avoid these agents in the setting of injurious parasomnias. We recommend that clinicians keep a vigilant eye for the exacerbation of DEB in people with RBD who are prescribed β-blockers.

Support (If Any):

0800

DOZING OFF IS A PROBLEM, AS IS A TOE FALLING OFF - METHYLPHENIDATE INDUCED RAYNAUD'S PHENOMENON.

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Introduction: Narcolepsy is a clinical syndrome characterized by a constellation of symptoms including excessive daytime sleepiness, cataplexy, sleep paralysis and sleep hallucinations. Stimulants are commonly used to treat hypersomolence associated with narcolepsy. Common adverse reactions reviewed with patients prior to initiation of amphetamines include decreased appetite, nausea, xerostomia, headache, insomnia, tachycardia and hypertension. A relatively rare concern with stimulants is development of peripheral vasculopathy including Raynaud's phenomenon.

Report of Cases: A 25-year-old female with past medical history of anxiety, depression and obstructive sleep apnea in childhood was treated with tonsillectomy and adenoidectomy. Over the years, she continued to have persistent hypersomnolence, auditory hypnogogic hallucinations with no symptoms of sleep paralysis or cataplexy. She had a polysomnography (PSG) along with multiple sleep latency test (MSLT). PSG did not show evidence of sleep apnea with an AHI of 0.96 per hour. MSLT confirmed the diagnosis of Narcolepsy, Type 2, with a mean sleep onset latency of 3.6 minutes and five sleep-onset REM periods (SOREMPs). She was started on 400mg daily of Modafinil and 20mg daily of Methylphenidate. After a month of using methylphenidate, she noticed purplish discoloration of her digits, sometimes with exposure to cold, other times with no obvious triggers, consistent with development of Raynaud's phenomenon. The proposed mechanism is that use of methylphenidate causes excessive release of catecholamines due to inhibition of the reuptake of dopamine and norepinephrine, leading to peripheral vasoconstriction. As the patient's hypersomnolence persisted, she was started on sodium oxybate and the dosage of methylphenidate was decreased to 10mg daily and eventually discontinued. With reduction in the dosage and discontinuation of methylphenidate, symptoms of Raynaud's phenomenon improved.

Conclusion: Dose-related peripheral vasculopathy including Raynaud's phenomenon has been reported in several case reports with the use of methylphenidate. Awareness of this relatively rare adverse effect is imperative among sleep physicians as it could cause significant delay in the diagnosis, management of Raynaud's phenomenon and its complications including critical digital ischemia and gangrene. Dose adjustments and discontinuation of methylphenidate should be considered in the treatment course of the patients with such concern.

Support (If Any):

0801

MELATONIN INDUCED AUTOIMMUNE HEPATITIS IN THE SETTING OF THE MANAGEMENT OF REM SLEEP BEHAVIOR DISORDER

Mahtab Moshtagh-Sisan[1], Kayvon Sarrami[1], Jay Patel[1], Brian Harris[1], Alon Avidan[1]
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Introduction: Melatonin is a neurohormone that serves a key role in human circadian physiology. It is widely used in the United States as an over-the-counter (OTC) sleep aid for managing insomnia, circadian rhythm disorders, and parasomnias. The US Food and Drug do not regulate it as a dietary supplement. However, insufficient data currently exist about formulations and overall safety for long-term usage. While serious adverse events with melatonin are rare, we describe a patient in whom clinical, laboratory, and biopsy features of autoimmune-mediated hepatitis developed in temporal association with time-release melatonin (MLTR) therapy for the treatment of dream enactment behaviors in the setting of REM-sleep behavior disorder (RBD).

Report of Cases: A 78-year-old female was referred to our clinic to manage disruptive dream enactment in the setting of RBD. The patient had been previously treated with Clonazepam, Diazepam, and Temazepam but remained refractory. Management with MLTR at 5 mg achieved clinical improvement and titration over a month up to 10 and 15 mg fully controlled dream enactment. Unfortunately, during this time, the patient developed swollen and erythematous joints and abdominal pain. Liver biopsy demonstrated lymphoplasmacytic infiltrate with rosette formation consistent with autoimmune hepatitis consistent with idiosyncratic drug-induced hepatitis associated with elevated liver function enzymes [AST 184 (H) (NL <39U/L), ALT 395 (H) (NL<56 U/L), Bilirubin, Direct= 0.3 (H) (NL<=0.2 mg/dL)]. Melatonin was discontinued achieving complete resolution of symptoms and normalization of liver function indicating its
causal association with hepatitis.

Conclusion: This unusual report of melatonin-induced autoimmune hepatitis is uncommon but points to intriguing immunostimulatory effects of melatonin. Our case highlights an important and sometimes overlooked attribute of melatonin that prescribers and patients must recognize. While melatonin is often viewed as a safe dietary supplement, its use, particularly among people with autoimmune disorders, should be documented and monitored with care.

Support (If Any):

0802

CENTRAL SLEEP APNEA AS A RESULT OF CEREBRAL CAVERNOUS MALFORMATION HEMORRHAGE IN THE PEDIATRIC POPULATION

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Introduction: Cerebral Cavernous malformations (CCMs) consist of a collection of capillaries in the central nervous system (CNS) that are enlarged and irregular in structure. Patients with CCMs are at increased risk of hemorrhage into the brain or spinal cord, resulting in seizures, focal neurologic deficits, hydrocephalus, and death. Given the importance of the brainstem and central chemoreceptors in regulating respiratory function, rupture of CCMs can also lead to dysregulation of breathing. We present a series of 3 pediatric patients who have a diagnosis of central sleep apnea (CSA) due to rupture of CCMs managed with home ventilators with significant differences in clinical presentation from mild CSA to night time respiratory support for severe CSA and chronic respiratory failure requiring continuous mechanical ventilation.
Report of Cases: Subject 1 is a 13 yo M with a history of ruptured posterior fossa arteriovenous malformation (AVM) complicated by post-hemorrhagic hydrocephalus, right hemiparesis and severe central apnea requiring nighttime mechanical ventilation via tracheostomy. Subject 2 is a 19 yo M with a history of mid-pontine cavernoma with multiple episodes of hemorrhage failing surgical resection resulting in right hemiparesis, severe central apnea and hypoventilation requiring continuous mechanical ventilator support via tracheostomy. Subject 3 is a 6 yo F with a history of thoracic cavernous hemangioma resulting in spinal cord injury and mild central sleep apnea requiring mask ventilation via home ventilator during sleep. All of these patients experienced loss of respiratory drive as a result of complications from brainstem or spinal cord lesions with varying degrees of ventilator support requirement and clinical presentation.
Conclusion: Due to the propensity for CNS bleeds among patients with CCM they are at increased risk of respiratory compromise. Home ventilator support can be used effectively to treat central apneas and chronic respiratory failure but this is a moving paradigm as subsequent bleeds worsen respiratory compromise.
Support (If Any): Support (if any):

0803

EXTREME UPPER EXTREMITY MOVEMENTS IN PATIENT WITH NARCOLEPSY TYPE 1 AND REM SLEEP BEHAVIOR DISORDER AFFECTING ACTIGRAPHY RESULTS.

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Introduction: Narcolepsy with Cataplexy is a central disorder of hypersomnia that is characterized by excessive daytime sleepiness and Rapid eye movement (REM) dissociation phenomena. A common manifestation of narcolepsy is REM behavioral disorder (RBD), a parasomnia characterized by loss of muscle atonia during REM sleep (RSWA). While RBD is relatively common in patients with narcolepsy, very extreme movements are considered rare.
Report of Cases: A 20-year-old male with no significant past medical history presented with 8 months of new onset daytime sleepiness, sleep paralysis, and auditory hallucinations at sleep onset. After initial evaluation at our sleep center, he was scheduled for actigraphy testing and sleep logs, followed by video polysomnogram and mean sleep latency testing (MSLT). Initial PSG results were notable for a total sleep time of 498 minutes, a normal apnea-hypopnea index of 0.7/hr., sleep onset latency of 0 minutes, and REM latency of 0 minutes. Based upon military medical standards, the MSLT scheduled for the following morning was cancelled due to limited sleep during the preceding 2 weeks as measured via actigraphy. However, the patient's sleep logs reported over 7.5 hours of sleep per night. The patient's video PSG was reviewed, which showed evidence of frank RSWA, as well as episodes of dream enactment behavior during REM sleep, all including very violent movement in his upper extremities. Repeat trial of MSLT 2 weeks later showed mean sleep latency of 1.7 minutes, with 5 sleep onset REM periods (SOREMPS), and evidence of dream enactment involving the upper extremities during 3 of these SOREMPS.
Conclusion: We present the case of a patient with narcolepsy and RBD with significant upper extremity movements to the point of affecting the actigraphy sleep/wake detection algorithm. Actigraphy has been validated as a diagnostic tool in assessing sleep and wake patterns in individuals without significant REM sleep dissociation phenomena; however, our case highlights the necessity of further research of the validity of actigraphy in patients with Narcolepsy and/or REM behavioral disorder.
Support (If Any):

0804

ENHANCED DRUG-INDUCED SLEEP ENDOSCOPY: DISTINGUISHING CENTRAL FROM OBSTRUCTIVE APNEAS

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Introduction: Drug-induced sleep endoscopy (DISE) is a useful tool for assessing upper airway collapse in patients with obstructive sleep apnea (OSA) and frequently influences surgical plans. The standard DISE setup of an endoscopic tower with flexible bronchoscope is adequate for visualizing collapse configurations, but endoscopic findings do not always correlate with actual respiratory physiology. We describe our enhanced clinical DISE setup incorporating nasal flow and respiratory effort measurements, which facilitates differentiation between central and obstructive events. Central sleep apnea was detected in two patients who were originally diagnosed with OSA and underwent DISE during hypoglossal nerve stimulation candidacy workup.
Report of Cases: Case 1 is a 58-year-old male with cardiomyopathy, atrial fibrillation and congestive heart failure who was diagnosed with moderate OSA on a home sleep apnea test. He was PAP intolerant due to claustrophobia. DISE during baseline breathing revealed complete anteroposterior collapse at the palate, tongue base and epiglottis. However, central apneas with Cheyne-Stokes breathing were noticed when positive airway pressure (PAP) was applied. A subsequent polysomnogram revealed severe sleep apnea which was primarily central in nature with Cheyne-Stokes breathing and OSA. He declined retrying PAP and opted

for phrenic nerve stimulation. Case 2 is a 48-year-old male with a history of aortic valve repair, hypothyroidism, atrial fibrillation provoked by excessive thyroxine, hypertension and moderate OSA diagnosed on several polysomnograms. He had been treated previously with nasal and palatal surgery, oral appliances and PAP. DISE revealed complete anteroposterior collapse of the palate and tongue base, but also central apneas during baseline breathing and at low PAP levels. Polysomnogram performed following his DISE confirmed central sleep apnea which was positional in nature. He chose to undergo positional therapy instead of PAP or phrenic nerve stimulation.

Conclusion: The nasal flow and respiratory effort measurements included in our enhanced DISE setup enable the sleep surgeon to recognize the absence of respiratory effort even in the face of soft tissue collapse observed on videoendoscopy. These cases demonstrate the ability of propofol to preserve pathophysiologic mechanisms of sleep apnea (i.e. central versus obstructive), and underscore the importance of DISE as a diagnostic tool prior to sleep surgery.

Support (If Any): NIH 1R01HL144859-01

0805

HALO-TRACTION INDUCED OBSTRUCTIVE SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is the most common sleep-related breathing disorder. It is a multi-factorial disease with a variety of identified causes including age, male gender, obesity, craniofacial and upper airway abnormalities. We would like to describe a patient who had severe OSA following application of Halo traction, which significantly improved following the removal of the device.

Report of Cases: 14-year-old male with medical history of spina bifida, chiari malformation s/p decompression, shunted hydrocephalus and severe scoliosis, was admitted to the hospital for anterior spinal discectomy L2-S1 and Halo application with traction for scoliosis. He previously had nocturnal polysomnogram (NPSG) in 2017 that demonstrated very mild mixed apnea with an apnea hypopnea index (AHI) of 5.5. Because central apneas were very brief and clustered in REM, family elected to repeat a study rather than treat. In 2019, he had a follow up study with complaints of snoring and thirst, and this demonstrated an AHI of 21 with 29 brief central apneas and 72 hypopneas, 1 obstructive apnea. He had a T&A and turbinate ablation and due to the global pandemic did not undergo repeat sleep study. During admission for his anterior spinal discectomy and Halo, he demonstrated persistent night time hypoxia. A split night sleep study showed evidence of severe OSA with pretreatment AHI of 94.4, oxygen nadir 86%. Continuous positive airway pressure (CPAP) was initiated at 5 cm of water and titrated to 11 cm of water. On CPAP of +11 severe obstructive events continued with an AHI of 40.6, oxygen nadir 92%. A bilevel positive airway pressure (BIPAP) titration study the subsequent night started at pressures of 12/6 and titrated to 21/9 with respiratory rate of 12 yet demonstrated AHI of 51, oxygen nadir 89%. Study transitioned to average volume assisted pressure support (AVAPS) with IPAP max of 26, IPAP minimum of 12 EPAP of 9, tidal volume of 175ml, rate of 12 with inadequate control of his obstructive events with an AHI of 24.8, minimum oxygen saturations of 91. While hospitalized, he remained on AVAPS with normal capillary blood gases. Halo traction was removed 2 weeks following his surgery with plan was to send him home on AVAPS and repeat NPSG in 6 weeks. However, as a result of COVID pandemic/Philips recall, CPAP was the only device available for home use, so CPAP therapy at +8 cm was trialed overnight, demonstrating oxygen nadir of 92% and a normal capillary blood gas in the morning. Patient was then discharged home on CPAP of +8 cm of water. He returned back to sleep center for a BIPAP titration study to re-establish BIPAP/AVAPS settings, as his inpatient sleep study had shown severe OSA. During the sleep study, he was started on BIPAP 12/6 and he remained on it throughout the night with 0 central and 0 obstructive events. As he did well, he was advised to continue CPAP +8 with plans to repeat the sleep study off CPAP. In clinic follow up, he reported mild skin breakdown and occasionally waking unrefreshed.

Conclusion: As our patient did significantly better following the removal of Halo traction device, it is likely that Halo traction device caused fixed over flexion of the cervical spine that resulted in decrease in his airway diameter, which further worsened during his sleep, and caused severe OSA.

Support (If Any):

0806

REM SLEEP WITHOUT ATONIA IN THE SETTING OF DUCHENNE MUSCULAR DYSTROPHY: CAN IT SERVE A PROTECTIVE ROLE?

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Introduction: Duchenne muscular dystrophy (DMD) has well-known associations with sleep-related breathing disorders such as sleep apnea and nocturnal hypoventilation. These disorders naturally follow from the progressive muscle weakness that is the hallmark of DMD. New data is emerging on the prevalence of other polysomnographic features affecting patients with DMD, particularly as they relate to the phenotype of the sleep disorders unique to DMD. We report on a patient with REM sleep without atonia (RWA) in DMD.

Report of Cases: A 13-year-old male with DMD was referred for a polysomnogram (PSG) due to new-onset snoring, but there was no history to suggest dream enactment behavior. He was not taking any CNS-acting medication such as serotonergic or sedative-hypnotic medications. Neurologic examination was notable for diffuse symmetric muscle weakness requiring the use of a wheelchair. PSG revealed obstructive sleep apnea syndrome with an apnea-hypopnea index of 3/hr overall and 5/hr during REM sleep, a respiratory disturbance index of 9/hr with minimum O saturation of 84%, and evidence of RWA in three 30-second epochs meeting AASM scoring criteria. Dream-enactment behavior was absent during the PSG and historically.

Conclusion: We report on a previously unrecognized finding of RWA the setting of DMD. While sleep studies are routinely performed in DMD due to the significant association with sleep-disordered breathing and REM-related hypoventilation, the presence of RWA was unusual. The finding of RWA in the setting of a dystrophinopathy prompts important questions. While it is unlikely that RWA is an emerging sign of an α-synucleinopathy in the setting of DMD, its presence in a young teenager raises the possibility of hypocretin deficiency in the setting of DMD, as is the case with myotonic dystrophy type 1 reflecting impaired hypocretin neurotransmission. However, a more attractive explanation is that RWA may promote a protective effect against sleep apnea in patients with vulnerability to REM-related hypoventilation. Our data suggest a potential protective role conferred by the preservation of muscle tone in the setting of sleep apnea in neuromuscular conditions.

Support (If Any): None

0807

SLEEP-RELATED HICCUPS: A CASE REPORT OF ANTIDEPRESSANT ASSOCIATED HYPNIC JERKS

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Introduction: A hiccup is a sudden activation of inspiratory muscles, followed by paradoxical glottic closure, producing a familiar sound [1]. Antidepressants are commonly prescribed and hypnic jerks and hiccups have been reported as a rare adverse drug reaction [2]. Few reports have described pronounced hypnic hiccups with subsequent audio/video polysomnogram confirmation.
Report of Cases: A 44-year old man with a history of depression, anxiety, and alcohol use disorder presented to clinic with a long history of violent hypnic jerks associated with a loud hiccup. These episodes started 30 minutes before he fell asleep and continued throughout the night every 30 minutes with forceful hiccups that were so loud they wake others in his house. We believe that these episodes were likely induced by venlafaxine since they were noted initially 8 years ago when he started taking venlafaxine and there was complete remission after discontinuation of the medication. He was later prescribed escitalopram 20 mg daily, restarted on venlafaxine XR 150 mg daily, and later sertraline 100 mg daily due to refractory depression and anxiety recurrence. Episodes progressively became more frequent and pronounced that he avoided sleep and they impacted his ability to hold a relationship. Gabapentin and clonazepam did not previously improve symptoms. He took trazodone 50 mg every other night to aid falling asleep and reported to have less frequent hypnic jerks. Upon presentation to our clinic, subsequent PSG demonstrated severe obstructive sleep apnea (AHI 63, HI 52, CI 11) with significant sleep fragmentation (sleep efficiency 46%) with very frequent sudden axial myoclonic contractions with head and neck movements along with vocalizations likely representing hiccups. Video and audio demonstrated the loud hiccups described. These events occurred while the patient was resting awake and transitioning to sleep and was less frequent but persisted in N2. The patient was prescribed CPAP for sleep apnea and recommended to follow up with psychiatry to consider other medications.
Conclusion: Pronounced hypnic jerks and sleep-related hiccups can significantly impact total sleep time, sleep quality, and quality of life. Clinicians should be aware of these potential side effects in patients on antidepressants.
Support (If Any): 1. Askenasy JJ. About the mechanism of hiccup. Eur Neurol. 1992;32:159-63.2. Bagheri H, Cismondo S, Montastruc JL. Hoquet d'origine médicamenteuse: enquête à partir de la Banque Nationale de Pharmacovigilance [Drug-induced hiccup: a review of the France pharmacologic vigilance database]. Therapie. 1999 Jan-Feb;54(1):35-9. French. PMID: 10216420.

0808

WORSENING CENTRAL SLEEP APNEA: A SOLE DIAGNOSTIC MARKER OF A BRAIN TUMOR IN A CHILD.

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University of Illinois Chicago [1]

Introduction: Central sleep apnea (CSA) in children is a relatively uncommon and under-studied sleep disorder. A small subset of patients may have intracranial anomalies, but clinical presentation varies. We present a case of malignant intracranial tumor diagnosed primarily due to the unusual presentation and progression of CSA.
Report of Cases: The presented patient is a 12-year-old developmentally appropriate female with a history of obstructive sleep apnea (OSA) status post adenotonsillectomy at two years of age who presented with snoring without witnessed apnea, sleep interruptions, and unrefreshing sleep. Other sleep-related history was unremarkable. No daytime sleepiness or behavioral or learning concerns were noted. Physical examination was unremarkable with normal growth parameters. Initial diagnostic PSG demonstrated severe OSA with an obstructive apnea-hypopnea index (OAHI) of 16/h and mild CSA (CAI:6.7/h); therefore, PAP therapy was pursued after ruling out adenoid regrowth. However, during the first PAP titration study(incomplete study due to mask intolerance), treatment-emergent central apneas were noted (OAHI: 9.8/h; CAI:25.8/h), which were noted even during the second titration study (OAHI:2.7/h; CAI:59.2/h). Even though ordered earlier, the brain MRI was not performed until after the repeat PSG one year later showed persistence of severe CSA (OAHI of 4.5/h and CAHI of 39.5/h) after much persuasion. Interestingly, snoring had reportedly improved with no daytime symptoms or neurologic complaints. The brain MRI demonstrated compressing brainstem lesion highly suspicious for glioma. The patient was emergently sent to neurosurgical care and had chosen hospice care after a few weeks.
Conclusion: CSA can be an early or the only finding in patients with brainstem tumors, even before neurologic signs and symptoms. The PSG findings changed from mild CSA to treatment-emergent CSA to severe CSA, possibly with the progression of underlying disease. Close follow-up and ensuring patient compliance are essential in CSA patients. CSA severity should prompt MRI brain even with an intact neurological examination. More research is needed to fully understand the link between cerebral disease and polysomnographic data. This could aid in early diagnosis and treatment.
Support (If Any): no conflicting or financial interests to disclose

0809

LATE ONSET NARCOLEPSY WITH CATAPLEXY

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Introduction: NT1 is characterized by EDS, cataplexy, sleep related paralysis, and hallucinations. Cataplexy is defined as weakness precipitated by emotions, more commonly with positive emotions and is associated with narcolepsy.
Report of Cases: 70 yo with history of OSA on APAP referred with year history of worsening EDS, dream enactment, and cataplexy. Initially CPAP titration followed by MSLT was performed. Unfortunately sleep logs/actigraphy were not performed. CPAP was titrated 7-10 cm demonstrating suboptimal control (AHI 30) and presence of RSWA. MSLT demonstrated MSL of 2.9 minutes with 5 SOREMPS, however was confounded by THC use, suboptimal OSA control, and Trazodone. Considering above, patient was started on 11-16cm, and reevaluation was recommended. Patient was seen by neurology and started on Fluoxetine 20mg with some relief in symptoms (4-5episodes/day to 1-2/day). Imaging was unremarkable. Reevaluation was planned. He stopped Fluoxetine and THC 3 weeks prior. Actigraphy demonstrated significant movement. PSG demonstrated SOREMP with optimal OSA control (15-17cm), but there was recurrent evidence of vocalization with RSWA. MSLT was significant for MSL of 2.5 minutes, and 4 SOREMPs. Patient was restarted on Fluoxetine 40mg and melatonin 15mg for RBD. With optimal CPAP pressure daytime symptoms improved, however cataplexy worsened (3-4/day) triggered by laughter. Fluoxetine dose was increased with some relief

the following days, but cataplexy returned leading to fall. He was transitioned to venlafaxine. With that patient noted complete resolution for 3 weeks. Cataplexy later recurred but resolved with an increase to venlafaxine 150mg. Three weeks later episodes recurred 3-4/week, with few causing collapse. Pitolisant was prescribed and currently pending prior authorization.
Conclusion: This case illustrates an unusual case given late onset of NT1 and refractory cataplexy that is disproportionately severe than the sleepiness. Cataplexy in geriatric populations is associated with falls and fractures. Medication for treatment of cataplexy comes with its own risks. Considering age and frequent falls, Pitolisant was added to the venlafaxine. It is noteworthy that daytime sleepiness improved with CPAP. There have been case reports with delayed onset NT1, however EDS was the prominent factor which responded well to stimulants, in our case cataplexy was refractory and prominent.
Support (If Any):

0810

MANAGEMENT OF NARCOLEPSY IN A PATIENT WITH SEVERE CHRONIC IRON DEFICIENCY: THE IMPORTANCE OF ADDRESSING NUTRITIONAL DEFICIENCIES IN THE TREATMENT OF NARCOLEPSY AND HYPERSOMNIAS

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Introduction: Since iron is a cofactor used in the synthesis of CNS dopamine, some of which is then converted into norepinephrine, CNS iron deficiency will have an impact on the availability of dopamine and norepinephrine. Medications for narcolepsy and hypersomnia, such as stimulants and wakefulness medications, are dependent on the availability of these neurotransmitters to achieve their clinical response. Unrecognized and untreated nutritional deficiencies may contribute to inadequate responses to treatment of these sleep disorders.
Report of Cases: A 26-year-old female with a history of iron deficiency since her pre-kindergarten health evaluation had a history of inadequate responses to stimulants and wakefulness medications. Additional labs were drawn to evaluate for nutritional deficiencies that could be contributing to the combination of fatigue and hypersomnolence. These revealed continued severe iron deficiency along with vitamin B6, B12, and D deficiencies. The treatment plan then expanded to include treatment of the nutritional deficiencies and a trial of pitolisant, which works to increase histamine levels in the brain. Sadly, pitolisant resulted in intolerable headaches, so it was discontinued.
Conclusion: This author feels that patients with hypersomnia warrant a broader approach that includes evaluating for nutritional deficiencies which may contribute to fatigue and hypersomnolence. In this case, the plan was to address the patient's nutritional deficiencies and switch to pitolisant which mediates increased CNS histamine levels. This was unsuccessful due to the side effect of increased frequency and intensity of headaches related to pitolisant. Treating her iron deficiency with iron infusions should increase CNS synthesis of dopamine and norepinephrine. She may now have a better response to stimulants or wakefulness medications which depend on the availability of these neurotransmitters. She may also benefit from combination therapy by adding sodium oxybate to one of these medications.
Support (If Any):

0811

PATIENT WITH PIERRE ROBIN SEQUENCE AND MOEBIUS SYNDROME - DIAGNOSTIC AND TREATMENT CHALLENGES

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Introduction: Pierre Robin sequence includes craniofacial anomalies - micrognathia, mandibular hypoplasia, glossoptosis, and cleft palate resulting in obstructive sleep apnea (OSA), respiratory dysfunction, and feeding difficulties. Moebius syndrome is a brainstem anomaly that causes cranial nerve VI and VII palsy, causing oculofacial paralysis, palatal weakness with feeding difficulties, and aspiration. We present a case of an infant with Pierre Robin and Moebius syndrome with sequalae of both - OSA and aspiration diagnosed after the neonatal period.
Report of Cases: A 4-month-old male infant was referred for suspected sleep-disordered breathing (SDB) in context of Pierre Robin sequence, Moebius syndrome, and a premature birth at 32 weeks gestation. Shortly after birth, the patient experienced respiratory distress requiring continuous positive airway pressure (CPAP) support in the neonatal intensive care unit. Also, he required a pediatric intensive care admission at 2 months of age for acute respiratory failure with hypoxemia requiring high-flow nasal cannula, and difficulty feeding. Parents reported snoring, apneas with cyanosis, and gasping respirations at night. Physical exam demonstrated micrognathia, glossoptosis, high-arched narrow palate, and the inability to fully close his eyes or mouth. Care at an outside facility did not include a laryngoscopy, swallow study, or sleep study. The patient had inadequate weight gain, eventually developed failure to thrive (FTT), and was admitted for an upper respiratory tract infection and dehydration that required a nasogastric tube. An urgent split-night polysomnogram was performed, which demonstrated OSA with an apnea-hypopnea index (AHI) of 22/hour and an oxygen saturation nadir of 83%. Use of 0.5 L/min of supplemental oxygen via nasal cannula, lowered his AHI to 1/hour. Urgent referrals to otolaryngology, oral and maxillofacial surgery were placed and both specialties recommended delay in surgical intervention. A swallow study was performed and demonstrated aspiration with all consistencies. He was discharged with supplemental oxygen for OSA with gastrostomy tube placement pending.
Conclusion: This case highlights a delayed diagnosis of OSA and aspiration in an infant with Pierre Robin and Moebius syndrome with FTT. The presentation emphasizes the importance of early recognition of SDB to provide appropriate treatment during the essential developmental stages of life.
Support (If Any):

0812

PERIODIC LIMB MOVEMENTS IN THE SETTING OF PEDIATRIC TRAUMATIC BRAIN INJURY

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Introduction: Sleep disturbances following traumatic brain injury (TBI) are commonly diagnosed and can affect up to 70% of individuals, with many occurring after mild injuries such as concussions.1 Patients can experience a variety of sleep problems such as sleep-wake disturbances, infrequent parasomnias, and periodic

limb movement disorders. While periodic limb movements (PLMs) can occur in pediatric patients, they are rare compared to their adult counterparts. Literature is limited regarding the presence of PLMs post-concussion in the pediatric population. We describe an unusual case of PLMs in the setting of mild TBI in a pediatric patient.

Report of Cases: A 6-year-old male with a past medical history significant for adeno-tonsillar hypertrophy and chronic cough was brought to the emergency department by ambulance after being found facedown secondary to a fall at school. Physical examination findings were significant for dried blood at the nares with an abrasion to the anterior nasal bridge. No other signs of trauma were noted, and his Glasgow Coma Scale (GCS) was 15. Computerized Tomography (CT) scan of the head was negative for any acute intracranial abnormality. He was diagnosed with a mild TBI and sent home with concussion precautions. Prior to his concussion, at the age of 4, he was diagnosed with obstructive sleep apnea (OSA) via polysomnography (PSG). Moderate OSA was noted with an apnea hypopnea index (AHI) of 8.1 per hour leading to adenotonsillectomy. Five weeks after his concussion, an evaluation by the pediatrician revealed complaints of restless sleep and worsened emotional lability prompting a referral to the sleep clinic. By comparison, the patient's post-TBI PSG at age 6 showed no evidence of sleep-disordered breathing (AHI of 1.48 per hour) but with new periodic limb movements and an elevated PLM index of 6.56 per hour. An iron panel is pending.

Conclusion: PLMs in the setting of pediatric TBI is a rarely diagnosed entity and, to our knowledge, has never been reported in the literature. Our case suggests that clinicians should have a high level of suspicion for sleep problems post-TBI and consider PSG to assess for PLMs which can affect recovery and the overall quality-of-life of the pediatric patient.

Support (If Any): Viola-Saltzman M, Watson NF. Traumatic brain injury and sleep disorders. Neurol Clin. 2012;30(4):1299-1312. doi:10.1016/j.ncl.2012.08.008

0813

POST-PINEALECTOMY INSOMNIA AND MELATONIN THERAPY

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Introduction: Melatonin is a hormone produced in the pineal gland that has an important role in sleep; immune, neurologic, psychiatric, metabolic, and endocrinologic function; cardiac-autonomic regulation and even cancer risk. We present a case of insomnia, somnambulism, dream enactment, and periodic limb movements of sleep (PLMS) after a pinealectomy.

Report of Cases: A 40-year-old woman with a history of a complete pinealectomy due to a pineal cyst presented to the sleep medicine clinic. Shortly after the pinealectomy, she developed sleep onset and maintenance insomnia. Two years later she developed somnambulism, and four years later she developed dream enactment and PLMS. She reported no prior treatments for her sleep issues, including no history of melatonin use. On average, her total sleep time (TST) was 2-8 hours/night with awakenings every 2 hours. Sleep latency was 10-45 minutes. Polysomnograghy demonstrated an apnea-hypopnea index of 0.6/hr, PLM index of 68.1/hr, normal REM atonia, and no complex behaviors. The patient started 1mg immediate release (IR) melatonin, which did not help her insomnia, but parasomnias resolved. She had improvement in her PLMS with iron supplementation and melatonin. The melatonin dose was increased to 3mg IR which helped increase her TST to 4-8 hours. She was switched to 3mg extended release (ER) melatonin, and then increased to 4mg ER. She obtained the most benefit for her insomnia with 1mg IR plus 4mg ER with sleep latency reduced to 5-10 minutes and TST improved up to 7.5 hours with rare awakenings.

Conclusion: Pinealectomy in humans is rarely reported. Most data about the consequences of pinealectomy and pathophysiology of melatonin come from animal research. Melatonin level after pinealectomy is often undetectable or severely diminished. Current limited literature on patients with pinealectomy consists of case reports about patients who experienced insomnia, non-24-hour sleep-wake rhythm disorder [SSM1] and mood disorders. Melatonin doses ranging from 0.5mg to 14mg IR and up to 5mg ER have been trialed with most patients having symptomatic improvement with doses above 3mg. We found that a combination of 1mg immediate and 4mg extended release melatonin was the most beneficial for our patient.

Support (If Any):

0814

THREE SLEEPY SIBLINGS

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Introduction: Narcolepsy type 1 is caused by destruction of hypocretin-producing neurons, likely via a T-cell mediated autoimmune process, and clinically identified either by CSF hypocretin deficiency or the presence of cataplexy. Individuals with narcolepsy type 1 have an underlying genetic predisposition attributed to the HLA DQB1*0602 gene. This genetic variant has been linked to increased propensity for sleepiness even in healthy adults. Relatives of patients with narcolepsy type 1 appear to be at increased risk for other disorders of hypersomnolence such as idiopathic hypersomnia. Here we describe three siblings, all positive for HLA DQB1*0602, who presented with distinct clinical features diagnostic for narcolepsy type 1, narcolepsy type 2, and idiopathic hypersomnia.

Report of Cases: A 15-year-old female was diagnosed with narcolepsy type 1 based on typical cataplexy, excessive daytime sleepiness, and mean sleep latency of 2 min with 2 SOREMPs on MSLT. Lumbar puncture (LP) performed 5 years after symptom onset showed low CSF hypocretin (9.3 pg/mL). Her older brother presented at age 21 with excessive sleepiness, somewhat atypical cataplexy, hypnagogic hallucinations, and sleep paralysis. MSLT showed mean sleep latency of 6 min with 5 SOREMPs. Despite the presence of cataplexy, LP performed 2 years after symptom onset showed normal CSF hypocretin (296.5 pg/mL) and he was diagnosed with narcolepsy type 2. Their younger sister presented at age 19 with progressive daytime sleepiness. PSG/MSLT showed mild OSA (RDI 9.2) and mean sleep latency of 6.5 min without SOREMPs. She does not have cataplexy, hypnagogic hallucinations, or sleep paralysis. The current findings are most consistent with idiopathic hypersomnia, although an LP to evaluate for hypocretin deficiency is an important next step. Similarly, a repeat LP in the brother might demonstrate change in hypocretin over time.

Conclusion: These cases may support a familial link between narcolepsy type 1, type 2, and idiopathic hypersomnia. The discordant hypocretin and cataplexy statuses of these siblings implies a mechanism for excessive sleepiness beyond hypocretin deficiency, possibly mediated by HLA DQB1*0602. Identifying the mechanisms of familial aggregation of sleepiness in the central disorders of hypersomnolence may shed light on the pathophysiology of these distinct disorders.

Support (If Any):

0815

TREATMENT SUCCESS IN A RESISTANT CASE OF INSOMNIA WITH AN IRREGULAR CIRCADIAN RHYTHM DISORDER

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Introduction: A 19-year-old non-verbal male with history of CHARGE syndrome, severe autism, intellectual disability, coloboma with blindness OD and severely imparied vision OS, deafness, self-injurious and aggressive behavior, Tetralogy of Fallot status post repair, pulmonary valve replacement, hypertension, hypothyroidism, megacolon, gastrostomy tube dependence, eosinophilic esophagitis and chronic kidney disease with an irregular sleep cycle who has failed multiple medications for insomnia has shown treatment success with suvorexant.
Report of Cases: This patient's sleep schedule ranges from 1.5 to 5 hour segments at various times of day or night including naps at school with occasional longer periods of sleep up to 10 hours and longer periods of wakefulness up to 22 hours who has been treated with the following medications: trazodone, clonidine, hydroxyzine, diphenhydramine, quetiapine, gabapentin, mirtazapine, eszopiclone, melatonin and ramelteon. His behavioral problems have been treated with olanzapine. He continued to be aggressive and difficult to direct. His parents reported exhaustion. Then, suvorexant 5mg was added at bedtime while the following sleep medications were continued: gabapentin total daily dose of 1500mg (300mg in morning and 3pm; 900mg at bedtime, 300mg one hour later if still awake), ramelteon 8mg, mirtazapine 7.5mg and olanzapine 10mg at bedtime and bid prn aggressive behavior. He also takes the following daily medications: bisacodyl, polyethylene glycol, simethicone, hyoscyamine, cholecalciferol, aspirin, levothyroxine, hypoallergenic nutritional formula, starch and albuterol prn. With the addition of suvorexant 5mg, he had been able to get 9.5 hours of consolidated sleep at night with improvement in his behavior until he contracted Covid-19 and regressed. The suvorexant dose was increased to 10mg which again improved his insomnia and behavior.
Conclusion: Various medications have either not worked at all or have worked suboptimally for insomnia in this medically complex patient who has an irregular Circadian rhythm disorder. Adding an orexin receptor antagonist as a novel mechanism to his regimen has shown promise. At this time, this patient has been stable for one month with suvorexant 10mg at bedtime after regression on the 5mg dose that coincided with a Covid-19 infection. We are proceeding with cautious optimism.
Support (If Any):

0816

CHRONIC INSOMNIA SECONDARY TO SEVERE NOCTURNAL VISUAL HALLUCINATIONS IN CHARLES BONNET SYNDROME; A CHALLENGING CASE TO MANAGE

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Introduction: Over 1 million Americans are blind. Charles Bonnet syndrome (CBS), a parallel to phantom limb syndrome and also known as release hallucinations, describes visual hallucinations in patients with severe visual loss and blindness. The prevalence of release hallucinations, though likely underreported, is believed to be 12 to 20% of visually impaired persons.
Report of Cases: A 45-year-old male with past medical history of migraines presented to the hospital with what was determined to be a ruptured pituitary macroadenoma and as a result, lost complete visual function including pupillary reflexes. The patient subsequently experienced both simple and complex release hallucinations and was eventually diagnosed with Charles Bonnet syndrome. Most disturbing to the patient was the simple release hallucinations which was described as a bright white light in a honeycomb lattice predominately in his right visual field which lasted for hours. This phantom light was not consistently associated with any other symptoms and could occur at any time throughout the 24-hour day. Nocturnal symptoms occurred approximately 50% of nights and caused severe onset/maintenance insomnia and insufficient sleep duration. The patient tried therapy in addition to proper sleep hygiene without relief. He was trialed on several medications and the only one able to alleviate all but the worst of the phantom light was diazepam. The GABA-A receptor agonist finally allowed the patient an opportunity to sleep. His insomnia was then treated with once nightly temazepam, in addition to as needed diazepam. Approximately nine years after losing his vision, he was transitioned from temazepam to the tricyclic antidepressant amitriptyline, which offered improved relief from the phantom lights causing his insomnia. The patient continues to utilize once nightly amitriptyline with diazepam for breakthrough symptoms, though he still suffers significant impairment due to the phantom lights of his Charles Bonnet syndrome.
Conclusion: Treatment of Charles Bonnet syndrome is multifactorial and includes maintaining optimal eye care, stimulating senses, psychosocial therapy, and pharmacotherapy. Insomnia from release hallucinations remains difficult to manage, though GABA-A receptor agonists have shown some relief. Case reports of atypical antipsychotics and antidepressants, including melperone and agomelatine respectively, have demonstrated ability to improve release hallucinations.
Support (If Any): Charles Bonnet Syndrome FAQs. Charles Bonnet Syndrome Foundation (Australia). https://www.charlesbonnetsyndrome.org/index.php/cbs/faq. Accessed December 15, 2021.Hsu HC, Huang YS, Fan WX, Chen TC. Charles Bonnet Syndrome (CBS): Successful Treatment of Visual Hallucinations Due to Vision Loss with Agomelatine in Three Cases. European Psychiatry. 2017;41(S1):S172-S172. doi:10.1016/j.eurpsy.2017.01.2065Pelak VS. Visual release hallucinations (Charles Bonnet syndrome). UpToDate. Waltham, MA: UpToDate; June 7, 2016; https://www.uptodate.com/contents/visual-release-hallucinations-charles-bonnet-syndrome.

0817

CONQUERING TWO SLEEP BIRDS WITH ONE IRON STONE: THE CASE OF RESOLVED RESTLESS SLEEP DISORDER AND PARASOMNIA WITH IRON THERAPY

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Introduction: Restless Sleep Disorder (RSD) is characterized by frequent nocturnal movements of large muscle groups or a complaint of restless sleep by observers with associated daytime dysfunction.1 RSD, like other movement disorders of sleep, is associated with low iron

stores.2 Children with RSD have increased NREM sleep instability and a propensity for parasomnia.2 No reports to date have demonstrated the use of iron therapy for parasomnia in patients with RSD. Furthermore, studies are limited in very young children with this disorder as they currently fall outside proposed diagnostic criteria.1

Report of Cases: A 2 year-old male presented to the sleep clinic with parental complaints of nightly sleep initiation and maintenance difficulty, mild snoring, restless sleep, episodes of sleepwalking and night terrors multiple times per week. Symptoms worsened over 6 months and were associated with daytime irritability and behavioral problems. Sleep quality measures assessed progress between visits: the PROMIS Sleep Disturbance (PROMIS SD) and Sleep Related Impairment (PROMIS SRI). Serum ferritin was initially 20ug/L. Polysmnogram demonstrated no significant sleep related breathing disorder, a large muscle group movement index of 14, periodic limb movement index of 3. Initial treatment included oral iron therapy, scheduled awakenings, and hypnotic dose melatonin. The sleep psychologist addressed limit setting and negative sleep associations with improved insomnia symptoms but parasomnia and restless sleep continued. The parent noted reduction in both movements and parasomnia frequency after one month of iron therapy. After a 3 month period on treatment, the parent reported complete cessation of the parasomnia, drastic reduction in restlessness, and near resolution of insomnia. Sleep quality measure PROMIS SD improved by 11, demonstrating reduced sleep disturbance. PROMIS SRI did not change. Ferritin level increased to 47ug/L.

Conclusion: RSD in a very young child with NREM parasomnia responded to oral iron therapy improving overall sleep quality. This case demonstrates the relationship between relative iron deficiency, RSD and associated parasomnia.

Support (If Any): 1. DelRosso LM, Ferri R, Allen RP, et al. Consensus diagnostic criteria for a newly defined pediatric sleep disorder: restless sleep disorder(RSD).SleepMed.2020;75:335-340. 2. Leung W, Singh I, McWilliams S, Stockler S, Ipsiroglu OS. Iron deficiency and sleep - A scoping review. SleepMedRev.2020;51:101274

0818

PSYCHOSIS ASSOCIATED WITH SODIUM OXYBATE

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Introduction: Sodium oxybate is commonly used to treat narcolepsy with cataplexy. At the approved doses, the most common side effects are typically described as nausea, vomiting, dizziness, hypersomnia, urinary disturbances, and weight loss. Cases of medication-induced psychosis have been reported in the literature but remain exceedingly rare. We present a case of rapid-onset psychosis in a patient with systemic lupus erythematosus, which added complexity to the evaluation, treatment and clinical course.

Report of Cases: The patient is a 42 year old woman with a past history of fibromyalgia, lupus and a prior diagnosis of narcolepsy evaluated for daytime hypersomnia and poor night time sleep. Prior medications included sodium oxybate which was effective; and modafinil and amphetamines which created intolerable side effects. Prior sleep studies were not available and a repeat PSG/MSLT were performed. PSG did not show sleep disordered breathing or nocturnal movements and MSLT showed an average sleep latency of 5.4 minutes and 4 SOREMs. HLA DQB10602 was positive. The patient was reinitiated on sodium oxybate and titrated to 4.5g twice nightly. A few weeks later the patient developed visual hallucinations, persecutory delusions, and insomnia for 3 days. She was admitted for an evaluation to rule out lupus cerebritis, and auto-immune vs. infectious encephalitis. MRI/MRA, lumbar puncture, as well as inflammatory markers and rheumatologic and infectious work up were unrevealing. Sodium oxybate was discontinued on the day of admission and the patient's mentation returned to baseline over the next few days. Discharge diagnosis was psychosis secondary to sodium oxybate.

Conclusion: Psychosis is an extremely rare side effect of sodium oxybate therapy among patients treated for cataplectic narcolepsy. It remains a diagnosis of exclusion, and any alternative diagnoses must be explored prior to making the diagnosis of psychosis secondary to sodium oxybate, particularly in the medically complex patient.

Support (If Any): None

0819

RESTLESS SLEEP, SNORING, EXCESSIVE DAYTIME SLEEPINESS, AND ATAXIA: A PEDIATRIC QUANDARY

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Introduction: Central sleep apnea in pediatrics is inherently complex, often going undiagnosed and untreated. Signs and symptoms of central nervous system dysfunction may be attributed to more common childhood conditions. We aim to educate on the diagnosis and treatment of central sleep apnea in this vulnerable patient population.

Report of Cases: A 12-year-old girl presents for initial sleep visit with global developmental delay, borderline obesity, chronic headaches, early morning tremors, and insulin resistance. She has history of snoring and restless sleep for years with severe daytime sleepiness for the past three months with worsening over two to four weeks. She is unable to stay awake in school. Epworth sleepiness scale (ESS) score is twenty-one. There is history of recurrent Strep but no history of infectious mononucleosis or influenza infection. Primary sleep disorders or CNS hypersomnia are suspected, and polysomnogram with MSLT is ordered. MRI of the brain is pending. The patient presents to the emergency department ten days later with frontal headaches, ataxia, altered speech, and oral aversion. CT head is normal. Hematology, neurology, and neurosurgery are consulted. MRI of the brain shows thrombosis of the superior sagittal sinus, the right transverse sinus, the right sigmoid sinus, the right jugular bulb, as well as cortical veins overlying both cerebral hemispheres, and she is started on anticoagulation for suspected stroke. A polysomnogram shows a severe degree of central sleep apnea with a central apnea index of 49.9 events per hour. There is significant periodic breathing present. There is no nonapneic hypoxemia or sleep hypoventilation present, and the patient is scheduled for an oxygen titration study.

Conclusion: Central sleep apnea is more prevalent in older male individuals and may affect patients with heart failure1.Pediatricians and subspecialists must remain vigilant as children are also susceptible to medical conditions which result in central nervous system dysfunction.

Support (If Any): 1.) Donovan LM, Kapur VK. Prevalence and Characteristics of Central Compared to Obstructive Sleep Apnea: Analyses from the Sleep Heart Health Study Cohort. Sleep. 2016;39(7):1353-1359. Published 2016 Jul 1. doi:10.5665/sleep.5962

0820

SLEEP AND OCULOPHARYNGEAL MUSCULAR DYSTROPHY: DISEASE PROGRESSION AFFECTING VENTILATORY NEEDS AND TREATMENT OF SLEEP-DISORDERED BREATHING

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Introduction: Oculopharyngeal muscular dystrophy (OPMD) is an autosomal-dominant, late-onset, and progressive disease characterized by ptosis and dysphagia, sometimes proximal limb weakness and gait abnormalities. It often presents in patients in their 50s. The progressive functional decline of the pharyngeal muscles results in feeding difficulties and aspiration; however, patients may also have risk of nocturnal hypoventilation and sleep apnea, complicated by variable airway obstruction and compliance.
Report of Cases: Using retrospective chart review, we identified patients with a known diagnosis of OPMD treated at the Raymond G. Murphy VA Sleep Center. We present a case where OPMD progression necessitated increased ventilatory support and affected positive airway pressure (PAP) compliance. A 58-year-old male with OPMD, DMT2, depression, and memory impairment underwent home sleep apnea testing showing severe OSA (REI 32.7, SpO2 nadir 72%). He started Auto-PAP 6-16 cwp and presented to discuss issues tolerating PAP. Pressures were lowered, but he continued to require maximum pressures without increased utilization. An in-lab CPAP titration showed treatment-emergent centrals but did not find optimal pressures due to limited sleep time. Having failed CPAP, he returned for an ASV titration which controlled his apnea in lateral position. Patient was switched to auto ASV to increase efficacy and comfort. Two months later he discontinued ASV due to frustration with disease progression and feeling unable to breathe deeply with the machine. Nocturnal oxygen at 1L was ordered while he awaited Neurology consult for OPMD. Later, concerned about progressive dyspnea, he resumed ASV, now with 3L O2 bleed. Given suspicion of hypoventilation (bicarbs 27-30), and that ASV could not adjust to his continually changing airway tone with his OPMD, he was switched to iVAPS. This resulted in good control of his sleep apnea, tidal volumes and minute ventilation. However, he reported pressures felt too high, returned to ASV for a period, then discontinued PAP altogether.
Conclusion: Patients with OPMD and sleep apnea require close follow-up as their disease progression may affect their ventilatory support needs. These patients may require more complex PAP modalities, such as AVAPs, and routine PFTs to help determine timing of ENT involvement for surgical airway planning.
Support (If Any):

0821

NARCOLEPSY AFTER WEST NILE VIRUS MENINGOENCEPHALITIS INFECTION

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UT Southwestern [1]

Introduction: Narcolepsy is a sleep disorder characterized by hypersomnia and inappropriate intrusion of REM sleep into wakefulness. Etiology is heterogeneous, and is broadly classified into Narcolepsy Type 1 and Type 2. There is growing evidence that the pathogenesis in many cases have a post-infectious autoimmune basis. We present the case of a patient seen in our sleep clinic who was eventually diagnosed with Narcolepsy type 2 following West Nile Virus (WNV) Meningoencephalitis.
Report of Cases: · The patient is a 44 year old Hispanic woman who had no prior sleep difficulties before 2013, when she was diagnosed with WNV meningitis. Lumbar puncture results from the time of infection are not available, as this evaluation occurred in the Dominican Republic. Subsequent lumbar punctures have shown the presence of anti-WNV IgG antibodies in her CSF. MRI and MRA brain were unremarkable.
· She also has a history of migraine, fibromyalgia, depression, and adrenal insufficiency.
· She presented with sleep complaints, including sleep onset insomnia, symptoms of sleep
disordered breathing, and excessive daytime sleepiness.
· She underwent home sleep apnea test in 12/2020 which revealed mild obstructive sleep apnea. Overall AHI was 7.9/hour without significant hypoxemia. She was subsequently started on CPAP therapy with good adherence, but she continued to have significant daytime sleepiness, notably with an Epworth Sleepiness Scale score of 21/24.
· She subsequently underwent overnight polysomnogram and multiple sleep latency test in our sleep laboratory.
· Overnight PSG confirmed mild obstructive sleep apnea (AHI 12.0) along with short REM latency (10.5 minutes). Next day MSLT showed mean sleep latency of 2.3 minutes, for 5 attended naps, with 2 SOREMPs, which was diagnostic of Narcolepsy type 2.
Conclusion: This case demonstrates the onset of narcolepsy after WNV meningoencephalitis.
Support (If Any):

0822

CAFFEINE AS A TREATMENT OPTION FOR PRIMARY CENTRAL SLEEP APNEA OF INFANCY IN TERM INFANTS

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Introduction: Primary central sleep apnea of infancy tends to improve over weeks with supportive care. No established treatments exist; however, infants with this condition remain at risk from sequelae of intermittent hypoxemia. We present a term infant with primary central sleep apnea of infancy treated with caffeine citrate resulting in clinical and polysomnographic improvement.
Report of Cases: A 7-day-old male infant born at 37 weeks gestation (gestational age confirmed by early first trimester prenatal ultrasound) was hospitalized following an episode of hypotonia and decreased responsiveness. Infectious studies, chest radiograph, and echocardiogram were normal. During the hospitalization, oxygen desaturations during sleep were observed and capillary blood gas during sleep showed a pH of 7.36 and a partial pressure of carbon dioxide of 54 mmHg. Polysomnography on room air showed central sleep apnea [central apnea hypopnea index (AHI) of 58, obstructive AHI of 4, hypoxemia, hypoventilation with transcutaneous carbon dioxide greater than 50 mmHg for 89% of sleep time, and periodic breathing for 21.7% of sleep time]. Brain MRI and paired-like homeobox2B (PHOX2B) genetic testing were normal. A trial of caffeine citrate was initiated with

prompt resolution of oxygen desaturations during sleep. Serial capillary blood gases showed improvement with partial pressure of carbon dioxide
between 39-44 mmHg. Polysomnography on room air three days after caffeine initiation demonstrated resolved hypoxemia, hypoventilation, periodic breathing, obstructive sleep apnea, and central sleep apnea (central AHI of 6.8). The patient was discharged home on caffeine and continuous pulse oximetry during sleep. At follow-up six weeks later, the patient had no oxygen desaturations and was successfully weaned off caffeine.
Conclusion: To our knowledge, there are no prior reports of term infants being treated with caffeine citrate for primary central sleep apnea of infancy. While caffeine is an established therapy for apnea of prematurity, it is typically discontinued at a postmenstrual age of 32 - 34 weeks. Our case demonstrates that in term infants with no underlying medical conditions and primary central sleep apnea of infancy, immature regulation of respiration should be suspected, and a trial of caffeine may be considered.
Support (If Any): None.

0823

ACDF - A HIDDEN ETIOLOGY OF OSA

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Introduction: OSA is characterized by recurrent episodes of upper airway collapse and obstruction during sleep, leading to oxygen desaturations. Risk factors include obesity, age, sex, family history, craniofacial abnormalities, stroke, diabetes, polycystic ovarian syndrome. This case illustrates symptomatic and clinically proven worsening of OSA after anterior cervical discectomy and fusion (ACDF), which can lead to narrowing of the airspace and dysfunction of the pharyngeal plexus leading to upper airway collapse.
Report of Cases: A 49-year-old female with cervical myelopathy was evaluated in the sleep clinic for snoring, witnessed apnea, and daytime somnolence. Her Epworth score was 11, and Mallampati score was 4, suggestive of underlying sleep-disordered breathing (SDB). A home diagnostic sleep test revealed mild OSA with AHI of 6.8/hr and was started on an Auto Continuous Positive Airway Pressure (APAP) device. She then reported worsening of her cervical pain leading to decreased use of APAP and total sleep time and underwent ACDF approximately 6 months after her diagnosis of OSA was made. Post-surgery she reported mild dysphagia, frequent nighttime awakening due to a choking sensation, and an increase in snoring. Following hospital discharge, the patient was re-evaluated in the sleep clinic for these complaints. Upon review, her BMI had decreased to 33.99 kg/m2, from 37.35 kg/m2, and the only medication change was the addition of hydrocodone-acetaminophen 5-325, 1-2 times daily as needed for pain. A repeat diagnostic home sleep study showed progression of OSA to moderate severity with an AHI of 24.5/hr, with no evidence of central sleep apnea or hypoventilation. Therefore, it was unlikely that the worsening of AHI was due to opioids. Thus, it was concluded that ACDF most likely led to the worsening of OSA.
Conclusion: Although there is no strong association in medical or sleep literature, this case demonstrates a strong association between ACDF and OSA. This highlights the importance of a timely diagnosis of new-onset or reassessment for worsening OSA in patients post-ACDF to improve sleep quality and prevent morbidity.
Support (If Any):

0824

CAN THE INTERFACE UTILIZED IN CONTINUOUS POSITIVE AIRWAY PRESSURE THERAPY SIGNIFICANTLY ALTER THE APNEA-HYPOPNEA INDEX IN CERTAIN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA?

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Introduction: Multiple studies and analyses have demonstrated that use of an oronasal interface for delivery of continuous positive airway pressure (CPAP) therapy can lead not only to higher pressure requirements, but also a higher residual apnea hypopnea Index (AHI) in patients with obstructive sleep apnea (OSA).
Report of Cases: We record a 75-year-old man with severe OSA, AHI of 38, and treated with CPAP 16 cm water. On routine follow up, the residual AHI was 2.9, but he reported mouth-venting with nasal mask and stretched out the chinstrap. He was transitioned to an oronasal interface, and on subsequent follow-up his AHI was 19.6. The decision was made to change back to a nasal mask with a better-fitting chinstrap, which reduced his AHI to 4. To verify that the AHI recorded by the CPAP device was physiologic, the patient later used CPAP while wearing a home sleep apnea test (HSAT) utilizing peripheral arterial tonometry for 2 nights. On the night he used a nasal mask with a chinstrap, the AHI recorded on the CPAP was 1.4 and 3.9 on the HSAT. The following night, he wore the oronasal interface and the recorded AHI on CPAP was 31.6 and 18.5 on the HSAT.
Conclusion: Although oronasal masks are commonly used as an interface for CPAP, there is significant evidence that nasal delivery systems are more effective at controlling AHI in some individuals. Many studies show that oronasal masks not only correspond to an increase in AHI but also are associated with higher pressure requirements and a lower adherence compared to nasal interfaces. Imaging has shown greater retropalatal airway expansion when using a nasal interface compared to an oronasal device. Oronasal devices may also push the tongue posteriorly and cause increased occlusion of the airway. The consistent finding of worsening OSA control in the setting of oronasal masks has led many to consider CPAP with a nasal interface to be the gold standard for treating OSA. The clinician should therefore be mindful of these considerations when initiating or altering a CPAP interface.
Support (If Any):

0825

A CASE OF FAMILIAL RESTLESS LEGS SYNDROME AND RAYNAUD'S PHENOMENON

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Introduction: Restless legs syndrome (RLS) is a common sensorymotor disorder that frequently leads to sleep disturbances and reduced quality of life. Raynaud's phenomenon (RP) is characterized by episodes of reduced blood flow mainly to the fingers due to vasospasms, with subsequent pain and discoloration, usually triggered by cold exposure or by stress. We present an interesting case

report of co-occurrence and familial transmission of RLS and RP which has not been reported previously.
Report of Cases: A 64-year-old woman presented for evaluation of long-standing RLS. She had a history of RP, osteoarthritis (OA), and recurrent late pregnancy losses. The patient, and one brother and a sister had RLS and RP. She had another sister and two maternal first cousins with RLS. Her mother suffered from neither and her father and his brother both had RP. She has a daughter who also has RLS. The patient's mother was treated with Diethylstilbestrol (DES) and had five pregnancy losses. The patient also had 3 miscarriages and the patient's daughter miscarried her first pregnancy as well. The patient first experienced RLS symptoms at the age of 12 and has been treated with several medications since then, most recently clonazepam. Since she was taken off clonazepam, she experienced a worsening of RLS and was subsequently started on Pregabalin up to 300 mg at bedtime but without significant relief. She was then started on pramipexole, titrated up to 0.375 mg which resulted in significant improvement of RLS symptoms. Her RP symptoms were infrequent, occurring every few months and not bothersome. She did not report rheumatological complaints other than chronic OA from lifelong sports.
Conclusion: This case report suggests a possible shared genetic abnormality in the transmission of both RLS and RP in this family. This genetic association may be related to a vascular dysfunction common to both disorders. The co-occurrence of frequent miscarriages (although could be related to DES), in association with the presence of RLS and RP, may also suggest an underlying autoimmune disorder. Further genetic research is needed to confirm above findings with the potential uncovering of new therapeutic targets for RLS.
Support (If Any): None.

0826

A CASE OF PROPRIOSPINAL MYOCLONUS IN A PATIENT WITH MULTIPLE SCLEROSIS

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Introduction: Described first in 1991, by Brown et al, Propriospinal Myoclonus is a rare movement disorder of rhythmic, typically flexor, jerking motions most pronounced when lying supine. Although most cases are thought to be idiopathic, identified causes have been infection, spinal lesions, and psychogenic.
Report of Cases: A 38-year-old female with medical history of multiple sclerosis, anxiety and PCOS was referred for jerking body movements with sleep onset. Symptoms of nightly, full body jerking, beginning in her back, were described as "legs being pulled up towards the chest" and present only while lying supine in bed with symptom onset of 1 month. Difficulty initiating sleep and daytime sleepiness ensued as a result of these jerks. Work-up with in-lab polysomnogram failed to demonstrate obstructive sleep apnea (AHI 2.8/hr), however, did demonstrate periodic limb movements of sleep. MRI of the brain, cervical spine, and thoracic spine were negative for new or enhancing brain or spinal cord lesions. CBC, CMP, TSH and ceruloplasmin were ordered for a complete myoclonus evaluation and found to be within normal limits. She was started on Klonopin 0.5 mg at night. Three month follow-up revealed improvement of symptoms, with the frequency of her myoclonus decreased to 1-2 episodes per week with reported less intensity of each event.
Conclusion: While proper work-ups are always important, this case reminds us of the diligence required when certain conditions exist. Although our patient had a negative myoclonus work-up, and is thought to have idiopathic myoclonus, the presence of multiple sclerosis made the investigation increasingly relevant. Work-up should include an MRI to rule-out spinal cord lesions.
Support (If Any): None

0827

OBSTRUCTIVE SLEEP APNEA IN A CONGENITAL CENTRAL HYPOVENTILATION SYNDROME PATIENT POST-TRACHEOSTOMY VENTILATED WITH DIAPHRAGMATIC PACING

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Introduction: Congenital central hypoventilation syndrome (CCHS) is a rare, autosomal dominant disorder associated with a genetic mutation in the PHOX2B gene. While the treatment of CCHS requires lifelong ventilatory support, advancements in management have allowed for life expectancies comparable to healthy individuals. Prolonged lifespan of CCHS patients presents new challenges with regards to the chronic management of the disease, including the concurrence of obstructive sleep apnea (OSA) in patients ventilated with diaphragmatic pacing post decannulation.
Report of Cases: A 23-year-old female with a past medical history of adenotonsillectomy and CCHS with nocturnal ventilatory support via diaphragmatic pacer (DP) was referred to sleep clinic by her pulmonologist for an evaluation of increased obstructive events and worsening nocturnal hypoxia. The patient did not require daytime ventilatory support and did not complain of any sleep-related symptoms. The DP was implanted at age 17 and the patient previously had a tracheostomy from age 3 months until decannulation at 18 years. She had a surgical closure a year later. The DP settings were titrated by her pulmonologist and monitored with repeat home sleep apnea testing (HSAT) to achieve optimal control of central hypoventilation. After an initial period of response, however, subsequent HSATs showed a progressive increase in obstructive breathing events associated with hypoxia. Further adjustments in the DP settings did not successfully correct the findings. An in laboratory polysomnography (PSG) confirmed moderate OSA with significant hypercapnia. At clinic follow-up, the patient was offered positive airway pressure therapy but chose to defer decision-making until pulmonary follow-up. The patient was also referred to ENT for an anatomic evaluation to look for potential causes contributing to upper airway obstruction.
Conclusion: DP remains a treatment option for select patients with CCHS. Limited studies have shown that OSA can occur in patients with CCHS using DP as their primary management modality. Our case demonstrates the importance of keeping a broad differential in evaluating the development of concurrent OSA in these patients. Potential contributors to developing OSA include weight gain, tracheomalacia or tracheal stenosis resulting from longstanding tracheostomy status, and effects of increased DP amplitude settings.
Support (If Any):

0828

POSITIONAL CENTRAL SLEEP APNEA

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Introduction: Obstructive sleep apnea (OSA) is well known to often improve with non-supine positioning as opposed to supine positioning. The prevalence of OSA that may improve on proper positioning is 50-60% and the prevalence of OSA that appears when supine and disappears when non-supine is 25-30%. Sleeping in a lateral positioning is thought to reduce pressure on the airway, shift the directional effect of gravity on airway structures, and counteract physiologic genioglossus collapse that occurs when supine. On the other hand, the effect of positional changes on the severity of central sleep apnea (CSA) is not well documented aside from Cheyne-stokes breathing in congestive heart failure.
Report of Cases: We present two cases of positional CSA. One patient is a 52-year-old male with a history of traumatic brain injury, hypogonadism, hypothyroidism and Parkinson's Disease. He underwent split-polysomnography (PSG) for dream enactment behavior, was found to have severe CSA, which occurred almost exclusively supine (Supine Apnea-Hypopnea Index (AHI) 66/hr, Non-Supine 0.8/hr). A positional belt was recommended to the patient. The second patient is an 89-year-old male with history of chronic obstructive pulmonary disease and chronic kidney disease who underwent PSG for symptoms of sleep apnea. He was found to have severe obstructive and central sleep apnea with periods of Cheyne-stokes breathing. This also occurred almost exclusively supine (Supine AHI 69/hr, Non-Supine 0/hr) and improved on continuous positive airway pressure (CPAP) independent of position (AHI 6/hr). CPAP or positional belt was recommended to the patient.
Conclusion: Positional CSA unrelated to congestive heart failure is an uncommon phenomenon with poorly understood pathophysiology. Treatment of CSA is often challenging and based on elucidating and addressing the underlying cause such as optimizing treatment of heart failure. Positional therapy is characteristically thought of as a potential treatment option for OSA. However, our findings further support the presence of a phenotype of central sleep apnea that may respond to positional therapy.
Support (If Any):

0829

WORKUP OF NOCTURNAL HYPOXEMIA LEADS TO DIAGNOSIS OF PATENT FORAMEN OVALE

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Introduction: Patent foramen ovale (PFO) in adults often remains asymptomatic until clinical manifestations such as cryptogenic stroke, migraine headache, air embolism, hypoxemia, or platypnea-orthodeoxia syndrome occur. In this case, prior workup of cryptogenic stroke failed to identify a PFO that was diagnosed after further investigation of polycythemia which revealed nocturnal hypoxemia on polysomnogram.
Report of Cases: A 60-year-old male with history of recurrent venous thromboembolic events (VTE), secondary polycythemia, and cryptogenic strokes was referred for a polysomnogram during the evaluation of polycythemia. Over the span of six years, he had multiple cryptogenic strokes and VTEs in the setting of polycythemia and normal hypercoagulability labs. Further evaluation suggested secondary polycythemia after serum erythropoietin and JAK2 mutation testing were negative. The patient was a never smoker without evidence of malignancy or renal disease leading to suspicion that his polycythemia was due to hypoxemia despite normal oxygen saturations during point of care evaluations. He frequently reported shortness of breath during appointments. During a polysomnogram, the patient was found to have a total apnea-hypopnea index of fewer than 5 events per hour but demonstrated hypoxemia with 49.7% of total sleep time spent below an oxygen saturation of 90%. He was referred to pulmonology for further evaluation that showed normal resting oxygen saturation, no desaturation on a six-minute walk test, mild restrictive defect on pulmonary function testing, and a normal chest computed tomography with angiography. Prior transthoracic echocardiogram had demonstrated an atrial septal aneurysm without communication between the atrial chambers. No evidence suggestive of a right-to-left shunt was found on lateral imaging of the brain during a ventilation-perfusion scan. Further evaluation of the aneurysmal atrial septum on transesophageal echocardiogram with an agitated saline bubby study demonstrated a patent foramen ovale with a right-to-left shunt. In the setting of hypoxia leading to secondary polycythemia, the patient was scheduled for PFO closure.
Conclusion: Hypoxemia out of proportion to sleep-disordered breathing on polysomnogram should prompt further evaluation. Despite multiple prior strokes, our patient's PFO had gone undiagnosed until polycythemia prompted a polysomnogram that demonstrated isolated nocturnal hypoxemia and prompted a further workup. Clinically significant hypoxemia is an indication for PFO closure.
Support (If Any):

0830

A PEDIATRIC CASE OF MYOCLONIC SEIZURES PRECIPITATING CENTRAL SLEEP APNEA AND SEQUENCES OF PERIODIC BREATHING DURING SLEEP

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Introduction: Myoclonic seizures are known to be influenced by the sleep-wake cycle. Although myoclonic seizures have been shown to alter sleep architecture, little is known about their influence on sleep-disordered breathing.
Report of Cases: A 7-year-old male with a history of generalized epilepsy of unknown etiology with absence as well as myoclonic seizures, poor impulse control, and fine motor delay was referred for restless sleep and frequent nocturnal awakenings. A routine electroencephalography (EEG) performed 33 months prior to presentation, at an outside institution, reportedly showed 3.0 Hz generalized frontally dominant spike and wave discharges lasting less than two seconds. Video EEG (vEEG) revealed diffuse bilateral poly-spike and slow wave discharges, predominantly during sleep, and myoclonic seizures with abrupt whole-body jerks. Polysomnography, at this time, was characterized by mild central sleep apnea (AHI: 3.7; OAHI: 0.0; CAI: 2.8; REM AHI:

14.4). His lamotrigine dosing was increased to from 1.8 mg/kg/day to 3.6 mg/kg/day, at presentation, with seizure control for three months but he developed a recurrence of myoclonic seizures in the setting of sleep deprivation. A repeat vEEG was similar to previous findings and his lamotrigine was increased further and clobazam was added. Due to worsening behaviors, clobazam was discontinued and a weaning plan for lamotrigine was formulated. Repeat polysomnography demonstrated worsening central sleep apnea (AHI: 18.3, OAHI: 2.3), without hypoventilation, characterized by sequences of periodic breathing that occurred in conjunction with myoclonic seizures. The majority of seizure-induced periodic breathing episodes were observed during a one-hour period of NREM sleep near the end of the study. Stereotyped epileptiform activity occurred in conjunction with a resumption of hyperventilatory respirations following apneic events. The increased respiratory drive, however, did not appear to be clinically epileptic in nature as the epileptiform activity either preceded or trailed the respirations. A variable REM and then NREM predominance of central events on successive polysomnograms further suggests that his central events are not intrinsic but that they are precipitated by epileptiform activity. Zonisamide, an anticonvulsant with carbonic anhydrase inhibitory properties was initiated and is being titrated to therapeutic goal.

Conclusion: This case illustrates an unusual presentation of myoclonic seizure-induced periodic breathing during sleep.

Support (If Any): Cincinnati Children's Research Foundation.

0831

IDENTIFYING SLEEP-RELATED BREATHING DISORDERS IN UNDERSERVED DEMOGRAPHICS USING COMMERCIAL PORTABLE MONITORING DEVICES: A CASE REPORT

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Introduction: An estimated twenty-five percent of American women are at high risk of having obstructive sleep apnea (OSA). However, male sex is the predominantly reported risk factor. Women are less likely to report "classic" symptoms such as snoring that prompt referral for sleep evaluation. This dichotomy potentially represents a disparity in clinical evaluation and treatment of OSA in women. Consumer digital health devices are frequently used to monitor sleep in people with and without sleep disturbances. They are generally highly sensitive yet have lower specificity when compared with formal actigraphy or polysomnography. They may be used in conjunction with physician evaluation to guide decision-making.

Report of Cases: A 33 year-old female with a pertinent past medical history of obesity (BMI 37.83 kg/m), depression, chronic pain, and anxiety was referred to our sleep center with a multi-year history of excessive daytime fatigue and non-restorative sleep that persisted despite healthy habits counseling and unremarkable lab evaluation. She ultimately presented her primary care physician with biometric data collected by her Garmin watch and Oura ring. This data, which included a reported low SpO of 83%, motivated a referral to Sleep Medicine. Her presentation Epworth Sleepiness Scale (ESS) score and Insomnia Severity Index (ISI) were 14 and 17, respectively. Polysomnography revealed an AHI of 32.6/hr, oxygen nadir of 79%, ODI of 28.7/hr, and a 97.2% sleep efficiency. PLMS index was 23.2/hour but did not contribute to sleep fragmentation and there was increased proportion of stage N3 sleep (28.2%). Severe OSA was treated with APAP. The two month follow-up ESS and ISS improved to 9 and 4, respectively. Device data revealed greater than 6 hours of consistent nightly use with a residual AHI of 3.1/hr. She subjectively stated APAP "has been a life changer" personally and professionally, as well as spousal report of resolution of snoring. Her consumer devices similarly reported improved sleep measures.

Conclusion: Minorities and women may be underserved in evaluation, diagnosis, and treatment of OSA. Portable monitoring using readily available consumer biometric devices may be a viable strategy for patients to further identify high risk features and prompt referral by primary care.

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0832

NOCTURNAL TACHYPNEA WITH NON-INVASIVE VENTILATION; A CASE REPORT

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Introduction: We present a case of nocturnal tachypnea secondary to suspected auto-triggering in a patient on Bilevel device. Auto-triggering is a patient-ventilator asynchrony in which a ventilator breath is triggered in the absence of inspiratory muscle activity. This phenomenon was mostly described in postcardiac surgery and in brain dead patients on mechanical ventilation. Detecting this asynchrony is important as it can lead to patient discomfort, poor compliance and hypocarbia that can lead to apneic events.

Report of Cases: An 82-year-old male with history of chronic atrial fibrillation, coronary artery disease (s/p bypass surgery) and Ischemic cardiomyopathy (EF 25-30%). He had moderate obstructive sleep apnea with central apnea. He was started on AutoPAP then was upgraded to BPAP (IPAP 16/EPAP 9 cmH2O). His wife reported episodes of nocturnal tachypnea and increased daytime somnolence. This was confirmed by the compliance reports from his BPAP device, and a portable sleep study obtained while using the BPAP (respiratory rate > 40 breaths/minute).

Conclusion: Vignaux et al estimated the incidence of auto-triggering with NIV to be 13%. This phenomenon can be caused by a major circuit leak or secondary to cardiogenic oscillations. Effect of cardiogenic oscillation on the pulmonary air flow was described by West and Hugh-Jones in 1961. Our patient had dilated cardiomyopathy with hyperdynamic circulation which we believe was the major cause of his auto-triggering asynchrony. Changes in intracardiac volume and cardiac movements during systole resulted in intrapulmonary flow oscillations exceeding the set flow-trigger threshold leading to the tachypnea. In our patient, the events resolved after cardiac resynchronization procedure that improved the overall cardiac function and adjusting the trigger sensitivity.

Support (If Any): [1]Kondili E, Prinianakis G, Georgopoulos D.; Patient ventilator interaction, Br J Anaesth. 2003; 91: 106-119 [2] Richard Arbour; Cardiogenic Oscillation and Ventilator Autotriggering in Brain-Dead Patients: A Case Series. Am J Crit Care 1 September 2009; 18 (5): 496–488. doi: https://doi.org/10.4037/ajcc2009690 [3] Imanaka,

Hideaki MD; Nishimura, Masaji MD; Takeuchi, Muneyuki MD; Kimball, William R. MD, PhD; Yahagi, Naoki MD; Kumon, Keiji MD Auto-triggering caused by cardiogenic oscillation during flow-triggered mechanical ventilation, Critical Care Medicine: February 2000 - Volume 28 - Issue 2 - p 402-407 [4]Vignaux L, Vargas F, Roeseler J, Tassaux D, Thille AW, Kossowsky MP, et al. Patient-ventilator asynchrony during non-invasive ventilation for acute respiratory failure: a multicenter study. Intensive Care Med 2009;35(5):840–846

0833
WITHDRAWN

0834
WITHDRAWN

0835
SUBSTANCE ABUSE, AN IMPORTANT FACTOR IN THE EVALUATION OF HYPERSOMNIA DISORDERS

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Introduction: A detailed history is essential in the diagnostic workup of hypersomnia, but can be limited by withheld information. A common piece of information hidden during a detailed history is the presence of substance abuse/use. AASM guidelines dictate an MSLT study must be conducted in patients free from certain psychoactive medications. The guidelines mention these therapies be stopped at least 2 weeks prior to the planned study date and recommend utilizing an urinary drug screen to evaluate patients who undergo the study. From review of the available literature, substance abuse has significant effects upon sleep architecture and the development of hypersomnia. Certain substances such as stimulants may normalize a disorder of hypersomnolence and the opposite holds true for sedatives and depressants.

Report of Cases: Mr. RB, a 52-year-old Veteran with a medical history inclusive of hypertension, DM2, cocaine abuse and hypersomnia. Initial workup demonstrated presence of OSA (AHI 16.4, O2 nadir 87%). After diagnosing and treating OSA, Mr. RB returned to clinic with complaints of persistent hypersomnia. Mr. RB was then evaluated by MSLT study for further assessment. Patient reported absence of cocaine use at time of clinic visit and prior to study. The results of the MSLT demonstrate MSL of 0.5 minutes and 3/4 SOREMs. Unfortunately, UDS verified Mr. RB had recently used cocaine (581 ng/mL). Mr. RB was then followed up in clinic due to persistent symptoms, with new reports of cataplexy, hypnopompic hallucination and sleep paralysis. Mr. RB also reported abstaining from cocaine use. A repeat MSLT was performed with MSL of 1.2 minutes and 3/5 SOREMS. Unfortunately, Mr. RB was again found to have recently used cocaine (441 ng/mL) on UDS. Mr. RB was then lost to follow-up.

Conclusion: This case demonstrates the importance of obtaining a truthful history during the evaluation of a sleep disorder. This case also demonstrates the utility of verifying the history obtained with laboratory testing. During this case, the physicians working with Mr. RB demonstrated detailed note documentation regarding reports of cocaine abstinence which was later disproven during the drug screening during the sleep study and follow up clinic appointment.

Support (If Any): 1. Angarita, G. A., Emadi, N., Hodges, S., & Morgan, P. T. (2016). Sleep abnormalities associated with alcohol, cannabis, cocaine, and opiate use: A comprehensive review. Addiction Science & Clinical Practice, 11(1). https://doi.org/10.1186/s13722-016-0056-72. Anniss, A. M., Young, A., & O'Driscoll, D. M. (2016). Importance of urinary drug screening in the multiple sleep latency test and maintenance of wakefulness test. Journal of Clinical Sleep Medicine, 12(12), 1633–1640. https://doi.org/10.5664/jcsm.63483. Dzodzomenyo, S., Stolfi, A., Splaingard, D., Earley, E., Onadeko, O., & Splaingard, M. (2015). Urine toxicology screen in multiple sleep latency test: The correlation of positive tetrahydrocannabinol, drug negative patients, and narcolepsy. Journal of Clinical Sleep Medicine, 11(02), 93–99. https://doi.org/10.5664/jcsm.44484. Krahn, L. E., Arand, D. L., Avidan, A. Y., Davila, D. G., DeBassio, W. A., Ruoff, C. M., & Harrod, C. G. (2021). Recommended protocols for the multiple sleep latency test and maintenance of wakefulness test in adults: Guidance from the American Academy of Sleep Medicine. Journal of Clinical Sleep Medicine, 17(12), 2489–2498. https://doi.org/10.5664/jcsm.96205.Roehrs, T. A., & Roth, T. (2015). Sleep disturbance in substance use disorders. Psychiatric Clinics of North America, 38(4), 793–803. https://doi.org/10.1016/j.psc.2015.07.0086. emasinghe Bandaralage, S., Sriram, B., Rafla, M., Sharma, N., & McWhae, S. (2021). P130 an audit of urinary drug screening use in multiple sleep latency and maintenance of wakefulness testing in an australian tertiary centre. SLEEP Advances, 2(Supplement_1). https://doi.org/10.1093/sleepadvances/zpab014.171

0836
ATYPICAL PRESENTATION OF BIOT'S BREATHING IN A PATIENT WITH ARNOLD CHIARI MALFORMATION II WITH COMPLEX SLEEP APNEA/SLEEP HYPOVENTILATION/HYPOXEMIA NOT ON OPIOID AND WITH NO HISTORY OF MENINGITIS.

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LSUHSC Shreveport [1] LSU Health Sciences Center Shreveport [2] LSUHSC Monroe Family medicine [3] LSU Health Sciences center [4] LSUHSC [5]

Introduction: Sleep disordered breathing is very common in Arnold Chiari malformation but Biots's breathing has not been reported in these cases.

Report of Cases: 3-year-old with history of Arnold Chiari II malformation with hydrocephalus (s/p VP shunt and surgical decompression), spina bifida myelomeningocele (s/p in utero repair), subglottic stenosis with prior tracheostomy and eventual decannulation presented for evaluation of sleep disordered breathing. Presenting symptoms included witnessed apneas, cyanosis, daytime sleepiness and frequent awakenings. Physical examination was largely unremarkable. Initial PSG demonstrated complex sleep apnea, with an AHI 20.6, REM AHI 57.8 per hour of sleep, ETCO2 peak of 69 cm H20 and an O2 saturation nadir of 34%, with sleep related hypoventilation/hypoxemia and Biot's breathing in the absence of opioid use and CNS infection. During titration study, Biot's breathing, complex apnea and sleep related hypoventilation/hypoxemia responded well to BiPAP ST of IPAP 18 cm H20 and EPAP 14 cm H20 BUR of 12 and oxygen of 1 L/min. She later developed intolerance to BiPAP due to high pressures and was decreased to BIPAP 13/11 cm H2O. Later the patient discontinued the use of BIPAP due to intolerance and was switched to night time

O2 at 3-4 L/min. Per the parents, the patient has been maintaining her oxygen saturation in the absence of BIPAP therapy with oxygen use. Due to COVID, patient was unable to follow up but will be scheduled for a repeat PSG in the near future. She followed with Neurosurgery for Arnold Chiari II and they recommended no surgical intervention at this time due to functional VP shunt.
Conclusion: This is an atypical presentation of Biot's breathing in the absence of CNS infections and opioid use in a patient with Arnold Chiari malformation II. Patient has complex sleep apnea, initially well controlled with BiPAP ST, but developed BiPAP intolerance. She is on oxygen with good control of hypoxemia in the absence of BiPAP therapy.
Support (If Any):

0837

AVERAGE VOLUME-ASSURED PRESSURE SUPPORT (AVAPS) AFTER CPAP FAILURE IN A PEDIATRIC PATIENT WITH SEVERE OBSTRUCTIVE SLEEP APNEA AND SLEEP-RELATED HYPOVENTILATION

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Introduction: Obstructive sleep apnea (OSA) has become an increasingly pervasive sleep disorder in the pediatric population. Current mainstream treatments include adenotonsillectomy and positive airway pressure therapy. Average volume-assured pressure support (AVAPS) is a relatively new mode of non-invasive ventilation, which has been increasingly used in the treatment of respiratory failure and hypoventilation syndromes. Here we present a case of a pediatric patient with severe OSA and sleep-related hypoventilation who was successfully treated with AVAPS after failure of CPAP therapy.
Report of Cases: A four year old boy with history of severe OSA, severe obesity, asthma, and allergic rhinitis underwent polysomnography one year after adenotonsillectomy and nasal turbinate reduction due to continued symptoms of sleep-disordered breathing. Results showed elevated residual apnea-hypopnea index (AHI = 30.4 events/hour), sleep-related hypoventilation (T ETCO2≥50 = 228.3 minutes), and sleep-related hypoxemia (T≤90% = 7 minutes). Therefore the patient underwent repeated adenotonsillectomy and turbinate reduction, with post-operative course complicated by pulmonary edema requiring intubation. He was extubated and weaned to nocturnal CPAP. Following discharge, CPAP titration failed to control AHI at maximal pressure (AHI 54.5 on 20 cm H2O, T≤90% = 15.3 minutes). The patient was then started on AVAPS with auto-titrating EPAP (AVAPS-AE, settings Pmax 20 cm H2O, PS 2-10 cm H2O, EPAP 5-10 cm H2O, RR auto, room air) with subsequent improvement of snoring and witnessed apneas, as well as reduction of daytime sleepiness. Afterwards, AVAPS-AE titration confirmed resolution of obstructive sleep apnea, sleep-related hypoxemia, and sleep-related hypoventilation (AHI = 2.5, T≤90% = 1.2 minutes, T ETCO2 ≥50 = 6.5 minutes.) The patient has since remained stable on AVAPS-AE until age ten, with the most recent AVAPS titration demonstrating continued resolution of sleep-disordered breathing.
Conclusion: AVAPS was an effective treatment for a pediatric patient with severe OSA and sleep-related hypoventilation who had failed CPAP therapy.
Support (If Any): None.

0838

CHEYNE-STOKES BREATHING IN A PEDIATRIC PATIENT WITH DILATED CARDIOMYOPATHY AND MUSCULAR DYSTROPHY PRIOR TO HEART TRANSPLANT

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Introduction: Cheyne-Stokes breathing (CSB) has rarely been identified in the pediatric population. Neuromuscular diseases (NMD) such as Duchene Muscular Dystrophy (DMD) can predispose patients to sleep-disordered breathing including central sleep apnea (CSA) and CSB. Sleep-disordered breathing in children with NMD may not have symptoms; thus, treatment can be delayed. Currently, there is limited data to support resolution of CSB in DMD with dilated cardiomyopathy post-transplant.
Report of Cases: We present a 15-year old female with a significant history of both dilated cardiomyopathy and DMD who presented with acute on chronic heart failure. Due to her disease progression, she was listed for heart transplant. Prior to her transplant, she completed an inpatient polysomnography (PSG) to rule out sleep-disordered breathing due to concerns of snoring and dyspnea during sleep. Her Pediatric Daytime Sleepiness Scale score (PDSS) was 8. The polysomnogram recorded moderate obstructive sleep apnea (OSA) and central sleep apnea (CSA) consistent with Cheyne-Stokes breathing along with rare premature ventricular contractions (PVCs). Patient was started on BPAP of 13/8 cm H2O with a back-up rate of 12 breaths per minute after titration study. The patient subsequently received a heart transplant in which the patient's dyspnea and snoring resolved. Post-transplant PSG pending to reassess the severity of sleep-disordered breathing.
Conclusion: Though CSA can be seen in children, CSB is rarely seen in children with either heart failure or muscular dystrophy. When CSB is observed, the cornerstone of treatment is correcting the underlying cause. This patient demonstrated CSB with symptoms that improved with BPAP and now post-heart transplant. When both heart failure and neuromuscular disease are involved, close monitoring for clinical symptoms along with screening for CSB is important and may affect overall quality of life and recovery.
Support (If Any):

0839

COMPLEX SLEEP APNEA IMPROVED WITH DECOMPRESSION OF A CHIARI I MALFORMATION IN A PEDIATRIC PATIENT

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Introduction: Chiari malformation (CM) occurs when a portion of the cerebellum herniates through the foramen magnum. CM is categorized as two types. Type 1 involves the cerebellar tonsils and type 2 involves the cerebellum and brain stem. Those with CM can be asymptomatic to having debilitating neurologic symptoms such as dysphagia, tinnitus, emesis, balance difficulty, muscle weakness, and/or headache. Central sleep apnea (CSA) and obstructive sleep apnea (OSA) have been associated with CM. It is postulated that

the sleep disordered breathing (SDB) is due to compression of the medulla which houses the breathing center and cranial nerves that play a role in nocturnal breathing. OSA has been thought to be related to muscle weakness of the lower airway in those with CM. After resolving CM with surgical decompression, residual OSA is common requiring treatment with positive airway pressure therapy.
Report of Cases: A 3-year-old male with a history of OSA and tonsillar hypertrophy. Polysomnography (PSG) was performed after tonsillectomy and adenoidectomy indicating severe OSA (oAHI 17.7/hr) and CSA (CSAI 29.9/hr). A titration study was conducted and bilevel positive airway pressure spontaneous/timed (BPAP ST) 10/6 cmH2O with a backup rate of 12 breaths per minute was utilized further resolving his SDB and daytime sleepiness. After months of BPAP ST therapy, he presented to an urgent care with symptoms of somnolence, emesis, and nystagmus of the left eye. Magnetic resonance imaging of the brain revealed a 2 cm herniation of the cerebellar tonsils indicating CM type 1. Neurosurgery performed surgical decompression without complication. Postoperative PSG indicated significant improvement of OSA (oAHI of 3.45/hr) and resolution of CSA (0.9/hr). BPAP ST therapy was discontinued with the resolution of his daytime sleepiness and SDB.
Conclusion: This case demonstrates a patient with severe OSA and CSA due to an undiagnosed CM type 1. OSA and CSA are associated with CM; however, residual OSA typically exists status post decompression and can require positive airway pressure therapy for treatment. Our case demonstrates the need for consideration of CM in patients with complex sleep apnea and that surgical decompression can improve both OSA and CSA in these patients.
Support (If Any):

0840

BE WARY OF ADJUSTMENT DISORDER WITH ANXIETY IN PATIENT WITH INSOMNIA AND DISCOMFORT WITH POSITIVE PRESSURE AIRWAY THERAPY

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Introduction: Insomnia is a common complaint. When it occurs in the context of treatment with continuous positive airway pressure (CPAP), it can complicate treatment and lead to dissatisfaction with CPAP therapy. Adjustment disorder with anxiety (ADWA) is a condition that develops following an identifiable stressor and can be associated with insomnia. We describe a case of ADWA causing disrupted sleep and dissatisfaction with CPAP therapy.
Report of Cases: The patient is an 80-year-old man with history of severe obstructive sleep apnea (OSA) and chronic obstructive lung disease, under stable management with CPAP. During a routine follow up visit, he reported the recent onset of frequent, and often prolonged, nocturnal awakenings associated with daytime sleepiness and fatigue. Insomnia was associated with discomfort with breathing, especially during exhalation, while using CPAP. His machine report indicated a significant decrement in compliance. Upon questioning, he reported that a few of his family members had died unexpectedly, following which he began to experience significant anxiety. His wife noted that he had become moody and irritable. On examination, the patient was visibly anxious; his speech was accelerated and animated, and he displayed psychomotor activation. Affect also displayed despondency. The patient was diagnosed with ADWA leading to insomnia and discomfort with CPAP use. He was prescribed buspirone 10 mg twice daily. On two week follow up patient reported no improvement in symptoms and was switched to escitalopram 10 mg daily. Following approximately three weeks, his clinical evaluation revealed significant improvement in mood; anxiety had dissipated, and sleep was more continuous with infrequent and brief awakenings. Daytime alertness had been restored. Of interest was the temporary return of anxiety and insomnia symptoms following the brief discontinuation of escitalopram because of hospitalization.
Conclusion: ADWA can occur in the setting of recent stressors and can result in sudden onset of insomnia, compromise CPAP adherence and decrease subjective benefit from PAP therapy. This case highlights the importance of questioning patients for the possibility of recent stressors and traumatic events when they develop difficulties with PAP use. These may indicate the presence of ADWA, whose management can restore CPAP compliance and improve sleep quality and daytime functioning.
Support (If Any):

0841

CASE REPORT: CAN LSD BE ASSOCIATED WITH CHRONIC EXPLODING HEAD SYNDROME?

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Introduction: Exploding head syndrome is a rare phenomenon characterized by a loud imagined noise at sleep onset. Less commonly, it is associated with a simultaneous stab of pain in the forehead. It may result in recurring arousals and anxiety regarding the events. The underlying pathophysiology remains unknown.
Report of Cases: A 27 year old male with no past medical history presented to the sleep medicine clinic with a 2-year history of sleep-onset pain between his eyes, like "a flash of lightning," associated with moderate to severe pain. He experiences "brain zaps" or "a jolt of electricity between his eyes every night." He would yell and jolt out of bed due to this sensation. These episodes occur approximately 60 to 90 minutes after sleep onset almost every night, jolting him from sleep and lasting approximately 1 minute. He also has difficulty seeing in the dark and also eye twitching. He experiences palpitations, diaphoresis, and a sense of fear often with these episodes. He denies any neurological deficits or muscle jerks. He is not on any daily medications. He does not regularly use any sleep aids but has tried melatonin 3 mg in the past. Evaluation by ophthalmology has ruled out ophthalmologic and neuro ophthalmic causes. He does report use of illicit substances including lysergic acid diethylamide (LSD), marijuana, methylenedioxymethamphetamine (MDMA), and cocaine. He did not experience any unpleasant effects after his first use of LSD, however within minutes of his second ingestion, he felt a sharp pain on his nasal bridge and forehead 10/10 in intensity. He states that since then, this pain has recurred almost every night. He does not have a family history of any neurologic disorders or migraines. The current plan for workup includes an in lab polysomnography with seizure montage and, if negative, a trial of a tricyclic antidepressant is planned.
Conclusion: This case illustrates the potential issues after LSD use causing severe dopaminergic and serotonin surge with drug use and the value of a complete history. Awareness of a possible correlation is clinically useful and may serve as a caution in the use of recreational drugs.
Support (If Any):

0842

NARCOLEPSY OR SARCOIDOSIS?

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Introduction: Narcolepsy is a common cause of chronic sleepiness, affecting 1 in 2000 people. Despite the frequency of narcolepsy, the average time from the onset of symptoms to diagnosis is 5 to 15 years, and may remain undiagnosed in as many as half of all affected people. The etiology of this problem is largely unknown and usually multifactorial. The prevalence of these sleep disorders is increased in sarcoidosis compared to the general population. We present a case of narcolepsy in a patient with biopsy proven extrapulmonary sarcoidosis.
Report of Cases: 42-year-old female has a history of Sjogren's syndrome (SSA/SSB positive, ANA positive 1:160), antiphospholipid syndrome with past left lower extremity deep venous thrombosis and positive LAC and anticardiolipin antibody, and Raynaud's syndrome for more than 15 years, asthma, pleurisy, irritable bowel syndrome, GERD, depression, migraine and fibromyalgia. Her primary sleep complaint is excessive daytime sleepiness and nonrestorative sleep requiring frequent napping. She exhibited intermittent hypnagogic hallucinations but denies cataplexy. She has no history of smoking and denies drinking caffeine/alcohol. Has 3-5 isolated awakenings at night otherwise denies insomnia. She had a score of 17 on the Epworth scale. Her in-lab polysomnography demonstrated an AHI of 0/hr, sleep latency of 4.5 minutes and REM latency of 31.5 minutes. No other abnormalities noted. She then underwent a multiple sleep latency test. Sleep was achieved in all the nap trials with a mean sleep latency of 1.2 minutes with three Sudden Onset REM Sleep recorded meeting criteria for narcolepsy. A subsequent PET/CT scan was obtained due to elevated liver enzymes and positive MRI findings, which incidentally showed a 2 mm enhancing focus involving the medial right cerebellar peduncle. She underwent biopsy which showed granulomatous disease consistent with sarcoidosis. Patient is currently successfully treated with methylphenidate for her underlying narcolepsy.
Conclusion: We present a patient with narcolepsy and multiple underlying autoimmune diseases including biopsy indicating extrapulmonary sarcoidosis. We, furthermore, present radiographic evidence in her brain that may have contributed to her narcolepsy.
Support (If Any):

0843

SEXSOMNIA IN A FEMALE PATIENT WITH NIGHTMARES AND OBSTRUCTIVE SLEEP APNEA: A CASE REPORT

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Introduction: Sexsomnia has been described as various sleep-related abnormal sexual behaviors primarily associated with confusional arousals and more rarely linked to rapid eye movement (REM) sleep behavior disorder (RBD). Clinical descriptions are based on case reports and review series, which leads to diagnostic ambiguity, challenges with appropriate classification, and forensic and legal ramifications
Report of Cases: We report a 34 year old female with a past medical history of polycystic ovarian syndrome and childhood post-traumatic stress disorder. Family history significant for parent with lifelong parasomnias. The patient was referred to Sleep Medicine with concern for snoring, sleepiness, and sleep behaviors. The patient reports sleep talking since childhood which predate trauma, traumatic themed nightmares, and ex-husband and current spouse reporting sleep-related masturbation, sexual advances described as coital-like pelvic movements which often lead to intercourse and subsequent amnesia. In addition, spouse describes bruxism and ongoing night terrors. Physical examination notable for body mass index 44 kg/m2, high arched palate, Mallampati class III, and 18 inch neck circumference. The patient underwent a polysomnagram which demonstrated fragmented sleep architecture, total arousal index up to 20.3/hr, and totalsleep time in stage N3 20%, Four awakenings fromN3, and findings of N3 partial arousal. The patient was observed in v-PSG to have periods of nocturnal lagophthalmos, finger movements, and vocalizations during NREM sleep. However, many of these observations were in the setting of respiratory events. The apnea-hypopnea index was 16.9/hr and a minimum oxygen saturation of 81% and mean saturation of 95%. A total of 3.1 minutes were spent less than or equal to 90%. TCO2 was without concern for hypoventilation. The patient was started on Auto CPAP 5-15cmH2O with resolution of snoring and some improvement to sleepiness. However, spouse reports ongoing sexsomnia in the same frequency despite treatment of obstructive sleep apnea.
Conclusion: This case reports a female adult with persistent sexsomnia despite early treatment of obstructive sleep apnea which highlights the possibility of co-occurring sleep disorder. The case does support current limited literature around sexsomnias having features of partial arousals from NREM sleep given the co-occuring history of night terrors, elevated N3 awakenings, and evidence of cortico-cortical dissociation.
Support (If Any): None

0844

ISOLATED, IDIOPATHIC PERIODIC BREATHING IN A SCHOOL AGE CHILD

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Introduction: Periodic breathing (PB) is a well described physiologic phenomenon of infancy and usually resolves with age1. PB that persists outside of infancy has been described in association with various pathologies such as Chiari malformation, upper airway anomalies and genetic abnormalities2. Isolated PB that persists past infancy is less well described, and there is little data to guide subsequent management and clinical decision making.
Report of Cases: Here we present a case of a 12-year-old female with isolated PB on polysomnography (PSG). She initially presented to our sleep center clinic with complaints of snoring, gasping during sleep and daytime sleepiness. She had no significant past medical history and not on any sleep-modifying medications. PSG was ordered to evaluate for suspected obstructive sleep apnea. Total sleep time was 7.75 hours with a mildly reduced amount of REM (16% of total sleep time). She had a total of 4 minutes of central sleep apnea that met AASM criteria for periodic breathing. This occurred exclusively during transitions between N1 and N2 and was not associated with hypoxemia nor hypocapnia. The patient's total apnea hypopnea index (AHI) was 2.97/hr, obstructive AHI

0.65/hr and central apnea index was 2.32/hr. Of note, this studywas not conducted at high altitude and was done in Houston (approximately 100 feet above sea level). Given the lack of significant sleep apnea, a conservative approach with nasal fluticasone and close follow-up was utilized.
Conclusion: Though rare, this case highlights the possibility of PB being an incidental finding of PSG in otherwise healthy, school aged children. The need for further research as to the significance of this incidental finding is also emphasized.
Support (If Any): 1. MacLean, Joanna E., Dominic A. Fitzgerald, and Karen A. Waters. "Developmental changes in sleep and breathing across infancy and childhood." Paediatric respiratory reviews 16.4 (2015): 276-284.2. Ghirardo, Sergio, et al. "Central apnea and periodic breathing in children with underlying conditions." Journal of Sleep Research (2021): e13388.

0845

LARGE ARACHNOID CYSTS AND HYPERSOMNOLENCE: SYMPTOMATIC OR NOT?

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Introduction: Arachnoid cysts are the most common type of brain cyst. They are often congenital, and most of them are stable and do not require treatment. On the other hand, some of them present a symptomatic problem such as headache, nausea and seizures. This rare condition was seen in a female patient who also had hypersomnolence.
Report of Cases: A 37-year-old female presented to hospital for evaluation of excessive daytime sleepiness (EDS) for the past 20 years, with repeated attacks several times a day without any REM sleep related symptoms. She also showed irregular wake sleep pattern of sleep extending over 24 hours, disturbing nocturnal sleep after each episode. Her sleep log showed sudden onset hypersomnolence with sleep duration of 30-40 hours every week. Epworth sleep scale was 10/24. PSG demonstrated her sleep architecture of 8 hours duration was unusual with sleep onset REM period (SOREMP) and decreased N3 sleep stage. MSLT showed reduced sleep onset latency (average: 5 minutes) and sleep onset REM on 1 of 4 naps. Brain MRI revealed a large arachnoid cyst on her left cerebral hemisphere. She was diagnosed as narcolepsy type2 and referred to the department of neurosurgery, but due to unclear association between hypersomnolence and the cyst, surgical treatment was not carried out. She was started on Modafinil 50mg which progressively increased to 200mg, but little effect was seen in sudden onset hypersomnolence and caused side effects such as headache and nausea. After Modafinil was discontinued, Melatonin agonist was administered in order to control her irregular sleep-wake rhythm, and since then her sleep-wake cycle has changed relatively stable and regular. At present, the frequency of hypersomnolence is gradually getting low and Epworth is 4/24.
Conclusion: In the present case, there is no evidence that her symptoms concerning sleep were secondary to any other disorder. Also, to our knowledge, there have been only a few cases reporting coexistence of hypersomnolence and arachnoid cysts. We are carefully following up on this patient and will reconsider to refer her to neurosurgery if any other symptoms appear.
Support (If Any):

0846

SEVERE OSA IN A 17YR OLD PATIENT WITH PRADER WILLI SYNDROME AND POORLY CONTROLLED DIABETES MELLITUS

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Introduction: Prader Willi Syndrome (PWS), while rare, is the most common genetic cause of obesity. It is caused by a functional loss of paternally expressed genes from chromosomal region 15q11-13. PWS is characterized by short stature, neurodevelopmental delay, obsessive-compulsive behaviors, hypothalamic dysfunction, and hyperphagia, associated with an aberrant satiety response and elevated levels of ghrelin. Excessive daytime sleepiness (EDS) and sleep-disordered breathing (SDB), including obstructive sleep apnea (OSA) and central sleep apnea, are common.
Report of Cases: A 17-year-old male, with PWS, morbid obesity, autism, and diabetes mellitus (DM) type-2 was referred for evaluation of snoring and EDS (Epworth Sleepiness Score 16). He had recently been admitted with diabetic ketoacidosis associated with binge eating. He had no prior sleep testing. He denied sleep paralysis, hypnagogic/hypnopompic hallucinations, and cataplexy. He had a body mass index of 54 kg/m2 with short stature (1.6m). On exam, he had a Mallampati score of 4 and 1+ tonsils. A recent echocardiogram was normal. Polysomnography showed sleep latency of 10 mins, apnea-hypopnea index (AHI) of 148/hr, nadir oxygen saturation of 73%, with 45% of total sleep time < 90%. Hypoventilation was not present. He was prescribed auto-titrating positive airway pressure (PAP) therapy. His mother was instructed to start locking access to food again. He was treated with insulin and metformin, with a plan to start on a glucagon-like peptide-1 (GLP-1) agonist. He had been on growth hormone (GH) previously, but in the context of his other morbidities, it was not reinitiated.
Conclusion: It is critical to screen and monitor patients with PWS for OSA, as SDB occurs in almost 70%. While PAP therapy may improve OSA, there is often residual EDS (likely due to underlying hypothalamic dysfunction), and alerting agents may be needed. GH can be considered for short stature but is contraindicated in patients with morbid obesity, untreated severe OSA, and uncontrolled diabetes. Management of diabetes, obesity, and hyperphagia in patients with PWS is challenging. Supervision and strict limitation of food intake using physical barriers are important. While data are limited, GLP-1 agonists may provide potential benefits for weight, glycemic, and appetite control in patients with PWS.
Support (If Any):

0847

SLEEP DISORDERED BREATHING IN A CASE SERIES OF 4 CHILDREN WITH TRISOMY 18

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Yale New Haven Hospital [1]

Introduction: Trisomy 18 (Edwards syndrome) is the second-most-common viable autosomal trisomy syndrome after trisomy 21, occurring in 1 in 2500 pregnancies. Obstructive Sleep Apnea (OSA) in Trisomy 21 has been well described in the literature. Even though trisomy 18 patients have upper airway obstructive (UAO) features overlapping with trisomy 21 that

could predispose them to develop SDB, there is a dearth of data published about it.

Report of Cases: We present a case series of four patients with trisomy 18 who were evaluated for SDB aged 17mo-3yrs at the time of the reported polysomnographies (PSGs). Two patients had multiple prior studies. Moderate OSA was noted in two patients, and one was noted to have severe OSA, while the fourth patient had resolution of their severe OSA post adenotonsillectomy (T&A). Reduced sleep efficiency was noted in 2 patients. All but one patient had abnormal EEGs, consistent with known underlying seizure disorders. While all patients desaturated during sleep, only two patients fulfilled the criteria for hypoxemia (SpO2 below 90% for more than 5 minutes). One of these had resolution of hypoxemia with a trial of positive airway pressure therapy (PAP) of 5 cmH2O on a titration study. While capnography showed hypoventilation in two patients, one of the patients was treated with supplemental oxygen and the recommendation for titration PSG study to evaluate the need for PAP.

Conclusion: With aggressive interventions, children with trisomy 18 have seen a higher survival over the recent years. These children often have micrognathia or retrognathia, midface hypoplasia, glossoptosis, and hypotonia, predisposing them to have UAO. Endoscopic assessments reveal laryngomalacia and/or tracheomalacia, tonsillar and adenoid hypertrophy. In a previously reported study by Kettler et al. (2020), a prevalence of SDB of 44.68% was noted compared to the 1-4% average prevalence in non-syndromic children, hence clinicians should have a low threshold to screen them. In our small case series, all 4 patients had moderate-to-severe OSA, to begin with. Our results show that both surgery and PAP therapy may be successful in the treatment of OSA. More longitudinal data is needed to understand the pathology and management of SDB in these children.

Support (If Any):

0848

TWO ARE BETTER THAN ONE: TREATMENT OF COMPLEX SLEEP APNEA WITH TWO DISTINCT SLEEP NEUROSTIMULATORS

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Hackensack Meridian Health School of Medicine [1] Hackensack Sleep & Pulmonary Center [2] Hackensack University Medical Center [3]

Introduction: Complex sleep apnea refers to the emergence of central apnea when obstructive apneas have been adequately treated. While a combination of medications and noninvasive positive airway pressure ventilation is frequently used in patients with this syndrome, the optimal treatment has not yet been fully elucidated. With the advent of nerve stimulation therapy, it is now possible to target specific physiologic mechanisms and provide precise and adjustable therapy. We present a case in which two distinct nerve stimulators were used to successfully treat a patient with complex sleep apnea.

Report of Cases: We present a case in which a ptient with complex slepe apnea was successfully treated by implantation of two distinct nerve stimulators: hypoglossal nerve stimulation therapy for obstructive sleep apnea and phrenic nerve stimulation therapy for concomitant central sleep apnea.

Conclusion: Complex sleep apnea was successfully treated in this patient with the combination of hypoglossal and phrenic nerve stimulation therapy as evidenced by a reduction in both the obstructive and central apnea hypopnea indices. This patient also had significant clinical improvement with decreased excessive daytime sleepiness and improved daytime functioning as evidenced by decreased Epworth Sleepiness Score, improved patient reported daytime activity, decreased apnea hypopnea index, and increased total sleep time. This case provides evidence for the efficacy and safety of the simultaneous use of hypoglossal and phrenic nerve stimulation for the treatment of complex sleep apnea. Is also highlights the importance of obtaining a laboratory polysomnographic evaluation in all patients prior to any sleep device implantation. Further study is needed, however, to establish the long-term efficacy of this approach to treatment.

Support (If Any): I am seeking financial support and assistance for meeting attendance and travel for the June sleep meeting from Inspire Sleep Apnea and other travel assistance funds.

0849

BACLOFEN-INDUCED SEVERE CENTRAL SLEEP APNEA

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Introduction: Baclofen is a gamma-aminobutyric acid-B agonist that targets neurons in the spinal cord and brain. It has skeletal muscle-relaxant properties and is FDA approved to treat spasticity from spinal cord injury (SCI), multiple sclerosis, or traumatic brain injury. Off label use includes treatment of alcohol use disorder, hiccups, and muscle spasms. A rare respiratory side effect of baclofen is apnea, with reports of baclofen-induced central sleep apnea (CSA) in a pediatric patient and four adults with alcohol use disorder. We describe a case of severe CSA in a veteran with T7 paraplegia due to chronic baclofen use.

Report of Cases: A 42-year-old veteran with T7 paraplegia was referred to sleep medicine for unrefreshing sleep. He had a remote history of spinal cord injury complicated by spasticity that was being treated with oral baclofen (40 mg TID). Further evaluation of unrefreshing sleep was obtained with baseline polysomnography. A total of 146 apnea and hypopnea events were observed (5 obstructive apneas, 131 central apneas, 4 mixed apneas and 6 hypopneas) for an AHI of 43.2 events/hour. Minimum oxygen saturation was 85% with 0.3 minutes spent <89%. Respiratory pattern was suggestive of crescendo decrescendo breathing but did not meet diagnostic criteria for Cheyne-Stokes respiration (cycle length <40 seconds). Other causes of CSA were investigated but unrevealing. A diagnosis of baclofen-induced central sleep apnea was made.

Conclusion: Spasticity is a common consequence of SCI and is commonly managed with baclofen. Apnea is a rare respiratory side effect of baclofen but can significantly impact patients' sleep quality and overall quality of life. Our case highlights how providers should have a high suspicion for sleep-disordered breathing in patients with chronic baclofen use.

Support (If Any): 1. Ghanavatian S, Derian A. Baclofen. In: StatPearls. Treasure Island (FL): StatPearls Publishing; May 15, 2021.2. Locatelli F, Formica F, Galbiati S, et al. Polysomnographic Analysis of a Pediatric Case of Baclofen-Induced Central Sleep Apnea. J Clin Sleep Med. 2019;15(2):351-354. Published 2019 Feb 15. doi:10.5664/jcsm.76443. Olivier PY, Joyeux-Faure M, Gentina T, et al. Severe Central Sleep Apnea Associated With Chronic Baclofen Therapy: A Case Series. Chest. 2016;149(5):e127-e131. doi:10.1016/j.chest.2015.10.001

0850

EXPLODING HEAD SYNDROME AND HYPERSOMNIA

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Introduction: Exploding head syndrome (EHS) is a hypnagogic parasomnia where the patient experiences a loud noise or flash of light and often reports distress secondary to the stimulus. EHS is relatively uncommon, and to our knowledge, there has been only one published report of comorbid EHS and narcolepsy, describing a 38-year-old male. This report focuses on a pediatric case of EHS, evaluating possible comorbid narcolepsy and sleep apnea.
Report of Cases: Eight-year-old male was referred for excessive daytime sleepiness. He endorsed trouble staying awake in school, both in the morning and after lunch time. His Epworth in clinic was a 16, despite nightly sleep duration ≥8 hours. He also endorsed weakness secondary to strong emotions and was observed to have difficulty grasping and holding a pencil while tickled. Patient and his caregiver denied snoring, witnessed apnea, dream enactment, and symptoms of restless leg syndrome. However, the patient did admit to auditory hallucinations, occurring about twice per week during the transition from wakefulness to sleep. He described the hallucination as a banging sound and the sound of clinging bracelets, noting he has searched for the source of the stimulus, but has never been able to find a cause. Patient's mother denied hearing similar noises. No visual hallucinations or sleep paralysis noted. Polysomnography revealed 0 Central Sleep Apneas, 0 Mixed Apneas, 10 Obstructive Apneas, and 12 hypopneas. The mean duration of these events was 0 seconds. The patient's Apnea-Hypopnea Index (AHI) was 2.5 and had a REM AHI of 8.3. Patient was supine 75% of the night.
Conclusion: This case illustrates a unique hypnagogic parasomnia in a pediatric patient. At this point, the patient's symptoms would suggest EHS characterized by auditory hallucinations that involve hearing the banging sound, upon transition from sleep to wake. The patient also exhibits some narcolepsy type symptoms - hypersomnia, Epworth of 16, and subtle symptoms of cataplexy. In lab PSG – showed overall AHI of 2.5, REM AHI of 8.3- oxygen nadir 90%. Patient referred to ENT for tonsillectomy and adenoidectomy. With follow up NPSG and MSLT if still sleepy. He was referred to behavioral sleep medicine clinic to address anxiety secondary to EHS, but did not attend.
Support (If Any):

0851

LONGITUDINAL MANAGEMENT OF NARCOLEPSY WITH ATYPICAL PRESENTATION OF CATAPLEXY (UNILATERAL WITH SYMPTOMS ONLY ON THE RIGHT SIDE FOR THE PAST 13 YEARS)

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Introduction: Narcolepsy with atypical unilateral cataplexy is a rare phenotype. We would like to share single center, single patient experience over the last 13 years of managing this patient.
Report of Cases: 64-year-old female diagnosed with narcolepsy with unilateral cataplexy in 2008 with MSLT. Her cataplexy syndrome has been atypical, in that it has a strictly unilateral presentation for the past 13 years, with right face, arm, and leg weakness with strong emotions(anger/laughter). Her right-side extremities go limp for a few seconds to a minute. Her cataplexy syndrome has never evolved to become bilateral or unilaterally on her left side. Her physical examination has been largely unremarkable. For Narcolepsy, was on Modafinil (2008) which was up titrated to 600 mg with no side effects, eventually switched to Armodafinil 250 mg (2013). Eventually did not control EDS fully, methylphenidate (2014) was added. The patient reported cognitive impairment with gradual memory loss on stimulants (starting in 2012) and nocturnal insomnia on methylphenidate SR. Due to worsening cognition and memory, stimulants were discontinued in 2014 and patient referred to neurology and had neuropsychiatric evaluation for memory loss. Dementia lab workup and MRI with spectroscopy were unremarkable. Due to continuation of EDS was restarted on Modafinil until May 2021. In May 2021, she reported no longer fully controlled daytime sleepiness and Pitolisant was added with improvement in ESS from 17/24 to 9/24. For the management of unilateral cataplexy, patient was well controlled initially on venlafaxine (2008), eventually up titrated with an additional dose a few times. After cognitive impairment, patient stopped refilling it in 2014 and subsequently slept better without the venlafaxine. She reported that she would fall when she got very upset/mad so learnt not to get mad at people. She had many episodes of unilateral cataplexy mainly with laughing or excitement so was started on Fluoxetine 20 mg and eventually up titrated to 40 mg. Her unilateral cataplexy symptoms have been well controlled with the addition of Pitolisant.
Conclusion: Management of Narcolepsy with atypical unilateral cataplexy is challenging and requires use of multiple medications with different sites of action.
Support (If Any):

0852

NARCOLEPSY TYPE 1 IN A PEDIATRIC PATIENT WITH TEMPORAL LOBE EPILEPSY

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Introduction: Narcolepsy type-1 is clinically characterized by irrepressible daytime sleepiness and REM-sleep dissociation, including cataplexy. Cataplexy usually manifests as episodes of brief, symmetrical sudden loss of muscle tone with retained consciousness. It may be difficult to distinguish from seizure activity as they may share overlapping features. We discuss a pediatric patient with temporal lobe epilepsy with co-occuring Narcolepsy Type 1.
Report of Cases: A 17-year-old boy with obesity and a history of focal epilepsy secondary to intracranial hemorrhage in the neonatal period status-post right parieto-occipital resection at age 11, presented with worsening fall episodes and feeling of imbalance Following surgery, his seizures improved, but he was having excessive sleepiness. At age 13, he started experiencing episodes of slurred speech, feeling of imbalance, "body heaviness and tongue heaviness" with occasional falls. He denied loss of consciousness, body shaking, stiffening, or incontinence. At age 17, he presented to medical attention due to increasing frequency of such episodes. Physical exam was significant for BMI 42.7 kg/m , Mallampati 4, tonsils 3+ bilaterally, and homonymous hemianopia. Epworth Sleepiness Scale: 22/24. Video EEG was negative for epileptiform discharges

despite occurrence of above-mentioned episodes increasing the clinical suspicion of Narcolepsy. Polysomnography revealed sleep latency of 0 minutes, REM latency of 2.6 minutes, and mild OSA. Toxicology screen was negative. MSLT showed mean sleep latency of 1.2 minutes with 3 SOREMPs. CSF orexin could not be obtained due to technical constraints. He was diagnosed with Narcolepsy type-1 and started on Venlafaxine and Methylphenidate with resultant improvement in both daytime sleepiness, and the severity and frequency of cataplexy. However, his feeling of imbalance persisted, prompting repeat video EEG which demonstrated left temporal lobe seizure activity. Anti-epileptic regimen was optimized with improvement in sensation of imbalance.
Conclusion: Temporal lobe epilepsy and Narcolepsy Type-1 can have overlapping features that make it difficult to distinguish between the two. While exceedingly rare, the two entities may co-occur. Diagnostic and therapeutic management require coordination between Sleep Medicine and Neurology. While PSG, MSLT, and CSF Orexin can clarify the diagnosis of narcolepsy, neurologic work up should be pursued if symptoms are not completely attributable to Narcolepsy.
Support (If Any):

0853

THE ROLE OF SLEEP-DISORDERED BREATHING IN THE OPTIMIZATION OF PEDIATRIC EPILEPSY MANAGEMENT

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Introduction: There is a known bidirectional relationship between epilepsy severity and disordered sleep; however, both the potential scoring limitations of polysomnograms (PSGs) of children with epilepsy and the effect of treatment of sleep disordered breathing (SDB) on epilepsy severity in these children remain poorly understood.
Report of Cases: We describe a 7-year-old male with a history of prematurity (ex-34 weeks), bronchopulmonary dysplasia, recurrent aspiration pneumonia, and refractory nocturnal epilepsy who experienced acute hypoxemic respiratory failure in the setting of co-infection with rhinoenterovirus and parainfluenza 4 virus. The patient's epilepsy history is notable for multiple nocturnal seizures most days of the week for a period of several years. His mother endorsed that the nocturnal seizures began shortly after his SDB symptoms, and that the severity of his nocturnal seizures seemed to be associated with the quality of his sleep. Two years prior to admission, he underwent adenotonsillectomy for mild obstructive sleep apnea (AHI 2.5, REM AHI 8.9, minimum SpO2 86%). He continued to have persistent SDB symptoms (e.g. witnessed apneas, nocturnal arousals 5-10 times/night, daytime sleepiness) despite adenotonsillectomy. Notably, the background EEG (in the context of epilepsy) demonstrated obscured sleep architecture and led to unreliable staging of sleep states and cortical arousals. Given the disorganized background EEG, arousal-based hypopneas could have been underestimated. In the setting of acute respiratory failure, our patient was hospitalized and treated with noninvasive ventilation for 6 days. Collateral benefits included improvements in SDB (evidenced by decreased nocturnal awakenings, lack of obstructive features) and reduction in seizure frequency. His mother noted that this hospitalization was the first time in years that her son did not experience nocturnal seizures.
Conclusion: Sleep apnea can be an important modifiable factor in the treatment of pediatric epilepsy. Some PSGs of children with epilepsy may be falsely reassuring given the potential difficulty with scoring cortical arousal-based hypopneas. Therefore, careful clinical correlation should be made between nocturnal seizures and sleep symptoms, even in the context of reassuring PSG parameters.
Support (If Any): Cystic Fibrosis Foundation Training Grant, AIRE grant, NIH 2T32HL110952-06

0854

A CASE OF COMPLETE HEART BLOCK IN A PATIENT WITH SEVERE OBSTRUCTIVE SLEEP APNEA

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University of Michigan [1]

Introduction: Obstructive sleep apnea (OSA) has been associated with bradycardic arrythmias and cases of transient heart block. Heart block occurring during sleep has been described in up to 10% of patients with obstructive sleep apnea, most commonly during stage R sleep and through a mechanism known as vagal activation. Stage R sleep is associated with desynchronization of respiratory and cardiovascular functions, and the excessive autonomic response (vagal activation) occurs due to the stronger stimulation of chemoreceptors and baroreceptors induced by hypoxemia, intrathoracic pressure swings, and hemodynamic alterations. Treatment of the underlying sleep-disordered breathing will typically treat the bradycardic arrythmia as well.
Report of Cases: A 49-year-old male with a BMI of 30 kg/m , neck circumference of 16 inches, and obstructive sleep apnea presented to the sleep center to establish care for management of his preexisting OSA. He was previously diagnosed with moderate OSA in 2007 but had discontinued therapy shortly after due to Continuous Positive Airway Pressure (CPAP) intolerance. The patient complained of snoring, nocturia, and excessive daytime sleepiness (18/24 on Epworth Sleepiness Scale). During the split night study, the patient was noted to have 2:1 second degree heart block followed by a transient episode of complete heart block, manifested by 4 non-conducted p-waves. The patient remained asymptomatic throughout the night. Upon study completion, the patient denied any prior chest pain, presyncope, syncope, or medications that might cause heart block.
Conclusion: Bradyarrythmias can be seen in severe obstructive sleep apnea in the setting of excessive vagal stimulation through increased stimulation of chemoreceptors and baroreceptors. Treatment with PAP therapy can lead to prevention of heart block in 80-90% of these patients.
Support (If Any):

0855

A CHALLENGING CASE OF NOCTURNAL VISUAL HALLUCINATIONS IN AN ELDERLY WOMAN

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Introduction: Nocturnal hallucinations can be part of a wide array of different disorders, like sleep disorders (e.g. narcolepsy), visual impairment (e.g. Charles-Bonnet syndrome), neurodegenerative disorders (e.g. Lewy Body Dementia) and psychiatric disorders

(e.g. schizophrenia). We explore the differential diagnosis, the challenging diagnostic workup and the limited therapeutic options in this patient with complex visual nocturnal hallucinations.
Report of Cases: A 64 year old woman was referred with detailed and vivid visual nocturnal hallucinations (seeing her dog smoking a cigar, seeing someone in the room moving her bed, etc.). The hallucinations started 1-2 months ago, were mainly present at night (both when falling asleep and during the night) but occasionally also during the day. She had also been suffering from worsening daytime sleepiness for 3-4 months, and from memory problems for 1 year. Cataplexy and sleep paralysis were absent. Clinical neurological examination was normal. The patient had been diagnosed in the past with OSAS. She had been treated with CPAP for 3 years and recent polysomnography showed good control of her apnea. She had also been diagnosed with Crohn's disease, COPD and cardiomyopathy. Because of her age, the vivid hallucinations, and the memory problems, we first wanted to rule out Lewy Body Dementia. Neuropsychological testing ruled out dementia. MRI of the brain showed some white matter lesions, without substantial atrophy. At a subsequent multidisciplinary consultation, her cardiologist considered her cardiomyopathy as a contraindication for stimulants. Therefore, and because we believed the a priori probability for narcolepsy to be low, an additional MSLT was not considered useful. Based on further pulmonary tests, we hypothesized that hypoxia could play a role in the hallucinations and hypersomnolence. The hallucinations improved over time, the hypersomnolence remained, but we found there were no good treatment options available, considering the cardiac contraindications for stimulants.
Conclusion: There is a wide-ranging differential diagnosis for nocturnal visual hallucinations. The specific patient characteristics are important both for further diagnosis and treatment options.
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0856

CORRECTING SLEEP/WAKE CYCLE AND REDUCING COMBATIVENESS IN AN 84-YEAR-OLD PATIENT

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Introduction: Sleep disruption is a common occurrence in hospitalized geriatric patients. Such patients frequently arrive at the emergency department for behavioral changes due to delirium, which can often be mistaken for, or compounded by, underlying dementia. Behavioral symptoms may vary, including disinhibition, aggression, distress during care, mood disturbance, and paranoia, affecting approximately 90% of patients. Effectively treating these patients is challenging; antipsychotic use is a commonly implemented treatment in hospitalized settings, but is complicated by adverse side effects and an increased risk of CVA. In this case report, we discuss the use of an antipsychotic, olanzapine, to treat an 84 year old hospitalized patient presenting with sleep disruption and changes in mental status.
Report of Cases: An 84 year old gentleman with a history of Alzheimer's dementia with worsening behavioral changes was admitted for urinary tract infection, humeral fracture secondary to mechanical fall, and increasing aggression toward his caretaker. At home the patient was sleeping during the day and more was active and combative at night. While hospitalized, he had become aggressive with hospital staff due to his distress and was minimally oriented at baseline. We trialed the patient on olanzapine 5mg at night to facilitate sleep and reduce his aggression, in addition to environmental changes to reorient day and night. After a few days of this treatment, this patient was much more pleasant and oriented, able to hold conversation, and no longer aggressive. His initial disposition was to be transferred to a memory care facility, given increasing safety concerns expressed by the caretaker. However, following these changes, he was able to return home in the comfort of his family and caretaker.
Conclusion: Antipsychotic use in the elderly for sleep disruption and behavioral disturbances is heavily debated, though there may be some benefit to their use. The CATIE-AD trial and a Cochrane Review suggest Olanzapine may reduce aggression, particularly in Alzheimer's disease, and has the added benefit of sedation which aids in establishing sleep cycles. However, many patients discontinue antipsychotic treatment due to side effects and routine use is discouraged. When in use, regular monitoring should take place to evaluate for side effects associated with pharmacotherapy and continued therapeutic benefit should be reassessed.
Support (If Any):

0857

HOW TO FIX MASK LEAK FOR THOSE WITH NO TEETH

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Introduction: Mask fit is a crucial factor for patient adherence and effective use of PAP therapy. However, patients using dentures may face significant challenges to achieving a good mask seal, resulting in mask leak and inefficacy of therapy.
Report of Cases: A 67-year-old male with Obstructive Sleep Apnea (OSA) previously adherent to Bi-level Positive Airway Pressure (BPAP) therapy presented to clinic for complaints of mask leak. Due to a suspected dental infection, he had had all his teeth removed three years prior to this visit and had been instructed by his dentist to remove the dentures each night when he slept. However, removal of the dentures affected the fit of his full-face mask, and he experienced significant mask leak with return of pre-PAP symptoms. He was a habitual mouth-venter and preferred full-face masks. Despite trialing different masks, he was no longer able to tolerate his BPAP secondary to the leak and discontinued PAP therapy altogether. During his visit to the sleep center, a mask refit was performed with and without his dentures in place. While no masks sealed effectively with his dentures out, a satisfactory alternative was found if he wore his dentures. He was counseled to wear his dentures while using PAP, remove his dentures for the recommended minimum amount of time during the day instead of removing them for sleep, and to follow up with his denturist/prosthodontist for further instructions.
Conclusion: Edentulous patients may pose difficulties with mask fit, and a multi-modal approach may be necessary to effectively treat their sleep apnea. Luckily, our patient was able to find a mask that he found comfortable while wearing his dentures and had minimal leak. Alternatives may include consideration of positional therapy with lower pressures for a potential nasal mask, weight loss, hypoglossal nerve stimulator, or referral to an oral surgeon, denturist, or prosthodontist for guidelines on sleeping with dentures. Close monitoring of symptoms and download data is recommended following oral surgery and switch of mask interface.
Support (If Any):

0858

UNDER REPORTING OF APNEA HYPOPNEA INDEX (AHI) IN PATIENTS WITH PREDOMINANT REM SLEEP DISORDERED BREATHING ON ANTIDEPRESSANTS.

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Introduction: The prevalence of Rapid Eye Movement (REM) related Sleep Disordered Breathing (SDB) ranges from 13.5% to 36.7% in patients suspicious to have SDB.1 It is reported that patients with REM related SDB often have associated depression and are commonly on anti-depressants.2 Antidepressants suppress overall REM sleep duration. Significant sleep disordered breathing is known to occur during REM sleep. These patients commonly present with excessive daytime sleepiness and fatigue. Obstructive sleep apnea (OSA) diagnosis is often missed in these patients secondary to REM sleep suppression and subsequent underreporting of AHI.1. Conwell W, Patel B etal 2012 PMID: 21614575. 2. Geckil AA, Ermis H. 2020 PMID: 30949927.
Report of Cases: Case 1 is a 53-year-old obese white female with stable depression on citalopram 20mg presented with witnessed loud snoring and apneas, sleep onset and maintenance insomnia, daytime fatigue and hypersomnolence. Her Epworth Sleep Score (ESS) was 13/24. Her in lab baseline polysomnogram demonstrated overall AHI 3.8/hour and REM only AHI 24.3/hour. To further explore her persistent daytime sleepiness a Mean Sleep Latency Test (MSLT) was ordered. Citalopram was held 2 weeks prior to MSLT. In the PSG her overall AHI increased to 7.6/hour diagnosing her with mild OSA. PAP therapy was initiated that improved patients nocturnal sleep, daytime fatigue and hypersomnolence. Case 2 is a 54-year-old overweight white female with past medical history of chronic stable depression on Wellbutrin SR 100 mg daily presented with significant day time fatigue and hypersomnolence (ESS 15/24). Her baseline PSG reported AHI 1.7/hour with REM only AHI 10.7/hour. However due to persistent excessive daytime sleepiness MSLT was ordered. Her Wellbutrin was held 2 weeks prior to testing. Her overnight PSG demonstrated increase in her AHI to 7.9/hour and REM AHI to 34.2/hour. Mild obstructive sleep apnea was diagnosed, and PAP therapy was initiated that improved her hypersomnolence.
Conclusion: These cases illustrate that antidepressants likely mask obstructive sleep apnea by suppressing REM sleep. Given the underreported AHI in patients with REM SDB who are on antidepressants it may be prudent to hold anti-depressants for 2 weeks to establish an accurate diagnosis of sleep apnea.
Support (If Any):

0859

AVAPS TO THE RESCUE: A CASE OF SEVERE OBSTRUCTIVE SLEEP APNEA WITH TREATMENT RESISTANT TO UPPP AND CPAP IN A PEDIATRIC PATIENT WITH PRADER-WILLI SYNDROME

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Introduction: Prader-Willi syndrome (PWS) has a prevalence of 1/10,000 to 1/30000 and is the most common syndromic form of obesity. Prader-Willi syndrome is defined by a multitude of features that develop from early childhood to adolescents, but one of the primary developments is obesity in the setting of hyperphagia during early childhood. Due to the development of obesity, there is a high prevalence of obstructive sleep apnea (OSA) among PWS patients.
Report of Cases: A 6-year-old boy with PWS with a 2-year history of loud snoring underwent polysomnography (PSG) which showed severe OSA with Apnea-Hypopnea Index (AHI, events/h) 133.7. The patient underwent surgical intervention with a combined uvulopalatopharyngoplasty and adenotonsillectomy and a follow up PSG showed a residual AHI of 37. On CPAP titration the AHI improved to 1.2 with CPAP 14 cm H2O and the patient was discharged on home nasal CPAP. Over the next several years, the patient had suboptimal CPAP compliance. At 11 years of age, the patient was admitted to the intensive care unit (ICU) with volume overload –with a normal cardiac workup- and respiratory failure requiring high flow nasal cannula oxygen. Venous blood gas (VBG) showed pH 7.34 and severe hypercapnia with pCO2 73 mmHg c/w obesity hypoventilation syndrome (OHS). The patient was started on CPAP then changed to bilevel PAP ST with supplemental oxygen. Due to persistent hypercapnia in the high 60s noninvasive ventilation (NIV) was switched to Average Volume-assured Pressure Support with auto titrating EPAP (AVAPS-AE) with significant improvement in hypercapnia and overall tolerance. Discharge VBG showed pH 7.35 and PCO2 56 mm Hg. The patient was discharged home, is doing well and has avoided readmission for at least 6 months.
Conclusion: This case highlights the potential for newer modes of noninvasive ventilation with autotitrating EPAP to treat severe OSA with OHS and hypercapnic respiratory failure in patients with PWS and other conditions. With the growing obesity epidemic, rates of treatment failures with CPAP and traditional bilevel PAP therapy may increase and consideration of alternative modes of NIV therapy should be considered.
Support (If Any):

0860

BURST SUPPRESSION DUE TO DIFFUSE ENCEPHALOPATHY

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Introduction: Burst suppression is a finding on electroencephalography (EEG) associated with a severe encephalopathy associated with coma, severe infantile-onset epilepsy syndromes, hypothermia, or may be medically induced by general anesthesia. It presents as a pattern of alternating high-voltage, 75-250µV, activity separated by periods of amplitude dampening, less than 5µV, of electrical brain activity1. The duration of the burst's activity is 1-20 seconds while the suppression lasts longer than 10 seconds1. When not medically induced, burst suppression is a known marker of poor prognosis.
Report of Cases: An 18-year-old male with cerebral palsy, spastic quadriplegia, and static encephalopathy secondary to hypoxemia ischemic injury in the perinatal period presents with excessive sleepiness during therapy sessions. He was empirically placed on non-invasive ventilatory support with BPAP ST 8/4 cm H2O with a rate of 10 breaths per minute for chronic respiratory failure during sleep. While awake he shows no evidence of hypoxemia or hypercapnia on room air. A polysomnogram was ordered showing moderate obstructive sleep apnea (oAHI 9.73) and central sleep apnea (5.84 events per hour) without hypoxemia (SpO2 nadir 90%), or hypercapnia (TcCO2 max 48 mmHg). The study was scored as REM/NREM as specific sleep architecture was not identified. Diffuse burst suppression was observed. No epileptiform abnormalities were recorded. A MRI of the brain shows diffuse

encephalomalacia involving the supratentorial brain parenchyma with volume loss of the cerebellum, the pons, and brain stem.
Conclusion: The abnormal brain activity noted in our patient is due to underlying encephalomalacia and diffuse brain injury secondary to his perinatal hypoxemic ischemic injury. Despite his significant underlying neurological abnormality, he can maintain adequate ventilation and oxygenation while awake. While asleep, he has moderate obstructive and central sleep apnea without hypoxemia or hypercapnia. This is likely due to the activity of control centers of respiration being spared despite the volume loss noted on the brain MRI.
Support (If Any): References:1) Bhattacharyya, Sourya; Biswas, Arunava; Mukherjee, Jayanta; Majumdar, Arun Kumar; Majumdar, Bandana; Mukherjee, Suchandra; Singh, Arun Kumar (1 November 2013). "Detection of artifacts from high energy bursts in neonatal EEG". Computers in Biology and Medicine. 43 (11): 1804–1814.2) Lee, Jaeyun; Song, Woo-Jin; Lee, Hyang-Woon; Shin, Hyun-Chool (2016). "Novel Burst Suppression Segmentation in the Joint Time-Frequency Domain for EEG in Treatment of Status Epilepticus". Computational and Mathematical Methods in Medicine. 2016.

0861

SLEEPY IN THE MOUNTAINS

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Introduction: Central sleep apnea (CSA) is a rare disorder caused by a reduction of airflow and ventilatory effort during sleep. CSA is rarely idiopathic and associated with medical conditions including heart failure, opioid medications, treatment emergent and high-altitude periodic breathing. At higher altitudes, hypoxemia induces periodic breathing with periods of deep and rapid breathing alternating with central apnea. Patients with high-altitude periodic breathing experience fragmented sleep, poor sleep quality, excessive daytime sleepiness, morning headaches and witnessed apnea. We discuss a patient with obstructive sleep apnea (OSA) who developed new-onset central sleep apnea after relocating to a higher altitude location.
Report of Cases: A 75-year-old male with a history of moderate obstructive sleep apnea well controlled on CPAP for eight years, with no known cardiovascular or pulmonary disease, presented with new-onset excessive daytime sleepiness. He had recently relocated to an area in the Colorado mountains (7000 ft elevation) from his previous home in Los Angeles (sea level). His residual apneahypopnea index (r-AHI) displayed on his CPAP machine increased to 7-14/hr from his normal of 1-2/hr after his relocation. Review of his compliance data revealed his central apnea index was elevated, contributing to his high r-AHI. A one-night nocturnal oximeter was mailed to the patient to use while on CPAP. Data revealed oxygen desaturation to less than 88% for about 2 hours of the night, worse during the early morning hours. The patient was advised to undergo a polysomnography and adaptive servo-ventilation titration if significant central sleep apnea was present. The patient declined due to concern about the COVID-19 pandemic. Supplemental nocturnal oxygen was initiated at 2L/min with normalization of the r-AHI.
Conclusion: Patients with OSA who experience worsening symptoms or increased r-AHI despite excellent compliance with PAP therapy should be considered for repeat polysomnography or titration study. While it is expected that high-altitude central sleep apnea will improve with acclimatization, nocturnal supplemental oxygen in addition to PAP therapy is indicated for patients with high-altitude central sleep apnea to diminish hypoxemia and improve residual AHI and sleep quality.
Support (If Any):

0862

A UNIQUE CASE OF SEVERE SLEEP ONSET AND MAINTENANCE INSOMNIA FOLLOWING COVID-19 VACCINATION

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Introduction: The COVID-19 vaccines have documented transient side effects, including injection site soreness, redness, headache, fatigue, and fever. In addition, there have been few reported long-term side effects, including Guillain-Barre, pericarditis, and cerebral venous sinus thrombosis. We present a rare case of severe insomnia as a long-term side effect following COVID-19 vaccination.
Report of Cases: A 59-year-old female with a past medical history of well-controlled hypothyroidism and migraine presented to the sleep center with four months of insomnia. She had a history of COVID infection in November 2020 with only mild symptoms of sore throat and fatigue. The patient finished her two-shot series of the Moderna COVID-19 vaccine in April 2021. Immediately following the vaccination, the patient had severe trouble falling and staying asleep. Her insomnia was resistant to multiple medications including zolpidem Immediate-release(IR), Controlled-release(CR) formulas, zaleplon, eszopiclone, trazodone, melatonin, clonazepam, suvorexant, and lemborexant. However, magnetic resonance imaging (MRI) brain imaging only showed nonspecific white matter disease. She had no mood disorders or psychosocial stressors, and the patient had excellent sleep hygiene measures. However, insomnia caused severe impairment of her daily life activities to a point where she was almost seeking inpatient admission for her insomnia. During the COVID-19 pandemic, the effects on sleep have been significant, particularly insomnia. Prescriptions for sleep medications have increased. Many have attributed the rise of insomnia to pandemic-related stress, disturbance of circadian rhythm from home confinement, and worsening mental health.
Conclusion: To our knowledge, there have not been documented side effects of insomnia on the COVID-19 vaccines, with some studies suggesting sleep deprivation reducing their effectiveness. As vaccination efforts continue worldwide, awareness of side effects from vaccines is paramount for clinicians facing the challenges in patient care.This case demonstrates that chronic insomnia can be a side effect of the COVID-19 vaccines. Therefore, further surveillance of patients and side effects from COVID-19 vaccination is warranted as insomnia can have significant clinical and psychosocial consequences.
Support (If Any):

0863

A UNIQUE CASE OF SLEEP STATE MISPERCEPTION IN AN ELDERLY PATIENT.

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Introduction: Insomnia is a widespread condition, especially in the elderly population. While the International Classification of Sleep Disorders (ICSD) third edition appropriately removed primary insomnia subtypes from the classification, our case illustrates the importance of these factors in considering a chronic insomnia disorder diagnosis. We present a case of severe subjective insomnia with no apparent objective findings,

instead with evidence of excellent sleep efficiency on the contrary.

Report of Cases: A 76-year-old male with a past medical history of anxiety and a recent diagnosis of early Parkinson's disease presented to the Sleep medicine clinic with two years of insomnia which started after his retirement. The patient felt difficulty with falling asleep every night. He underwent a sleep study and was found to have sleep-disordered breathing, which responded well to Bilevel positive airway pressure (BiPAP) therapy. However, insomnia symptoms persisted and were resistant to multiple medications, including Mirtazapine, Melatonin, and Suvorexant. He was referred for Cognitive Behavioral Therapy with minimal to no improvement in his symptoms. Conversely, a one-week Actigraphy recording on Bipap therapy surprisingly revealed an excellent sleep efficiency with near-continuous seven to eight hours of sleep every night. The etiology of chronic insomnia is poorly understood but is typically multifactorial, as described in the second edition of ICSD. In this case, paradoxical insomnia played a significant role in the patient's clinical presentation. Paradoxical insomnia is defined as thoughts or perceptions of time asleep as wakefulness, with objective measures documenting normative amounts of sleep. Previous work suggests that alterations in the sleep/arousal system may contribute to this apparent mismatch between conventional objective sleep measures and subjective reports.

Conclusion: This case demonstrates the challenge of effectively diagnosing and managing chronic insomnia. While the new classification guidelines from the ICSD appropriately remove insomnia subtypes from the diagnostic paradigm, familiarity with these previously described subtypes may aid clinical decisions. Crucial to this discussion is that previously described "secondary" or "subtypes" of primary insomnia may develop an independent clinical course that may require further attention.

Support (If Any): ICSD 2nd,3rd editions.

864

SEVERE CENTRAL SLEEP APNEA

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University of Alabama at Birmingham [1]

Introduction: Central sleep apnea (CSA) is a rare form of sleep disordered breathing with repeated apneic episodes with absence of associated respiratory effort. CSA due to medication is well described in literature with opiate therapy. Baclofen which is a gamma-aminobutyric acid-B agonist with muscle relaxant properties has been implicated in CSA. We present a rare case of CSA likely due to chronic baclofen use. Patient underwent a polysomnogram (PSG) while on baclofen therapy which revealed severe central sleep apnea. Patient was weaned off baclofen therapy completely and a subsequent PSG was performed which revealed resolution of the CSA.

Methods: 28 year old male with cerebral palsy and neurogenic bladder who presented for evaluation of snoring, chronic insomnia and non-refreshing sleep. Overnight PSG was performed for further evaluation of his sleep related complaints while on chronic baclofen therapy, which revealed severe central sleep apnea. Trial of positive airway pressure therapy for treatment of CSA and supplemental oxygen therapy were attempted during the PSG but had to be terminated due to intolerance. Echocardiography and magnetic resonance imaging of the brain were performed to rule out congestive heart failure and Chiari malformation respectively, which revealed no underlying pathology to explaining the CSA. CSA in this patient was thought to be associated with chronic baclofen therapy. Patient was weaned off baclofen with repeat PSG revealing resolution of the CSA.

Results: 1st diagnostic PSG - on Baclofen: 139 central apneas, 6 obstructive apneas, 3 mixed apnea, and 38 hypopneas. This study showed severe central sleep apnea. The apnea-hypopnea index (AHI) was 51.5, REM index 21.8 and supine index 51.5. Central apnea index 39.5. Respiratory events were associated with moderate oxygen desaturations. The mean oxygen saturation during the study was 92.8%, with a minimum oxygen saturation of 81%. The patient spent 2.9 minutes with an oxygen saturation equal to or less than 88% for the entire study. CPAP titration was attempted and aborted, due to patient having difficulty tolerating CPAP. Supplemental oxygen was briefly added at 0.5 LPM, which was also discontinued due to patient complaining of burning sensation in the nose. Head of the bed was elevated at several levels (20 degrees, 30 degrees and 45 degrees) which did not attenuate the respiratory events. 2nd Diagnostic PSG – patient weaned off baclofen for study – Sleep efficiency reduced at 59.4%. Sleep onset latency 7.5 minutes. REM latency 163 minutes. 100% of total sleep time in supine position Moderate snoring. The apnea-hypopnea index (AHI) was 4.2, REM index 36.5 and supine index 4.2. Respiratory events were mainly noted using REM sleep. Respiratory events were associated with moderate oxygen desaturations. The mean oxygen saturation during the study was 93.9%, with a minimum oxygen saturation of 83%. The patient spent 1.2 minutes with an oxygen saturation equal to or less than 88% for the entire study. Labs and imaging – Workup for severe central sleep apnea after first diagnostic sleep study – Echo and MRI brain, which revealed no underlying pathology explaining his central sleep apnea. Therefore, thought to be due to baclofen.

Conclusion: 28 year old male, concurrent and past medical history of cerebral palsy, neurogenic bladder. Presented, initially to sleep medicine clinic for complaints of insomnia, snoring, and non-refreshing sleep. Wheelchair bound. Has muscle spasticity, was on baclofen. Underwent initial sleep study, for snoring and insomnia. The initial PSG was on baclofen doses. His initial PSG – showed apnea-hypopnea index (AHI) of 51.5, REM index 21.8 and supine index 51.5, Central apnea index 39.5. Oxygen nadir – 81%. Patient had 139 central sleep apnea events. Patient had MRI and echo, which revealed no pathology to explain his severe central sleep apnea. Baclofen on his medicine list – was the concern for the driving force behind his central sleep apnea. As a result, baclofen was weaned and stopped. Repeat PSG – showed moderate snoring, overall AHI greatly improved from first study to 4.2. Respiratory events were associated with moderate oxygen desaturations. The mean oxygen saturation during the study was 93.9%, with a minimum oxygen saturation of 83%. The patient spent 1.2 minutes with an oxygen saturation equal to or less than 88% for the entire study. In closing – due to the side effect profile of baclofen leading to central sleep apnea in this case, recommend alternative therapy in place of baclofen due to severe central sleep apnea with baclofen use.

Support (If Any): 1. Ghanavatian S, Derian A. Baclofen. In: StatPearls. Treasure Island (FL): StatPearls Publishing; May 15, 2021.2. Locatelli F, Formica F, Galbiati S, et al. Polysomnographic Analysis of a Pediatric Case of Baclofen-Induced Central Sleep Apnea. J Clin Sleep Med. 2019;15(2):351-354. Published 2019 Feb 15. doi:10.5664/jcsm.76443. Olivier PY, Joyeux-Faure M, Gentina T, et al. Severe Central Sleep Apnea Associated With Chronic Baclofen Therapy: A Case Series. Chest. 2016;149(5):e127-e131. doi:10.1016/j.chest.2015.10.001

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