Late Breaking Abstracts (CME)

LBA1255

Development and Validation of Obstructive Sleep Apnea Screening Model Using Deep Learning on Wearable Patch Holter Monitoring Signals

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Introduction: Obstructive sleep apnea (OSA) is a significant health concern; however, current diagnostic methods, such as polysomnography (PSG), are cumbersome and expensive. This study developed and validated a deep learning model using electrocardiogram (EKG) signals from a wearable patch Holter device for efficient and accurate OSA detection.

Methods: The study involved patients from the Severance Hospital's sleep clinic and used EKG signals from patch-type Holter devices concurrent with PSG. A 1-dimensional convolutional neural network (1-D CNN) model was developed for OSA detection, and its performance was assessed against PSG results.

Results: Among the 92 patients, who were predominantly men (75.0%) with an average age of 55.1 years, a varied distribution of OSA severity was observed, with severe OSA (47.8%) being the most common. The final artificial intelligence model for detecting sleep apnea displayed robust performance metrics, including an accuracy of 0.7739, precision of 0.7877, recall of 0.7793, and F1-score of 0.7835. This Model significantly outperformed traditional sleep questionnaires in predicting moderate-to-severe OSA, achieving an area under the receiver operating characteristic curve of 0.8877. The Model was particularly effective in accurately detecting cases of no OSA (100%) and severe OSA (81.0%), while showing moderate effectiveness for mild (50.0%) and moderate (51.7%) OSA.

Conclusion: This study successfully demonstrated the feasibility of using a 1-D CNN model with EKG signals from a wearable patch Holter device for OSA detection. This approach offers a promising alternative to conventional methods, highlighting its potential for clinical application and enhancing patient care during OSA diagnosis.

LBA1256

Trajectories of Insomnia Symptoms and Prediction of Depression in Adults: A 5-Year Longitudinal Study

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Introduction: Accumulating evidence has supported insomnia being a risk factor for depression, while the long-term course of insomnia and its effects on depression outcomes remained largely unknown. This study aimed to identify different trajectories of insomnia symptoms over five years and prospectively investigate their associations with depression in adults.

Methods: Participants were selected from a population-based study on the natural course of insomnia in Canada, and they completed annual surveys about their sleep and health status for five consecutive years. In the current study, we only included participants who did not have depression at baseline and had available data on their depression status for at least one follow-up point. Possible depression cases were identified by using a cutoff score of ≥ 20 on Beck Depression Inventory-II (BDI-II). Latent class growth mixture modeling was used to identify trajectories of insomnia symptoms measured by Insomnia Severity Index (ISI) over the 5-year period.

Results: A total of 2725 participants (mean [SD] age, 49.5 [15.0] years; range, 18.0-94.0 years; 1660 [60.9%] female) were included in this study. Five insomnia trajectory groups were identified: (a) good sleepers (n = 650 [23.9%]), (b) individuals with stable low insomnia severity (n = 949 [34.8%]), (c) individuals with progressive symptoms (n = 132 [4.8%]), (d) subthreshold cases with gradual improvements (n = 166 [6.1%]), and (e) those with persistent insomnia symptoms (n = 828 [30.4%]). Compared with good sleepers, the other four insomnia trajectory groups all exhibited higher risks of developing depression at follow-ups, especially those with progressive insomnia symptoms (RR, 18.80 [9.94 to 35.55]). Subthreshold cases with gradual improvements were less likely to experience depression than those with persistent (RR, 0.55 [0.35 to 0.86]) and progressive insomnia symptoms (RR, 0.34 [0.21 to 0.56]). The results remained unchanged after removal of the sleep item from the BDI-II.

Conclusions: Our findings indicate that insomnia symptoms, particularly when becoming persistent or progressive, are associated with greater risks of developing depression, which underscores the importance of timely addressing and managing insomnia in the prevention of depression.

Support: The research was funded by grant MOP42504 from the Canadian Institutes of Health Research.

LBA1257

Overnight Change in Alzheimer's Disease-Related Proteins Associated with Local Sleep Deficits and Emotional Memory Retention

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Introduction: While deficits in sleep oscillations are associated with Alzheimer's disease (AD), amyloid-β (Aβ) and tau pathologies, it remains unknown if overnight accumulation of these proteins, reflecting dynamic changes in production and clearance, are also associated with local sleep expression. Here, we examined salivary measures of AD-related proteins prior to and following overnight polysomnography (PSG) with high density electroencephalography (hdEEG), alongside sleep-dependent memory assessment in cognitively intact older adults.

Methods: Fifteen participants (aged 71.8 ±6.3 years, 10 female) underwent PSG with 128-channel hdEEG , with emotional memory assessed prior to and following sleep. Saliva samples were collected using a passive drool protocol within 1 hour of bedtime and waketime. EEG data during non-rapid eye movement sleep were preprocessed and relative spectral power was computed using multitaper spectral analysis with 11 tapers, with a focus on slow wave activity (0.5-4.5Hz) and total (11-16Hz), slow (11-13Hz), and fast (13-16Hz) sigma power. Salivary concentrations of Aβ38, Aβ40, Aβ42 and total-tau were quantified using Mesoscale Discovery assays on the MESO QuickPlex SQ120 instrument.

Results: Evening Aβ40 levels were negatively associated with posterior total (r=-0.58, p=0.038), fast (r=-0.56, p=0.045), and slow (r=-0.59, p=0.034) sigma power, while morning Aβ40 levels were associated with lower posterior slow sigma power (r=-0.63, p=0.046). Overnight increases in Aβ42 levels were associated with lower posterior slow sigma power (r=-0.59, p=0.045), and overnight increases in the Aβ42/40 ratio were associated with lower total (r=-0.65, p=0.020) and fast (r=-0.65, p=0.021) sigma power. Overnight retention of mnemonic discrimination ability for positive emotional stimuli was associated with posterior total (r=0.63, p=0.024) and fast (r=0.62, p=0.027) sigma power and trended towards significance with overnight increases in the Aβ42/40 ratio (r=-0.58, p=0.061). Evening (r=-0.62, p=0.018), morning (r=-0.60, p=0.035), and overnight change (r=-0.58, p=0.036) in total tau levels were negatively associated with central SWA, while overnight increases in total tau levels were positively associated with fronto-central gamma (28-40Hz, r=0.60, p=0.031) and theta (4.5-7.5Hz, r=0.62, p=0.027) power.

Conclusions: These findings indicate that overnight increases in AD-related proteins may disrupt slow wave and sleep spindle expression, increase cortical excitability during sleep, and impair emotional memory retention.

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LBA1258

Huddling During Sleep: Fragmentation and Synchronization Consequences

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Introduction: While the impacts of social interactions on animal development, physiology, and behavior are well documented, very little is known about how social context affects sleep, as animals are predominantly isolated during laboratory sleep studies. In this study, we employed wireless neurophysiological devices to characterize sleep behavior and neurophysiology in multiple freely moving mice living together under varying social conditions. In addition, as many animal species sleep while in close physical proximity to conspecifics, including humans, we investigated whether mice are motivated to huddle during sleep.

Methods: We employed video recording alongside simultaneous EEG/EMG recording from multiple mice within a group over 24 hours. To investigate if sleep huddling is a motivated behavior, we designed a novel behavioral apparatus that allows mice to choose between huddling with a conspecific or sleeping alone, under different experimental conditions. Furthermore, we employed a deep-learning-based approach to classify huddling behavior from video recording data. Finally, we characterized sleep architecture under different social conditions to examine how sleep is modulated by social context.

Results: We found that mice seek physical contact before initiating sleep and sleep in close proximity to one another. Our findings further suggest that huddling during sleep is a motivated behavior as mice are willing to give up their preferred sleeping location, even when heated, to have social contact during sleep. We also found that social sleeping fragments NREMS but synchronizes different neurophysiological features during sleep. Notably, we revealed that co-sleeping male siblings display a significant synchronization in REMS timing, although this was not present in female or unfamiliar mice.

Conclusion: Our findings provide novel insights into the motivation for physical contact and social modulation of sleep. Considering the prevalence of sleep disturbances and social isolation, understanding how social factors impact sleep health is essential. Further insights into these behavioral and neurophysiological interactions can yield strategies for combatting social stress-related sleep disturbances.

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Late Breaking Abstracts (Non-CME)

LBA1352 (Non-CME)
Prospective Clinical Validation of AI for PPG-based OSA detection utilizing Standardized Skin Color Assessments

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Introduction: Skin pigmentation influences pulse oximeter accuracy. However, standardized assessment is limited regarding skin pigmentation measures in HSAT and PPG-based wearable sleep tracker performance validation. HSAT, PPG-based wearable sleep tracking, and even PSG performance rely crucially on pulse oximetry and PPG signal accuracy. A clinical performance validation study was conducted on a PPG-based AI system for OSA detection and Sleep Staging, utilizing a prospective, non-randomized, IRB approved trial design with all-comers participation offered to subjects referred for PSGs. This study included standardized skin pigmentation assessments to enable bias analyses, in addition to self-identified ethnoracial affiliations.

Methods: The study sample included N=217 subjects enrolled with informed consent and PSGs with simultaneously recorded PPG signals using wearable PPG devices. PSG studies were scored by 3 sleep technologists (RPSGTs) and reviewed by sleep physicians. OSA diagnostic performance measures including AHI and TST were evaluated in relation to standardized skin color measures utilizing Ordinary Least Squares (OLS) analysis to evaluate for any systematic, directional, or significant differences in AHI or TST performance as a function of two continuous measures of skin pigmentation (Chroma and Color-Value) collected through clinician administration of standardized Munsell Color System (MCS) assessments during trial enrollment.

Results: The PPG-based AI system's AHI and TST measures demonstrated performance in comparison to gold-standard PSG measures, showing an average difference of 0.95 (95% CI: 0.66, 1.22) between PPG-AHI and PSG-AHI values, and -2.7 minutes (95% CI: -4.08, -1.44 minutes) between the TST values. For each subject, the absolute difference between the PPG-based AHI and TST, and gold-standard PSG AHI and TST, were also calculated to estimate the relationships between AI performance and skin pigmentation based on MCS-Chroma and Color-Values respectively. No statistically significant differences were observed in AHI performance (MCS-Color-Value OLS: $p>0.05$ (0.172), coefficient: -0.060) (MCS-Chroma OLS: $P>0.05$ (0.759), coefficient: 0.019), or TST performance (MCS-Color-Value OLS: $p>0.05$ (0.405), coefficient: 0.037) (MCS-Chroma OLS: $P>0.05$ (0.220), coefficient: -0.076), in relation to skin color.

Conclusion: The prospective trial findings showed no significant differences or bias in PPG-based performance related to skin color, statistically demonstrating the absence of influence of skin color on the accuracy and reliability of the AI system PPG-based AHI and TST results.

LBA1317 (Non-CME)

Effect of Oral Orexin Receptor 2 Agonist TAK-861 on the Severity of Symptoms in Individuals with Narcolepsy Type 1: Results from a Phase 2 Study

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Introduction: Narcolepsy type 1 (NT1) is characterized by excessive daytime sleepiness and the presence of cataplexy episodes and defined by low cerebrospinal fluid (CSF) orexin levels. The orexin receptor 2 agonist TAK-861 has shown wake-promoting effects and improvement of cataplexy-like symptoms in animal models of narcolepsy and is under investigation as a therapeutic agent for NT1.

Methods: An analysis of exploratory data from the randomized, double-blind, placebo-controlled, Phase 2 study (NCT05687903) was conducted to explore disease severity in individuals with ICSD-3 confirmed NT1. Eligible participants were age 18-70 years (Japan: 16-70), with an Epworth Sleepiness Scale (ESS) score >12, and ≥4 partial/complete episodes of cataplexy/week. Participants were randomized to oral TAK-861 (0.5mg twice 3 hours apart, 2mg twice 3 hours apart, 2mg then 5mg 3 hours later, or 7mg once daily), or placebo. Exploratory endpoints included change from baseline to Week 8 in the Narcolepsy Severity Scale for clinical trials (NSS-CT), and Clinical Global Impression (CGI) and Patient Global Impression (PGI) at Week 8. The NSS-CT, a validated, self-administered 15-item scale, evaluates the severity, frequency, and impact of five main narcolepsy symptoms (with four severity levels: mild 0-14, moderate 15-28, severe 29-42, very severe 43-57). Efficacy and safety data are reported separately.

Results: A total of 112 participants (mean age of 34.0 years, 51.8% female, ESS score 18.5, NSS score 30.7) were randomized to TAK-861 (0.5mg/0.5mg n=23, 2mg/2mg n=21, 2mg/5mg n=23, 7mg n=23) or placebo (n=22). Significant improvements in NSS-CT total score were achieved with TAK-861 (Least square [LS] mean [SE] change from baseline to Week 8: -18.2 [0.5mg/0.5mg], -21.0 [2mg/2mg], -21.1 [2mg/5mg], -17.2 [7mg]) with TAK-861 and -3.5 for placebo; all P<0.001 vs placebo). At Week 8, >70% of patients treated with TAK-861 were much/very much improved on the PGI and CGI, consistent with NSS-CT. TAK-861 was generally well tolerated and there were no treatment-related serious TEAEs or discontinuations due to TEAEs during the study.

Conclusion: In this Phase 2 study, TAK-861 showed significant and clinically meaningful improvements in NSS-CT and improvements in PGI and CGI versus placebo in participants with NT1 over 8 weeks.

Support: Funded by Takeda

LBA1318 (Non-CME)

Efficacy and Safety of TAK-861, an Oral Orexin Receptor 2 Agonist, in Individuals with Narcolepsy Type 1: Results From a Phase 2 Study

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Introduction: Narcolepsy type 1 (NT1) is characterized by excessive daytime sleepiness and cataplexy associated with low cerebrospinal fluid orexin levels. Orexin receptor agonists are promising treatments for NT1. The orexin receptor 2 agonist TAK-861 has shown wake-promoting effects and improvement of cataplexy-like symptoms in narcolepsy animal models.

Methods: This randomized, double-blind, placebo-controlled, Phase 2 study (NCT05687903) evaluated the efficacy and safety of TAK-861 in participants with ICSD-3-confirmed NT1. Eligible participants were age 18-70 years (Japan: 16-70), with an Epworth Sleepiness Scale (ESS) score >12, and ≥4 partial/complete episodes of cataplexy/week. Participants were randomized to oral TAK-861 (0.5mg twice 3 hours apart, 2mg twice 3 hours apart, 2mg then 5mg 3 hours later, or 7mg once-daily), or placebo. Endpoints included change from baseline to Week 8 in mean sleep onset latency on the Maintenance of Wakefulness Test (SOL-MWT; primary endpoint), ESS total score, weekly cataplexy rate (WCR), and occurrence of treatment-emergent adverse events (TEAEs).

Results: A total of 112 participants, previously withdrawn from stimulant and anti-cataplectic medication, were randomized (0.5mg/0.5mg n=23, 2mg/2mg n=21, 2mg/5mg n=23, 7mg n=23, placebo n=22). Participants had a mean age of 34.0 years and ESS score of 18.5 at baseline; 51.8% were female. Least squares (LS) mean (SE) changes from baseline to Week 8 in SOL-MWT were: 12.49 (2.13), 23.50 (2.04), 25.42 (2.07), 14.96 (1.95), and -1.16 (2.06) minutes with 0.5mg/0.5mg, 2mg/2mg, 2mg/5mg, 7mg and placebo, respectively (LS mean difference versus placebo all P≤0.001). After adjustment for multiple comparisons, statistically significant changes from baseline to Week 8 were achieved for all dose groups versus placebo for SOL-MWT and ESS, and for the 2mg/2mg and 2mg/5mg dose groups for WCR. TEAEs occurred in 77.8% (70/90) patients on TAK-861 versus 31.8% (7/22) on placebo. The most common TEAEs were urinary urgency/frequency and insomnia. No treatment related serious TEAEs or discontinuations due to TEAEs occurred during the study.

Conclusion: In this Phase 2 study, TAK-861 showed significant and clinically meaningful improvements versus placebo on objective and subjective measures of sleepiness and cataplexy frequency. TAK-861 was generally well tolerated in participants with NT1 over 8 weeks.

Support: Funded by Takeda

LBA1320 (Non-CME)

Improved Phenotyping Between Narcolepsy Type 1, Type 2 and Idiopathic Hypersomnia Through Classification and Clustering Methods Applied to Polysomnography

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Introduction: Differentiation between central disorders of hypersomnolence can be challenging due to overlapping clinical features, especially between narcolepsy type 1 (NT1) and type 2 (NT2), and between NT2 and idiopathic hypersomnia (IH). Recent debates even questioned whether NT2 is a distinct disease entity. This work seeks to better characterize disease phenotypes by studying nocturnal polysomnography (PSG) characteristics.

Methods: First, we developed an automated classification method to improve differentiation between patient groups. A rich set of sleep features, including quantitative electroencephalography (qEEG), was derived from routine PSG of 358 drug-free adults, with 114 NT1, 90 NT2, 105 IH and 49 clinical controls (CC) diagnosed according to ICSD-3 criteria at a French Reference Center for Rare Hypersomnias. Features were computed by whole night and by quarter-night. Classifier performance was evaluated on resampled training and test sets. Next, we used cluster analysis to quantify how sleep features varied within and across diagnostic groups. Unsupervised k-means clustering was performed within each diagnosis to identify subject sub-groups (clusters); the number of clusters per diagnosis (between 2-10) was selected by minimizing the Calinski-Harabasz index. We then tested (Kruskal-Wallis) for between-cluster differences and compared sleep characteristics across clusters.

Results: Random forest classifiers performed best, achieving AUCs of 0.78, 0.85, and 0.82 in discriminating NT2 versus IH, NT2 versus CC, and IH versus CC, respectively. Adding qEEG and quarter-night features improved NT2 versus IH classification (AUC was 0.67 for whole-night hypnogram-derived features, versus 0.78 for all features). Clustering revealed two NT1 subgroups, with more extreme (shorter REM sleep onset, higher wakefulness) and less extreme phenotypes. Two main IH clusters were found, with similar hypnogram-derived features but some qEEG differences. Two NT2 subgroups emerged: one more similar to the NT1 clusters, another to the IH clusters.

Conclusion: Classification results show the value of quarter-night features, with qEEG being especially helpful in NT2 versus IH classification. Clustering results provided insights into potential heterogeneity within each diagnosis and suggest the existence of one NT2 subgroup similar to NT1 and another similar to IH. These results may help improve patient diagnosis and identify novel biomarkers for clinical trials.

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Late Breaking Abstracts - Posters

LBA 1259

Improving Sleep Quality and Quantity in Hospitalized Patients with Melatonin: A Quality Improvement Project at HCA Oak Hill Hospital

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Introduction: Sleep disturbances are prevalent in hospitalized patients, negatively impacting well-being and clinical outcomes. Despite initial non-pharmacological efforts, challenges remain, prompting exploration of pharmacologic solutions. We aimed to improve sleep quality and quantity in hospitalized patients using melatonin.

Methods: We conducted a before-and-after study. A total of 117 participants were included in the study, with sleep-related parameters assessed before and after melatonin administration. Prior to melatonin administration, a comprehensive survey adapted from the Richards-Campbell Sleep Questionnaire Sleep Efficiency Index (RCSQ) and Pittsburgh Sleep Quality Index (PSQI) assessed various sleep dimensions: sleep latency, awakenings from sleep, sleep quality, and total sleep duration. Sleep duration was measured in hours. Sleep latency, awakenings, and overall sleep quality were measured on a scale from 0 to 10, with 0 indicating the poorest and 10 the best sleep experience. Descriptive statistics and non-parametric tests were employed to analyze the data. Non-parametric tests (NPar Tests and Wilcoxon Signed Ranks Test) analyzed survey data and objective sleep duration measurements before and after melatonin administration.

Results: Melatonin administration led to significant improvements in sleep parameters. Average sleep duration increased by 17.9% (4.9 to 5.7 hours), sleep latency score increased by 22.3%, awakenings from sleep score decreased by 29.3%, and sleep quality score increased by 32%. These findings suggest a positive impact of melatonin on both objective and subjective aspects of sleep.

Conclusion: Melatonin administration improved sleep quality in hospitalized patients. Increased sleep duration, improved sleep latency, reduced awakenings, and significant subjective sleep quality improvement suggest that melatonin supplementation may be a promising intervention to enhance sleep in this population.

Support: HCA Healthcare Disclaimer

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LBA 1260

No Time to Sleep! Investigating the Relationships Between Stress, Time Management, and Sleep in Young Adults

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Introduction: Stress is often reported by young adults and has been shown to increase arousal and impair sleep health. Poor time management, which may be both a cause and consequence of stress, may also impair healthy sleep by limiting available time in bed. However, little is known about the potential synergistic effect of stress and time management on sleep health. The purpose of the present study was to examine the independent association between stress, time management, and sleep duration and to test the extent to which the relationship between time management and sleep duration was moderated by stress in a sample of 199 young adults. We hypothesized that better time management skills and lower perceived stress would independently predict longer sleep duration. We also hypothesized a significant interaction effect, such that the negative association between time management behaviors and sleep duration would be exacerbated by higher stress levels.

Methods: 199 healthy young adults completed the Perceived Stress Scale-10 and Time Management Behavior Inventory and wore an Actiwatch for one week to estimate average sleep duration.

Results: Linear regression models showed that better time management (B = 0.43, p = 0.03), but not perceived stress (B = -0.35, p = 0.67), predicted longer sleep duration. Although stress and time management were significantly correlated (r = -0.33, p = 0.001), stress did not moderate the association between time management and sleep duration.

Conclusion: These results suggest that time management behaviors may be related to sleep duration independent of stress. Further research might consider time management as a potential behavior target to improve sleep health among young adults.

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LBA 1261

Opt-Out

LBA 1262

Evaluating the Clinical Performance of a Novel, Precision Oral Appliance Therapy Medical Device Made Wholly from a Medical Grade Class VI Material for the Treatment of Obstructive Sleep Apnea

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Introduction: To evaluate the clinical performance of a novel, precision, oral appliance therapy ("OAT") medical device made entirely from a US Pharmacopeia ("USP") medical grade class VI qualified material for the treatment of obstructive sleep apnea ("OSA").

Methods: Multi-center, single-arm, chart based, retrospective study of 91 patients diagnosed with OSA, treated utilizing a novel, precision, OAT medical device. Performance criteria were: overall efficacy (reduction of OSA events to less than 10 per hour); efficacy for patients with severe OSA (reduction of OSA events to less than 20 per hour and a 50% improvement); and compliance (the rate of continuation of treatment after at least a one year follow up, or, conversely, the rate of discontinuation of treatment due to materials-related adverse events or side effects after one year).

Results 89% of all subjects diagnosed with all levels of OSA severity were successfully treated to an apnea hypopnea index ("AHI") < 10 events per hour. 98% of subjects diagnosed with mild to moderate OSA were successfully treated to an AHI < 10. Eighty percent of subjects with severe OSA, without screening or excluding subjects for airway collapse profile, were successfully treated to an AHI < 20 with a 50% improvement in AHI. After a minimum one-year follow-up period, 96% of patients were confirmed to remain in active treatment. No subjects were reported to discontinue treatment due to adverse events or side effects.

Conclusion This novel, precision OAT medical device made from USP Class VI qualified material demonstrated efficacy and safety for the treatment of patients with OSA.

LBA 1263

Using Machine Learning to Predict Depression and Slow-Wave Sleep Deprivation with Transcranial Magnetic Stimulation Measures of Neuroplasticity

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Introduction: This study evaluates whether major depressive disorder (MDD) and sleep slow-wave deprivation (SWD) states can be predicted with machine learning (ML) using proxies of neuroplasticity and cortical excitability. We engineered two measures of neuroplasticity (ρ and δ) using paired transcranial magnetic stimulation (TMS). ρ and δ measure intracortical inhibition/facilitation by comparing paired stimulation power with mean single and inverse single stimulation power, respectively.

Methods: Individuals with MDD (N=26) and healthy controls (N=17) underwent TMS of the motor cortex after baseline sleep conditions and SWD. SWD was induced using auditory stimuli. TMS sessions included 24 single pulses and eight paired pulses per interstimulus interval (ISI) of 4, 5, 8, 10, 15, and 20 milliseconds. MEP amplitude was measured with peak-to-peak electromyography (PTP-EMG) of the targeted muscle. The resulting data consisted of N=9382 samples. Random forest models were tasked with predicting the interaction of sleep condition (baseline vs. SWD) with group (MDD vs. healthy controls) of each stimulation (multinomial task), followed by MDD and SWD separately (binary tasks). Per task, we tested a model with PTP-EMG and ISI as predictors and another with the same predictors plus δ and ρ. All models had the same parameters.

Results: δ, ρ and PTP-EMG predict depression, SWD, and their interaction, with remarkable accuracy (balanced accuracy ≥ 0.856). While models without δ and ρ did not outperform random guessing, when δ and ρ were added, multinomial prediction reached a balanced accuracy of 0.856 and a macro-averaged recall of 0.856. Binary prediction of depression had a balanced accuracy of 0.884 and a recall of 0.937. SWD state prediction had a balanced accuracy of 0.929 and a recall of 0.925.

Conclusion: δ and ρ have great predictive power and may provide a general contribution to the study of neuroplasticity in the brain. Upon validation, our results suggest that TMS data can assist diagnoses of both depression and slow-wave activity abnormalities. If TMS-induced mood improvements stem from enhanced synaptic dynamics, data from a depressed individual undergoing therapeutic TMS should eventually be classified as that of healthy control. Thus, therapeutic TMS data can gauge treatment response.

Support: K23MH118580

LBA 1264

The Association Between Slow-Wave Sleep and Choroid Plexus Calcifications in Older Adults

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Introduction: For much of the 20th Century, investigators considered the main function of the choroid plexus to be CSF secretion. More recently, this structure emerged as a key element of early brain development, brain microenvironment homeostasis, immune and chemical trafficking, circadian rhythms, and presumably as a support for the glymphatic system. This study aims to expand our knowledge on the latter mentioned relationship, by exploring a potential association between automated measurement of CPC volume according to percentages of N3 sleep as determined by polysomnography (PSG).

Methods: Community-dwelling individuals aged ≥60 years enrolled in the Atahualpa Project Cohort were invited to receive head CTs (for automated determinations of CPC volume) and a single-night polysomnography (PSG) for quantification of N3 sleep percentages. Linear regression and non-parametric models were fitted to assess the association between these variables, after adjusting for demographics, clinical covariates, and PSG parameters.

Results: A total of 125 older adults (median age: 65 years; 32% males) were included. The mean percentage of N3 sleep was 12.4±9.1%, and the mean volume of CPC was 655±345.3 µL. Linear regression models did not show any association between both variables. Non-parametric locally weighted scatterplot smoothing showed that the volume of CPC increased as the percentage of N3 sleep increased, but only when N3 sleep is reduced (up to 12% of total sleep time). The significance disappeared in participants with normal N3 sleep percentages.

Conclusion: Study results suggest that in the presence of severe reductions in N3 sleep, increased CPC volume may be a manifestation of choroid plexus compensation or adaptation, and not necessarily dysfunction.

LBA 1265

The Effect of Medicinal Cannabis on Sleep in Children with Autism Spectrum Disorder

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Introduction: Children with Autism Spectrum Disorder (ASD) frequently encounter sleep disturbances that adversely affect their daily functioning and quality of life. Conventional treatment modalities often fall short in providing relief, leading to a growing interest in alternative therapies. Medicinal cannabis, particularly due to its varied cannabinoid profiles, has emerged as a potential therapeutic option. This study aims to assess the efficacy of specific CBD:THC ratios in improving sleep parameters among children with ASD.

Methods: This open-label trial involved 80 children aged 3 to 17 years diagnosed with ASD and experiencing sleep disturbances. Participants were randomized to receive medicinal cannabis oil with CBD:THC ratios ranging from 0:1 to 19:1, tailored to individual needs and responses. The primary focus was on evaluating the overall effectiveness as well as of various ratios of CBD and THC. Sleep metrics, including onset latency, quality, and duration, were assessed using actigraphy, parental diaries, and validated questionnaires at baseline and after a 12-week treatment period.

Results: Significant improvements in sleep onset latency, quality, and duration were observed in participants, with the most pronounced benefits seen at CBD:THC ratios of 1:1 to 4:1. These findings suggest that these ratios might offer an optimal balance for therapeutic effects in children with ASD. Conversely, the effectiveness appeared to diminish at the extremes of the CBD:THC ratios (0:1 and 19:1), indicating the significance of an optimal balance. The intervention was well-tolerated, with minimal adverse effects reported, underscoring its safety profile.

Conclusion: Medicinal cannabis, at the specific range of CBD:THC ratios of 1:1 to 4:1, demonstrates promising therapeutic potential for managing sleep disturbances in children with ASD. This study highlights the importance of cannabinoid profiling in developing effective treatments. Further research is warranted to explore long-term impacts and mechanistic insights.

Support: This research was conducted independently, without external funding, to ensure the integrity and unbiased nature of the findings.

LBA 1266

Sleep Duration in Midlife is Associated with Memory Deficits in Later Life

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Introduction: Cross-sectional studies suggest that both short and long sleep duration predict worse performance on tests of cognitive function, but little is known about how decades-long exposure to unhealthy sleep duration in midlife is associated with declines in cognition in older age.

Methods: A subset of Wisconsin Sleep Cohort study participants (N-526; 42% femail/ Mean(SD) age 57(6) years at first cognitive test) who had at least 2 cognitive assessments from age 50 onward and who gave consent for APOE4 genotyping were included in the sample. The analytic sample included 1562 observations. At each study exam, participants completed questionnaires about sleep and health habits and completed a neurocognitive assessment, including the Controlled Oral Word Association Test, Trails Making Test Part B, Grooved Pegboard Test, Auditory Verbal Learning Test (AVLT), Digit Cancellation, and Symbol Digit Modalities Test. Self-reported weekday and weekend sleep were collected at each study visit. Midlife sleep was defined as the average sleep duration from ages 45-60 years. There were multiple study visits per participant (range 2-7, mean=3; follow-up time (first to last), range 3033 years, mean-15)). PROC MIXED in SAS with repeated measures was used to regress cognitive performance after age 50 on average midlife sleep duration (separate models for each cognitive test) in linear regression models. Models were adjusted for age, sex, education, BMI, APOE4 status, AHI, and CPAP use.

Results: Midlife sleep duration was significantly associated with each of the measures of the AVLT in later life, including immediate recall, learning, delayed learning, recognition, and retention. Sleep duration-squared was significantly (two $p<0.03$, three $p<0.01$) associated with each of these outcomes, suggesting a non-linear relationship between sleep and cognition, where both short and long sleep were associated with worse cognition. None of the scores derived from the other 5 cognitive tests was significantly associated with midlife sleep duration.

Conclusion: Optimal sleep duration across midlife years may be an important modifiable contributor to better cognitive outcomes later in life.

Support: This work was supported by the National Heart, Lung, and Blood Institute (R01HL62252) and the National Institute on Aging (R01AG058680) at the US National Institutes of Health.

LBA 1267

Heart Rate Variability During Wake and Sleep in Veterans with Comorbid Traumatic Brain Injury, Post-Traumatic Stress Disorder, and REM Sleep Behavior Disorder

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Introduction: Individuals with comorbid REM sleep behavior disorder (RBD) and neurotrauma (NT-defined by traumatic brain injury plus posttraumatic stress disorder) have earlier age of RBD symptom onset, increased symptom severity and worsened prodromal synucleinopathy features compared to RBD only. An early sign of neurologic impairment is autonomic dysfunction, which we evaluated via heart rate variability (HRV) during sleep. This may yield insight into neuropathologic trajectories.

Methods: Participants with overnight polysomnography and confirmed RBD with and without NT were recruited from the VA Portland Health Care System. Veterans (age ±2 years and sex-matched) without NT or RBD (controls; n=19), with RBD but without NT (RBD; n=9), without RBD but with NT (NT; n=8), and with RBD+NT (RBD+NT; n=20) were evaluated. Eligible epochs (wake, NREM 1/2/3, REM) were free of apneas/hypopneas, microarousals, and ectopic beats. Time and frequency domain HRV analyses were done via WinCPRS. Data were log transformed. One-way ANOVAs with post hoc tests examined HRV group differences during each sleep stage.

Results: Heart rate did not significantly differ between groups in any sleep stage ($p>0.05$). Overall, RBD+NT showed reduced HRV in terms of time and frequency domain outcomes. Specifically, low frequency power during NREM was significantly lower in RBD+NT compared to RBD alone and controls ($p=0.0243$, $p=0.017$, respectively). High frequency (HF) power during NREM was significantly lower in RBD+NT compared to RBD ($p=0.003$), NT ($p=0.021$) and controls ($p=0.024$). HF power during wake was significantly reduced in RBD+NT compared to RBD ($p=0.0096$), NT ($p=0.0.13$), and controls ($p=0.034$). Root mean square standard deviation (RMSSD) of HRV during NREM was significantly lower in RBD+NT compared to RBD ($p=0.002$), NT ($p=0.026$), and controls ($p=0.031$). Similarly, pNN50 (%differences in successive RR values >50ms) during NREM was significantly reduced in RBD+NT compared to RBD ($p=0.007$) and NT ($p=0.027$).

Conclusion: These data suggest significant reduction in HRV in RBD+NT, indicating greater autonomic dysfunction in these individuals compared to controls or either condition alone. HRV may be a promising biomarker, yielding mechanistic insight for diagnosis and prognosis of early neurodegeneration in this vulnerable population.

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LBA 1268

Putative Association Between Elevated Plasma p-tau Levels and Decreased Sleep Spindle Activity among Older African Americans

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Introduction: Newly developed biomarkers, including blood p-tau181, p-tau217, and p-tau231, have been established and validated as indicators reflecting the underlying pathophysiological processes of tau and amyloid-β (Aβ) in the brain. Sleep spindles, recognized for their role in memory consolidation and generalization, hold promise as biomarkers in preclinical Alzheimer's disease (AD). This study aimed to explore the association between sleep spindle activity and p-tau levels in cognitively healthy older African Americans.

Methods: Participants for this study were recruited from the ongoing longitudinal research study, *Pathways to Healthy Aging in African Americans*, conducted at Rutgers University–Newark. Seventy-five individuals aged between 60 and 87 years were included in the study. Participants completed a blood draw and sleep monitoring at home over two nights using the DREEM 3 Headband. Plasma samples were obtained from the blood draws and analyzed for p-tau231 levels using Single Molecule Array technology, employing in-house methods at the University of Gothenburg. Participants were classified into two subgroups based on their p-tau231 levels, with a subset identified as having elevated levels (8.944 pg/mL) according to the sample median thresholds. The covariates considered in this abstract were age, sex, and education.

Results: Participants with high levels of p-tau231 (≥8.944 pg/mL) had significantly lower frontal sleep spindle relative power than individuals with lower p-tau 231 levels (≤ 8.944 pg/mL) (F(add degrees of freedom)= 1.110, η_p^2 = 0.175, p = 0.378).

Conclusion: Sleep spindle relative power may be a potential indicator for p-tau231 levels in cognitively intact older African Americans with preclinical AD.

LBA 1269

Who Supports Sleep-Related Public Health Policies?

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Introduction: Insufficient sleep is common in the United States, with more than a third of adults and two-thirds of adolescents not meeting sleep duration recommendations (CDC, 2022; Wheaton, Jones, Cooper, & Croft, 2015). Such levels of sleep deprivation have wide-ranging public health implications, prompting increased recognition of the importance of sleep health-promoting policies among scientists. However, studies examining public support for policies promoting sleep health are rare.

Methods: We quantify support for three sleep health-related policies in a sample of 1159 American adults in an online survey (mean age = 40.2 ± 13.3 years; 49.3% female; 64.2% White). We also examine demographic and sleep-related factors as predictors of support for each policy using binary logistic regression.

Results: Generally, respondents reported favorable perceptions of sleep health-related policies: 66.8% supported elimination of daylight savings time in favor of a fixed, national year-round clock time, 58.2% supported a national requirement for later high school start times, and 58.2% supported broadening of national regulations of working hours to include all American industries. However, predictors of support varied by the policy in question. Respondents who ranked themselves higher on social status were more likely to support a fixed clock time, while Asian and Black respondents (versus White respondents), those living in the Northeast and South (versus West), and those scoring higher on a measure of belief in sleep myths were less likely to support a fixed clock time. Younger individuals, females, and those with a stronger interest in sleep were more likely to support later high school start times, while those living in the Midwest (versus West), and those with high sleep myth scores were less likely to support later high school start times. Individuals supporting increased regulation of work hours were younger, Black, employed full-time (versus unemployed), of lower subjective social status, and longer sleepers (> 8 hours per night).

Conclusion: A better understanding of perceptions of sleep health-related policies can inform the development of targeted public health and educational interventions.

LBA 1270

Association of Hippocampal Volume and Insular Thickness with Sleep Disorder Diagnoses in Epilepsy Patients

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Introduction: Comorbid sleep disorder increases the risk of sudden unexpected death in epilepsy (SUDEP). The hippocampus is implicated both in sleep disorders and epilepsy, but the role of the insula is lesser known. In the current pilot study, we quantify the hippocampal volumes and insular cortical thickness and correlate that to documented sleep disorders in epilepsy patients.

Methods: We analyzed the MRI of 73 epilepsy patients: adult (55), adolescent (18), females (32), right-handed (57), age (32 years median). Hippocampal volumes and insular thickness were obtained from 3D T1 MRI scans analyzed with CAT12. Hemispheric asymmetry indices were compared to age and gender matched normative values from ENIGMA database. We conducted cross-correlations of the hippocampi volumes and insular thickness as a function of sleep disorder diagnosis: Obstructive sleep apnea (OSA), non-OSA sleep disturbances, or no known sleep disorder. ANOVA to analyze which brain structural changes predicted sleep diagnosis.

Results: 19 patients had OSA, 36 sleep disturbances, and 18 had no sleep disorder diagnosis. The known origins of epileptic foci were 26 left, 19 right, 23 bilateral. 57 patients had temporal lobe epilepsy. Compared to normative volumes, all adults and 77% adolescents had bilateral hippocampal atrophy. Abnormal leftward hippocampal asymmetry was seen in 83% adolescents and 20% adults, whereas abnormal right hippocampal asymmetry was seen in 79% adults. The right insular cortex showed abnormal thickening in 53% of all OSA patients, 44% in other sleep disturbances and 44% with no sleep disturbances. Insular asymmetry was abnormally right in 96% of adults and corresponded to abnormal thickness of the right insula. Left hippocampal volumes correlated significantly with right insular thickness (R=0.25). Only right hippocampal volume predicted sleep diagnosis significantly (p<0.05).

Conclusion: Most of our epilepsy subjects showed bilateral hippocampal atrophy and only right hippocampal volume predicted sleep diagnosis. Right insular cortical thickenings were observed in most adult epilepsy patients although more predominantly in comorbid OSA patients. The insula is known to play a significant role in autonomic and respiratory function. Our preliminary findings warrant further investigation into the role of hippocampal and insular brain regions in epilepsy patients with comorbid sleep disorders.

LBA 1271

Magnesium Citrate Monotherapy Improves RLS Symptoms and Multiple Suggested Immobilization Test Scores in an Open-Label Pilot Study

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Background: An estimated 2-3% of the population suffers from clinically significant restless legs syndrome (RLS). Given the limited pharmacological options in the arsenal, there is a need for a therapeutic agent with a better side effect profile.

Methods: Twelve treatment naïve adults (10 women and two men with a median age of 41.5 [32-48.5] years) with primary RLS were recruited in our open-label pilot study; magnesium citrate 200 mg was administered daily for eight weeks. Participants maintained stable RLS-exacerbating medication doses. Untreated OSA patients were excluded. None of the subjects used iron and magnesium concurrently during the study. Serum magnesium levels, IRLS, Kohnen QOL scale, and multiple suggested immobilization tests (m-SIT) – three 1-hour tests - were performed before and after supplementation. Paired t-tests and Wilcoxon signed-rank tests were used for data analysis. Pearson and Spearman's analyses assessed the association between magnesium levels and RLS variables.

Results: Participants had a significant reduction in IRLS scores (- 6.67 [2.33-11], p=0.006) and improved Kohnen QOL scores (-8.5 [2.09-14], p=0.014) without notable differences in serum magnesium levels (1.91 ± 0.23 vs 1.95 ± 0.16, p=0.3). Average PLMW across all SIT trials (30.40 [5.20, 122.40] to 8.63 [0.32, 17.47], p=0.043) and subjective measures on m-SIT (Trial 1: 20 [17-32] vs 7 [0.25-12.5], p=0.028), Trail 2: 26[15-39] vs 5.5[0.75-8.25], p=0.012, Trial 3: 21[14-35] vs 6 [0-8], p=0.043) also demonstrated improvement. Serum magnesium levels negatively correlated with m-SIT self-reported scores and the PLMW indices.

Conclusion: All participants tolerated the magnesium citrate 200 mg dose well. Objectively measured PLM improvement suggests that the observed benefits of magnesium citrate supplementation are unlikely solely due to the placebo effect. Despite the limitations of open-label design, our study's positive results indicate the need for a placebo-controlled trial with a larger sample size.

LBA 1272

Influenza A(H1N1) pdm09 and B Viruses but not COVID-19 as Triggers for Narcolepsy with Cataplexy

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Introduction: Influenza A(H1N1) pdm09 (H1N1) infection may trigger narcolepsy with cataplexy (NC) onset. Yet it fails to explain the seasonality of NC onset and common childhood cases in China before 2009, as well as increased incidences in years after 2009 without H1N1 epidemics. This suggests other triggers in NC pathogenesis. Dual seasonal pattern of influenza and infection prevention for COVID-19 in China enable exploring the link between NC onset and influenza activity as well as COVID-19.

Methods: Using nationwide surveillance network of narcolepsy and flu data in China, the association, causation, and serological evidence between NC and influenza were assessed. Among 3,335 patients with typical cataplexy, 2,358 (70%) patients with accurate onset month were analyzed. First, seasonality and annual NC incidence (2000-2023) correlated with SARS (2003) and COVID-19 (2020-2022) pandemics were explored. Second, seasonal patterns of NC onset in North and South China were characterized by spatial analysis. Third, association and causation of NC onset with influenza activity (2005-2023) were assessed by temporal analysis. Finally, to ascertain the specific flu infection as a risk for NC, the influenza antibody was tested by a matched case-control serological study.

Results: The annual NC onset had a prominent peak in 2010 after H1N1, and two troughs in 2004 and 2021 following SARS and COVID-19 control measures. The seasonal NC onset was high in Spring and Summer, and low in Winter. Spatial analysis found a single onset peak in April for North China and two later peaks in May and September for South China, fitting the flu patterns across regions. Temporal analysis identified that besides H1N1, B/Victoria and B/Yamagata were also triggers for NC, especially in children, with a gap of 5 months for H1N1, and 3-4 months for influenza B viruses (IBV) between pandemic and NC onset. Serum testing further confirmed NC has higher titers for H1N1 and IBV, specifically B/Victoria.

Conclusion: H1N1 and IBV, but not COVID-19, are triggers for NC, highlighting the significance of IBV infection, particularly in children who are more vulnerable and have more severe symptoms. New IBV antigens may help illustrate immune-mediated mechanisms of orexin/hypocretin neuronal destruction in NC.

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LBA 1273

Transitional Change in A Fluctuation of Sustained Attention During Intensive Inpatient Treatment Predicts Clinical Outcome in Patients with Delayed Sleep-Wake Phase Disorder

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Introduction: Delayed sleep-wake phase disorder (DSWPD) is primarily characterized by difficulties in synchronizing individual's endogenous circadian rhythms with the social demands of the sleep-wake schedule. However, about half of the patients are known to show normal endogenous circadian rhythms with maladjustment in sleep-wake schedule. A common neural mechanism may underlie both the sleep-wake switch and sustained attention, suggesting that fluctuations in sustained attention are a key to understanding the difficulty in synchronization. We investigated the relationship between fluctuations of sustained attention and clinical outcomes from an intensive inpatients intervention of DSWPD.

Methods: Thirty-three patients with DSWPD received a 3-week intensive inpatient intervention to advance their sleep-wake phase, which consisted of melatonergic medication, bright light exposure, and enhanced behavioral therapy, from April 2019 to December 2023. The outcomes of the intervention were assessed at 1 week after admission and 3 months follow-up using diary- or actigraphy-measured waketime. Changes in fluctuations in sustained attention during hospitalization were quantified using the Conners Continuous Performance Test, and their relationships to treatment effects were examined.

Results: Among 25 study completers, the more the sleep-wake phase advanced during the early phase of treatment, the more greatly the hit reaction time (HRT) block change worsened during hospitalization (β=0.650, p=0.013). The worsening of HRT block change then predicted a greater sleep-wake phase advance at follow-up relative to the pretreatment baseline (β= 0.628, p=0.049). At baseline, waketime was delayed in the severely delayed group (SDG) by 2:49 hours relative to the mildly delayed group (MDG), while at both discharge and follow-up periods, waketimes were similar between the groups. During hospitalization, while HRT block change remained unchanged in the MDG, it worsened in the SDG. No associations were found between changes in HRT standard deviation during hospitalization and changes in sleep-wake phases at 1 week after admission and follow-up.

Conclusion: Fluctuations in sustained attention may suggest intensive treatment response in DSWPD. Although sustained attention worsens, which may come at the cost of maintaining waketimes, DSWPD patients with a severely delayed sleep-wake phase appear to similarly benefit from an intensive inpatient treatment as those with a mildly delayed sleep-wake phase.

LBA 1274

Tongue Image and Radial Arterial Pulse Waveform Analytics in the Assessment of Insomnia: An Actigraphy-Validated Study

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Introduction: Insomnia is a common psychiatric disorder, yet it lacks consistent biomarkers and precise measurements for diagnosis. Although actigraphy and sleep diary provide quantitative evaluation for sleep, subjective-objective sleep measurement discrepancies remain a challenge. Here we present a pilot study using innovative Chinese medicine measurements, including tongue image and pulse waveform analytic devices, to correlate the results with actigraphy-based and sleep questionnaire-based measurements.

Methods: Forty insomnia patients were enrolled in this prospective observational study. Primary outcome measures included 7 consecutive days of actigraphy with a sleep diary, clinical symptoms, sleep questionnaire (Insomnia Severity Index; ISI), psychiatric questionnaire (Beck Depression Inventory), and actigraphy, along with tongue and pulse diagnostic exams. Tongue images including tongue shape, color, fur thickness, fur color, saliva, tongue fissures, ecchymoses, teeth marks, and red spots were collected using an Automatic Tongue Diagnosis System and analyzed by a Chinese medicine doctor in the study group. In addition, pulse waveforms were collected at the three nearby locations of the radial artery above the styloid process on both wrists, where the frequency and amplitude of the waveform were analyzed by the Asia Plus Pen Pulse Analysis System. Chi-square and ANOVA analyses were performed to correlate data between TCM and current sleep instruments.

Results: The tongue images showed a significant difference among the tongue fur and fissure amounts at the bilateral tongue region ($p=0.011$) between the mild and severe insomnia groups. The result was consistent using ISI (cutoff score 11, $p=0.01$) and actigraphy ($p<0.001$). Pulse waveforms revealed strong correlations between pulse pressure and insomnia severity at three detection sites ($R^2= 0.79, 0.95, 0.99$). In subgroup analysis classified by degree of depression, low pulse wave signals at both 0-10 Hz and 13-50Hz spectrograms were found in the less depressed group.

Conclusion: Our study demonstrated that the results from tongue images and pulse waveforms strongly correlated with questionnaires and actigraphy-based results in diagnosing insomnia. This preliminary finding may have the potential for introducing precise measurements of sleep, facilitating the diagnosis and subtyping of insomnia.

LBA 1275

CBT-I Improves Multidimensional Sleep Health in Veterans with and without Obstructive Sleep Apnea

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Introduction. Nearly half of US Veterans with obstructive sleep apnea (OSA) have comorbid insomnia (coined "COMISA"). Recent trials suggest Cognitive Behavior Therapy for Insomnia (CBT-I) effectively treats insomnia in adults with COMISA. As Veterans with COMISA have complex sleep presentations, characterizing treatment-related changes by multidimensional sleep health – a composite measure of key sleep dimensions – may be beneficial. However, the effects of CBT-I on multidimensional sleep health are not yet established in insomnia/COMISA. This study uses electronic medical record data of Veterans who engaged in CBT-I to assess changes in sleep health dimensions.

Method. Data were obtained from VA CBT-I progress notes from 10/2015 to 06/2023. OSA diagnosis was determined by ICD-10 codes. Three sleep health dimensions were extracted from averaged weekly sleep diaries from CBT-I notes, dichotomized to reflect optimal levels [efficiency (>85%), duration (6-8 hours), and timing (sleep midpoint 2-4 AM)], then summed to represent total sleep health (0-3). Multilevel models assessed within-person changes from the first to final CBT-I session and compared between Veterans with and without OSA. Covariates included sex, age, race, and total sessions attended.

Results. Among 11,444 Veterans (82.6% Male, mean age = 51.6 years, 38% non-White, 54.4% with OSA, mean total sessions = 4.2), the proportion meeting optimal sleep health significantly improved from first to final session (duration: 37.4 to 43.4% [339.9 to 349.9 minutes], efficiency: 21.7 to 57.1% [71.9% to 82.9% efficiency], midpoint: 54.8% to 60.0% [midpoint of 2:52 to 3:02]). In multilevel models, OSA was associated with relatively smaller improvement in efficiency ($b = -.06$, $p < .0001$), midpoint ($b = -.02$, $p = .03$), and total scores ($b = -.08$, $p < .0001$) at the final session compared to Veterans without OSA. However, in a subsample of Veterans who completed 4 or more CBT-I sessions (n = 6,358), there was no significant OSA*time interaction for any sleep health measure.

Conclusion: CBT-I improves sleep health in Veterans with and without OSA, though this benefit was slightly less pronounced in Veterans with OSA. Completing ≥ 4 CBT-I sessions yielded comparable sleep health improvements regardless of OSA diagnosis.

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LBA 1276

Finite Element Analysis (FEA) Study to Assess Tooth Forces of a 3-D Printed Nylon Oral Appliance to Treat Obstructive Sleep Apnea

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Introduction: Oral appliance (OA) therapy provides a treatment option for obstructive sleep apnea (OSA). Concerns regarding occlusal changes and side effects exist. Finite Element Analysis (FEA) is an accepted mathematical simulation approach for biomechanical analysis. This study evaluated the force distribution on teeth and periodontal ligaments (PDL) for the Panthera D-SAD (Classic and X3) OAs.

Methods: The FEA application included material properties and boundary conditions such as forces and constraints. Computer-aided engineering workflows were used. A CT scan of a female OSA patient's oral anatomy (teeth/PDL ligaments) was integrated into FEA software (Ansys) and matched with OA digital files. Various design permutations and their impact were assessed to gauge forces generated on the teeth.

Results: The OA titration system location propagates the highest force load on the adjacent teeth. For both OA models, positions of the titration system produced a negligible average difference of 0.72 Newton (N) applied to the upper and lower canines, premolars, and molars in favor of traction OA. Bands with overlap and no contact with anterior teeth resulted in zero forces applied. No OA contact between the anterior teeth redistributes the force among the stronger teeth and leads to a 17.14% reduction of negligible teeth displacement, predominately for the anteriors. The upper band with overlap/no contact led to better force distribution within the OA than the upper labial band with no contact (average difference of 2.33N). Evaluation of full/full versus lateral/lateral plateaus revealed an insignificant difference in force distribution (3.01%; 0.84N).

Conclusions: This FEA study found the location of the titration mechanism directed forces toward the strongest teeth (canines, premolars, and molars). The different permutations of bands without anterior contact (applying zero force on the fragile anterior teeth) achieved negligible force distribution and tooth movement. Configurable design options, titration systems, bands, and plateaus can be chosen according to the patient's dental/medical needs while ensuring negligeable stress on teeth and ligaments. This allows clinicians to use a person-centered approach, optimizing treatment outcomes and minimizing potential complications. A noted study limitation is the static FEA model. A dynamic modeling study is warranted.

Support: Panthera Dental, Quebec, Canada

LBA 1277

Chemogenetic or Optogenetic Manipulation of the Striatal Indirect Pathway Affects Cognitive Rigidity and Sleep Rebound in Rats.

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Introduction: Sleep deprivation (SD) impairs adaptive decision-making and promotes cognitive rigidity as evidenced by perseverative errors, but the underlying mechanisms are poorly understood. The direct and indirect pathways of the striatum function to promote and inhibit goal-oriented behavior, respectively. We hypothesized that the indirect pathway mediates the effects of SD on cognitive flexibility and activating this pathway would mimic the effects of SD in rested animals, whereas inactivating it would rescue SD-induced performance deficits.

Methods: Transgenic rats were transfected with viruses targeting dopamine 2 receptor-positive neurons of the striatal indirect pathway. Control groups expressed mCherry reporter constructs without opsins or modified muscarinic receptors necessary for optogenetic or chemogenetic manipulations. All rats underwent daily training on an operant pairwise image discrimination task, at Zeitgeber Time (ZT) 10, until performance criteria of ≥80 trials with 80% correct responses on two sessions were met. To measure cognitive flexibility, the rewarded image was switched to the previously non-rewarded image. Reversal sessions occurred daily for 10 days or until performance criteria were reestablished. In the SD mimic studies, in place of manual SD, striatal activation was performed by light stimulation (10Hz) or designer drug injection (clozapine-N-oxide; 1 mg/kg) before the first reversal session. In the SD rescue studies, rats received manual SD followed by striatal inhibition before the first reversal session. EEG was recorded and analyzed for sleep/wake states and EEG spectral power.

Results: Striatal activation by optogenetics or chemogenetics increased cognitive rigidity with twice as many perseverative errors on days 4-6 after stimulation, compared to mCherry controls. SD with chemogenetic, but not optogenetic, inhibition restored perseverative errors compared to mCherry controls. Furthermore, after optogenetic activation, rats had elevated non-REM delta power and slept more than mCherry controls in the 2 hours after dark onset (when rats are normally awake), suggesting increased sleep need. Analyses of EEG data with chemogenetic manipulations are ongoing.

Conclusion: Activation of the rat striatal indirect pathway mimicked the effects of SD, as manifested in cognitive rigidity and EEG hallmarks of sleep rebound; and conversely, inhibiting this pathway rescued cognitive flexibility in SD rats.

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LBA 1278

Primary Efficacy and Safety Results of a Phase 2 Double-Blind, Placebo-Controlled Proof of Concept, Signal Detection Study of Pitolisant in Myotonic Dystrophy

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Introduction: Myotonic dystrophy type 1 (DM1) is the most common adult-onset muscular dystrophy presenting with multi-systemic symptoms including excessive daytime sleepiness (EDS) and fatigue which occurs in up to 80-90% of patients with DM1 and can impact daily functioning as much as muscular symptoms (myotonia and muscle weakness). DM1 may have direct effects on CNS sleep regulatory circuits, with patients exhibiting signs of central sleep-wake dysregulation. Pitolisant is a histamine 3 receptor antagonist/inverse agonist approved for EDS and cataplexy in adults with narcolepsy. The aim of this phase 2 proof of concept study was to evaluate the efficacy and safety of pitolisant in adults with DM1.

Methods: Eligible patients were enrolled into an 11-week double-blind phase. Patients were randomized (1:1:1) to low dose pitolisant, high dose pitolisant, or matching placebo. The primary efficacy endpoint was change from baseline to Week 11 in the Daytime Sleepiness Scale (DSS). Additional efficacy endpoints included changes in daytime sleepiness as measured by the Epworth Sleepiness Scale (ESS) and Clinical Global Impression of Severity (CGI-S) as well as changes in the Fatigue Severity Scale (FSS). Upon completion, eligible patients had the option to enroll in an open label extension phase.

Results: A total of 30 patients with DM1 aged 18-65 were randomized in the study. The mean change from baseline in DSS to end of the double-blind period was -2.5 and -1.0 for the higher and lower dose pitolisant groups, respectively, compared to -0.2 for placebo. Clinically meaningful improvements in ESS, CGI-S, and FSS were also demonstrated by pitolisant. A clear and consistent dose-response was observed with the higher dose pitolisant group showing a greater response than the lower dose group. Most common adverse events included headache, insomnia, and nausea.

Conclusion: Pitolisant improved EDS in adults with DM1 in a dose-dependent manner. The safety and tolerability profile of pitolisant in patients with DM1 was consistent with the known safety profile of pitolisant.

Support: This study was sponsored by Harmony Biosciences.

LBA 1279

Opt-Out

LBA 1280

Sleep-Activity Features and Metabolic Syndrome: Insights from Wearable Device Data Analysis

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Introduction: Metabolic syndrome (MetS) is a complex disorder comprising various metabolic conditions such as obesity, hypertension, and diabetes. Currently, health management systems utilizing wearable devices are gaining significant attention. Wearable devices can continuously monitor an individual's sleep and daily activities in real-time. This implies the continuous tracking of crucial indicators related to MetS, such as sleep, heart rate, and activity levels, aiding in real-time assessment of an individual's health status and early detection of anomalies.

Methods: This study examines the relationship between sleep-activity features based on wearable devices and MetS. It proposes a sleep-activity features-based MetS detection model (Extreme Gradient Boosting) and employs explainable artificial intelligence to analyze important features. To validate the proposed model, the Korean Medicine Daejeon Citizen Cohort (KDCC) dataset spanning from 2021 to 2022 was utilized. Among these participants, 526 individuals wore Fitbit devices. After excluding participants who wore Fitbit for less than 5 weekdays or had more than 1 hour of missing heart rate data during a day, the final dataset comprised 70 individuals with MetS and 118 individuals without MetS. To address data imbalance, 16 individuals with MetS were added from 2023 to March 2024.

Results: The wearable device-acquired information including heart rate, step count, and sleep data, was utilized to detect important features for identifying MetS. These features included 20 sleep-activity features in addition to general demographic information such as gender, age, height, weight, and BMI. Sleep-related information encompassed median and standard deviation for sleep start time, wake-up time, sleep duration, and heart rate during sleep. The proposed model achieved an impressive accuracy of 87.28±4.38% in identifying MetS. Notable factors contributing to the risk of MetS included reduced activity levels, delayed wake times, and inconsistencies in sleep-wake schedules.

Conclusion: This study has demonstrated that demographic factors such as gender, age, and BMI, as well as daily activities and sleep-related features, play a significant role in identifying MetS. Future research should focus on collecting more extensive data and exploring methods to enhance interpretability.

LBA 1281

Oral Appliance Therapy for Obstructive Sleep Apnea: Dose-Response Relationship Between Mandibular Protrusion and Improvement in Respiratory Effort Burden

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Introduction: Increased respiratory effort (RE) is an important feature of obstructive sleep apnea (OSA), recently shown to be associated with hypertension and type-2 diabetes. While prior studies have established the efficacy of mandibular advancement devices (MADs) therapy in decreasing the apnea-hypopnea index (AHI), the effect of MAD treatment on RE burden remains unexplored.

In this study, we utilized a thoroughly validated mandibular jaw movement (MJM) monitoring technology to investigate the dose-response relationship between MAD protrusion levels and sleep duration with elevated RE (REMOV, %TST) during MAD titration.

Methods: Ninety-three OSA patients eligible for MAD treatment were included. Titration of the custom-made MAD (NOA, OrthoApnea, Spain) involved iterative adjustments based on OSA symptoms. Home sleep tests utilizing MJM automated analysis (Sunrise, Namur, Belgium) were conducted at four timepoints: pre-treatment, minimal, intermediate, and optimal protrusion levels.

Results: Initial OSA diagnosis confirmed by polysomnography (PSG) revealed an average AHI of 28.79±14.40 /h and a baseline REMOV of 24.17±14.95 %TST.

Regression analysis showed a significant dose-response relationship between REMOV and the protrusion level, with a REMOV reduction of 2.63 %TST (95%CI: 2.52 to 2.86) per millimeter of MAD advancement. Further analysis indicates that the treatment effect on REMOV was mainly attributed to reductions in obstructive AHI. REMOV would reduce by 1.43 %TST (1.38 to 1.47) for each one-event-per-hour reduction in OAHI.

During MAD titration, REMOV and AHI showed different patterns of response, with REMOV decreasing on average by 75.5%, 80.4%, and 83.6%, while AHI by 47.7%, 58.6%, and 59.7% across the three protrusion levels, compared to baseline values.

AHI and REMOV both independently contributed to snoring improvement. Even in cases where the AHI did not decrease by >50%, a REMOV reduction of 8.27±15.69 %TST was observed, resulting in a 10.6% decrease in snoring symptom score. When achieving an optimal AHI reduction (≥50%), 12.5% of cases still exhibited REMOV values exceeding the upper limit of normality of 15%TST.

Conclusion: Monitoring REMOV along with other metrics via at-home MJM analysis allows for identifying the optimal advancement level during MAD titration. This approach would enhance the treatment efficacy by enabling personalized adjustments based on multiple physiological outcomes.

LBA 1282

Evolving Diagnostic Patterns in Central Disorders of Hypersomnia: Has Time to Diagnosis Gotten Shorter Over the Last Decades?

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Introduction: Diagnostic delays for individuals with central disorders of hypersomnolence (CDH, e.g. narcolepsy and idiopathic hypersomnia) have been well-described in the literature, but it is unknown if this problem is improving over time. The aims of this *Project Sleep* (patient advocacy organization) study were to understand the social experiences and unmet needs of people living with CDH and to describe changes in diagnosis delays over time, in a large sample of individuals with self-reported CDH.

Methods: Adult participants completed an online survey between March and April 2021, that included questions with categorical options about year of diagnosis and time between symptom onset and diagnosis. Data were analyzed descriptively, graphically, and by sub-groups. The survey was IRB exempt.

Results: Data from 1272 people (115 male, 1122 female, 33 other) diagnosed between 1954 and 2021 in the US (n=840) and ex-US (n=425) were analyzed. Among them, 488 were aged 18-30, 594 were 31-50, and 189 were 50+ years; with 616 NT1, 366 NT2, and 290 IH.

The number of CDH diagnoses increased steadily since the early 2000s, with a dramatic jump in 2009 (n=54) compared to 2008 (n=25). Distributions were similar but not identical between regions (US, ex-US) and disorders (NT1, NT2, IH). Notably, no 2009 incidence spike was observed in IH.

The most common delay in diagnosis was 5-10 years (22.6%), while the least common was 0-6 months (1.9%). Before 2011, 25.8% of participants were diagnosed in <3 years and 41.0% in <5 years compared to 2011-2021 (this past decade) when 21.9% of participants were diagnosed in <3 years and 37.9% in <5.

Conclusion: There was no clear evidence of a reduction in time to diagnosis in last decade. However, changes may be obscured by the population's age and rising rates of CDH diagnosis (new and old cases) over the last two decades, which is a welcomed trend. The 2009 surge in NT1 and NT2 diagnoses could be linked to the H1N1 flu pandemic and vaccine Pandemrix®, alongside increased awareness and internet access. Overall, this study offers valuable insights into diagnostic patterns in CDH over time.

LBA 1283

Sleep, Hypertension, and Nocturia: Multicomponent Approach for Comorbid Illnesses

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Introduction: Sleep interruptions and nocturia are known to increase nighttime systolic blood pressure (SBP) which results in poor daytime blood pressure control, nighttime nondipping and adverse cardiovascular outcomes. Effect of behavioral sleep intervention or chronotherapy (switching antihypertensive to bedtime dosing) on nighttime nondipping or daytime blood pressure control in older adults is unclear. We conducted pilot randomized controlled trial to assess safety and tolerability of these interventions.

Methods: We randomized 30 healthy community-dwelling older adults (mean age, 72±5 years; 57% women) who take ≥1 non-diuretic daily antihypertensive medication and awaken ≥2 times nightly to void to one of 3 groups **i) control:** continuing morning antihypertensive dosing, **ii) behavioral sleep intervention** (**BBTI**- brief behavioral treatment of insomnia) while continuing with morning antihypertensive dosing, or **iii) chronotherapy:** switch their non-diuretic antihypertensive to bedtime dosing for 6-weeks. All participants completed three-day bladder diary to assess nocturia, nighttime urine volume (NUV), and nocturnal polyuria index (NPi:% of 24h urine volume excreted during sleep). Ambulatory BP monitor was used to record 24h BP. Participants concurrently wore a single-channel, EEG device Z-machine® for objective in-home sleep assessment.

Results: The BBTI arm showed a decline in nocturia frequency (2.3±0.6, 1.7±0.5, p=0.03) NUV (809.3±383.2, 747.3±568.9, p=0.4) and NPi (40.5±8.7, 34.5±9.0, p=0.08). These participants also showed a significant increase in sleep efficiency (68.8±10.1,80.9±6.1, p<.01) and decline insomnia severity index (13.6±4.6, 9.1±3.3, p=0.01). These bladder or sleep parameters remained unchanged in the control and chronotherapy groups. Both BBTI and chronotherapy groups demonstrated a significant nighttime dipping of SBP post-intervention (BBTI *p*=.04, chronotherapy *p*<.01, control *p*=.07). All groups demonstrated tolerability with intervention without any complaints of lightheadedness or falls with nighttime awakenings during the study duration.

Conclusion: Chronotherapy was well tolerated without any adverse fall events during this study and did decrease nighttime SBP. Behavioral sleep intervention, BBTI not only improved sleep and decreased nocturia but also affected nighttime SBP. Larger studies are warranted to assess the effect of improved sleep and nocturia on daytime BP control.

Support: This work was supported by the National Institutes of Health Grants R21AG060292, and R01AG 076575. This work was also supported by the Health Care Systems Research Network (HCSRN)-Older Americans Independence Centers (OAICs) AGING Initiative (R33AG057806).

LBA 1284

A Framework to Harmonize Self-Reported Sleep Times with Consumer Sleep Technology (CST) Data for Improved Summary Sleep Metrics

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Introduction: CSTs estimate sleep with sensitivity and specificity of around 90% and 50% respectively compared to polysomnogram. However, performance estimates benefit from a designated time-in-bed (TIB) period, information that is not collected by these devices in the free-living environment. Given the dependence of summary sleep metrics on accurate estimates of TIB (a self-reported measure), we developed a framework to integrate self-reported bed/wake times and wearable CST data to improve accuracy. Here, we report on the discrepancies between wearable data alone versus wearable data cleaned with self-reported bed/wake time.

Methods: Participants were monitored for one week, sleeping ad-lib. They wore a Fitbit Charge 5™ (non-dominant wrist), completed sleep diaries, and texted a lab email account before trying to fall asleep at night (bedtime) and at their final wake time. Fitabase software was used to export 30-second epochs of sleep-wake data. An automation protocol was developed to integrate text times with wearable data and calculate and auto-extract nightly summary sleep variables (e.g. sleep onset time, total sleep time, sleep efficiency).

Results: To date, 29% of nights were identified with discrepant sleep onset, typically because Fitbit identified sleep onset prior to the participant actually trying to sleep. This occurred when participants were lying down using their smartphone, watching TV or reading before bedtime. When corrected with self-reported bed/wake times, sleep onset time shifted by up to 2.1 hours later, wake time did not change, total sleep time decreased by up to 24 minutes, and sleep efficiency increased by up to 16%.

Conclusion: Oftentimes, wearable sleep data are taken at face value, although accurate computation of sleep parameters requires knowledge of when a participant is actually intending to sleep, as opposed to the intentional relaxed wakefulness that often flanks the attempted sleep period. Here we automated the extraction of 30-second interval wearable data, integration of self-reported bed/wake times, and computation of sleep parameters for a more accurate representation of summary sleep metrics. Therefore, this automation reduces the burden of the data cleaning processes necessary for rigorous and reproducible research utilizing CST. Data collection is ongoing.

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LBA 1285

Feeding, Dysphagia, Weight, and Sleep in Pediatric Patients: Mediation Analysis and Comparison of Autism and Non-Autism

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Introduction: Feeding difficulties impact child wellbeing and are associated with sleep. Children with autism are known to have problems with sleep, however, a gap in evidence exists regarding relationships between other symptoms such as feeding difficulties. The purpose of this study was to describe feeding difficulties in children with autism referred for polysomnography and examine the relationships between feeding difficulties, dysphagia, weight, and sleep diagnoses.

Methods: A secondary analysis of the de-identified 2017-2019 Nationwide Children's Hospital (NCH) Sleep DataBank was completed in 2023. The data were filtered for age (>2, <18 years); autism, feeding/dysphagia, and weight-related diagnoses.

Results: Our sample included 3,053 participants (M = 7.26 years); 56% males, 66% White, and 94% non-Hispanic. The most common feeding diagnoses in the total sample (autism and non-autism) were feeding difficulties (11%) and dysphagia (9%). The most common weight diagnoses were obesity (30%) and abnormal weight gain (24%). Feeding difficulties and dysphagia predicted sleep disorders in both autism and non- autism, however, those with autism were 3.83 times more likely to have feeding difficulties than patients without autism; and 2.19 times more likely to have dysphagia. In the autism group, obesity and abnormal weight gain partially mediated the relationship between feeding difficulties and sleep, and between dysphagia and sleep.

Conclusions: Both feeding difficulties and dysphagia are predictive of sleep disorders in pediatrics and are more likely in autism. The relationship between feeding, dysphagia, and sleep in autism is enhanced by the presence of obesity and abnormal weight gain, findings that inform anticipatory guidance for providers and parents of children with autism.

Support: NCH Sleep DataBank was supported by the National Institute of Biomedical Imaging and Bioengineering of the National Institutes of Health under Award Number R01EB025018. The National Sleep Research Resource was supported by the U.S. National Institutes of Health, National Heart Lung and Blood Institute (R24 HL114473, 75N92019R002

LBA 1286

Sleep-Related Cognitive and Behavioral Factors in Fibromyalgia

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Introduction : Approximately 80% of fibromyalgia patients experience sleep disturbances, which not only exacerbate pain perception but also negatively impact other associated symptoms such as depression and fatigue. CBT-I has been shown to improve sleep quality with minimal side effects. Identifying possible mechanisms that worsen sleep quality is important for developing appropriate CBT-I interventions. Therefore, this study aims to understanding the associations between dysfunctional beliefs, sleep hygiene, pre-sleep arousal, and sleep quality in fibromyalgia patients.

Method: Forty-one fibromyalgia patients (mean age = 47.98 ± 10.08; female = 92.9%) participated in the study. Participants completed a 7-day prospective sleep diary and underwent actigraphy monitoring, along with completing a battery of questionnaires including the Pittsburgh Sleep Quality Index, Pre-Sleep Arousal Scale, Dysfunctional Beliefs and Attitudes about Sleep, and Sleep Hygiene Practices Scale. Correlational analysis was employed to explore the associations between sleep-related cognitive and behavioral factors and sleep quality.

Results: The results revealed that participants with fibromyalgia have significantly poorer sleep quality and sleep maintenance. Higher levels of dysfunctional belief about sleep (r =.302-.458), pre-sleep arousal (r =.358-.566), and poor sleep hygiene practices(r =.325-.610) were significantly associated with poorer sleep quality.

Conclusion: Evidence of insomnia-related control and predictability, unrealistic sleep expectations, hyperarousal, and arousal-related sleep practices are apparent in fibromyalgia. These findings bear significant implications for the conceptual understanding and clinical management of sleep problems in fibromyalgia patients, supporting the potential use of CBT-I as an adjuvant therapy.

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LBA 1287

Explore the Risk Factors of Post-COVID-19 Conditions Among Adolescents in Taiwan

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Background: A significant portion of patients experience persistent or emerging symptoms following COVID-19 infection. Sleep disturbances are prevalent sequelae of post-COVID-19. Additionally, post-COVID-19 conditions (PCC) may exacerbate the negative impact of neuropsychological health among adolescents. Thus, this study aims to investigate variances in sleep patterns and daytime fatigue among adolescents at various time points following infection compared to those uninfected with COVID-19, employing a cross-sectional approach. Additionally, the study seeks to identify potential risk factors for Long COVID.

Method: The study enrolled 223 adolescents, with an average age of 15.26 ± 1.72, from junior and senior high schools. Participants completed a comprehensive set of questionnaires covering demographic information, emotions, sleep quality, and levels of fatigue. T-tests were utilized to examine differences in fatigue and sleep between groups with and without COVID-19 infection. ANCOVA and Chi-square tests were employed to assess variations in sleep patterns and daytime fatigue among different post-COVID-19 groups at various time points. Correlation and regression analyses were conducted to explore the relationship between potential risk factors and Long COVID symptoms.

Result: Among the 133 participants who reported COVID-19 infection, the group with post-COVID conditions (PCC) demonstrated significantly higher scores on the Fatigue Severity Scale (FSS) and the Chinese Pittsburgh Sleep Quality Inventory (CPSQI), particularly in the subjective sleep quality dimension, compared to the healthy control group. However, no significant differences were observed in fatigue and sleep among post-COVID-19 groups at 3-6 months, 6-9 months, and 9-12 months post-infection. High trait anxiety, greater severity of COVID-19, and older age were predictive of poor sleep quality in PCC groups.

Conclusion: COVID-19 infection significantly increases the risk of fatigue and sleep disturbances at three to twelve weeks post-onset of infection compared to an uninfected control group. Low trait anxiety, mild COVID-19 symptoms, and younger age are also associated with a reduced risk of post-COVID conditions (PCC). Continuously monitoring psychological issues, particularly fatigue and sleep, among adolescents with PCC is essential. Additionally, further referral and intervention should be carefully considered.

LBA 1288

Quantification of Differences in Sleep Measurement by A Wrist-Worn Consumer Wearable and Research-Grade Accelerometry of Healthy Adults in Free-Living Conditions Across the United States

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Introduction: Large scale, long-term epidemiologic studies of sleep often rely on self-reported measures. The development of mobile health technologies (such as consumer wearables) provides an opportunity to quantitatively assess sleep and wake patterns in free-living (i.e. non-laboratory) conditions on a larger scale; however, due to their novelty and proprietary nature in scoring algorithms, validation of these tools is vital to their integration in research settings.

Methods: In the US-based prospective Nurses' Health Study 3 (NHS3), the Sleep and Physical Activity Validation Substudy (SPAVS) was conducted in 50 participants who were asked to wear Fitbit Charges (3 and 5) and an Actigraph GT3X+ concurrently and fill out a sleep diary for 14 days. We scored Actigraph accelerometry using sleep diaries and the Cole-Kripke algorithm and used proprietary algorithms for Fitbit devices. We calculated mean absolute percent error (MAPE) and intraclass-correlations (ICCs) for Fitbit compared to Actigraph measurements for total sleep time (TST) and sleep efficiency, specifying a random effect for participant and an autoregressive correlation structure to account for correlation between adjacent sleep periods.

Results: In the first 15 participants of NHS3 SPAVS, we had 7 participants who used Fitbit Charge 3s and 8 participants who used Fitbit Charge 5s; between the two Fitbit models, over the 14-day study period, participants on average had 12 and 14 sleep periods recorded, respectively. For the Fitbit Charge 3 compared to Actigraph, we observed a MAPE of 0.57% for TST and 5.82% for sleep efficiency; we estimated ICCs of 0.82 for TST and of 0.74 for sleep efficiency. For the Fitbit Charge 5 compared to Actigraph, we observed a MAPE of 0.46% for TST and 6.10% for sleep efficiency; the ICC for TST was 0.81, while the ICC for sleep efficiency was 0.48.

Conclusion: For both models of Fitbit Charge, we observed higher agreement with Actigraph measures in TST than in sleep efficiency. In these preliminary data, there were only small differences observed between the two Charge models; as data collection concludes, we intend to continue our analyses in the full analytic dataset.

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LBA 1289

Opt-Out

LBA 1290

Sex-Based Differences in Obstructive Sleep Apnea and Atrial Fibrillation: Implication of Atrial Fibrillation Burden

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Introduction: Obstructive sleep apnea (OSA) is recognized as a risk factor for atrial fibrillation (AF), but whether AF elevates the risk of OSA remains uncertain. Additionally, the potential differences between sexes in patients with both AF and OSA have not been fully explored. We sought to investigate the connection between increased AF burden and OSA and to examine differences in clinical characteristics between women and men affected by AF and OSA.

Methods: We conducted a descriptive, cross-sectional analysis utilizing data from a prospective cohort study. Patients diagnosed with non-valvular AF were recruited from cardiology electrophysiology clinics at a tertiary center and underwent both home sleep apnea tests and 14-day ambulatory electrocardiography monitoring. Moderate-to-severe OSA was defined as an apnea-hypopnea index of ≥ 15.

Results: Among 320 patients with AF, 53.4% exhibited moderate-to-severe OSA, with a mean body mass index (BMI) of 25.6 kg/m2. A lower percentage of women (38.2%) had moderate-to-severe OSA compared to men (59.3%) ($p<0.001$). Multivariate analysis revealed that age, male gender, and BMI were significantly associated with moderate-to-severe OSA. Notably, AF burden was linked with moderate-to-severe OSA exclusively in men (odds ratio: 1.008; 95% confidence interval: 1.001–1.014). While women and men with OSA exhibited similar BMI ($p=0.526$) and OSA severity ($p=0.754$), women were older than men (70.1 ± 1.3 vs. 63.1 ± 0.9 years, $p<0.001$). Furthermore, women with moderate-to-severe OSA demonstrated a lower AF burden compared to men (27.6 ± 7.1 vs. 49.5 ± 3.9%, $p=0.009$).

Conclusions: AF burden appears to be a sex-specific risk factor for OSA, primarily affecting men. Conversely, despite being older and exhibiting similar OSA severity and body habitus, women with both AF and OSA tend to have a lower AF burden than men. This suggests that AF may develop later in women with OSA compared to men.

LBA 1291

Revised Criteria of the Seasonal Pattern Assessment Questionnaire for Winter Seasonality in the East Asian Population: Results from Machine Learning Clustering Algorithm

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Introduction: The Seasonal Pattern Assessment Questionnaire (SPAQ) is a questionnaire evaluating seasonal changes in mood and behavior. According to the Kasper criteria, individuals who satisfy the criteria for seasonal affective disorder (SAD) or subsyndromal SAD (S-SAD) can be classified as winter-type or summer-type, depending on the month they “feel worst”. Especially in the East Asian countries where summer is hot and humid, determining the season type based on the “feel worst” item alone may not be accurate or sufficient. The aim of this study is to utilize machine learning to expand the Kasper criteria by re-establishing screening metrics used to identify winter-type seasonality.

Methods: We clustered 96 SPAQ questionnaires from the Mood Disorder Cohort Research Consortium study participants into winter-type and the other, using the K-modes clustering algorithm and referenced the data with the individuals classified as winter-types according to the Kasper criteria. A decision tree algorithm was used to classify winter seasonality identified through the clustering algorithm with the minimum number of SPAQ items.

Results: The clustering results showed a high degree of concordance with other items when compared to the Kasper criteria. When the respondents checked one of the winter months or “no particular month” on the “feel worst” item, they would be considered winter-type if they also checked one of the winter months for any of the following items: “Tend to gain most weight,” “Sleep most,” and “Socialize least.” Even when respondents checked one of the summer months for the “feel worst” item, they could also be winter-type if they selected one of the winter months for either “Tend to gain most weight” or “Sleep most”.

Conclusion: Our study assessed the season type of those classified as SAD or S-SAD using the SPAQ and Kasper criteria in the cohort of early-onset mood disorder patients in South Korea. The results suggest that considering atypical vegetative symptoms and decreased social activity in addition to mood may be more accurate for determining winter seasonality, especially in the East Asian countries. With this expanded version of the Kasper criteria, more defined symptoms can be targets for diagnosis and management.

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LBA 1292

A survey of Sleep Disturbance after COVID-19 Vaccination

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Introduction: To describe the incidence of sleep disturbance after COVID-19 vaccination and explore the relevant risk factors.

Methods: An online questionnaire survey was conducted from December 2021 to February 2022, by collecting the nationwide data of participant aged 18-65 years who had received the COVID-19 vaccines, regardless of the vaccine dose. Since there was no large-scale COVID-19 infection or lockdown in China during this period, the data is valuable to analyze the relationship between COVID-19 vaccination and sleep disturbance.

Results: 10739 participants with qualified replies were included in the analysis. 8748 (81.5%) reported no sleep change after vaccination, 1495 (13.9%) reported only hypersomnia, 401 (3.7%) reported only insomnia, and 95 (0.9%) reported both. Multivariable logistic regression showed comorbidities, self-reported prior insomnia, and sleep disturbing factors were moderately associated with only hypersomnia or only insomnia regardless of the vaccine dose. The highest incidence of hypersomnia was after the 1st dose (11.4%) and the highest incidence of insomnia was after the 3rd dose (3.7%). The most prevalent patterns of sleep change were hypersomnia after both doses (5.6%) and hypersomnia after 1st dose but no change after 2nd dose (5.4%). Further analysis of interval between onset of hypersomnia and the vaccination as well as duration of hypersomnia after the initial two doese indicated that, the intervals were shorter and the durations were longer after 2nd dose than 1st dose in patients with recurrent episodes of hypersomnia.

Conclusions In our observation, hypersomnia was the most frequently reported symptom after COVID-19 vaccination. Recurrent hypersomnia after the initial two doses might be associated with inflammation after COVID-19 vaccination.

LBA 1293

Utility of Rapid Eye Movement Sleep in Localizing Generalized Epilepsies

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Introduction: Although rapid eye movement sleep (REM) is known to help localize the epileptogenic zone in focal epilepsy, its localizing effects in generalized epilepsy are largely unknown. At the same time, generalized epilepsies can mimic focal epilepsies demonstrating secondary bisynchrony (SBS) in which an epileptogenic focus demonstrates rapid secondary generalization throughout the brain. Based on REM's putatively greater localizing abilities, we hypothesize that the source localization extents of interictal epileptiform discharges (IED) in truly generalized epilepsy (i.e. non-SBS) should be largest (i.e. most generalized) in REM when compared to any other sleep-wake state (SWS).

Methods: We used standardized low-resolution electromagnetic tomography (sLORETA) to conduct electrical source imaging at the peak of IED occurring in NREM1, NREM2, NREM3, wakefulness, phasic REM, and tonic REM from a prospectively recruited cohort of generalized epilepsy patients who had been admitted to an epilepsy monitoring unit to rule out focal SBS. Results were co-registered to individual patient clinical magnetic resonance imaging for boundary-element method volume conductor brain models. We used Student's t-test to statistically compare source localization extents.

Results: Over 18 months, we prospectively recruited 5 adult generalized epilepsy patients (average age 30.8 years, 80% female) who had 155 total IED over an average of 8.4 days of continuous inpatient video-electroencephalographic telemetry. After comprehensive semiologic and EEG review of captured seizures in the EMU, consensus from institutional multidisciplinary pre-surgical conferences ruled out focal SBS in 2 patients with juvenile myoclonic epilepsy, 2 patients with Lennox-Gastaut syndrome, and 1 patient with Jeavons syndrome (i.e. epilepsy with eyelid myoclonia). Mean IED source localization spatial extents were significantly larger in REM than in other SWS (mean 71.8% vs. 58.1% cortical grey matter voxels, p=0.0386).

Conclusion: These findings support the hypothesis that REM IED source localization extents are largest out of all SWS in generalized epilepsies, which can help disentangle whether an epilepsy is truly generalized rather than mimicking focal SBS. Resolution of this question has important clinical implications regarding future medical versus surgical epilepsy management.

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LBA 1294

Hyperoxia Partially Restores Obstructed Breathing During Recovery from General Anesthesia: A Single-Blind, Non-Randomized Crossover Trial

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Introduction: Post-surgery opioids cause respiratory depression associated with obstructed breathing and hypoxemia.[1] While supplemental oxygen (O2) corrects hypoxemia and promotes respiratory stability during sleep in a drug-free environment,[2-4] its effect on post-anesthesia ventilation remains controversial.[5-7] Using standard home sleep apnea testing (HSAT) equipment (Nox T3s, Nox Medical), we have recently demonstrated an improvement in apnea hypopnea index (AHI) with hyperoxia in patients recovering from general anesthesia.[8] However, this effect was largely driven by a decrease in desaturation-based hypopnea events. In this trial we tested the hypothesis that hyperoxia improves respiratory flow and stability independent of oxygenation during immediate recovery from surgery and anesthesia.

Methods: We studied the effect of hyperoxia on obstructed breathing in 10 patients recovering from general anesthesia. In a single blind, non-randomized, crossover study design, patients underwent a 100-minute-long post-anesthesia HSAT recording consisting of a 20-minute baseline, followed by two 40-minute-long intervention sessions during which supplemental O2 was administered via a non-rebreather mask to target an SpO2 > 96% (Liberal O2), or an SpO2 90-94% (Conservative O2). HSAT was scored by a board-certified sleep physician who was blind to the interventions, and with the SpO2 channel removed from the recording. To measure respiratory disturbance index (RDI), events were scored using recommended AASM criteria with the exception that all events that met the definition for hypopnea were scored regardless of resultant desaturation.

Results: Compared with the Conservative O2 intervention [median (range) RDI: 31 (15 to 80) events per hour], hyperoxia (Liberal O2) significantly decreased RDI [22 (3 to 59), median difference between interventions: -14 (0 to -21), Wilcoxon matched pairs signed rank test, P = 0.0156]. As previously demonstrated, Liberal O2 also resulted in a significantly lower AHI, oxygen desaturation index (ODI), as well as higher mean and minimum SpO2, compared with the Conservative O2 intervention.

Conclusion: Hyperoxia improves respiratory disturbances in the immediate post-operative state. Some proposed mechanisms for this improvement include alterations in centrally mediated responsiveness to carbon dioxide, changes to loop gain, and augmentation of opiate-induced respiratory suppression. We intend to test these theories using further analysis of the respiratory channels.

LBA 1295

Association Between Sleep Quality and Predicted Mortality in Patients with COPD

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Introduction: Sleep quality is known to be poor in patients with COPD. We hypothesize that sleep quality is worse in COPD patients with a higher mortality risk as determined using the BODE index.

Methods: Patient cohort was derived from the COPDGene project and NETT trial who completed an overnight polysomnogram (PSG). To confirm presence of COPD, and prior to the PSG, patients had spirometry performed. In addition, to calculate the BODE index, patients underwent a 6-minute walk test and completed the mMRC score questionnaire. For patients in the NETT trial, in place of the mMRC, BODE Index was calculated using the UCSD SOBQ based on a quartile distribution as previously described by Martinez et al 2006. Four quartiles based on the BODE score were determined: quartile 1 as a score of 0 to 2, quartile 2 as a score of 3 to 4, quartile 3 as a score of 5 to 6, and quartile 4 as a score of 7 to 10.

Results: Fifty-nine patients [28 (48%) males, 62±8 years old, FEV_1 1.1±0.5 L, FEV_1 % Predicted 43±19%, FVC 2.4±0.8 L, FVC % Predicted 74±17%, FEV_1/FVC 45±14%, BMI 28±7 kg/m^2, apnea-hypopnea index 5.7 ±9.6 events/hr] were included in the study. Based on the BODE score there were 14 patients in quartile 1, 21 patients in quartile 2, 10 patients in quartile 3 and 14 patients in quartile 4. Sleep quality, measured by total sleep time and sleep efficiency, was significantly worse in those in quartile 4 (199±101 min and 49±23%, respectively) as compared to quartile 3 (259±88 min and 65±22%, respectively), quartile 2 (298±80 min and 74±20%, respectively) and quartile 1 (290±69 min and 67±19%, respectively) (p=0.008 and p=0.01, respectively). There was no difference between quartiles in regard to nocturnal oxygenation as measured by mean SaO_2 (p=0.28), lowest SaO_2 (p=0.11), and % total sleep time SaO_2 < 90% (p=0.42).

Conclusions: Sleep quality, as measured by total sleep time and sleep efficiency, is worse in COPD patients with a higher mortality risk based on the BODE index. Whether poor sleep quality contributes to a higher mortality is yet to be determined.

LBA 1296

CPAP vs. APAP: Associations with Adherence and Satisfaction in Practice

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Introduction: Positive airway pressure (PAP) is considered the most effective treatment for obstructive sleep apnea (OSA); however, clinical practice has diverged widely as to which PAP initiation strategy to use, fixed continuous PAP (FCPAP) or auto-CPAP. The present study explored associations between CPAP modality, initial CPAP adherence, and patient therapy satisfaction (PTS).

Methods: This cross-sectional study examined initial adherence/therapy data collected by Southeast Michigan durable medical equipment companies for new CPAP users, aged ≥ 18 years, treated for OSA between 01/2022-12/2022. Logistic regression unadjusted and adjusted for age, gender, body mass index (BMI), health insurance, diagnostic testing, prescription source, initial setup (in-person vs. virtual), mask type, median mask leaks, mask changes, and diagnostic apnea-hypopnea index (AHI) was used to examine associations between CPAP modality, and CPAP adherence (CPAP used ≥4h for ≥70% of 30 days) and PTS. Linear regression models, unadjusted and adjusted (same variables), were used to examine associations between CPAP modality and CPAP adherence (total days CPAP used, percent days CPAP used ≥4h, and average hours on days CPAP used).

Results: Among 482 subjects, 50.4% were female, and mean age and median BMI at diagnosis were respectively 51.9±15.8 years and 33.8±9.0 Kg/m^2. Users of FCPAP and auto-CPAP were 201 and 281, respectively, with FCPAP users being older (53.6±16.3 vs. 50.6±15.3 years), more often diagnosed via in-lab polysomnogram (70.6% vs. 56.6%). showing higher AHI (median 18.0±27.0 vs 11.4±14.1), and median mask leaks (median 3.2±7.5 vs 1.5±4.6 L/min, each $p<0.05$). The higher CPAP adherence among FCPAP users (61.7% vs. 57.7%) was not statistically significant ($p=0.37$). Adjusted logistic regression models showed associations between FCPAP modality and PTS (OR=1.5, 95% CI [1.0, 2.4]), but not CPAP adherence. Adjusted linear regression models showed increased hours of CPAP use on days used (β=0.5, 95% CI [0.1, 0.8] h), and a trend towards increased total days CPAP used (β=4.9, 95% CI [-0.4, 10.3] days), and percent days CPAP used ≥4 h (β=4.6, 95% CI [-1.5, 10.7] %) among FCPAP users.

Conclusion: This study highlights higher patient satisfaction and some improvement of CPAP adherence among FCPAP compared to auto-CPAP users.

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LBA 1297

A Randomized, Double-Blind, Placebo-Controlled, Single-Dose, Crossover, Pilot Study Investigating the Effects of Cannabinol (CBN) 30 mg and 300 mg on Sleep Architecture and Next-Day Function in Insomnia Disorder ('CUPID' study).

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Introduction: *Cannabinol* (CBN) is a cannabinoid produced by oxidation of delta-9-tetrahydrocannabinol that has been proposed as a hypnotic, but its isolated effects on objective sleep have never been tested. This randomised, double-blind, single-dose, cross-over study investigated CBN efficacy and safety in adults aged 25-65 years with clinician-diagnosed insomnia disorder (NCT05344170).

Methods: Participants self-administered oral liquid CBN (300mg and 30mg) and matched placebo across three treatment arms (≥2-weeks washout) at the Woolcock Institute of Medical Research (Sydney, Australia). The primary outcome was wake-after-sleep-onset (WASO) minutes via overnight in-laboratory polysomnography. Secondary outcomes included sleep stages, sleep onset latency (SOL), and absolute spectral power during non-rapid eye movement (NREM) sleep. Ancillary outcomes assessed subjective and objective sleep and next-day neurobehavioral function.

Results: All randomised participants (n=17/20 female; age 42±13years and Insomnia Severity Index 20.4±3.2) completed the protocol and were statistically analysed (AUG2022-SEP2023). Compared to placebo, WASO did not change with 300mg or 30mg CBN (-6.3mins [95%CI: +18.2+5.5], *p*=0.29 and -4.0mins [-15.9+7.9], *p*=0.50, respectively). 300mg and 30mg did not respectively change N1 (-0.6% [-1.7+0.5], *p=0.*27 and -0.3% [-1.4+0.8], *p*=0.62), N3 (-0.1% [-2.3+2.1] *p*=0.94 and -0.7% [-2.9+1.5] *p*=0.51), REM (-0.4% [-2.8+2.0], *p*=0.76 and -0.6% [-3.1+1.8], *p*=0.59), or wake (-2.8% [-6.6+1.1], *p*=0.16 and 0.9% [-2.9+4.8], *p*=0.62) stages. 300mg but not 30mg, respectively, increased N2 (3.8% [+0.5+7.1], *p*=0.03 and 0.7% [-2.6+4.0], *p*=0.67); and decreased SOL (-7.0mins [-11.6-2.3,], *p*=.004 and -0.8mins [-5.4+3.9], *p*=0.74) and absolute NREM delta power (-140.2μV^2 [-246.7-33.7,], *p*=0.01 and -74.7μV^2 [-185.7+36.4], *p*=0.18). No other spectral power changes occurred during NREM sleep. Driving simulator lateral position did not change on either dose. No other driving changes occurred, aside from increased headway distance and speed variability with 300mg (16.6metres [0.6, 32.6], *p*=0.04 and 1.1km/h_{SD} [0.4, 1.9], *p*=.005, respectively). 189 non-serious adverse events were reported (57 in 30mg and 68 in 300mg arms).

Conclusions: We observed small changes to sleep with an acute 300mg dose of CBN in insomnia disorder patients; however, not the primary outcome of WASO. Future trials should consider at-home repeated dosing in larger samples, concentrating on sleep-onset insomnia disorder.

Support: The study was funded by the Lambert Initiative for Cannabinoid Therapeutics, University of Sydney.

LBA 1298

Behavioral Regulation and Sleep Duration in Infants and Toddlers: Insights from Videosomnography

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Introduction: Sleep problems have been associated with heightened behavioral responses to sensory stimuli in individuals with neurodevelopmental conditions. During infancy, sleep and regulatory systems undergo rapid development. However, the relationship between sleep and behavioral regulation in infants and toddlers remains unclear. In this study, we leveraged objective sleep measures to examine how parent-reported behavioral regulation to sensory stimuli relates to nighttime sleep duration.

Methods: Parent users of the Nanit baby monitor were invited to participate in the current study. Parents reported on their child's behavioral regulatory patterns by completing the Toddler Sensory Profile 2. A behavioral dysregulation item was created based on three questions related to routines from the "General Processing" item and all questions from the "Behavioral Responses Associated with Sensory Processing" item. Objective sleep metrics from 507 children (7-18 months) were collected from the Nanit baby monitor and a computer-vision algorithm was used to compute sleep/wake states based on body position and movement. Children with at least 3 nights of sleep data were included.

Results: Overall, children who displayed longer nighttime sleep duration had lower behavioral dysregulation scores ($r = -0.13$, $p = 0.003$). Given the wide age range (7-18 months), we regressed out the effect of age. This relationship between behavioral regulation and sleep duration held in the whole sample even when age was added as a regressor ($r = -0.15$, $p = 0.001$), and in both males ($r = -0.16$, $p = 0.008$) and females ($r = -0.13$, $p = 0.041$) separately.

Conclusion: Our findings demonstrate that infants and toddlers with worse behavioral regulation have shorter sleep duration during the night. This suggests that either the inability to properly regulate behavioral responses to sensory stimuli disrupts nighttime sleep duration or shorter sleep duration results in altered behavioral regulation. While additional studies are needed to better understand this association, these results show that there is a clear relationship between sleep duration and behavioral regulation as early as 7 months of age, which continues into toddlerhood.

LBA 1299

The Correlation of Serum Bicarbonate and Paco2 in a High-Risk Obstetric Population

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Introduction: Literature regarding Obesity Hypoventilation Syndrome (OHS) in pregnancy is sparse, and it is uncertain if the usual markers of OHS in the general population could apply to pregnancy. OHS is defined by a BMI ≥ 30 kg/m2 and hypercapnia evidenced by an arterial CO2 [PaCO2] ≥ 45mmHg. However, in pregnancy, the expected values for serum bicarbonate and PaCO2 are lower due to the change in respiratory dynamics related to progesterone levels. The expected serum bicarbonate is expected to be 21.7 +/- 1.6 mmol/L and the expected PaCO2 is 30.4 +/- 0.6 mmHg in the third trimester of pregnancy. Our study aims to define the association of serum bicarbonate with PaCO2 among pregnancies, and how that may correlate with pregnancy related outcomes.

Methods: This is a cross-sectional retrospective study of 19,439 singleton pregnancies from January 1, 2012-December 31, 2022. Patients over 18 with a BMI ≥ 30 kg/m2 were included. The Cochrane-Armitage trend test, Pearson correlation coefficient and the Chi-Square test, were used to evaluate the rates over time, correlation between serum bicarbonate and PaCO2, and determine association of OHS to pregnancy related outcomes, respectively.

Results: Between 2012 and 2022, the practice grew considerably; there was an increase in the proportion of women with obesity ($p<0.01$). There were 10,327 pregnancies with BMI ≥ 30 kg/m2. Of this, 67 pregnancies had PaCO2 and time-matched serum bicarbonate. Using multiple lab draws per pregnancy, there were 163 PaCO2 corresponding to a unique serum bicarbonate value, and there was a correlation between PaCO2 and serum bicarbonate ($r=0.69$, $p<0.01$). In the secondary analysis, there was a higher rate of cesarean delivery in pregnancies with a serum bicarbonate ≥ 25 mmol/L versus those with serum bicarbonate < 25mmol/L (44.0% vs. 39.8%, $p<0.01$).

Conclusion: Our data supports that there is a significant correlation between an elevated serum bicarbonate and PaCO2 in pregnancies with BMI ≥ 30 kg/m2. Additionally, we found an increased risk of cesarean delivery in pregnancies with higher serum bicarbonate. These findings have never been studied in pregnancy before and suggest that more research is needed to better understand the prevalence and morbidity associated with OHS in this population.

LBA 1300

Gluten-Free Diet Therapy for Hypersomnia in Narcolepsy

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Introduction: Excessive daytime sleepiness despite pharmacologic therapy often remains a problem for patients with narcolepsy. However, there is a paucity of data regarding the effect of modifiable factors such as diet on symptoms. One previous study demonstrated benefit from a low carbohydrate, ketogenic diet on Narcolepsy Symptom Status Questionnaire (NSSQ) by 18% after 8 weeks of treatment. The role of a gluten-free diet has not been well explored.

Methods: 8 patients with a diagnosis of narcolepsy and symptoms of persistent excessive daytime sleepiness were evaluated retrospectively through electronic medical record review. 5 of these patients had type 1 narcolepsy (NT1). One patient also carried a diagnosis of Crohn's Disease. The majority were female (7 patients) with an average age of 31.5. Of the available sleep studies, the mean sleep latency was 3.6 minutes and the average sleep onset REM events was 2.6.

Results: The average Epworth Sleepiness Scale (ESS) score prior to intervention was 12.9. When gluten was reduced or removed, the score decreased to 7.6 for a difference of 5.3. One patient was already on a gluten free diet and found no improvement when switched to a ketogenic diet. While the majority of patients continued to have medication adjustments based on symptoms, 75% of patients reported symptomatic benefits directly related to dietary changes.

Conclusion: In addition to pharmacologic therapy, a gluten-free diet appears to improve hypersomnia in narcolepsy, though the mechanism is unclear. It is known that orexin signaling is impaired in narcolepsy, which may be due to immune-mediated death of orexin containing neurons. Gut microbiota may be linked to CNS inflammation and immune dysregulation through cytokine and inflammatory mediator release. There are gut microbial structure diversity alterations in NT1 compared to control. Hypoglycemia may activate orexin containing neurons. However, a gluten free diet and Celiac disease leads to lower ghrelin levels; this is the opposite of our findings showing improvement in symptoms. Therefore, alternative pathways, such as cytokine milieu changes, may be implicated in the improvement in ESS.

LBA 1301

Association Between Weekday/Weekend Physical Activity and Sleep Using Fitbit

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Introduction: The intensity of physical activity is known to be an important factor in sleep health. Additionally, adults and children were found to be more active during the week than on weekends. This study investigated the association between sleep time and intensity of physical activity on weekends and weekdays among Korean adults.

Methods: This study was conducted on 587 subjects who agreed to wear Fitbit from 2020 to 2024, out of 2,000 subjects of the Korean Medicine Daejeon Citizen Cohort in their 30s to 50s. The subject's physical activity (PA) and sleep time were investigated for two weeks using Fitbit, a wearable device worn on the wrist. To find out the difference in sleep time according to PA, the number of steps was divided into quartiles and the difference in sleep time was examined on weekdays and weekends. Additionally, to determine the relationship between PA and TST, a general linear model adjusted for age, height, and weight was performed.

Result: When looking at differences in sleep time by dividing physical activity into quartiles, men's weekdays were TST, WASO, REM, SE, and on weekends differences were found in WASO, REM, and Light. In women, differences were found in TST, WASO, and light on weekends, but no significant differences were found on weekdays. When looking at the association with TST using very lowest PA(Q1) as a reference. In men, very high PA (Q4) was associated with reduced TST on weekdays (B = -43.4, CI = -67.3 ~ -19.5, $p<0.000$) and weekends (B= -42.9, CI= -73.0 ~ -12.8, $p=0.006$) compared to very low PA(Q1). In women, TST tended to decrease during weekend Q4 (B: -30.2, CI: -47.0 ~ -13.4, $p<0.000$), but there was no association on weekdays.

Conclusion: This study shows that when looking at the relationship between physical activity and sleep time, men show an association that sleep time decreases as physical activity increases on both weekdays and weekends, but women show the same relationship only on weekends. Additional research on the causal relationship between sleep time considering physical activity content is needed in the future.

LBA 1302

Harmonization Effects of Structural Estimates Obtained with Different MR Scanners in Obstructive Sleep Apnea

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Introduction: To analyze data obtained from different MR scanners, data harmonization (DH) is required to remove scanner effects. However, this process may eliminate underlying pathological effects during computation. This study aims to investigate whether DH affects the effects due to obstructive sleep apnea (OSA).

Methods: T1-weighted (T1w) images of 2000 participants from the KoGES Ansan Aging Study were acquired. The images were obtained using a 1.5T GE SIGNA MR scanner (FSPGR, TR = 10.9ms, TE = 5.01ms, TI = 450ms, voxel size = 0.47 x 0.47 x 1.2 mm^3) and 3T Siemens Skyra scanner (MPRAGE, TR = 1980ms, TE = 2.55ms, TI = 998ms, voxel size = 0.54 x 0.54 x 0.9 mm^3). All T1w images is processed using the recon-all pipeline of FreeSurfer to extract gray/white matter volume (GMV/WMV), cortical thickness (CT), and subcortical volume (SCV) as structural estimates. ComBat was applied to harmonize the extracted GMV/WMV/CT/SCV preserving the interested covariates (i.e., age, gender, body mass index, hypertension, and diabetes). The status was defined as OSA if the apnea-hypopnea index was 5 or higher. The effects of OSA on the harmonized GMV/WMV/CT/SCV were analyzed using a paired t-test and generalized linear model (GLM), with false discovery rate correction ($P_{corrected} < 0.05$).

Results: Participants without and with OSA had mean ages of 61.36 ± 5.71 (40% male, 60% female) and 63.53 ± 6.51 (56% male, 44% female), respectively. Paired t-test showed statistically significant differences only in CT (36 regions) and SCV (5 regions) including left and right hemispheres. In multivariable models, GMV/WMV/CT/SCV did not represent statistically significant differences for all brain regions. GMV/WMV/CT/SCV had the same results both before and after harmonization.

Conclusion: Our results provided that data harmonization did not affect the change of structural estimates based on OSA status. This enables the gathering and analysis of big data from multi-center studies.

Support: This study was supported by the Korea Centers for Disease Control and Prevention grant (2015-P71001-00, 2016-E71003-00, 2017-E71001-00, 2018-E7101-00, 2019-E7104-00, 2019-E7104-01, 2021-E0602-00, 2021-E0602-01); National Institutes of Health (NIH, USA) (RF1NS120947).

LBA 1303

Obstructive Sleep Apnea and Risk of Cerebral Microbleeds

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Introduction: Till date, no significant association between obstructive sleep apnea (OSA) and risk of cerebral microbleeds (CMBs) has been reported in previous studies. The aim of the present study is to examine the associations between OSA severity and risk of incident CMBs in middle-age through older general population.

Methods: From the Korean Genome and Epidemiology Study (KoGES) Ansan Cohort, we prospectively included 1445 eligible participants who had home-based overnight polysomnography (PSG) data and brain magnetic resonance imaging (MRI) done at baseline (2011–2014) and 4-yearly follow-ups (between 2015–2018 and 2019–2022). OSA was categorised by apnoea–hypopnoea index levels as non-OSA (0–4.9 events·h^{-1}), mild OSA (5.0–14.9 events·h^{-1}) and moderate–severe OSA ($\geqslant$15.0 events·h^{-1}). CMBs were defined as well-defined focal areas (<10 mm in diameter in size) of very low signal intensity on T2*w MRI images. We used relative risk (RR) estimation by Poisson regression (robust error variance) to estimate RR and 95% confidence interval (CI) of incident CMBs by OSA groups.

Results: The average age of the participants was 57.75 (SD±5.53) at baseline. The cumulative incidence rate of CMBs at 4-year were 1.84% (n=15), 1.60% (n=7), 4.66% (n=9) and at 8-year were 3.32% (n=27), 3.20% (n=14), 7.25% (n=14) in non-OSA, mild OSA and moderate–severe OSA, respectively. In the multivariable Poisson models, after adjusting for age, sex, education level, body mass index, regular exercise, smoking, drinking, total cholesterol, low-density lipoprotein cholesterol, hypertension and diabetes, we found that participants with moderate–severe OSA compared to non-OSA group was associated with doubled risk of developing CMBs at the end of the 4-year (RR 2.50, 95% CI 1.07–5.80, p= 0.0349) and 8-year (RR 2.0, 95% CI 1.03–3.90, p= 0.0417) follow-ups. No significant increased risks were observed in mild OSA group.

Conclusion: In this population-based prospective cohort study, moderate–severe OSA was independently associated with increased risk of incident CMBs in the general adult population.

Support: This study was supported by the Korea Centers for Disease Control and Prevention (2011-E71004-00, 2012-E71005-00, 2013-E71005-00, 2014-E71003-00, 2015-P71001-00, 2016-E71003-00, 2017-E71001-00, 2018-E7101-00, 2019-E7104-00, 2021-E0602-00, and 2021-E0602-01); National Institutes of Health (NIH) (RF1NS120947).

LBA 1304

Technical Success and User-Experience with Wireless Patch-Based, Self-Applied, Home Polysomnography

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Introduction: The gold standard for sleep monitoring is in-lab polysomnography (PSG). The Onera Sleep Test System (STS) is a wireless patch-based PSG system, consisting of four sensors that can be applied by the patient, quickly, without supervision, at their home. One sensor is placed at each of the head, chest, abdomen and leg.

Methods: Thirty patients (age 48.5±18.2, 60% male) with a suspected sleep disorder referred for at-home PSG received the Onera STS and instructions on fitting and conducting an unsupervised home PSG study, via mail. Once their study was completed, patients returned their device to a fulfilment center, where their study was uploaded to a secure online portal and independently scored according to AASM criteria (Sleep Center Services LLC, Utah).

Results: 80% of self-applied studies were successful (≥4 hours of complete signals). Scoring of studies took 31.8±12.4 minutes with scorers rating all sleep stages and events as easy to score on a 5 point Likert-Scale. Scorers reported that the signals had high data quality and quantity by rating percent of signals available per study. The referring physician rated the signal quality as good or excellent for all signals except respiratory effort which was rated average. Ninety-seven percent of patients reported that the time it took to put on the Onera STS on was acceptable, 73% that it didn't negatively affect their sleep environment, 80% that they fell asleep as usual and 87% reported that they would recommend the Onera STS to others requiring a sleep test. Only 16% reported that the Onera STS negatively affected their sleep quality. Of the patients that reported having a previous PSG study in a sleep lab, 60% reported that the Onera STS system was more comfortable and 30% were neutral. There were no unanticipated adverse events.

Conclusion: Performing self-applied home PSG studies using the Onera STS is feasible, and was rated as a positive experience for patients, scorers and the referring clinician. Further technical and usability improvements will increase the success rate of first-time sleep studies.

Support: The work was supported by Onera Health.

LBA 1305

Towards Personalized Early Detection of Parkinson's Disease: An RBD-Based Approach Combining Statistical Analysis and AI-powered Stratification Methods

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Introduction: This study harnessed AI-powered tools like principal component analysis (PCA) and multivariate models (PCA-MV) to analyze clinical and laboratory data from Parkinson's disease (PD) patients, individuals with idiopathic REM sleep behavior disorder (iRBD), and healthy controls. By integrating statistical analyses with these advanced techniques, the study aimed to identify and stratify patients at risk of developing Parkinson's disease.

Methods: This study analyzed baseline clinical and laboratory data in 56 participants: PD (n=16), idiopathic RBD (iRBD) (n=22) and and healthy volunteers (n=18). Data included Hoehn and Yahr scale, UPDRS Part III, MOCA, MMSE, SCOPA-cognitive, SCOPA-Autonomic Test, Beck Depression Inventory, Farnsworth Munsell 100 Hue Test, PSQI, ESS, RBDQ-HKQ, polysomnography/video-polysomnography and plasma microRNA 27/29 levels. Logistic regressions and ANOVA were performed using Python libraries. Principal Component Analysis (PCA) was used to reduce data dimensionality, followed by supervised machine learning algorithms like support vector machines (SVMs) and F1 scores for stratification. A post-hoc analysis, using variables selected by our clinical interest were underwent to PCA-MV analysis.

Results: This study employed supervised machine learning algorithms, including logistic regression and PCA-MV, to classify subjects. To assess the correlation between the methods, we utilized Spearman's correlation for four carefully chosen variables (SCOPA AUTO, x miRNA, MMS, and PSQI) with a p value of the logistic regression of $8x10^{-5}$. Through the Vector Machine method (VM) four different functions were used to evaluate the ability to separation between them where evaluated (f1-score PCA-MV = 0.92/ f1-score post-hoc PCA-MV = 0.89). In both instances the PCA-VM method showed that the Kernel radial functions predicted that 69% of RBD patients belong to the same Parkinson's region.

Conclusion: Machine learning models with dimensionality reduction allow us to analyze multiple variables simultaneously, leading to more accurate identification of similarities and differences between groups. In both instances, the PCA-VM method showed that the Kernel radial functions predicted that 69% of RBD patients belong to the same Parkinson's subspace defined by shared features. This results strongly suggests the potential utility of PCA-MV analysis in clinical settings for stratifying patients at risk of developing Parkinson's disease.

LBA 1306

Activation of Sleep Deprivation-Sensitive Basolateral Amygdala Neurons Promotes NREM Sleep

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Introduction: The amygdala is an emotion-processing centre and recently implicated in sleep. In humans, the amygdala exhibits differential connectivity associated with mood changes following sleep deprivation (SD). In rodents, amygdalar subnuclei can initiate rapid eye movement (REM) and non-REM (NREM) sleep states. Our preliminary findings from whole-brain tissue clearing showed activation of the mouse amygdala after SD. However, the distribution and functional contribution of SD-sensitive amygdala cells were unresolved.

Methods: Tissue from male wildtype mice that were undisturbed, underwent 4-h SD, or had 2-h recovery sleep (RS) after SD were immunolabeled for cFOS and parcellated to generate standardized amygdala maps of cFOS+ cells. We then performed whole-cell patch-clamp recordings to assess functional cellular activation after SD. Finally, we trapped the expression of excitatory chemogenetic hM3D(Gq) receptor in anterior basolateral amygdala (BLAa) cells of tamoxifen-inducible *Fos*$^{2A\text{-}iCreERT2}$ mice during SD to determine the sleep-wake outcome of undisturbed or sleep-deprived mice treated intraperitoneally with clozapine-N-oxide (CNO; 3 mg/kg) or its vehicle. Sleep recordings were collected using wireless telemeters and scored for wake, REM, NREM, or corresponding artifact.

Results: Several amygdalar regions increased cFOS production after SD but that in the basolateral amygdala (BLA), especially the anterior portion (BLAa), remained elevated even with RS. SD did not alter the resting membrane potential of BLAa cells. However, BLAa cells needed less current to fire action potentials and tended to receive more excitatory synaptic input after SD. Chemogenetic activation of SD-sensitive BLAa cells increased the percent time spent in NREM and decreased percent wake time in both undisturbed and SD mice compared to vehicle-treated controls. Moreover, the fold-change in NREM and wake time after CNO treatment correlated with the number of BLAa cells transduced with hM3D(Gq) expression.

Conclusion: BLAa cells were more excitable after SD, and the selective activation of SD-sensitive BLAa cells promoted NREM sleep while decreasing wake. These results point to a new amygdalar candidate that regulates sleep-wake behaviour by increasing sleep pressure. Future experiments will delineate the transcriptomic identity and projection sites of SD-sensitive BLAa cells.

LBA 1307

A Qualitative Exploration of Patient and Healthcare Provider Perspectives on Oxybate Treatments for Narcolepsy

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Introduction: Limited qualitative literature exists on patient and healthcare professional (HCP) considerations in selecting a narcolepsy treatment. This qualitative study examined patient and HCP perspectives regarding oxybate treatments for narcolepsy to provide insight into treatment decision-making.

Methods: Patients ≥18 years of age with a self-reported diagnosis of narcolepsy taking an oxybate treatment and board-certified or -eligible HCPs with a specialty/subspecialty in sleep medicine managing patients with narcolepsy were recruited from national opt-in survey panels. Using a semi-structured guide, patients and HCPs participated in virtual interviews to explore their thoughts and experiences with oxybate treatments for narcolepsy. All interviews were fully transcribed, and thematic analysis was performed.

Results: Twelve patients (median age, 46 years) and 10 HCPs (median years in practice, 22.5) were interviewed in December 2023–January 2024. Patients reported that oxybate treatment reduced daytime sleepiness and allowed them to experience good-quality sleep. Patients and HCPs highlighted similar treatment characteristics, with efficacy being the most important outcome. Sodium content is a treatment consideration, particularly in the context of long-term health, or for those with relevant comorbidities (eg, cardiovascular) or underlying risk. Individualized dosing is considered in treatment selection, as it allows for tailored dosing, per physician guidance, to meet patients' needs and reduce or prevent side effects. Patients and HCPs discussed the ability to adjust the amount of medicine in each dose and the timing of dose administration to accommodate patients' schedules. Dosing frequency may factor into treatment selection. Patients on a twice-nightly regimen shared being accustomed to the routine of preparing and taking their medication, as prescribed. For patients, other treatment characteristics, such as side effects and medication preparation, were less important than treatment efficacy.

Conclusion: In this qualitative study, symptom relief emerged as the leading treatment consideration for patients; sodium content and dosing flexibility were among other characteristics. Effective symptom relief was also a consideration for HCPs selecting an oxybate treatment for narcolepsy, followed by sodium content. Patients and HCPs valued the ability to adjust dosing, per physician guidance, according to patients' needs and response. Further research characterizing perspectives on treatment is needed.

Support: Jazz Pharmaceuticals.

LBA 1308

Vitamin D and Excessive Daytime Sleepiness

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Introduction: Vitamin D may affect sleep quality and influence energy levels during the day. Our study aims to analyze the effects of low Vitamin D on excessive daytime sleepiness (EDS).

Methods: Data was collected between 2018-2020 from patients who completed an Epworth Sleepiness Scale (ESS) questionnaire and had a Vitamin D level within 6 months of this. Patients taking sedatives or reporting insufficient sleep were excluded. EDS was defined as ESS ≥10, while ESS < 9 was considered normal. Lab values were used to create a continuous or categorical Vitamin D group variable: <20 ng/ml (deficient), 20-29 ng/ml (insufficient), and ≥30 ng/ml (normal). For subgroup analyses, a granular scale of excessive sleepiness was generated as: ESS ≤9 (normal), 10-14 (mildly sleepy), 15-19 (moderately sleepy), and 20-24 (excessively sleepy). To examine the association between EDS and Vitamin D, a Generalized Estimating Equation model with binomial distribution and logit link clustered by patient to consider multiple ESS surveys per patient was generated.

Results: Data included 624 surveys from 516 patients. Median ESS was 6.0 across groups. Median age was 58.8 years with 57% men and 43% women. There were 191 patients (30.6%) with and 433 (69.4%) patients without EDS, respectively. Mean Vitamin D was 32.7 ng/ml and 32.8 ng/ml among patients with and without EDS, respectively. The proportion of observations with and without excessive daytime sleepiness with deficient (22.0% vs 21.9%), insufficient (24.6% vs 23.8%), or normal (53.4% vs 54.3%) Vitamin D was similar across groups. Analysis of odds ratio modeling excessive daytime sleepiness using Vitamin D as a continuous variable did not show significant association between Vitamin D and excessive daytime sleepiness (OR 0.99, p-value=0.3164). Categorical values showed patients with deficiency were more likely to have excessive daytime sleepiness compared to those with normal Vitamin D (OR=1.233; IQR [0.764, 1.990]; p-value=0.3914]. Subgroup analysis showed median Vitamin D level was lower in the excessively sleepy group (23.0 ng/ml); however, results were not statistically significant (p = 0.9055).

Conclusion: Statistically significant association of Vitamin D level and EDS (p-value=0.6986) was not present. Vitamin D deficiency might be associated with severe daytime sleepiness. Further studies are needed.

LBA 1309

Association of Sleep Quality with Asthma Control and Asthma Quality of Life

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Introduction: Severe asthma remains symptomatic and uncontrolled despite giving appropriate treatment and care. Asthma is interconnected with lower health-related quality of life and lack of sleep. Circadian activation of inflammatory cells and reduction in lung volume are mechanisms for poor sleep quality. There is limited study in which the sleep quality of asthmatics was observed in the Indian population. We intend to provide evidence of sleep quality in asthmatics and the association between sleep quality and patient outcome as asthma control and asthma quality of life.

Methods: In a cross-sectional study until March 2024, We included 45 known asthmatics subjects from the Pulmonary Medicine department and 45 normal controls. We assessed sleep quality and daytime sleepiness using a questionnaire. FEV1 prebronchodilator were recorded by spirometry. The questionnaires on asthma control and asthma quality of life, gastroesophageal reflux disease(GERD) impact scale, and sleep apnea scale of the sleep disorders were filled out with informed consent. Asthmatic subjects were categorized as having either non-severe asthma (NSA) or severe asthma (SA). Present study examined the association between sleep quality and asthma control and asthma quality of life after accounting for GERD and obstructive sleep apnea.

Results: The comparison of studied variables Pittsburgh sleep quality index (PSQI) global score, sleep quality, sleep latency, sleep disturbance, sleep medication, and daytime dysfunction between the control and study groups was significant (Mann-Whitney U test p value<0.05). Study participant age in NSA(42.50 ± 11.25) and SA(38 ± 15.12). The correlation between the asthma control questionnaire (ACQ) with sleep quality and the Epworth sleepiness scale (ESS) was significant. AQLQ mean was negatively correlated with sleep quality, ACQ code, and ESS. It showed that sleep quality was negatively correlated with age. The association between PSQI and asthma severity was not significant.

Conclusion: To the best of our knowledge, the present data findings highlight that severely impaired asthma quality of life has not well-controlled asthma, poor sleep quality, and excessive sleepiness. Identifying modifiable risk factors such as sleep can help better manage asthma.

Support: Short-term studentship protocol (Ref ID:2023-04841) approved by the Indian Council of Medical Research.

LBA 1310

Network Analysis of Daily Activities for Improving Sleep Quality in Middle-Aged Adults

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Introduction: Sleep and daily activities are closely related, showing mutual dependence and reciprocal causation. The quality of sleep can influence the performance of activities. This study aims to compare and analyze differences in the structure of daily activities related to sleep based on subjective sleep quality in middle-aged individuals.

Methods: A total of 313 adults aged 50 and above were categorized into poor sleeper and good sleeper groups based on the Pittsburgh Sleep Quality Index (PSQI). Social network analysis was employed to analyze the structure of daily activities related to sleep. Group differences were examined using independent t-tests, while correlations within groups were analyzed using Pearson correlation analysis.

Results: The analysis revealed that activity frequency, number of connections, average connectivity, and density of daily activities were significantly higher in the good sleeper. The difference in activities during the pre-sleep, sleep preparation, and post-sleep periods between the two groups was particularly evident in terms of connectivity characteristics. Positive correlations were observed regarding pre- and post- sleep activities, but no significant differences were found between the two groups.

Conclusion: This study provides valuable insights for interventions targeting activities or behaviors aimed at improving sleep among middle-aged individuals with poor subjective sleep quality. Based on these findings, we can offer specific suggestions for developing intervention plans and setting goal for daily activities when implementing cognitive-behavior therapy for middle-aged individuals with insomnia.

Support: This research was supported by a grant of the Korea Health Technology R&D Project through the Korea Health Industry Development Institute funded by the Ministry of Health Welfare (Grant Number: HR21C0885040021) and a grant of the Korea Planning & Evaluation institute of Industrial Technology (KeIT) funded by the Ministry of Trade, Industry and Energy (MOTIE, Grant Number: 20024263).

LBA 1311

Apnea-Event Related Changes in Instantaneous Heart Rate Depend on Sleep Stage and Sleep Posture in a Pediatric Population

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Introduction: Apnea-related changes in instantaneous heart rate (IHR) have been identified as predictors of apnea severity, hypoxemic burden, and cardiovascular conditions. Also, the duration and severity of apnea events depend on the sleep stage (REM/NREM) and posture (supine/non-supine) in which they occur. The relationship between sleep stage, posture, and the nature of IHR changes has not been characterized, let alone in a pediatric population.

Methods: Polysomnography data from 74 children (36F/37M), mean age 7.46 (SD: 1.96) years-old, who participated in an UW-Madison IRB approved study were used in this study.

The electrocardiogram channel was used to estimate IHR using a wavelet-based R-peak detection algorithm. The IHR was upsampled to 10 Hz using local interpolation. Apneas and hypopneas were annotated by a sleep technician.

The mean IHR time-locked to the end of apnea events (time = 0) was calculated for all events and for all combinations of NREM/REM stage and supine/non-supine posture. The baseline was the mean IHR in the interval from –40 to –20 seconds. Baseline values were subtracted from the IHR.

Statistically significant deviations from baseline were identified using a two-sided Wilcoxon signed-rank test. Multiple comparison correction was applied.

Results: The mean IHR curve (regardless of stage and posture) showed a significant IHR decrease (-1 bpm) in the interval from 0 to 10 seconds. IHR increased up to +2 bpm in the interval from 10 to 20 seconds.

Apnea events in the supine position and in NREM were associated with an IHR decrease (-2 bpm) in the interval from 0 to 10 seconds. Apnea events in the supine position and in REM were associated with an IHR increase (up to +2 bpm) in the interval from 10 to 20 seconds. No significant changes in IHR were identified in the non-supine position.

Conclusion: Apnea-event related changes in IHR were analyzed in a pediatric population. Significant IHR changes were found in the supine position and the direction of change, i.e. decreasing or increasing was associated with NREM and REM respectively. These findings can inform the characterization of apnea-caused cardiovascular burden and positional treatment recommendations.

LBA 1312

AHI and Sleep-Staging Derived from a Patch-Based, 2-EEG Channel PSG Device

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Introduction: The gold standard for sleep monitoring is in-lab polysomnography (PSG), an expensive, time consuming test requiring attendance and analysis by a trained sleep technician. The wireless, patch based, Onera Sleep Test System (STS) was developed to enable PSG to be performed unattended at the patient's home. It consists of four sensors that are designed for self-application by the patient before sleep. This study aims at assessing the diagnostic accuracy of the Onera STS in comparison with in-lab PSG.

Methods: 150 subjects with a suspected sleep disorder were recruited from 7 clinical sites and underwent single night, simultaneous, in-laboratory PSG and Onera STS recording. Scoring was completed in a blinded fashion according to the AASM criteria by 1) an independent sleep scorer in Germany and 2) the Johns Hopkins Center for Interdisciplinary Sleep Research and Education in the United States. Sleep staging and apnea hypopnea index (AHI) scores were compared between the devices using correlation analysis.

Results: The Pearson's correlation coefficients (r^2) between methods (in-laboratory PSG vs Onera STS) were 0.84 TST, 0.78 NREM, 0.82 REM and 0.95 AHI when combining the scoring of the 2 independent scorers. The ICC between scorers for the in-laboratory PSG were 0.91 TST, 0.90 NREM, 0.91 REM, and 0.99 AHI. The ICC between scorers for the Onera STS were 0.90 TST, 0.86 NREM, 0.89 REM, and 0.98 AHI.

Conclusion: The results indicate that the Onera STS provides comparable sleep staging and AHI data to a traditional PSG for diagnostic purposes. A similar level of agreement between scorers suggests that the Onera STS is as accurately scored as traditional PSG. These results open the possibility of performing unattended PSG studies efficiently and accurately outside the sleep laboratory at a larger scale, thus improving access for patients with sleep disordered breathing.

Support: The work was supported by Onera Health and independently managed by MAXIS Medical GmbH.

LBA 1313

Association Between Sleep Microarchitecture and Cognitive Function in Obstructive Sleep Apnea

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Introduction: Obstructive sleep apnea is associated with an increased risk of cognitive impairment and dementia, but associations between cognitive function and conventional measures of nocturnal hypoxemia and sleep fragmentation are modest at best. This study examined whether changes in sleep microarchitecture (spindles, odds-ratio product (ORP; a novel continuous measure of sleep depth), and normalized EEG power) are associated with cognition in patients with OSA.

Methods: Adults from the Canadian Sleep and Circadian Network's OSA observational cohort who underwent in-laboratory polysomnography, completed sleep and medical history questionnaires, and underwent cognitive testing [Montreal Cognitive Assessment (MoCA; global cognition), Rey Auditory Verbal Learning Test (RAVLT; memory) and Digit–Symbol Coding (DSC; information processing speed)] were included in this study. Associations between cognitive scores and stage 2 non-rapid eye movement (NREM) sleep spindle density, power, frequency and %-fast (12-16Hz), ORP, and normalized EEG power (EEG_{NP}) were assessed using multivariable linear regression (MLR) adjusted for age, sex, education, and total sleep time. Mediation analyses were also performed to investigate whether measures of sleep microarchitecture may mediate the detrimental effect of moderate-to-severe OSA on cognitive performance.

Results: Compared to participants with no/mild OSA [n=443, 56% female; median (IQR) apnea-hypopnea index (AHI): 8.4 (5.2-11.2)], spindle density, power, frequency and %-fast were lower (all comparisons, $p<0.001$) in participants with moderate [n=257, 46% female; AHI: 21.5 (18.3-25.2)] and severe OSA [n=442, 39% female; AHI: 56.0 (41.3-86.2)], and were positively associated with MoCA, RAVLT and DSC scores (false discovery rate corrected p-value, $q\leq0.026$). ORP during NREM sleep (ORP_{NREM}) was highest in patients with severe OSA ($p\leq0.001$ *versus* no/mild and moderate OSA) but was not associated with cognitive performance in MLR analyses ($q\geq0.166$). In mediation analyses, spindle density [-0.09 (-0.2 to -0.01)]) and EEG_{NP} [-0.05 (-0.13 to -0.01)]) mediated the negative effect of moderate-severe OSA on MoCA total score, while ORP_{NREM} [-0.03 (-0.06 to -0.01)], spindle power [-0.03 (-0.07 to -0.01)] and %-fast spindles [-0.02 (-0.04 to -0.0004)] mediated the negative effect of moderate-severe OSA on DSC scores.

Conclusion: Assessment of spindle activity, ORP and normalized EEG power may help identify patients with OSA at risk of cognitive impairment.

LBA 1314

Sleep Disturbance in Menopausal Women with Vasomotor Symptoms: Findings From Two Phase 3 Studies

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Introduction: Sleep disturbances associated with menopause are common and bothersome and can impact women's health and quality of life. However, many women do not attribute their sleep disturbance to menopause and clinicians may not ask about sleep disturbances in counselling. This analysis aims to characterize sleep disturbances among women entering the two pivotal, phase 3, OASIS clinical trials of elinzanetant, a neurokinin-1,3 receptor antagonist, for the treatment of vasomotor symptoms (VMS) associated with menopause.

Methods: Postmenopausal women experiencing moderate/severe VMS were randomized 1:1 to elinzanetant 120 mg (n=199 OASIS 1; n=200 OASIS 2) or placebo (n=197 OASIS 1; n=200 OASIS 2) for 12 weeks (followed by 14-week active-treatment phase). There was no threshold for severity of sleep disturbances to enter the study. The Patient-Reported Outcomes Measurement Information System (PROMIS SD-SF-8b) questionnaire was administered electronically at baseline and weeks 1, 2, 3, 4, 8, 12, 16, 26, and 30 to assess sleep disturbance. The questionnaire consisted of eight items e.g. 'I was satisfied with my sleep' and 'I had trouble sleeping' to assess aspects of sleep disturbance. Each item was scored on a 5-point scale. Items were assessed individually or summed to yield total raw scores which were converted to total T-scores (range 28.9–76.5). Higher scores indicated greater severity of sleep disturbances.

Results: At baseline, mean (SD) PROMIS SD-SF-8b total T-scores ranged from 60.2 (7.2) to 61.7 (6.2) across the studies. The majority of participants were 'not at all' or 'only a little bit' satisfied with their sleep at baseline; ranging from 69.4% (placebo group OASIS 2 n=193) to 78.7% (elinzanetant group OASIS 2 n=188). The majority also reported 'often' or 'always' having trouble sleeping at baseline; ranging from 58.1% (placebo group OASIS 1 (n=179) to 68.6% (elinzanetant group OASIS 2 n=188).

Conclusion: In both OASIS trials, the average level of sleep disturbance was in the moderate range at baseline. Most women were unsatisfied with their sleep and reported trouble sleeping. These data highlight the high frequency and magnitude of sleep disturbance among postmenopausal women with VMS and support the need for HCPs to address sleep disturbances while counselling.

LBA 1315

Enhancing Physician Sleep through a Web-Based Cognitive Behavioral Therapy for Insomnia Program: A Pilot Implementation Study

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Introduction: Physician burnout, exacerbated by the COVID-19 pandemic, poses a significant threat to the medical profession, highlighting the need for interventions to improve physician mental health. As sleep disturbance is a predictor for burnout, accessible, evidence-based physician-directed insomnia interventions may represent a novel strategy to improve sleep symptoms acutely and improve mental health in the long term. This pilot implementation study examines the feasibility and acceptability of a web-based, self-guided Cognitive Behavioral Therapy for Insomnia (CBTi) program for physicians self-reporting insomnia symptoms.

Methods: This single-arm pilot study enrolled healthy physicians who did work <1 night shift/week from an urban, academic hospital (Boston, MA). After completing baseline assessments using a secure web-based platform, participants were given free access to Sleep Healthy Using the Internet (SHUT-i) program, a six-session self-guided CBTi treatment program. We collected data on the feasibility, uptake, and acceptability via surveys and interviews and repeated assessments post-intervention and 2-month follow-up.

Results: Among 58 physicians screened on-line, 34 enrolled (mean age 46.6 yrs, 57.6% female). Mean baseline Insomnia Severity Index (ISI) scores were 19.8 ± 4.1. Fifteen (44.1%) physicians logged in to SHUT-I at least once. Among those 15 participants, ten completed at least two SHUT-i treatment sessions, and eight completed all six SHUT-i treatment sessions. In exploring effectiveness among the eight completers, SHUT-i was associated with improvements in insomnia severity (primary exploratory sleep outcome, mean change -6.0, 95% CI: -9.7 -2.3), sleep disturbance and sleep-related impairment (mean T-score change -7.0, 95% CI: -11.6, -2.5 and mean T-score change -6.1, 95% CI: -11.9, -0.3, respectively) Improvements were maintained at 2 months. We also observed improvements in depression, anxiety, and emotional exhaustion, but not burnout.

Conclusion: This pilot implementation study demonstrates the promising feasibility and potential effects of an organizationally supported physician-directed web-based CBTi intervention on reducing insomnia symptoms among physicians. Future implementation studies are needed to understand how to optimize organizational-supported uptake and implementation of sleep interventions for healthcare professionals across different healthcare settings and to rigorously evaluate their impact on mental health and burnout over time.

LBA 1316

History of Dopaminergic Treatment Predisposes to a Gradual Loss of Response to all Treatments in Non-Augmented Restless Legs Syndrome (RLS) Patients

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Introduction: In RLS patients who are not yet augmented, long-term exposure to dopaminergic agents gradually reduces treatment response to these same agents. We aimed to investigate whether this reduction in treatment response also applies to non-dopaminergic drugs.

Methods: We reanalyzed three clinical trials on effective non-dopaminergic treatments: gabapentin enacarbil (GBPen, presynaptic glutamate inhibitor), dipyridamole (DPD, adenosine reuptake inhibitor), and suvorexant (SVX, orexin antagonist).

Included patients were blindly stratified into two separate groups:

a) Dopaminergic-treated (DT): Not augmented patients previously treated with dopaminergics for >5 yrs.
b) Non-dopaminergic-treated (NDT): Patients never exposed to dopaminergic agents.

These studies shared a common randomized, double-blind, cross-over, placebo-controlled design with a two-week treatment administered at 8-9pm. International RLS Scale (IRLS) and Clinical Global Improvement (CGI) were used weekly. Multiple Suggested Immobilization Tests (m-SIT) (followed by polysomnography in DPD and SVX) were performed after each treatment phase.

Results: The three studies included a total of 106 patients: GBPen (DT: 19; NDT: 19), DPD (DT: 10; NDT: 18), and SVX (DT: 14; NDT: 26).

- Baseline values on IRLS, CGI, and mSIT were similar across patient groups (n.s.).
- Both patient groups improved more on active treatments than on placebo. However, IRLS and CGI improvement were lower on DT than NDT when treated with:
  - GBPen (mean ± SD) [IRLS: -4.1 ± 0.5 vs -11.9 ± 2.7, $p<0.05$; CGI: $p< 0.01$].
  - DPD [IRLS: -4.1 ± 0.5 vs -11.9 ± 2.7, $p<0.05$; CGI: $p< 0.01$].
  - SVX [IRLS: -3 ± 1.2 vs -11.3 ± 0.7; $p<0.01$; CGI: $p< 0.05$].
- mSIT-discomfort scale: Placebo-corrected responses to GBPen (Z: -2.005; $p<0.01$) and DPD (T: 1.7, $p<0.1$) were lower in DT. No differences were observed across patient groups on SVX (n.s.).
- Polysomnography: DPD improved in DT Total Sleep, WASO, N1, and N3 less than in NDT.
- No differences were observed in PLMS.

Conclusions: Before augmentation is clinically established, previous long-term exposure to dopaminergic treatment impairs subsequent response to non-dopaminergic treatments. Thus, dopaminergic treatment gradually causes changes in dopamine receptors (i.e., upregulation of D1-receptors), alters the pathophysiology of RLS, and diminishes the response to alternative treatments. Clinical and pathophysiological implications will be discussed.

Support: None.

LBA 1318

Effect of Oral Orexin Receptor 2 Agonist TAK-861 on Function and Health-Related Quality of Life in Individuals With Narcolepsy Type 1: Results From a Phase 2 Study

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Introduction: Narcolepsy type 1 (NT1) is a rare disorder of sleep-wake instability, characterized by excessive daytime sleepiness and associated with impaired functioning and overall health-related quality of life (HRQoL). The orexin receptor 2 agonist TAK-861 has shown improvement of narcolepsy symptoms in animal models and is under investigation as a therapeutic agent for NT1.

Methods: Analyses of exploratory data from the randomized, double-blind, placebo-controlled, Phase 2 study (NCT05687903) investigated the effect of TAK-861 on functioning and HRQoL in individuals with ICSD-3 confirmed NT1. Participants aged 18-70 years (Japan: 16-70), with an Epworth Sleepiness Scale (ESS) score >12, and ≥4 partial/complete episodes of cataplexy/week were eligible for inclusion. Participants were randomized to oral TAK-861 (0.5mg twice 3 hours apart, 2mg twice 3 hours apart, 2mg then 5mg 3 hours later, or 7mg once-daily), or placebo. Exploratory endpoints included 3 domains from the Functional Impacts of Narcolepsy Instrument (FINI; social activities, everyday activities, and everyday responsibilities domains; each item uses a 5-point Likert scale, higher standardized domain scores (0-100) indicate more severe impact; Sleep 2024, Abstract #664), the 36-item short-form (SF-36), and the EuroQoL 5-Dimensions 5-Levels (EQ-5D-5L) questionnaire. Efficacy and safety data are reported separately.

Results: A total of 112 participants (mean age 34.0 years, and ESS score 18.5, 51.8% female) were randomized to TAK-861 (0.5mg/0.5mg n=23, 2mg/2mg n=21, 2mg/5mg n=23, 7mg n=23) or placebo (n=22). Statistically significant improvements in FINI domains were achieved with TAK-861 at Week 8. Least square [LS] mean [SE] changes from baseline to Week 8 for TAK-861 doses versus placebo were -29.9 to -43.1 versus -4.5, respectively, for FINI-social activities, -41.4 to -54.5 versus -8.0 for FINI-everyday activities, and -35.0 to -53.7 versus -1.5 for FINI-everyday responsibilities (all $p<0.001$ for all doses versus placebo). Statistically significant improvements in SF-36 and EQ-5D-5L were achieved with all TAK-861 doses. TAK-861 was generally well tolerated and there were no treatment-related serious TEAEs or discontinuations due to TEAEs during the study.

Conclusion: In this Phase 2 study, TAK-861 showed statistically significant and clinically meaningful improvements in functioning and HRQoL in participants with NT1 over 8 weeks.

Support: Funded by Takeda

LBA 1321

Transvenous Phrenic Nerve Stimulation to treat Central Sleep Apnea in Heart Failure: Win Ratio Analysis

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Introduction: Novel therapies in heart failure (HF) have typically been evaluated against traditional mortality/morbidity endpoints. The Win Ratio, a newer hierarchical composite approach, assigns an order of clinical importance to endpoint components and provides a measure of treatment effect and statistical significance. The components may include clinical and other patient outcomes that support a positive treatment impact to the disease state or patient.

The aim of this analysis was to retrospectively apply a Win Ratio analysis to data from the HF subgroup of the remedē® System Pivotal Trial, which examined the effects of transvenous phrenic nerve stimulation (TPNS) for the treatment of central sleep apnea in adult patients. The objective is to underscore the contribution to sleep specific outcomes of the therapy in this important group. After TPNS device implantation, subjects were randomized to treatment (active therapy) or control (inactive device) and followed for 6 months.

Methods: The HF subgroup was analyzed with a generalized analytical solution to the Win Ratio. The primary analysis used 3 pre-defined components to compare all treated to all control patients, in the following order of importance, to determine winners of each pair: longest survival, lowest HF hospitalization rate, and 25% improvement in 4% oxygen desaturation index (a physiologic measure of oxidative stress) at 6 months. The 43 treatment group and 48 control group subjects provided 2,064 pairwise comparisons using the unmatched pairs approach to calculating the Win Ratio.

Results: There were 1,141 (55.28%) winning pairwise comparisons for the treatment group and 222 (10.76%) for the control group, yielding a Win Ratio of 5.14 (95% confidence interval 2.34-11.27, p-value<.0001). This indicates a 5-fold improvement in clinical benefit with TPNS. The number of wins for each component was higher for TPNS than control, demonstrating concordance of TPNS benefit across all three components, supporting the validity of the main finding.

Conclusion: This Win Ratio analysis of the **rem**edē System Pivotal Trial shows that TPNS may be superior to control in HF patients with central sleep apnea using a hierarchical clinical benefit endpoint comprising mortality, HF hospitalization, and oxygenation improvement status.

Support: ZOLL Respicardia, Inc. sponsored the trial.

LBA 1322

Age-Dependent Activation of cFos in Pre-Hypoglossal Region Elicited by Chemogenetic Activation of Noradrenergic A7 Neurons

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Introduction State-dependent excitatory noradrenergic drive to hypoglossal motoneurons is mediated by interneurons situated within the pre-hypoglossal region (PHR) as demonstrated by a high potency of a1-adrenoceptor drugs to activate the genioglossus muscles when injected into this region. We aimed to locate the PHR interneurons by assessing neuronal cFos expression that was elicited in response to DREADD-induced bilateral activation of A7 noradrenergic neurons and determine whether the cFos expression is age-dependent.

Methods Three young DBH-cre mice (3–6 month-old) and three aging mice (21-26 month-old) of both sexes were bilaterally injected with excitatory M3-DREADD into A7 noradrenergic region. After four weeks, mice were injected with CNO (0.3 mg/kg, i.p.) and transcardially perfused 2 hours later. Pontine sections were subjected to immunohistochemistry for tyrosine hydroxylase (a marker for noradrenergic neurons), and M3-positive A7/SubC neurons were counted. Medullary coronal sections were processed for cFos immunohistochemistry, and the cFos-positive neurons were counted bilaterally between AP -7.08 and -6.48 mm from Bregma using 6x4 cell grids (0.15x0.15 mm counting cell size) centered at the ventral floor of the IV ventricle.

Results In young mice, the largest number of cFos-expressed neurons was found within counting cells located bilaterally close to midline, and just ventral to the IV ventricle at AP levels between -6.84 and -6.64 (mean 24.8 ± 4.9 (SE), n=6). Importantly, these numbers were positively correlated with the number of transfected A7, but not SubC, noradrenergic neurons in each mouse (linear regression R^2 ranged from 0.5 to 0.7). In older mice, the largest number of cFos-positive neurons was found only between AP levels -6.84 and -6.64 within the same counting cells, which was significantly lower as compared to the young mice (mean 12.1 ± 0.9, n=6, p=0.041, Mann-Witley test). The linear regression between the number of M3-transfected A7 noradrenergic neurons and the number of cFos-positive neurons was also positive but lower R^2 (between 0.04 to 0.5).

Conclusions The obtained results suggest that the most PHR interneurons are located close to midline just ventral to the IV ventricle and between AP levels -6.84 and -6.64 from Bregma. In addition, the noradrenergic activation of PHR interneurons may decrease with age.

Support: Albany Medical College startup funds and NIA R01AG065233

LBA 1323

Safety and Pharmacodynamic Effects of the Orexin 2 Receptor Agonist ALKS 2680 in Patients with Narcolepsy Type 1: A First-in Human Phase 1 Study

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Introduction: ALKS 2680 is a potent, centrally active, orally bioavailable, and highly selective orexin 2 receptor agonist being developed for the treatment of narcolepsy and other central hypersomnolence disorders. Initial dose-ranging and safety data in healthy volunteers have been presented. Here we provide safety and efficacy results in patients with narcolepsy type 1 (NT1).

Methods: This randomized, double-blind, phase 1 study assessed the safety, tolerability, and pharmacodynamics of ALKS 2680. Patients with NT1 in Australia received single doses of 1, 3, and 8 mg ALKS 2680 and matching placebo in a 4-way randomized crossover design. Safety assessments included adverse events (AEs), vital signs, clinical laboratory testing of blood and urine, and electrocardiograms (ECG). Pharmacodynamic efficacy assessments include the Maintenance of Wakefulness Test (MWT) and the Karolinska Sleepiness Scale (KSS).

Results: In patients with NT1 (N=10), there were no serious or severe adverse events, and no patient discontinued due to any AE. Adverse events related to study drug and occurring in >1 patient included insomnia, pollakiuria, salivary hypersecretion, decreased appetite, dizziness, and nausea. The majority of AEs related to study drug were observed at the 8 mg dose. No drug-related, treatment-emergent, clinically meaningful changes from baseline were identified in laboratory values, vital signs, or ECGs. On the MWT, ALKS 2680 increased mean sleep latency, demonstrating placebo-corrected changes from baseline of 18.4 minutes (1 mg), 22.6 minutes (3 mg), and 34.0 minutes (8 mg) through 8 hours post-dose ($p<0.001$ at all dose levels vs placebo). On the KSS, ALKS 2680 showed clinically meaningful, dose-dependent improvements of 2-3 points in self-reported alertness between 1 and 8 hours ($p<0.001$ at all dose levels vs placebo).

Conclusions: ALKS 2680 was generally well-tolerated among patients with NT1. Single doses of ALKS 2680 up to 8 mg led to statistically significant, clinically meaningful improvements in sleep latency and patient-reported alertness. The results of this study support further clinical evaluation of ALKS 2680 in phase 2.

Support: This study is sponsored by Alkermes.

LBA 1324

Staging Alterations and Determining Optimal Phenotypes in Patients Pre and Post Implantation of Hypoglossal Nerve Stimulator

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Introduction: Treatment of obstructive sleep apnea (OSA) with hypoglossal nerve stimulation is gaining momentum in populations intolerant of positive airway pressure. Previous studies demonstrated encouraging effects on sleep staging and arousal thresholds with this therapy. The ADHERE registry demonstrated subjective and objective improvement in OSA outcomes[1]. However, most trials defined responders as having met adequate reduction in AHI, typically defined as > 50% reduction or AHI < 20. Few trials defined responders as having adequate duration of use. We sought to evaluate therapy duration to better phenotype adherent subjects.

Methods: A retrospective analysis was performed on 30 subjects from a cohort of 210 who were implanted with hypoglossal stimulators at our institution. These subjects underwent in lab polysomnography both pre and post stimulator implantation. Wilcoxon Sign Rank and Mann Whitney U – Tests assessed changes in AHI, Epworth score, latency, wake after sleep onset (WASO) and stage percentages in all subjects. Subjects were placed in two groups as adherent or non-adherent based on the duration of use meeting a minimum of 4 hours for 70% of the nights. Analysis using Chi–square test and Odds Ratio evaluated differences in gender, race, age, AHI, Epworth, and staging percentages.

Results: Subjects were 96.7% Caucasians, 73.3% males. with a median age of 67.5 years, BMI of 30.2 and neck circumference of 17 inches. A statistically significant decrease in AHI, Epworth score and increase in percentage of stage 3 and REM sleep was noted in all subjects. A borderline significant increase in REM latency was noted but no change in sleep latency or WASO.

Compliance revealed 16 subjects were adherent. A significant statistical difference was noted in pre and post-AHI, percentage of REM in both groups. However, adherent subjects had lower pretreatment AHI, hypertension. Adherent patients had significant differences in Epworth, REM periods and stage 3 sleep. No significant differences noted in age, gender, BMI, neck size, insomnia, CHF or COPD.

Conclusions: Hypoglossal nerve stimulation improved AHI, Epworth, stage 3 and REM sleep in all subjects. Adherent subjects had lower pretreatment AHI, HTN and more significant changes in Epworth, REM periods and stage 3 sleep.

Support: Thaler E, Schwab R, Maurer J, Soose R, Larsen C, Stevens S, Stevens D, Boon M, Huntley C, Doghramji K, Waters T, Kominsky A, Steffen A, Kezirian E, Hofauer B, Sommer U, Withrow K, Strohl K, Heiser C. Results of the ADHERE upper airway stimulation registry and predictors of therapy efficacy. Laryngoscope. 2020 May;130(5):1333-1338. doi: 10.1002/lary.28286. Epub 2019 Sep 14. PMID: 31520484; PMCID: PMC7217178.

LBA 1325

Sleeping is a Luxury: A Qualitative Study on Exploring the Experiences of Poor Sleep Quality in Pregnant Women in China

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Introduction: The prevalence of poor sleep quality is relatively high among pregnant women. Each stage of pregnancy poses different challenges that can lead to poor sleep quality. There is lack of understanding of the sleep-related experiences in pregnant women, which is critical in developing and implementing targeted sleep interventions in this population. In this study, we aimed to explore and understand the experiences among pregnant women with poor sleep quality, with a specific focus on identifying the influencing factors and their unmet needs of sleep across the three trimesters of pregnancy.

Methods: We conducted semi-structured interviews with 22 pregnant women who reported poor sleep quality [Pittsburgh Sleep Quality Index (PSQI) score > 5] during their 37th week of pregnancy, from December 2023 to February 2024 at a specialized women's hospital in Hangzhou, Zhejiang, China. All interviews were audio-recorded and transcribed verbatim. Qualitative thematic content analysis was employed to analyze the transcripts. Inductive coding was performed using NVivo 12 to develop themes.

Results: The pregnant women had a mean age of 32.00 years (SD = 3.27), and their mean PSQI score was 7.95 (SD = 1.91). Five themes were identified: different sleep changes across the three trimesters (e.g., progressive deterioration, initial deterioration followed by improvement, and initial improvement followed by deterioration); factors exacerbating poor sleep quality (e.g., physical discomfort, emotional distress, and inadequate sleep hygiene); factors alleviating poor sleep health (e.g., spouse support, peer assistance, and internet information); existing coping strategies for promoting sleep quality (e.g., catching up on sleep, engaging in physical activities, and practicing relaxation techniques); unmet sleep-related needs (e.g., medical support from healthcare professionals or sleep specialists, reliable information about sleep promotion, and effective remedies for emotional distress and physical discomfort).

Conclusion: Our findings reveal that pregnant women experiencing poor sleep quality often exhibit distinct patterns of sleep changes, with the first and third trimesters being the most vulnerable stages. These changes are influenced by various factors, yet they lack access to professional support. It is imperative to prioritize the sleep health of this population and offer them tailored sleep interventions.

Support (if any): China Scholarship Council (202306320510).

LBA 1326

Suicide and Nightmares: Understanding Predictive Factors of Suicidality

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Introduction: Nightmares are widely regarded as a significant risk factor for experiencing suicidal ideation and behavior, which is an increasingly prevalent issue in society today. While evidence shows that nightmare severity is a significant predictor for suicidal ideation severity, the short-term relationship requires further study. Our aim was to explore the daily relationship and directionality between nightmare severity and suicidal ideation severity.

Methods: We recruited 26 participants, 8 male and 18 female, ranging from 19-38 years old who reported being suicidal. For a period of 10-21 days, participants filled out a sleep survey each morning and night about their suicidal ideation and nightmare experiences. Participants completed a sleep diary each morning, which included questions about their nightmare severity the prior night. Each evening, participants completed a survey asking about the severity of suicidal ideation they experienced that day. Our hypothesis was examined with a two-level cross-lagged panel model, using Bayesian methods without any priors. We estimated the cross-lag effects of disturbing dream severity and suicidal ideation severity without any covariates.

Results: We found that suicide severity on any day predicted next-day suicide severity (SE=0.2, p=0.008). Nightmare severity did not predict suicide severity or next-day suicide severity (SE=0.1, p=0.440; SE=-0.1, p=0.161). Nightmares also did not predict next-day nightmares (SE=-0.15, p=0.067). No other significant cross-lagged effects or covariate effects were found.

Conclusion: We were unable to find a relationship between nightmare severity and next-day suicidal ideation severity. However, we found a strong positive relationship between suicide severity on any day and next-day suicide severity. Previous studies have found nightmares to be a strong predictor of suicidality over months and years, suggesting that this relationship may only be found within long-term considerations. More research may be necessary to fully understand the relationship between nightmares and suicidality.

LBA 1327

Treatment Satisfaction with Oral Orexin Receptor 2 Agonist TAK-861 in Patients With Narcolepsy Type 1: Findings From a Phase 2 Study

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Introduction: Narcolepsy type 1 (NT1) is characterized by excessive daytime sleepiness (EDS) and cataplexy. The orexin receptor 2 agonist TAK-861 has shown wake-promoting effects and improvement of cataplexy-like symptoms in animal models of narcolepsy and is under investigation as a therapeutic agent for NT1.

Methods: Treatment Satisfaction Questionnaire for Medication (TSQM) and exit interview results from the randomized, double-blind, placebo-controlled, Phase 2 study (NCT05687903) were evaluated to explore the impact of TAK-861 treatment on individuals with ICSD-3-confirmed NT1. Participants aged 18-70 years, with an Epworth Sleepiness Scale (ESS) score >12, and ≥4 partial/complete episodes of cataplexy/week were eligible for enrollment in the trial. Participants were randomized to oral TAK-861 (0.5mg twice 3 hours apart, 2mg twice 3 hours apart, 2mg then 5mg 3 hours later, or 7mg once daily), or placebo. Primary and secondary efficacy/safety results are reported separately.

Results: 112 participants (mean age 34.0 years, 51.8% female, ESS score 18.5) were randomized to TAK-861 (0.5mg/0.5mg, 2mg/2mg, 2mg/5mg, or 7mg) or placebo. At Week 8, least square (LS) mean TSQM effectiveness and global satisfaction domain scores were 67.7-80.5 versus 24.8 and 71.0-83.7 versus 29.8 across TAK-861 doses versus placebo, respectively (all P<0.001). Convenience domain scores for TAK-861 were similar to placebo (70.9-74.6 vs 60.8). The level of satisfaction with side-effects was high across TAK-861 treatment arms (92.4-96.4) and somewhat lower with the 7mg-dose (85.9). After Week 8, 25 individuals (TAK-861: n=21/placebo: n=4) participated in exit interviews, which revealed meaningful improvements in narcolepsy symptoms and functional impacts for most TAK-861 participants. Symptoms rated as most important to improve from baseline were EDS, cataplexy and impaired cognitive function; most frequently cited impacts were work/school-related, social/leisure activities and general quality of life. Changes in impacts were meaningful for TAK-861-treated participants but not for placebo-treated participants. Overall, 94.7% of TAK-861-treated participants (18/19 respondents) would be willing to recommend TAK-861 to others with narcolepsy.

Conclusion: Quantitative (TSQM) and qualitative (exit interviews) Phase 2 data revealed high treatment satisfaction with TAK-861 in participants with NT1, demonstrating meaningful improvements in symptoms and functional impacts important to patients.

Support: Funded by Takeda

LBA 1328

The Effectiveness of Digital CBT to Treat Insomnia in a Diverse Sample of Participants with Insomnia Disorder

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Introduction: Insomnia Disorder is common, and although cognitive behavioral therapy (CBT) is widely recommended as the first-line treatment, it is seldom available due to a shortage of trained providers and high costs of care. Digital CBT, for insomnia, however, offers an accessible approach to delivering evidence-based treatment. Despite this, trials of digital CBT have typically recruited predominantly white and high socioeconomic status samples not representative of the general population. This trial investigated the effectiveness of digital CBT (Sleepio) for the treatment of insomnia disorder in a racially and socioeconomically diverse sample of participants from across the U.S.

Methods: 336 participants with diagnostic interview-confirmed insomnia disorder were randomized to either digital CBT or online sleep hygiene education (SHE) in this parallel arm, decentralized trial. Racial diversity of participant recruitment was monitored and continuously adjusted to increase the representativeness of the sample. Primary outcomes included insomnia severity (ISI), sleep onset latency (SOL) and wake after sleep onset (WASO) at 10-weeks post-randomization (post-intervention). Follow-up assessments occurred at 16-and 24-weeks post-randomization.

Results: Of the total sample, 56% of participants identified as female; 52% were in less than full-time employment; 61% had a household income at or below the US median; 44% had less than a bachelor's degree; and 29% identified as a racial minority. Across demographic and socioeconomic variables the study sample closely aligned with US census data. At post-intervention, participants allocated to digital CBT had lower insomnia severity, SOL and WASO than SHE participants with small-to-large between-group effects (d=0.21-0.90). Compared with SHE, participants allocated to digital CBT had 2.5x and 5.8x significantly greater odds of insomnia disorder response and remission respectively. Among participants with ≤6.5 hours of sleep per night at baseline, improvements in insomnia severity, SOL, and WASO were larger.

Conclusion: Digital CBT is an effective treatment for insomnia in a socioeconomically and racially diverse sample of participants with insomnia disorder that aligns closely with the US general population and may improve equitable access to first-line CBT for insomnia.

Support: This trial was funded by Big Health Inc.

LBA 1329

Opt-Out

LBA 1330

A Mixed Methods Investigation of Intimate Partner Violence During Sleep Among Survivors

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Introduction: Intimate partner violence (IPV) research has focused on physical, sexual, and psychological abuse. However, abusive partners may also attempt to restrict, interrupt, monitor, or control women's sleep. We conceptualize "sleep IPV" as a novel type of IPV that involves violent or controlling behaviors that target or impact sleep. We conducted qualitative interviews with women who reported ongoing or past IPV to characterize sleep IPV; we also collected validated self-report questionnaires to better understand sleep among IPV survivors.

Methods: Women completed 1-hour qualitative, semi-structured interviews via Zoom/phone from Feb-Nov 2023. Interviews were audio recorded, transcribed, and coded. Participants self-reported insomnia symptoms (Insomnia Severity Index ≥15), poor sleep quality (Pittsburgh Sleep Quality Index >5), multi-dimensional sleep health (RUSATED; range: 0-12, higher=worse), cognitive/behavioral fears around sleep (Fear of Sleep Inventory, FoSI-1; range: 0-92, higher=worse), and sleep-related traumatic events and nighttime vigilance (FoSI-2).

Results: Participants included 30 women aged 18-62 [*M*(*SD*)=40.2(11.5) years; 70% White, 30% Black; 17% sexual minorities]. To date, 20% of transcripts have been coded. Preliminary themes include: (1) intentional interruptions during sleep (*"He would turn on lights, slam drawers, and stomp around*"); (2) sleep routines dictated by the abusive partner *("I [had] to go to bed when he went to bed"*); (3) abusive partners remotely monitoring women's sleep *("He had hidden cameras in the bedroom"*); (4) physical or sexual abuse during sleep (*"I'd wake up to him touching me"*); (5) vigilance/fear of sleep (*"I never fell asleep before him"*); and (6) adverse impacts of disturbed sleep on mood and health. Considering quantitative results, 67% and 53% of women reported poor sleep quality and moderate/severe insomnia symptoms, respectively, as well as poor sleep health [*M(SD)*=6.9(2.5)] and fears around sleep [*M(SD)*=27.8(22.2)]. Over 55% of women reported traumatic experiences when they were in bed (73%), while they were sleeping (70%), or in the dark (55%); additionally, 62% women reported vigilance at night.

Conclusion: Findings provide initial support for the concept of sleep IPV. Sleep disturbances, sleep-related fears, and vigilance are prevalent among IPV survivors. Results will inform the development of a self-report measure on sleep IPV.

Support: NIH (K23HL159293, UL1TR001857), University of Pittsburgh

LBA 1331

Improved Estimation of Total Sleep Time Measurement Using an Integrated Sleep Diary: A Preliminary Validation

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Introduction: Precision in sleep monitoring remains a challenge across clinical, research, and at-home settings. Sleep diaries capture subjective perception of sleep whereas wearable devices use sensors and algorithms to determine sleep parameters. Both approaches to measurement are subject to significant error. In this study, we allowed participants to view their wearable device data while completing an integrated digital daily sleep diary to develop a method for improving sleep measurement. We hypothesized that if participants corrected their daily diary response in a physiologically meaningful (more accurate) way, we would be able to detect the correlation between the diary entry and heart rate during sleep.

Method: This was a randomized, crossover study in which participants (N = 24, M age = 22.36, range 19-40; 50% female) completed three different 7-night phases using a Fitbit Inspire 2, which collected data on sleep and heart rate. In the control phase, they completed a daily control diary (without feedback from the device data), a washout phase, and then an integrated diary phase (with feedback from the device integrated into the diary). Participants were randomized to start with control or test phases.

Results: We observed a statistically significant correlation between self-reported TST and the minimum heart rate during the sleeping period in the integrated condition (Pearson's r = -0.19, p = 0.019) but not the control condition (Pearson's r = -0.084, p = ns). Further analysis reveals that these findings are sensitive to the crossover study design with strong sequence effects.

Conclusion: These results suggest integrating objective device data with subjective sleep assessments may improve sleep measurement accuracy. Our results confirm previous findings that both devices and diaries in isolation produce error-prone data. Participants tended to overestimate TST, and the device tended to underestimate TST. By integrating wearable device data into a sleep diary users adjust their diary responses in a way better associated with their physiology. More research is needed to clarify sequence-related effects using a parallel design study. Overall, integration of device and diary data can lead to more accurate sleep assessment which can help with research, diagnosis, and overall improvement of sleep health.

LBA 1332

Baseline Features of Participants with Idiopathic Hypersomnia: Insights from the DUET Study

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Introduction: Jazz DUET (Develop hypersomnia Understanding by Evaluating low-sodium oxybate Treatment; NCT05875974) is a phase 4, prospective, multicenter, single-arm, open-label interventional study assessing the association of low-sodium oxybate (LXB, Xywav®) treatment with nighttime/daytime symptoms, polysomnography, and functional outcomes in adults diagnosed with idiopathic hypersomnia or narcolepsy type 1 or 2. DUET is actively recruiting participants; reported here are baseline features of the participants with idiopathic hypersomnia enrolled thus far.

Methods: DUET has several phases: a 2- to 6-week screening period (including a 2-week washout period for participants currently taking oxybate), an 8-day baseline period, a 2- to 8-week titration period (participants begin LXB treatment with flexible dosing adjustments to achieve their optimal dose), a 2-week stable-dose period (at optimal LXB dose), a 1- to 2-week end-of-treatment period, and a 2-week safety follow-up. Eligible participants are 18–75 years of age and have a diagnosis of idiopathic hypersomnia or narcolepsy. The primary endpoint is change in Epworth Sleepiness Scale score; secondary efficacy endpoints for the idiopathic hypersomnia cohort include change in Idiopathic Hypersomnia Severity Scale score, Patient Global Impression of Severity, and Patient Global Impression of Change.

Results: Twenty-four participants with idiopathic hypersomnia have passed screening and enrolled in DUET as of February 5, 2024. Their mean (SD) age is 40.5 (13.4) years (range, 20–75 years). Most participants are female (75%, n=18) and White (83%, n=20) or Black/African American (8%, n=2). Mean (SD) body mass index is 28.3 (6.4) kg/m^2. At study entry, 7 of the 24 participants were taking oxybate. Additionally, 11 participants entered taking concomitant alerting agents. Idiopathic hypersomnia symptoms reported at screening include (% of N=24) excessive daytime sleepiness (96%), fatigue (75%), brain fog (67%), sleep inertia (50%), unrefreshing naps (46%), and disrupted nighttime sleep (42%).

Conclusion: Baseline features of DUET participants with idiopathic hypersomnia who are enrolled thus far align with those reported from other studies of idiopathic hypersomnia. When complete, the DUET study is anticipated to add to our understanding of idiopathic hypersomnia and treatment effects of LXB.

Support: Jazz Pharmaceuticals.

LBA 1333

Exploring the Influences of Sleep Disturbances on Mothers of School-Aged Children with Developmental Disabilities

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Introduction: Mothers of children with developmental disabilities (DD), life-long conditions affect communication, learning, self-care, and/or mobility, increasingly report sleep disturbances. Available studies have predominantly used self-report questionnaires, and the nature of sleep disturbances, including the interplay of child sleep problems and caregiving to the sleep disturbances in mothers of children with DD, has been rarely explored.

Methods: This study used a qualitative descriptive approach to explore mothers' sleep disturbance; the range and interplay of child sleep problems, nighttime caregiving activities, and caregiver stress on mothers' sleep; strategies used to improve mothers' and their children's sleep; and the influence of sleep disturbance on mothers' mental and physical health. Using a semi-structured interview guide, 13 mothers of school-aged children (6-12 years) with DD who reported poor sleep quality (Pittsburgh Sleep Quality Index [PSQI] > 5) participated in this study. Interviews were audio-recorded and transcribed verbatim. Codes and themes were identified.

Results: Mothers, on average, were 38.5 (SD=5.5) years old, and primarily Caucasian (84.6%), married (92.3%), and working (53.7%). On average, children with DD were 10 (SD=1.6) years old, and the most common diagnoses were rare genetic disorders (n = 5, 38.5%) and autism spectrum disorder (n = 4, 30.8%). We identified four themes ("*I haven't slept well for years", "my child doesn't sleep well", "being a mother of a child with DD", and "different strategies to sleep better"*). Mothers described chronic sleep disturbances, trouble falling asleep, and difficulty returning to sleep after waking in the night. Mothers reflected that they did not know "how to shut my brain down" and other stressors (e.g., child's behavior problems, juggling family issues) with their child's sleep problems as reasons for their sleep disturbances. Mothers reported mental and physical symptoms after having a poor night's sleep, such as headaches, feeling "sick," and "mom brain." Mothers wanted to learn how to sleep better for themselves and their children, including desiring strategies to manage their negative feelings and stress.

Conclusion: Our results emphasize the need for developing family sleep health interventions that address strategies to improve the sleep of mothers and their children with DD.

Support: This study was supported by a research grant to support the Programs to Increase Diversity Among Individuals Engaged in Health-Related Research (PRIDE), Behavioral Sleep Medicine (BSM), by the National Heart, Lung, and Blood Institute (NHLBI) awarded to Jiwon Lee (R25HL105444, PI:Jean-Louis).

LBA 1334

The Clinical and Humanistic Burden of Idiopathic Hypersomnia in the United States: Analysis of the National Health and Wellness Survey

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Introduction: Understanding of the clinical and humanistic burden of idiopathic hypersomnia in the US general population is limited. This study used US National Health and Wellness Survey (NHWS) data to describe this burden.

Methods: This retrospective, observational study used de-duplicated data from the NHWS (2021, 2023), a cross-sectional, self-administered, internet-based survey designed to reflect the US general adult (age ≥18 years) population's health. Individuals who self-reported a physician's diagnosis of idiopathic hypersomnia and experienced idiopathic hypersomnia within the past 12 months were included; non–idiopathic hypersomnia controls did not experience or report an idiopathic hypersomnia diagnosis within the past 12 months; individuals who self-reported a narcolepsy diagnosis were excluded. Baseline differences in demographic and health characteristics were minimized between adults with idiopathic hypersomnia and non–idiopathic hypersomnia controls using 1:2 propensity-score matching. Bivariate analyses compared demographic characteristics, comorbidities, body mass index (BMI), and scores on the Charlson Comorbidity Index (CCI), Patient Health Questionnaire–9 (PHQ-9), Generalized Anxiety Disorder–7 (GAD-7), RAND-36, EQ-5D, and EQ-VAS between adults with idiopathic hypersomnia and matched controls.

Results: Included in this study were 163 adults with idiopathic hypersomnia (64.4% female; mean age, 38.4 years) and 326 matched controls (66.0% female; mean age, 39.6 years). After matching, adults with idiopathic hypersomnia had higher CCI scores (1.43 vs 0.34; $P<0.001$), higher prevalence of cardiovascular/cardiometabolic comorbidities (eg, arrhythmia, type 2 diabetes, high cholesterol, high blood pressure) and psychiatric comorbidities (eg, attention-deficit/hyperactivity disorder, anxiety, depression, posttraumatic stress disorder), and higher BMI (29.01 vs 27.33 kg/m^2) than matched controls (each $P<0.05$). Adults with idiopathic hypersomnia reported worse depression (mean PHQ-9 score, 11.91 vs 7.53) and anxiety (mean GAD-7 score, 9.16 vs 5.73), poorer mental health and physical function (mean RAND-36 mental health composite score, 31.99 vs 39.56; RAND-36 physical health composite score, 36.80 vs 44.95), and worse health-related quality of life (mean EQ-5D utility score, 0.675 vs 0.786; EQ-VAS score, 63.67 vs 73.00) compared to matched controls (each $P<0.001$).

Conclusion: This study highlights the substantial comorbidity and health-related quality-of-life burden that adults with idiopathic hypersomnia experience. This burden should be considered when managing this condition.

Support: Jazz Pharmaceuticals.

LBA 1335
Withdrew

LBA 1336
The Economic Burden of Idiopathic Hypersomnia in the United States: Analysis of the National Health and Wellness Survey

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Introduction: Limited research describes the economic burden of idiopathic hypersomnia in the US general population. This study quantified healthcare resource utilization (HCRU) and medical costs for US adults with idiopathic hypersomnia.

Methods: De-duplicated data from the US National Health and Wellness Survey (2021, 2023), a cross-sectional, self-administered, internet-based survey designed to reflect health in the US adult (age ≥18 years) population, were used in this retrospective cohort analysis. Included individuals with idiopathic hypersomnia reported a physician diagnosis of idiopathic hypersomnia and experienced idiopathic hypersomnia within the past 12 months; non–idiopathic hypersomnia controls did not meet these criteria; individuals diagnosed with narcolepsy were excluded. Propensity-score matching (1:2) was conducted to minimize differences in baseline demographic and health characteristics between adults with idiopathic hypersomnia and non–idiopathic hypersomnia controls. Bivariate analyses examined differences in HCRU, work productivity, and activity impairment, and annualized costs (direct [calculated from HCRU and Medical Expenditure Panel Survey data] and indirect [calculated from work productivity impairment and US Bureau of Labor Statistics data]), between adults with idiopathic hypersomnia and matched controls.

Results: Adults with idiopathic hypersomnia (n=163; 64.4% female; mean age, 38.4 years) and matched controls (n=326; 66.0% female; mean age, 39.6 years) were analyzed. Compared to matched controls, adults with idiopathic hypersomnia reported more healthcare provider (HCP) visits (total, 13.34 vs 3.14; neurologist, 0.63 vs 0.09; pulmonologist, 0.16 vs 0.01; psychiatrist, 1.53 vs 0.17; psychologist/therapist, 2.81 vs 0.21; each $P<0.01$), emergency room (ER) visits (0.88 vs 0.45; $P=0.007$), and hospitalizations (0.95 vs 0.35; $P=0.034$) within the past 6 months and had higher annualized direct medical costs (inclusive of HCP visits, ER visits, hospitalizations; $46,424.39 vs $14,700.21, $P=0.004$). Adults with idiopathic hypersomnia had greater absenteeism (20.15% vs 13.81%; $P=0.050$), presenteeism (40.59% vs 28.88%; $P=0.002$), total work productivity impairment (49.07% vs 32.28%; $P<0.001$), and activity impairment (48.22% vs 30.77%; $P<0.001$) compared to matched controls. Additionally, adults with idiopathic hypersomnia had higher mean total annual indirect costs ($15,269.22 vs $10,576.96; $P=0.007$) than matched controls.

Conclusion: US adults with idiopathic hypersomnia reported significantly greater economic burden (HCRU, medical costs, work productivity) compared to individuals without idiopathic hypersomnia.

Support: Jazz Pharmaceuticals.

LBA 1337

Baseline Features of Participants with Narcolepsy: Insights From the DUET Study

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Introduction: Jazz DUET (Develop hypersomnia Understanding by Evaluating low-sodium oxybate Treatment) is a phase 4, prospective, multicenter, single-arm, open-label, interventional study (NCT05875974). This patient-centric study investigates the association of low-sodium oxybate (LXB, Xywav®) treatment with excessive daytime sleepiness (EDS), polysomnography (PSG), and functional outcomes in participants with idiopathic hypersomnia or narcolepsy. Baseline features of the narcolepsy population enrolled thus far are reported.

Methods: DUET comprises a screening period (including a 2-week washout period for participants currently taking oxybate), 8-day baseline period, 2- to 8-week titration period (participants receive flexible LXB dosing adjustments to meet individualized needs), 2-week stable-dose period (optimized LXB dose), 1- to 2-week end-of-treatment period, and 2-week safety follow-up. Eligible participants are 18–75 years of age with confirmed idiopathic hypersomnia or narcolepsy (type 1 [NT1] or type 2 [NT2]). The primary endpoint is change in Epworth Sleepiness Scale score. Secondary efficacy endpoints for the narcolepsy cohort include PSG measurements, pharmacokinetic parameters (optional), the Patient Global Impression of Severity, and the Patient Global Impression of Change.

Results: A total of 24 participants with narcolepsy (NT1, n=9; NT2, n=15) passed the screening period and are enrolled as of February 5, 2024. Most participants are female (% of N=24: 71%), White (83%), and not Hispanic or Latino (96%). Mean (SD) age is 30.4 (11.2; range 20–62) years. Mean (SD) body mass index is 30.0 kg/m^2 (7.0). At study entry, 4 participants were taking oxybate (NT1, n=1 [LXB, n=1]; NT2, n=3 [LXB, n=1]), while 20 were not currently taking an oxybate. Nine participants entered taking concomitant alerting agents (NT1, n=4; NT2, n=5). Narcolepsy symptoms reported at screening were EDS (96%), fatigue (79%), disrupted nighttime sleep (50%), brain fog (46%), sleep inertia (42%), cataplexy (38%), sleep paralysis (29%), and hypnagogic/hypnopompic hallucinations (29%).

Conclusion: Enrollment in the DUET study is ongoing. Comparison of initial features is generally consistent with those reported in other narcolepsy studies. Future attention will focus on wider initial symptom presentation, including comparison with the DUET idiopathic hypersomnia cohort. Upon completion, the DUET study is anticipated to add to our understanding of narcolepsy and treatment effects of LXB.

Support: Jazz Pharmaceuticals.

LBA 1338

Sleep Changes Over the Course of Multisession Intermittent Theta Burst Stimulation in Patients

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Introduction: Severe, uncontrollable worry, distinct from depression and anxiety, has been linked to hyperexcitability in specific brain regions, notably the superior parietal gyrus (SPG). Intermittent theta burst stimulation (iTBS) is a non-invasive neuromodulation technique that induces long-lasting neuronal plasticity. This pilot study utilized multi-session iTBS targeting the right SPG to investigate its efficacy in treating severe worry. Additionally, iTBS has been shown to enhance slow-wave activity during sleep, suggesting improved sleep depth, though initial negative effects on global sleep measures have been reported, possibly due to participant discomfort. This secondary analysis examined changes in global sleep measures over the course of iTBS.

Methods: Twenty adults (mean age = 57.8, sd = 5.2) with severe worry underwent iTBS, for five to six minutes, five days a week for two consecutive weeks. Sleep measurements were recorded via sleep diary and actigraphy at baseline and throughout iTBS sessions. Repeated measures ANOVAs assessed changes in sleep over time, with visual inspection defining baseline, iTBS adjustment period, and post-adjustment period. Linear mixed models followed by pairwise comparisons examined changes from baseline to each period.

Results: Significant quadratic relationships between time and sleep were identified for diary- and actigraphy-assessed sleep efficiency (SE) and diary-assessed WASO, $F(2,38)=3.8$, $p=.031$; $F(2,36)=5.1$, $p=.012$; $F(2, 38)=3.7$, $p=.034$. Visual inspection of the quadratic relationship suggested an initial worsening of sleep the first four nights, and recovery on the subsequent nights after iTBS. Thus, the first four nights were defined as adjustment period and the subsequent six nights were defined as post-adjustment period. Pairwise comparisons showed significant improvements from baseline to the post-adjustment period for actigraphy-assessed SE, $t(250)=2.07$, $p=.039$. Pairwise comparison also showed actigraphy WASO enhancement at post-adjustment period from adjustment period, $t(235)=3.0$, $p=.003$; and from baseline, $t(234)=2.07$, $p=.039$.

Conclusion: A pattern of adjustment for the initiation of iTBS was observed. Dairy data demonstrated a significant decline in WASO and Actigraphy demonstrated increase in SE after iTBS, meaning that there is potential sleep enhancement compared to baseline overcoming the first night effect. Due to the small sample size, covariates like depression and medical comorbidities were not fully addressed.

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LBA 1339

MRI Neurodegenerative Markers in Down Syndrome

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Introduction: Sleep activates the glymphatic system, supporting the clearance waste products and toxic proteins via the CSF-interstitial fluid (ISF) exchange. Enlarged CSF spaces may reflect CSF stasis and inadequate exchange with ISF, potentially increasing the risk of Alzheimer's disease (AD). About half of patients with Down syndrome (DS) develop AD in the later life. In this study, we aimed to compare extra-axial CSF volumes, volume of subcortical structures, and cortical thickness in adult DS individuals with and without obstructive sleep apnea (OSA). We hypothesize that extra-axial CSF (EA-CSF) volumes will be greater in DS patients with comorbid OSA, thereby further increasing their risk of AD. We also examined whether brain regions implicated in DS would show age related atrophy, especially in regions that are also affected in AD.

Methods: We reviewed clinical brain magnetic resonance imaging (MRI) of DS individuals seen at the single academic center over 11 years. We synthesized high resolution, research grade 1x1x1 mm^3 images from low resolution clinical scans (1x1x2-5 mm^3) using FreeSurfer v7.0. We measured the cortical thickness in the medial-lateral prefrontal, postcentral, posterior cingulate, precuneus, inferior temporal and hippocampus. Extra-axial CSF space relative to the total brain volume was evaluated using the same software.

Results: Brain MRIs of 16 individuals with DS were reviewed (age 38,SD 12, male: 44%, OSA: 60%). Mean EA-CSF was 30.3% (SD: 2.4). There was no difference in EA-CSF between individuals with (median 27.9,range 23.6-30.9) and without OSA (median 27.1,range 25.9-30.3). Postcentral (r= -0.6, p =0.008) and precuneus cortical thickness (r=-0.5, p-value=0.03) were negatively associated with age. There was a trend of negative correlation between age and brain white matter and grey matter volume (r= -0.2, -0.4; p= 0.3, 0.09, respectively).

Conclusion We successfully synthesized clinical scans to construct high resolution scans. In individuals with DS, brain structures did not differ by OSA status possibly due to small sample size and underdiagnosis of OSA. However, cortical thickness was significantly associated with age. Future directions include comparing EA-CSF, cortical thickness, and regional brain volumes between DS and age and sex-matched adults without DS.

Support: RO1 AG069960, AASM Physician-Scientist Grant

LBA 1340

A Multimodal Investigation of Sleep Health and Anxiety at the Cusp of Puberty

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Introduction: Sleep is crucial for neuro-affective development and is implicated in adolescent-onset anxiety. Despite consistent reports of poor sleep among anxious adolescents, objective sleep measures like actigraphy do not often corroborate sleep disturbances in pediatric populations. Polysomnography (PSG), the "gold standard" for assessing sleep architecture and neurophysiology, can offer insight into evolving sleep patterns and ongoing neuro-affective maturation in the developing brain. Here, we use a multimodal, dimensional approach to characterize anxiety and sleep health in early adolescents, shedding light on the intricate interplay between sleep, brain development, and mental health at the onset of puberty.

Methods: Two-hundred adolescents (10-13y/o) completed a larger study examining sleep and emotional memory in youth. Participants wore wrist actigraph watches and completed daily sleep diaries over a 2-week period, as well as undergoing one night of PSG monitoring. Anxiety was assessed via the Anxiety and Related Disorders Interview Schedule, Pediatric Anxiety Rating Scale, and Screen for Child Anxiety Related Disorders. A composite anxiety score was estimated using principal components analysis to capture a dimensional measure of anxiety that integrates reports from clinician, parent, and child perspectives.

Results: As hypothesized, anxiety was associated with poor subjective sleep health, especially in more pubertally-advanced youth. Gender differences emerged in actigraphy sleep metrics, with boys experiencing worse sleep than girls; however, anxiety was not associated with actigraph-measured sleep. Interestingly, puberty and anxiety showed divergent associations with rapid-eye-movement (REM) sleep architecture and neurophysiology: with pubertal development, adolescents spent more time in REM sleep and exhibited decreases in high frequency frontal power during REM, while anxious adolescents spent less time in REM paralleled by REM prefrontal hyperarousal.

Conclusion: This study demonstrates the importance of integrating subjective and objective measures of sleep health when evaluating adolescent sleep and anxiety. Findings suggest that anxiety is linked to altered REM sleep in puberty, contrasting with typical development. As REM plays a crucial role in emotional regulation and memory consolidation, altered REM may contribute to the emotional disturbances characteristic of anxiety disorders. Interventions targeting REM sleep could potentially mitigate the emotional difficulties associated with anxiety and support healthy development from childhood to adolescence.

LBA 1341

Clinical and Epidemiological Evaluation of Sleep Disorders in Chronic Kidney Disease Patients at a Dialysis Center in Amazonas, Brazil

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Introduction: Sleep disorders range from simple insomnia to more severe conditions, affecting overall bodily function. In Brazil, about 20 million people report some form of sleep disorder, and this number is even higher among patients with chronic kidney disease (CKD). Therefore, it becomes relevant to gather clinical and epidemiological data from patients with CKD undergoing dialysis and correlate them with sleep disorders to assess whether there is evidence of a worse prognosis in these patients.

Methods: The proposed study is a cross-sectional observational type and will be conducted at the Amazonas Kidney Disease Center, in Manaus, from December 2023 to March 2024. The sample will include CKD patients from the clinic, selected after approval by the Ethics Committee and signing of the Informed Consent Form. Patients underwent extensive data collection, including medical information, completion of sleep questionnaires, and the diagnosis of Restless Legs Syndrome (RLS) that followed clinical criteria.

Results: A total of 100 CKD patients were evaluated, 63 (63.0%) of whom were male, 51 (51%) aged between 50-69 years, and 43 (43%) in the overweight range. Considering the Mini Sleep Questionnaire (MSQ), 60 (60%) have highly altered sleep; 43 (43%) have abnormal daytime sleepiness according to the Epworth scale; and, according to the Stop-Bang questionnaire, 41 (41%) are at high risk of developing sleep apnea. Among the group, 76 (76%) have CKD-related sleep problems (RLS). Comparing the MSQ classification and the presence of RLS with renal function independently, it was observed that there is no significant evidence of these correlations ($p>0.05$); however, there seems to be a relationship between the MSQ classification and the presence of RLS ($p=0.027$); 19 (86.4%) patients with RLS also have highly altered sleep.

Conclusion: In this study, 60% of CKD patients through MSQ had alterations in sleep patterns, suggesting complexity in sleep conditions, with a variety of challenges ranging from daytime sleepiness to potential risks of sleep apnea. These findings underscore the importance of a holistic approach in managing the sleep of these patients, necessitating further studies for deeper exploration of this topic.

Support: Amazonas State Research Support Foundation and Adriano Jorge Hospital Foundation.

LBA 1342

Dreamer Perceptions of a Modern Situational Measure for Dream Content and Experience

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Introduction: Our objective is to develop a modern, reliable, and validated measure that comprehensively assesses dream content and experience by adapting the DIAMONDS, a taxonomy of waking situations from Social/Personality Psychology, for the study of dreams. The measure includes adapted DIAMONDS items, plus novel items for dream-specific experiences (e.g., continuity, clarity, etc.). As part of the validation process, participants report their dreams using the adapted measure as well codes from the Hall and Van de Castle (HVDC) system. Here, we report participant experiences with both methods from our study.

Methods: In this ongoing pre-registered study, participants (n = 53 undergraduate students) visit the lab and self-report their psychosocial factors, sleep, and the most recent dream they can recall. Participants then are given instructions to maintain actigraphy, sleep diaries, and dream diaries for one week. Thus, participants have between 1-3 dream reports (one occurring at the laboratory visit), and provide feedback on the measures after every report, as well as in a structured exit interview.

Results: Participants noted the new measure was simpler to use throughout the week (p=.002). Additionally, participants felt more confident using the newly adapted measure based on their memory of the dream, compared to the HVDC method, at all time points (ps≤.0002). Most participants (83%) preferred the adapted measure over the self-reported HVDC method because it was easier (61%), quicker (16%), perceived as more accurate (16%), and it allowed them to report relevant or important aspects of their dreams (25%).

Conclusion: Our ongoing, pre-registered study indicates a strong preference for our newly adapted measure of dream content over the HVDC rating system. Importantly, participant ease of use of the measure suggests the potential for enhanced reliability and validity of the dream reports. Given the challenges posed by dream amnesia and sleep inertia in dream research, this innovative measure appears promising for facilitating accurate dream reporting. We will reassess participant feedback, as well as scale reliability and validity, when we reach our pre-registered sample size of 350 participants.

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LBA 1343

Sleep Spindles are Associated with Pain-Interference among a large cohort of middle-aged US adults: Results from the Sleep Heart Health Study

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Introduction: Patients with high pain levels commonly report sleep and daytime disturbances. This association raises the importance of finding a biomarker to both predict and treat pain. Sleep neurophysiology links sleep spindles to sleep-maintenance and sensory gating and may be relevant for chronic pain. We aimed to examine the extent to which sleep spindles, measured using sleep electroencephalogram (EEG) measures, were associated with pain measured by the SF – 36. Data were collected from the Sleep and Heart Health Study (SHHS1), which is a large, publicly available dataset of adults over 40 with varying degrees of sleep and cardiovascular morbidity.

Methods: Polysomnography (C3, C4 EEG channels) data from 5584 participants from the SHHS1 were used to analyze: 1) sleep spindle density; 2) frequency (Hz); 3) fast spindles percentage, and 4) spindle power (Uv/Hz^2). Pain was measured via the two self-reported, 5-point Likert scale items from the SF-36 Bodily Pain Scale rated over the past 4-weeks: 1) Pain severity (0=None; 5=Very Severe) and 2) Pain interference in normal work (0 = Not all; 5=Extremely). The relationships between spindles metrics and pain items were analyzed through linear regression analyses.

Results: We found no significant relationships between the sleep spindle metrics and the pain severity item. Greater spindle density C4: B = -0.039, p = 0.03, C3: B = -0.047, p = 0.009), higher frequency (C4: B = -0.047, p = 0.033), and a greater fast spindles percentage (C4: B = -0.001, p = 0.02) were significantly associated with lower bodily pain interference with work. Greater spindle density (C4: B = 0.082, $p < 0.001$, C3: B = 0.065, p = 0.003), frequency (C4: B = 0.055, p = 0.045, C3: B = 0.065, p = 0.02), power (C4: B = 0.005, $p < 0.001$, C3: B = 0.006, $p < 0.001$), and fast spindles percentage (C3: B = 0.002, p = 0.024 were associated with more frequent pain-related awakenings.

Conclusion: Our findings demonstrate that sleep spindles are associated with less pain interference and a greater frequency of pain related awakenings. Future studies should evaluate the causality of sleep spindle metrics on pain.

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LBA 1344

The Role of Sleep in the Relationship Between Familial SSS and Depression

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Introduction: There is ample evidence of a relationship between lower subjective familial social status (SSS) and elevated depressive symptomatology. Despite this, little work has explored the psychosocial mechanisms by which this relationship occurs. Additionally, there is very little literature examining this phenomenon in college students, who are at high risk for experiencing an initial depressive episode. Thus, the current study explores loneliness, pre-sleep arousal and sleep quality as potential mediators of the relationship between subjective familial social status and depressive symptoms in a college student population.

Methods: The sample included 173 undergraduate students (mean age: 19.2 ± 1.1 years) who reported their subjective familial social status using a modification of the MacArthur Scale of Subjective Social Status. Participants also completed the 3-item UCLA Loneliness Scale, Pittsburgh Sleep Quality Index, Pre-Sleep Arousal Scale and the Center for Epidemiological Studies Depression Scale. A serial multivariable mediation analysis examining the relationship of familial SSS and depressive symptoms through the indirect path of loneliness, pre-sleep arousal and sleep quality was conducted to analyze the data.

Results: Lower familial SSS was associated with increased loneliness ($B = -.26$, $p < .01$), and increased loneliness was associated with higher pre-sleep arousal ($B = 2.27$, $p < .01$). Higher pre-sleep arousal was related to poorer global sleep quality ($B = .11$, $p < .01$), which, in turn, was related to increased depressive symptoms ($B = .50$, $p < .01$). The indirect effect of lower familial SSS on higher depressive symptoms through increased loneliness, higher pre-sleep arousal, and poorer sleep quality was significant ($B = -.03$, 95% CI = -.08 to -.005). The indirect effect remained significant after further adjusting the model for a measure of individual social status relative to one's peers.

Conclusion: Our results are consistent with an indirect pathway in which the relationship between familial SSS and depressive symptomatology is mediated by loneliness, pre-sleep arousal and sleep quality. Since this is a cross-sectional analysis, examining loneliness, pre-sleep arousal and sleep quality as mediators of the link between subjective familial social status and depressive symptomatology in future longitudinal studies is warranted.

LBA 1345

Sleep Disordered Breathing in Adults with Sickle Cell Disease: Frequency and Correlation with Cardiovascular Indicators

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Introduction: The African American population is at increased risk of cardiovascular disease (CVD) and increasingly sleep disorders are recognized as contributors to adverse CV outcomes. Individuals with sickle cell disease (SCD) appear to be particularly at risk for adverse consequences of sleep disordered breathing (SDB) as nocturnal hypoxemia could promote RBC sickling and thrombosis. Data are limited, however, evaluating the role of SDB in SCD adults. This study investigates the frequency of SDB in a SCD Clinic population and its correlation with CVD indicators.

Methods: Participants included 47 adults (age > 18) with homozygous HbSS followed in the Howard University Sickle Cell Center. Subjects were recruited irrespective of sleep symptoms when stable with no admissions or medication changes within 4 weeks. Exclusion criteria included a prior sleep disorder diagnosis or requirement for supplemental oxygen. Data collection included medical history, echocardiography, 6-minute walk test, blood tests, and in-lab polysomnography with capnography (3% AASM Scoring Manual Chapter VIII, IA criterion).

Results: The mean age was 40 (range 23-70), BMI = 24.7 (18.6-47.3), Hgb = 8.6 g/dl (5.9-12.2), and LDH = 342 U/L (177-738). Twenty-one were female and 26 male. An AHI > 5 events/hour was recorded in 55% of subjects (mild = 34%, moderate = 8%, severe = 13%). 51% of subjects demonstrated > 5 minutes oxygen saturations < 89% (mean 59 minutes). Hypercapnia was absent (mean ET CO2 = 37.5 mmHg, range 30-46).

AHI only correlated with BMI (R = 0.47). AHI did not correlate with age, gender, history of snoring, or use of long-acting narcotics. AHI did not correlate with systolic or diastolic BP, 6-minute walk distance, brain natriuretic peptide levels, mitral valve E/A ratio, or RVSP.

Conclusion: A remarkably high frequency of SDB was identified in this unselected sample of SCD clinic patients, despite a low average BMI of 25. Nocturnal hypoxemia was also frequent. However, indices of SDB did not correlate with cardiovascular indicators. Further research regarding the significance of this highly prevalent SDB to quality of life and pain indicators in SCD is planned.

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LBA 1346

Sociodemographic Factors and Sleep: An Intersectional Framework

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Introduction: Understanding the impact of multiple demographic factors on sleep is an important consideration for health interventions and health equity. Although disparities in sleep associated with sociodemographic factors are well-documented, most studies do not use intersectional frameworks. Here, we evaluated whether sociodemographic factors interacted with each other in predicting multiple sleep outcomes, consistent with an intersectional framework.

Methods: This study uses data from the NDSU National COVID Study, which has followed 300 American adults across five waves of data collection since April 2020. The current analysis includes data from Wave 1 (April 2020) in 263 participants with complete data on demographics, sleepiness, sleep health, sleep disturbance, sleep-related impairment, insomnia, and bedtime procrastination. Participants reported a range of identities (51% male, 25% people of color, 12% LGBTQ, M_{age} = 44, M_{SES} = 5 on a 10-point scale). Using correlations and regressions, we examined whether age, sex, socioeconomic status, race/ethnicity, and LGBTQ status were associated with sleep. Regression interactions were used to test whether consideration of intersectional identities enhanced the prediction of sleep, over and above linear effects.

Results: Sociodemographic factors best predicted bedtime procrastination (~18% of the variance), followed by insomnia (15%), sleep disturbance (14%), sleep-related impairment (14%), and sleep health (8%). Sociodemographic factors did not significantly predict sleepiness. Across sleep outcomes, age was the strongest predictor of sleep (M_B = 0.28), followed by sex (M_B = 0.18), socioeconomic status (M_B = 0.17), race/ethnicity (M_B = 0.10), and LGBTQ status (M_B = 0.03). Interactions between sociodemographic factors were not statistically significant.

Conclusion: We found sociodemographic factors were additively related to self-reported sleep. Although there were no significant interactions within the sociodemographic level, interactions may still be present across levels. Interactions between sociodemographic factors and individual, interpersonal, community, and policy-level factors, would be consistent with the socioecological model of sleep.

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LBA 1347

Associations Among Adult Temperament Traits and Resting State Functional Networks Across Wake and Sleep Onset States

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Introduction: Temperament is defined as the biologically rooted collection of dispositions upon which personality is thought to expand and develop. Given temperament's closeness to biology, it was hypothesized that temperament traits in young adults would associate with resting state functional networks (RSFNs). There are neurological differences between wake and the various stages of sleep. Thus, associations were also tested to determine whether they manifest differentially across wake and sleep onset.

Methods: Functional magnetic resonance imaging data were collected from 33 young adult Brigham Young University students (mean age 20.03, SD=1.7; 48.5% female; 90.9% white) in morning (wake) and evening (sleep onset) scan sessions. Temperament was measured with the Adult Temperament Questionnaire which measures the traits of negative affect, effortful control, extraversion/surgency, and orienting sensitivity. RSFNs were parcellated using Yeo et al.'s (2011) parcellation scheme. Activity within each network for each participant in wake and in sleep onset scans was averaged across time and voxel, then used in subsequent analyses. Spearman's rho was used to correlate temperament traits with activity in the RSFNs.

Results: Effortful control was positively associated with the dorsolateral attention, ventral attention, frontoparietal, and default mode networks (r from .36 to .41; p<.05). Negative affect was negatively associated with the ventral attention, limbic (non-subcortical), frontoparietal, and default mode networks (r from -.38 to -.49; p<.05). Orienting sensitivity was negatively associated with the ventral attention, frontoparietal, and default mode networks (r from -.38 to -.43; p<.05). Extraversion was not significantly associated with any RSFN. Importantly, there were no significant associations in sleep onset.

Conclusion: Evidence suggests that temperament associates with RSFNs during wake in ways that are similar to findings in personality neuroscience. Associations between RSFNs and temperament were not significant in sleep onset. This is a novel finding that if replicated could alter interpretations about the neurological nature of these individual differences. For example, it could be that temperament neurologically manifests as the individual differences in which people interact with the external environment, even in a passive state. Future research should confirm or refute these findings, explore different stages of sleep, and examine associations with different psychological constructs.

LBA 1348

Evaluating the Role of Interceptive Awareness in Insomnia and Across the Sleep Health Spectrum

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Introduction: Interoceptive awareness, characterized by a non-judgmental and trusting attitude towards body sensations, is an understudied construct that is implicated in sleep and health outcomes. Interoceptive awareness is cultivated via contemplative and mindfulness-based practices. Given that it may be utilized to reduce pre-sleep arousal, which is a key mechanism in insomnia, interoceptive awareness is posited to be a protective factor for sleep health.

Methods: A cross-sectional study was conducted among undergraduate university students (*n*=420) in the Mid-Atlantic region of the United States to assess the association between interoceptive awareness and sleep outcomes. Participants received a survey link and completed a 45-minute online questionnaire via REDCap. Measures included the Multidimensional Assessment of Interoceptive Awareness-2 (MAIA-2), Pittsburgh Sleep Quality Index, Pre-sleep Arousal Scale, RU-SATED, Insomnia Severity Index, and the Mindful Attention Awareness Scale (MAAS). Data were analyzed using hierarchical linear and logistic regressions.

Results: Interoceptive awareness predicted pre-sleep arousal, sleep health, sleep quality, and insomnia. The 'not distracting' factor, in particular, emerged as the strongest interoceptive predictor. When adjusting for covariates such as mood, not distracting significantly predicted pre-sleep arousal (b*=-0.13, *p*<.001) and sleep duration (b*=0.14, *p*=.01). This indicates that not engaging in maladaptive distraction from pain and discomfort was associated with lower levels of disruptive heightened cognitive and physiological states before sleep and longer total sleep times. Interoceptive awareness explained global sleep (MAIA general: b*=-0.12, *p*=.016; not distracting: b*=-0.14, *p*=.008) and sleep health (MAIA general: b*=0.12, *p*=.02) above and beyond mindfulness.

Conclusion: Findings suggest that specific training in interoceptive capacities could be a valuable complement to interventions for sleep health and insomnia.

LBA 1349

A Remote Patient Monitoring (RPM) Program to Improve CPAP Adherence Among Treatment Experienced Patients: Preliminary Findings

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Introduction: CPAP remains the gold standard treatment for OSA, yet adherence rates remain suboptimal, with 50% of patients quitting treatment within the first year. The sleep care system struggles to meet the demands of the growing number of OSA patients, a figure that continues to rise annually. RPM has been successfully utilized in other medical fields to offer supplemental patient support without overburdening staff. Sleep medicine has recently embraced RPM with the introduction of CPT codes in 2019. We present preliminary results of Somnea Health's RPM program on adherence among treatment experienced OSA patients prescribed CPAP.

Method: Fifty-six patients were enrolled in the RPM program, with nine having prior CPAP experience. Seven patients (aged 48-78, 57.14% male) with functioning CPAP machines and ≥30 days of RPM enrollment were included in the analysis. Pre-RPM compliance was assessed over the standard 90-day window, while monitoring occurred during RPM enrollment. Compliance was defined as ≥4 hours of PAP use per sleep session.

Results: Patients were enrolled in RPM between 9/11/23 and 2/29/24, with an average enrollment duration of 79.29 days (Range=14-135, SD=42.91). On average, patients had 4.57 (SD=1.90) coaching appointments during monitoring. Treatment noncompliance decreased from six patients pre-RPM to one during RPM. Pre-RPM, patients attempted CPAP use for 32.20 days (SD=21.25) on average, with 22.57 days (SD=21.25) of compliance and 9.71 days (SD=5.85) of noncompliance. During monitoring, patients attempted CPAP use for 68.71 days (SD=49.75) on average, with 62.71 days (SD=45.09) of compliance and 6.00 (SD=10.79) days of noncompliance. The average AHI decreased from 2.17 (SD=0.79) pre-RPM to 1.81 (SD=0.65) during RPM.

Conclusion: Preliminary findings suggest this RPM program may improve CPAP compliance and usage among treatment-experienced OSA patients. These findings underscore the potential of RPM to enhance patient care and support long-term treatment engagement, particularly within the context of constrained sleep health professional resources, staffing shortages, and growing patient volume. Further research with larger sample sizes is needed to understand the potential impact of RPM on long-term patient outcomes in the management of OSA.

LBA 1350

The Concordance Between Sleep Diagnosis and Symptoms in Autistic and Non-Autistic Adults

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Introduction: Autistic adults' sleep is substantially worse than non-autistic counterparts. However, the concordance between self-reported symptoms and clinical diagnosis of sleep disorders is not well understood. Given research suggesting autistic sleep is worse than non-autistic sleep, even without complaint, we hypothesized that this concordance would be weaker in autistic than in non-autistic adults specifically in insomnia, restless leg syndrome (RLS), sleep apnea, and chronic fatigue.

Methods: A total of 310 participants were recruited from Australia and the US, self-reportedly diagnosed as either autistic (*n*=195) or non-autistic (*n*=115) (age *M*=36.4, *SD*=13.6, range 18-75; 32% female). The participants completed an anonymous online survey which included the Insomnia Severity Index (ISI), Restless Leg Syndrome rating scale (RLSRS), an obstructive sleep apnea scale (STOP-BANG), and the Flinders Fatigue Scale (FFS). Measurement properties of questionnaires were first evaluated with confirmatory factor analyses to retain the most sensitive items for subsequent structural equation modeling (SEM), which included self-reported binary diagnoses of insomnia, RLS, sleep apnea, and chronic fatigue (yes or no) as the endogenous variables, and ISI, RLSRS, STOP-BANG, and FFS as exogenous latent variables (probit modeling). Autism (yes or no) and its product-terms with the above latent variables were included to examine whether the concordance differed between autistic and non-autistic participants. The model was estimated with Bayesian methods to interpret the estimates easily with probability.

Results: Concordance for all participants was high in RLS (*β*=.82, *se*=.15) and insomnia (*β*=.69, *se*=.25), but only moderate in chronic fatigue (*β*=.46, *se*=.21) and sleep apnea (*β*=.38, *se*=.21). Additionally, the concordance between sleep apnea diagnosis and symptoms differed between autistic and non-autistic participants (*β*=.32, *se*=.13, *p*=.03).

Conclusion: The concordance between clinical diagnosis and self-reported symptom severity differed in specific sleep disorders. In the total sample, concordance was high in insomnia and RLS but only moderate in sleep apnea and chronic fatigue, suggesting that individuals with symptoms of apnea and fatigue were less likely to be diagnosed clinically. Contrary to our hypothesis, non-autistic individuals were even less likely to be diagnosed with sleep apnea than autistic individuals.

Support: N/A

LBA 1351

Genetic Variants Associated with TST and LPS in Insomnia Patients: Whole Genome Sequencing Study

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Introduction: Insomnia disorder is characterized as the difficulty in initiating or maintaining sleep and corresponding daytime dysfunction, and occurs in 10–20% of the population. Although the molecular underpinnings of sleep-onset insomnia remain unclear, many insomnia patients with sleep onset insomnia have a misalignment of their circadian rhythms with respect to their desired bedtime. Thus far, little is known about the underlying genetic risk factors for sleep-onset insomnia patients. We explored the association of genetic variants with TST and LPS in patients diagnosed with insomnia with SL of >45 mins and TST of <6.5 hr.

Methods: Samples were obtained from adults (ages 18-70) with primary insomnia participating in a randomized, double-blind, placebo-controlled, multi-center study investigated 20 mg or 50 mg tasimelteon vs placebo in 322 patients over 5-weeks of treatment, using polysomnography measures of sleep. WGS was conducted with 30x read depth using whole blood samples. TST and LPS measures were obtained from daily sleep diary and PSG. GWAS using linear model was conducted on variants with MAF ≥0.01 using Plink with adjustment of the subject's age, sex, and the first 2 PCs.

Results: Top variants associated with LPS at baseline included loci within GRIK2 (rs11756558 beta=85.2 p-value=2.84e-8, MAF 0.02), in vicinity of GABRG2 and within TAFA1, PTPRD and RAPGEF5. GRIK2 - glutamate receptor, ionotropic, kinase 2 is known to be involved in a series of neurodevelopmental disorders as well as implicated in chronic fatigue syndrome.

Top variants associated with TST at baseline were from loci within the DAB1 gene, as well as within BABAM2 and NCKAP5. The top variant was rs12070267 with a MAF of 0.02 (gnomAD all), where minor allele was associated with shorter TST (beta -84.5= 0.68, p=3.36e-7). We expanded the analysis with single gene tests which shows that DAB1 is significant especially for MAF>0.05 variants (SKAT-O p=0.001). Interestingly, DAB1 variants were reported in the largest GWAS of insomnia on UK biobank.

Conclusions: In this work, we identified potential insomnia loci associated with TST and LPS that further shed light upon understanding of the pathophysiology of insomnia disorder.

LBA 1353

Prospective Clinical Performance Validation of AI for PPG-based Sleep Staging

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Introduction: An interoperable AI system was designed for automated Sleep Staging of single-channel Photoplethysmography (PPG) signal data. The AI was trained utilizing a transfer learning-inspired approach, by applying machine learning and statistical signal processing methods, including multiple deep neural network models, to a database of over 1,000,000 diagnostic PSGs with concurrently recorded PPG. Clinical performance validation was conducted on the AI system in an IRB approved study using a prospective, non-randomized trial design with all-comers enrollment offered to subjects undergoing a routine PSG.

Methods: The study sample included N=235 subjects enrolled with informed consent, completed PSGs with simultaneously recorded PPG signals using wearable PPG devices, and had >4-hours of adequate data. The PSG studies were scored by 3 sleep technologists (RPSGTs), and reviewed by sleep physicians. Demographics including Age, Sex, Skin Pigmentation, BMI, ESS, confounding conditions and medications, and OSA severity were reported. Sleep Staging performance was evaluated by comparing the AI sleep staging of the wearable PPG data to the 2/3 Majority Scoring of the gold-standard in-lab PSGs.

Results: PPG-based AI sleep staging demonstrated epoch-by-epoch agreement with a sensitivity (PPA) and specificity (NPA) of 84.2%/97.5% for stage REM, 80.7%/86.7% for Light Non-REM (N1/N2), 67.9%/95.5% for Deep Non-REM (N3), and 87.8%/93.7% Wake compared to PSG sleep staging. The PPG-based AI sleep staging demonstrated agreement in sleep quality measures with an average difference of -2.7 minutes (95% CI: -4.08, -1.44) in the total sleep time (TST), -0.50% (-0.90%, -0.30%) in sleep efficiency (SE), -8.94 minutes (-9.84, -7.56) in sleep latency (SL), and 8.46 minutes (7.44, 9.48) in wake after sleep onset (WASO) indices compared to PSG.

Conclusion: The prospective trial findings suggest reliable agreement and high concordance between PPG-based AI sleep staging and gold-standard PSG both in epoch-by-epoch stages and macro-sleep quality measures. AI sleep staging for PPG-based wearables expands opportunities for multi-night diagnostic testing, remote longitudinal OSA therapy monitoring, and expanding the utility of Consumer Sleep Technologies to promote sleep wellness.

LBA 1354

Association Between Sleep Quality and Changes in Cognition in Older Adults: A Population-Based Study

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Introduction: Adequate sleep is needed for maintaining physical, social, emotional and cognitive domains of a healthy life. Ageing is one of the strongest and consistent factors which affect sleep. Poor quality sleep may be one of the initial presentations of poor cognitive decline in neurodegenerative disorders. In this study, we assess the association of changes in sleep quality with cognitive function in older adults.

Methods: 54 participants between 50-80 years without sleep disorders and without diagnosed dementia were recruited from geriatric clinic and community. For assessing sleep quality Pittsburgh Sleep Quality Index Questionnaire (PSQI) was used. Indian Council of Medical research-NeuroCognitive Toolbox (ICMR-NCTB) was used for assessing the different cognitive domains.

Results: Mean age of the participants was 63 years (Male=49, Female=05). 25 were good sleepers (PSQI score ≤5) and 29 were poor sleepers (PSQI score >5). PSQI global score was found to have a negative correlation with episodic memory (immediate recall score) ($r=-0.38$, $p=0.004$) and delayed recall score ($r=-0.31$, $p=0.024$) and significant positive correlation with attention and executive function measured with trail making test-B (TMT-B) ($r=0.35$, $p=0.01$). There was a significant difference between good and poor sleepers in immediate recall score ($p=0.042$) and trail making test-B (TMT-B) ($p=0.002$) but not for delayed recall score ($p=0.115$).

Conclusions: As sleep quality decreases, episodic memory performance also declines. The impact of poor sleep might be more pronounced on the ability to recall information immediately after it is presented than on the ability to recall information after a delay. Poorer sleep quality is associated with worse performance in tasks requiring attention and executive functions. The lack of a significant difference in delayed recall scores ($p=0.115$) between good and poor sleepers suggests that the impact of sleep quality on memory may be more immediate rather than affecting the consolidation of memory over time. This suggests addressing sleep quality could mitigate cognitive decline risks in older adults.

Support: This study was funded by All India Institute of Medical Sciences, New Delhi and University College of London collaborative grant.

LBA 1355

Epoch-level Agreement of Manual Sleep Stage and Arousal Scoring using a Reduced Montage versus Conventional Polysomnography

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Introduction: Conventional polysomnography (PSG) is costly, time-consuming, and can be uncomfortable for patients. Home sleep apnea testing (HSAT) devices offer a simpler and more convenient alternative, but they lack electroencephalography (EEG), electrooculography (EOG), and electromyography (EMG) signals needed to detect sleep stages and arousals. Here we introduce a reduced montage that can be self-applied at home, if desired, while still providing the necessary EEG/EOG/EMG signals. The aim of this study was to compare epoch-level agreement of manual sleep stage and arousal scoring using the reduced montage versus conventional PSG montage.

Methods: Retrospective data was obtained from concurrent reduced channel and full PSG studies conducted on 102 adults with obstructive sleep apnea. Two Nox A1s recorders were used simultaneously to collect data, with one hooked up as full PSG according to AASM guidelines, and the other recording only from a reduced frontal EEG montage (including 5 bipolar electrodes placed over E2/E4, E1/E3, AF3/AF7, AF4/AF8 and an AFz/ground pair). Studies were manually scored according to AASM guidelines using either the reduced or full EEG with all other signals shared. Sensitivity, specificity, and accuracy was calculated for epoch-level agreement in each sleep stage and for arousal presence.

Results: 244 double hook-up studies were included. The sensitivity, specificity, and accuracy for each sleep stage was Wake = 84%, 95%, 92%; REM = 78%, 99%, 96%; N1 = 48%, 94%, 88%; N2 = 76%, 87%, 82%; and N3 = 94%, 92%, 92%. For arousal presence, the sensitivity, specificity, and accuracy was 69%, 89% and 85%.

Conclusions: The reduced channel PSG montage showed a high level of agreement with conventional PSG for manual sleep stage and arousal scoring, consistent with usual levels of interscorer agreement reported for these tasks. The reduced montage may therefore be a suitable alternative to PSG for measuring sleep stages and arousals in a real-world home sleep environment. Accurate sleep stage and arousal scoring allow for more accurate estimates of downstream clinical parameters than HSAT, though further studies are needed, especially in a home setting, to evaluate the accuracy of such parameters and determine the full potential of this reduced montage.

LBA 1356

Opt-Out

LBA 1357

Exploring the Relationship Between Work-Life Imbalance and Subjective Cognitive Complaints and Its Effect on Sleep

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Introduction: Subjective cognitive complaints (i.e. self-reported cognitive concerns; SCCs), though not often connected to objective impairment, are associated with higher risk of Mild Cognitive Impairment and potentially dementia. Sleep, stress, and anxiety have been shown to explain significant portions of variance in relationships between multi-morbidity and SCCs, likely via sleep mediating stress which may prevent worsening cardiovascular risk and cognitive decline. While there are many barriers to sleep, the most universal is lack of time. Specifically, 30% of US adults sleep less than the recommended seven hours and are afforded little vacation/leisure time indicating a work-life imbalance (WLI) which may result in added stress. Though discussions are rising around federal minimum wage, and remote work, there's little insight into WLI's, and its relationship to sleep, or impact on cognition and long-term health outcomes.

Methods: We explored the effect of possible markers of WLI on the presence of SCCs in participants (n=2605, 54.9% Female, 15.5% Black, Mage=41.7 years) from the 2010 National Health Interview Survey. WLI was defined via composite score of subjective measures: hours worked, social satisfaction, and hours slept. A higher WLI score implies an unequal distribution of time between work, leisure, and sleep. SCC was defined via reporting at least some difficulty on the self-report "difficulty remembering/concentrating" item, scored on a five-point scale from never--all the time.

Results: Participants slept an average of 7.2 hours a night and were most likely to endorse memory problems sometimes (78.5%) and a little exhaustion (48.3%) on some days (51.2%). A one-way ANOVA demonstrated higher WLI was associated with higher frequency of memory issues $F=3.259$, $p=0.040$ ("all the time"-M=9.18; "frequently"-M=8.02; "sometimes"-M=7.74). Subsequent analyses demonstrated an association between higher WLI and increased frequency of exhaustion $F=52.81$, $p<.001$ ("everyday"-M=8.05; "most days"-M=7.71; "some days"-M=6.68; "never"-M=6.10); and severity of exhaustion $F=11.43$; $p<.001$ ("a little"-M=6.64; "a lot"-M=7.31;"somewhere in between"-M=6.90).

Conclusion: Findings indicate potential harmful effects of WLI on sleep health and cognition and confirm previous connections of sleep and other modifiable risk factors for AD to SCCs, suggesting an avenue for intervention. Further research is needed to fully illuminate applications to cognitive decline and ADRD.

LBA1358

Demographic and Clinical Features of Upper Airway Collapsibility

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Introduction: Drug-induced sleep endoscopy with positive airway pressure (DISE-PAP) can provide both quantitative and qualitative metrics of upper airway collapsibility in patients with obstructive sleep apnea with the use of pharyngeal opening pressure (PhOP). In this study, we sought to build upon prior research evaluating the relationship of clinical and demographic features of upper airway collapsibility in a larger, more diverse patient population.

Methods: This study was a retrospective, consecutive cohort study of adult sleep surgery patients referred for CPAP alternatives and evaluated by an experienced sleep surgeon at a tertiary care facility from July 2021 to October 2023. Adults over the age of 18 with a history of OSA (AHI >5) and CPAP intolerance were included. The primary outcome, pharyngeal opening pressure (PhOP), was measured through a stepwise titration of positive air pressure via a nasal PAP until airway obstruction was alleviated during DISE. Demographic data, clinical findings, symptom questionnaires, and sleep studies, were collected via electronic medical records. Regression models evaluated the relationship between PhOP and patient characteristics.

Results: Of the 289 patients included in the analysis, the average patient was middle-aged (51.6 ± 15.1), borderline obese (BMI 30.2 ± 4.6), male (71.1%), white (64.6%), with moderate-severe obstructive sleep apnea (AHI 33.9± 26.1). The mean PhOP was 7.9 ± 3.2. Using linear regression and controlling for race and ethnicity, PhOP increased by 0.15 cm H2O per 1-point increase in BMI. PhOP weakly correlated with AHI 3% (Spearman coefficient 0.283, $p < 0.001$). Age did not statistically correlate with PhOP ($p = 0.116$). In exploratory analyses, while controlling for BMI, PhOP was 2.3 times higher in self-identified Black or African American patients than in self-identified White patients. There was no significant difference in PhOP between any other race compared to White patients. No significant correlation was noted between PhOP and patient questionnaires.

Conclusion: Pharyngeal opening pressure demonstrated a weak correlation with both BMI and AHI and no clinically significant relationship with age. PhOP was significantly higher in patients identifying as African American which has not been demonstrated previously and requires further investigation.

LBA 1359

Endocrine Disrupting Chemicals with Circadian Rhythm Modulating Effects: New Approach Methodologies for Rapid Reassessment of Environmental and Occupational Exposure

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Introduction: A previously unknown effect prior to regulatory assessment, the common carbamate pesticide carbaryl has been shown to induce melatonin receptor activation with rest-activity behavioral effects occurring at levels below daily exposure limits. Exposure to environmental and occupational toxicants with circadian rhythm modulating potential can lead to impaired sleep and associated negative health and safety outcomes. Tens of thousands of previously reviewed chemicals urgently require re-assessment to account for this circadian rhythm disrupting effect.

Methods: For rapid re-assessment, *in silico* methods often used in drug discovery were leveraged to predict chemicals with circadian rhythm disruption potential. A ChemMine structural similarity search using carbaryl as the seed molecule was conducted (80% structural similarity, PubChem Fingerprint database). A cheminformatic approach was then used to down-select high priority chemicals based on functional groups and molecular docking potential to melatonin receptors.

Results: We previously presented that carbamate pesticides and their metabolites represented 54% of the top 50 returned compounds. Further cheminformatic analyses found that 50% of the compounds contained a methylcarbamate functional group while 14% contained functional groups with structural similarities to methylcarbamate. Methylcarbamate groups were primarily attached to monocyclic benzene (46%) or bicyclic naphthalene (6%). Other returned compounds were comprised of esters or ethers attached to naphthalene (22%).

Conclusion: New approach methodologies using chemical structural similarity and cheminformatic analyses allowed for rapid identification of chemicals with possible melatonin-activating properties. Fewer returned compounds contained methylcarbamate attached to naphthalene; however, given that previous studies suggest this combination has higher molecular docking potential to putative melatonin binding pockets than methylcarbamate attached to benzene, the former should be prioritized for further research in physiological models. Considering the significant research gap concerning endocrine disrupting chemicals, especially with regard to melatonin receptor activation, the results from this study contribute to addressing the urgent need to investigate potential circadian rhythm disrupting effects of environmental and occupational exposures. No DoD endorsement implied.

Support: Navy BUMED Program of Record for Toxicology

LBA 1360

Threshold Wars: 3% vs 4% Desaturation in WatchPAT Home Sleep Apnea Testing

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Introduction: Obstructive sleep apnea (OSA) is quantitatively defined by the Apnea + Hypopnea Index (AHI). A hypopnea is defined as a respiratory event with a peak signal drop by ≥30% of the pre-event baseline, for ≥10 seconds, along with an oxygen desaturation or an arousal. In 2023, the American Academy of Sleep Medicine (AASM) updated their Scoring Manual, which included recommended changes when scoring hypopneas. Scoring a hypopnea using ≥4% oxygen desaturation (AHI-4%) was now an "optional" rule, opposed to "acceptable" in previous versions. Scoring using ≥3% oxygen desaturation (AHI-3%) remained a "recommended" guideline. In our study, we aim to better understand the diagnostic gap between studies scored by AHI-3% and AHI-4%.

Methods: The airflow surrogate used in this study was a peripheral arterial tone signal reported by the WatchPAT device (pAHI). WatchPAT data was analyzed using pAHI-3% vs pAHI-4% scoring. Patient studies were selected at random with 51 men and 50 women. A positive sleep apnea diagnosis was made using pAHI≥5, and negative diagnosis with pAHI<5.

Results: Out of 101 patients, 58 (57%) were diagnosed with OSA using pAHI-4%, out of which 23 (40%) were female. Using pAHI-3%, out of the same 101 patients, 84 (83%) were diagnosed with OSA, out of which 39 (46%) were female. pAHI-4% misses 26% of patients with OSA (p-value = 0.029).

Upon further analysis of gender, of all female patients (n = 50), 39 (78%) were diagnosed with OSA using pAHI-3%, while only 23 (40%) were diagnosed with pAHI-4%. This represents 38% of women who were missed using pAHI-4% (p = 0.042). In comparison, of 51 male patients tested, only 10 (20%) were missed using pAHI-4.

Conclusion: There is a large diagnosing gap between pAHI-4% vs pAHI-3%. Overall, use of pAHI-4% missed 26% of patients with OSA compared to using pAHI-3%. Further, pAHI-4%, when compared to pAHI-3%, misses more female patients (38%) compared to males (20%). The discrepancy in this data leads to a conclusion that using pAHI-4% is not only underdiagnosing patients, but also particularly underdiagnosing female patients.

LBA 1362

Reactivating Specific Memories During Sleep in Conjunction with a Suppression Context

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Introduction: Recently acquired memories are reactivated during sleep, leading to their strengthening. Reactivation can be biased using odor and sound presentations during sleep to benefit associated memories (through a procedure known as targeted memory reactivation). For example, when a rose odor served as context during object-location learning and was later presented during sleep, location recall improved. Likewise, sounds linked with individual objects and unobtrusively presented during sleep also improved recall. We hypothesized that joint reactivation of odors and sounds may create synergistic effects. In addition, we hypothesized that odors could enhance memory suppression.

Methods: Participants first engaged in an odor-based directed-forgetting task, whereby one odor was linked with instructions to remember and another with instructions to forget. A third odor was not used and functioned as a control. During a nap, each of the three odors was presented concurrently with sounds previously linked with object-location learning. Spatial recall was tested after sleep.

Results: Objects reactivated with sounds plus the control odor showed memory-strength-dependent improvement, as in previous targeted-memory-reactivation studies. Contrary to prediction, concurrent presentation of remember or forget odors with object sounds did not clearly impact spatial recall. Furthermore, sleep spindles were more frequent for control odors than for the other two odors.

Conclusion: These results suggest that targeted memory reactivation during slow-wave sleep was rendered ineffective when multiple memory cues were presented simultaneously, in keeping with results using two sound cues in rapid succession (Schreiner et al., 2015). We posit that conjoint presentation of a sound with a meaningful odor nullifies the benefits of reactivation.

LBA 1363

Vibrance-1: Study Design and Methods for a Phase 2, Randomized, Placebo-Controlled, Parallel Group Study Evaluating the Safety and Efficacy of ALKS 2680 in Patients With Narcolepsy Type 1

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Introduction: ALKS 2680 is a potent, centrally active, orally bioavailable, and highly selective orexin 2 receptor agonist being developed for the treatment of narcolepsy and other central hypersomnolence disorders. Narcolepsy type 1 (NT1) is a chronic condition characterized by excessive daytime sleepiness, cataplexy, and orexin deficiency. In non-sleep–deprived healthy volunteers who underwent single- and multiple-ascending dose regimens, ALKS 2680 was generally well-tolerated, demonstrated pharmacokinetic characteristics that support once-daily dosing while mimicking the natural sleep/wake cycle, and improved alertness both objectively (quantitative electroencephalography [EEG]) and subjectively (Karolinska Sleepiness Scale [KSS]). In patients with NT1, single doses of ALKS 2680 demonstrated statistically significant, clinically meaningful, and dose-dependent improvements in sleep latency on the Maintenance of Wakefulness Test (MWT). The Vibrance-1 study aims to assess the safety and efficacy of ALKS 2680 through 6 weeks of treatment in a larger population of patients with NT1.

Methods: Vibrance-1 is a phase 2, parallel group, dose-ranging study with a randomized double-blind treatment period and an open-label extension period. After 2 weeks of washout, approximately 80 patients with NT1 will be randomized 1:1:1:1 to receive placebo or ALKS 2680 once daily at doses of 4, 6, or 8 mg for 6 weeks. Eligible patients are between the ages of 18 and 70 years with a confirmed NT1 diagnosis, BMI ≥18 and ≤35 kg/m^2, no comorbid sleep-related illness that may influence the sleep-wake cycle, no significant cardiovascular or psychiatric conditions, and no shift work or activities that interfere with regular nighttime sleep. The primary endpoint is change in mean sleep latency on the MWT from baseline to Week 6. Key secondary endpoints include the Epworth Sleepiness Scale and weekly cataplexy rate. Safety will be evaluated by treatment-emergent adverse events, laboratory assessments, vital signs, and electrocardiograms. Quantitative EEG and patient-reported outcomes, including the KSS and Narcolepsy Severity Scale, are included as exploratory assessments.

Results: Vibrance-1 results are pending study completion.

Conclusions: Results from Vibrance-1 will inform further clinical development of ALKS 2680 in patients with NT1. Additional studies will explore the use of ALKS 2680 in other patient populations.

Support: This study is sponsored by Alkermes.

LBA 1364

A Systematic Review of Measures of Fears and Worries Interfering with Sleep in Youth

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Introduction: Sleep disturbance is common in youth with prevalence rates of 40%. Untreated sleep problems are likely to persist with age, particularly amongst anxious youth. There is high comorbidity between anxiety and sleep difficulties. Up to 98% of children with an anxiety disorder experience at least one sleep related problem. The relationship between anxiety and sleep is complex and likely bidirectional.

Worry occurring before bed is posited as a significant component of both cognitive and neurocognitive models of sleep disturbance. Moreover, nighttime fears (i.e. fears that occur in anticipation of night or bed) are a common developmental challenge experienced by children and research indicates that they are early predictors of more persistent sleep problems and anxiety.

A better understanding of these temporal fears and worries related to sleep in children may help identify early symptoms and increase access to intervention. However, there is lack of knowledge and inconsistency in the use of measurement tools, compromising research conclusions and advancement in the field for researchers and practitioners.

The aim of this systematic review is to identify outcome measures that include an assessment of temporal fears and worries that impact sleep in children up to 12 years. The second aim is to review the psychometric properties of measures to facilitate recommendations for a battery of robust tools.

Methods: This review was designed and reported in line with PRISMA and published on PROSPERO. The following databases were searched: MEDLINE, EMBASE, CINAHL, and PsycINFO. A total of 14,855 articles were retrieved and screened. Measures will be assessed based on the criteria of the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN).

Results: Our findings were synthesised by measures and age group (children and adolescents). Data reported included information on the sample and psychometric properties.

Conclusions: Although worry before bed is an important part of our theoretical models of sleep disturbance and may serve as early predictor of sleep and anxiety problems, our results suggest that there are few measures that adequately assess fears that may contribute to pre-sleep arousal.