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

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

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

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0093

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

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

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

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

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

Support (If Any):

0094

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

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

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

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

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

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