observations at the level of spectral measures and evoked potentials.
Results: Our observations show that slow wave measures were consistently increased, as apparent in measures of discrete SO's, SO and delta power and deflections in the ERP. On the other hand, fast spindle measures showed a short-term grouping (local increase) during a stimulus-induced Slow wave positive deflection around 1 second after stimulation, but were globally decreased, both on the short and long term. This was apparent in measures of discrete fast spindles and PSD across longer periods of sleep.
Conclusions: Acoustic stimuli precisely phase locked to the SO onset increase SO's and delta power globally, therewith deepening sleep. Fast sleep spindles are globally depressed. This appears to be due in part to interruption of ongoing spindles by the stimulus, and may furthermore reflect a depressing influence of slow oscillations (sleep depth) on fast spindle dynamics.
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AUDITORY STIMULATION ALIGNED TO THE ASCENDING PHASE OF THETA OSCILLATIONS DURING REM SLEEP

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Introduction: Closed-loop auditory stimulation (CLAS) approaches have been gaining popularity and have been used extensively to investigate brain oscillations during non-REM sleep. Here, for the first time, we present a new method based on sine wave fitting approach to model and predict EEG oscillatory dynamics and to track and phase-target theta oscillations (4-8 Hz) during human REM sleep.
Materials and Methods: Twenty-four subjects (19 female, 5 male; M = 20.46 years, SD = 2.06) were recorded overnight with polysomnography. During periods of REM sleep, an advanced oscillatory phase prediction algorithm was deployed to target auditory stimuli at the start of the positive deflection (0°) of ongoing theta oscillations.
Results: Results showed that the up-wave of REM sleep theta waves was precisely targeted (336 +- 58 degrees), evoking significantly boosted theta and beta activity shortly after stimulus onset.
Conclusions: The present study concludes that sine wave fitting can be reliably applied to precisely detect phase of theta activity during human REM sleep theta activity. This study contributes to a technical advance, introducing a non-invasive method to influence theta wave activity in the brain during REM sleep. In this way, paving the way to reliably interact with arbitrarily chosen phases of theta waves, possibly bringing light to research questions that would benefit of direct interference on theta oscillations, to further explore its link to human cognition
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BED-SHARING IN THE FIRST 6 MONTHS: ASSOCIATIONS WITH INFANT-MOTHER ATTACHMENT, INFANT ATTENTION, MATERNAL BONDING, AND SENSITIVITY AT 18 MONTHS

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Introduction: The objective of this study was to investigate whether bed-sharing during the first 6 months of life is associated with infant's attachment and behavioral outcomes and mother's bonding and sensitive parenting at 18 months of age.
Materials and Methods: The sample with complete longitudinal data comprised 178 infants and their caretakers. Bed-sharing was assessed with maternal report at term, 3, 6, and 18 months. Infant attachment was measured at 18 months using the strange situation procedure. Infant behavioral outcomes (i.e., poor attention/hyperactivity and task persistence) were assessed with 2 observational measures at 18 months. Maternal sensitivity was observed at 3 and 18 months, and mothers reported on bonding to their infant at term, 3, and 18 months.
Results: Bed-sharing was common at term (41.2%), which decreased at 3 months (22.6%) followed by a slight increase at 6 (27.5%) and 18 months of age (31.3%). No associations between bed-sharing during the first 6 months and infant-mother attachment and infant behavioral outcomes at 18 months were found. Similarly, there were no associations between bed-sharing during the first 6 months and maternal bonding and sensitivity at consequent assessment points (i.e., 3 and 18 months).
Conclusions: Bed-sharing during the first 6 months is not associated with positive or negative outcomes about infant-mother attachment, infant behavior, maternal bonding, or sensitive parenting.
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BOOSTING VOCABULARY LEARNING DURING SLEEP VIA A PORTABLE CLOSED-LOOP TARGETED MEMORY REACTIVATION SYSTEM IN A HOME SETTING: A PILOT STUDY

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Introduction: Sleep plays a critical role in the process of memory consolidation. Targeted memory reactivation (TMR) is a well-established methodology to manipulate memory processing overnight, typically employed in a laboratory setting. Sensory cues are used to non-invasively reactivate associated memory traces during the deepest sleep stage (N3), thus promoting memory consolidation. Considering the comprehensive literature supporting the high efficacy of the TMR approach, the next step consists of translating this paradigm to daily life. We developed a portable closed-loop TMR (CL-TMR) system that automatically delivers sound stimuli during N3, relying on the ongoing electroencephalographic (EEG) activity recording of a commercial wearable EEG headband. We applied CL-TMR to enhance vocabulary learning by presenting verbal stimuli during sleep in a home setting.
Materials and Methods: A total of 12 healthy young Italian native speakers (mean age ± standard deviation, 24.50 years ± 2.32) participated in the pilot study. In the evening, subjects performed a vocabulary learning task requiring the acquisition of the Italian translation of pseudo-words (T1). During the subsequent night, half of the pseudo-words were aurally presented (*cued*) during the ascending phase of the slow oscillations (SOs) through the CL-TMR system. Half of them consisted of pseudo-words that participants translated correctly at T1, while the other half were pseudo-words whose translation was not learned. EEG signals were recorded with the *Dreem Headband* (*Rythm SAS*, Paris, France). Stimulations were triggered by the SO detection algorithm of the headband. Vocabulary memory performance was re-evaluated in the morning post-stimulation (T2). We compared the T1-T2 differences between *cued* and *uncued* correctly translated pseudo-words. At the electrophysiological level, we evaluated event-related potentials (ERPs) and event-related spectral perturbations in the 5-18 Hz range for *cued* pseudo-words. We compared cortical responses leading to a successful recall of the Italian translation with those associated with a not-remembered translation in the morning.
Results: Re-exposure to pseudo-words during sleep improved later memory for the Italian translation of the *cued* words (mean ± standard deviation, +13.20% ± 20.75) compared with *uncued* words (−5.26% ± 22.31; p=0.04). EEG analysis showed that successful reactivation during sleep was associated with higher frontal positivity and negativity in ERPs. Time-frequency analysis revealed an increase in the spindle band in the 1000−2000 msec time window after the stimulation onset (p<0.05) as the correlate of the reactivation of memory traces correctly recalled in the morning.
Conclusion: This pilot study showed the effectiveness of our CL-TMR system in boosting vocabulary learning during sleep in an ecological home setting. The successful cueing was characterized by increased spindle activity after stimulus presentation, confirming the importance of specific oscillatory dynamics in supporting the TMR effect. The application of a