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NEUROBEHAVIORAL RESILIENCE AND VULNERABILITY TO SLEEP LOSS DIFFERS BETWEEN OBJECTIVE AND SELF-RATED METRICS REGARDLESS OF CATEGORIZATION METHOD UTILIZED

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Introduction: Trait-like individual differences in neurobehavioral responses to sleep restriction (SR) and total sleep deprivation (TSD) are robust and phenotypic. We investigated whether the concordance between multiple approaches for defining differential vulnerability depends on the methods and metrics utilized for categorization, including comparisons between objective and self-rated metrics. Trait-like individual differences in neurobehavioral responses to sleep restriction (SR) and total sleep deprivation (TSD) are robust and phenotypic. We investigated whether the concordance between multiple approaches for defining differential vulnerability depends on the methods and metrics utilized for categorization, including comparisons between objective and self-rated metrics.
Methods: Forty-one adults (33.9±8.9y; 18 females) participated in a 13-day experiment (two baseline nights [10h-12h time-in-bed, TIB], 5 SR nights [4h TIB], 4 recovery nights [12h TIB], and 36h TSD). The 10-minute Psychomotor Vigilance Test (PVT), Digit Symbol Substitution Test (DSST), Digit Span Task (DS), Karolinska Sleepiness Scale (KSS), Profile of Mood States Fatigue (POMS-F) and Vigor (POMS-V) were administered every 2h during wakefulness. Three approaches (Raw Score [average SR score], Change from Baseline [average SR minus average baseline score], and Variance [intraindividual SR score variance]), and six thresholds (±1 standard deviation, and the best and worst performing 12.5%, 20%, 25%, 33%, and 50%) categorized Resilient and Vulnerable groups. Kendall's tau-b correlations assessed the group categorization's concordance between pairings of PVT lapses (reaction time [RT]>500ms), PVT mean response speed (1/RT), DSST number correct, DS total number correct, KSS score, POMS-F score, and POMS-V score (tau-b=0.0: zero; 0.1: weak; 0.4: moderate; 0.70: strong; 1.0: perfect).
Results: Generally, tau-b correlations comparing Resilient and Vulnerable categorizations between two objective metrics (i.e., PVT, DSST, DS) revealed weak to moderate significant relationships (tau-b=0.29-0.53, p<0.001-0.049) between at least two of the approaches at most thresholds. However, comparisons between one objective (i.e., PVT, DSST, DS) and one self-rated metric (i.e., KSS, POMS) revealed a general lack of significant relationships (tau-b=-0.25-0.28, p=0.052-1.00), regardless of approach or threshold.
Conclusion: Comparisons between two objective metrics revealed significantly concordant Resilient and Vulnerable categorizations, whereas categorizations were generally not significantly correlated between one objective and one subjective metric, regardless of the method utilized. Our findings support and extend previous assertions that SR differentially impacts objective and subjective neurobehavioral domains and have important implications when assessing resilience and vulnerability to sleep loss in both laboratory and applied settings.
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REPETITIVE WEEKLY REM SLEEP DEPRIVATION-RECOVERY CYCLE OBTAINED FROM A LARGE U.S. SAMPLE BY HOME-BASED UNDER-MATTRESS MONITORING DEVICES

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Introduction: American adults are typically sleep deprived during weekdays and attempt to recover sleep on the weekends. Technological advances in home sleep monitoring have provided the opportunity to analyze sleep patterns on a scale much larger than previously imaginable. This study explores the weekly REM sleep deprivation–recovery cycle in a large U.S. sample.
Methods: Estimated total sleep time (TST) and REM/TST (R%) were analyzed by a commercially-available home-sleep-monitoring device (Sleeptracker-AI Monitor, Fullpower Technologies, California, USA). The device passively monitors sleep using piezoelectric sensors that register the forces exerted through the mattress. The de-identified data from the devices were analyzed following review and exemption of the study (#57681) from the Stanford University IRB. Data from 07/2020–06/2021, from 101,442 individuals with 14,277,964 recorded nights, were available. The analytic dataset included individuals with at least 300 nights of sleep per year and 26 of 52 nights per each day of the week (excluding nights abutting federal holidays).
Results: A total of 21,543 individuals (11,095 men, 51±14 years; 9,821 women, 50±15 years; 627 unspecified genders) and 6,850,717 recorded nights met the inclusion criteria. There is a stepwise increase in R% from Sunday night to Friday night and a decrease back to Sunday night, following a cycle of weekday sleep deprivation and weekend recovery. The means and standard deviations (across individuals' averages) of TST in hours and R% for each night were: Sunday (TST*:7.21±0.885, R%*:24.20±3.09), Monday (TST*:7.18±0.853, R%*:24.56±3.10), Tuesday (TST*:7.16±0.847, R%*:24.67±3.13), Wednesday (TST*:7.16±0.845, R%*:24.80±3.15), Thursday (TST*:7.18±0.845, R%*:24.87±3.15), Friday (TST*:7.51±0.904, R%*:25.05±3.15), and Saturday (TST*:7.59±0.897, R%*:24.83±3.12). Each statistic, when compared with the previous night of the week, was significant ($p < 0.05/7$, Bonferroni corrected) by paired t-test (denoted by an asterisk).
Conclusion: The use of advanced technology to estimate sleep-wake patterns in a large sample permits the validation of a repetitive REM sleep deprivation–recovery cycle. Individuals are, on average, partially sleep deprived starting Sunday night, which leads to a progressive REM sleep rebound that transitions into a REM recovery cycle on Friday and Saturday nights. Further work will focus on studying this cycle within different groups (e.g., age, gender), across seasons, and including other sleep parameters.
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