Conclusion: Collectively, our results demonstrate a striking sexual dimorphism in the elevation of hippocampal KYNA and contextual memory retention after an acute period of SD. Additionally, we introduce KAT II inhibition as an efficacious strategy to combat cognitive disruption after SD.

Support (If Any): NIH K12 HD43489.

0258

EFFECTS OF SLEEP DEPRIVATION ON COMPONENT PROCESSES OF WORKING MEMORY IN YOUNGER AND OLDER ADULTS

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Introduction: Working memory (WM) has been described as a process comprised of multiple components, including: attention, capacity for rehearsal of information, and encoding to and retrieval of information from episodic memory. Impairments can have significant impacts on higher order cognitive processes and many everyday functional abilities. As both WM and sleep have been shown to decline throughout aging, further investigation is needed into the impact of sleep changes on WM across the life span. Here, we aimed to better understand effects of sleep deprivation on component processes of WM, comparing younger (YA) and older adults (OA) across both verbal and spatial modalities.

Methods: 31 YA (19–38 years) and 33 OA (59–82 years) were studied twice, in counterbalanced order, approximately two weeks apart: once after a regular night's sleep (well-rested condition) and once after 32 hours of total sleep deprivation (TSD condition). Participants completed matched versions of a verbal and spatial WM task each time. Test order was counterbalanced across subjects.

Results: Performance on the WM task showed YA significantly outperformed OA on attention and capacity component processes, for both verbal and spatial modes of WM. Following TSD, YA showed a significantly larger drop in the attention component of verbal WM, and in the capacity component of spatial WM, compared to OA. A main effect of condition was observed for the verbal capacity parameter.

Conclusion: Differences were observed in the performance of YA and OA on component processes of WM following TSD. In both studies, YA showed impairments in WM attention and rehearsal span, but not episodic memory. Our older adults experienced verbal rehearsal span deficits following TSD. They did not, however, show attention deficits nor episodic memory deficits. In the spatial task, OA did not show any statistically significant changes in spatial WM parameters following TSD, though they had overall lower attention parameter scores than YA. Understanding the profile of changes in WM components can inform prevention and intervention in operational settings. In the context of aging, it could provide a basis for development of compensatory strategies or interventions, and differentiation of clinical and healthy populations.

Support (If Any):

0259

SLEEP DEPRIVATION EFFECTS ON THE DIGIT SYMBOL SUBSTITUTION TEST: GENERAL COGNITIVE SLOWING OR WAKE STATE INSTABILITY?

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Introduction: Sleep deprivation (SD) causes wake state instability, which amplifies variability in reaction times (RTs), skews the RT distribution, and increases the frequency of lapsing on the Psychomotor Vigilance Test (PVT). SD also causes various other effects on a range of cognitive performance tasks. Any shared underlying mechanisms for these effects have been difficult to demonstrate due to heterogeneity of task characteristics and outcome measures. Here we used a computerized Digit Symbol Substitution Test (DSST), which involves matching symbols to digits based on a 9-number key. Cognitive throughput (number of correct responses) on the DSST is used as a measure of cognitive processing speed, in both aging and sleep research. SD reduces cognitive throughput on the DSST, suggesting that SD slows cognitive processing speed. We investigated whether RT distributions on the DSST reflect general cognitive slowing, or rather wake state instability.

Methods: N=56 healthy adults (ages 22–37, 29 females) completed a 4-day/3-night in-laboratory study, randomized with a 2:1 ratio to a total SD (TSD) condition or a well-rested control condition. The TSD condition (n=37) had 10h sleep opportunities (22:00-08:00) on the first and last nights, with 38h TSD between; the control condition (n=19) had 10h sleep opportunities each of the three nights. A 10min, computer-paced PVT and a 4min, subject-paced DSST were administered twice before TSD, twice during TSD, and once following recovery. Lapses were defined as RTs≥2000ms on the DSST and RTs≥500ms on the PVT.

Results: TSD reduced cognitive throughput on the DSST ($p<0.001$). TSD reduced mean response speed (1/RT) on the DSST ($p<0.001$) and PVT ($p<0.001$). However, TSD also increased the number of lapses on the DSST ($p<0.001$) and PVT ($p<0.001$). Furthermore, TSD skewed the RT distribution for both tasks.

Conclusion: A hallmark effect of SD on the PVT is wake state instability. Despite considerable differences in task characteristics, we observed the same phenomenon on the DSST. It thus appears that reduced cognitive throughput on the DSST during SD reflects wake state instability.

Support (If Any): Office of Naval Research grant N00014-13-1-0302.

0260

IMPACT OF SLEEP RESTRICTION AND RECOVERY ON MOTIVATION DURING REPEATED COGNITIVE PERFORMANCE TESTING

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Introduction: Both motivation and sleep deprivation affect cognitive performance. Especially during long-lasting studies with repeated cognitive performance tasks there is concern that subjects will lose motivation over time. Results may be confounded due to changes in motivation.

Methods: In an ongoing study, 29 healthy volunteers performed 55 cognitive performance tasks at three-hourly intervals in a 12-day inpatient study. After two baseline nights with 8 h time in bed (TIB) the intervention group (N=20; mean age 26 ± 4 years, 9 females) underwent chronic sleep restriction for 5 nights (5 h TIB) with a following recovery night of 8 h TIB. The control group (N=9; mean age 25 ± 5 years, 3 females) had the opportunity to sleep 8 hours every night. Participants completed the Karolinska Sleepiness Scale (KSS) and a questionnaire about their motivation (from 1=very little/not motivated to 5=very motivated) at 6 p.m. on all days.