0125

FLUID INTELLIGENCE DOES NOT MEDIATE COGNITIVE THROUGHPUT DEFICITS DURING TOTAL SLEEP DEPRIVATION

Kimberly Honn[1], Courtney Kurinec[1], John Hinson[2], Paul Whitney[2], Hans Van Dongen[1]

Washington State University Spokane [1] Washington State University [2]

Introduction: The Digit Symbol Substitution Test (DSST) has been used in sleep research to measure slowing of cognitive throughput. The task shows large aptitude differences in baseline performance and substantial inter-individual differences in vulnerability to performance deficits during total sleep deprivation (TSD). Fluid intelligence (Gf) is generally positively related to processing speed. However, DSST performance is typically found to be independent of Gf. The possible interaction of sleep loss with Gf on performance remains to be examined.

Methods: N=56 healthy adults (ages 22–37, 29 females) completed a 4-day/3-night in-laboratory study and were randomly assigned (2:1 ratio) to a TSD (n=37) or control (n=19) condition. Sleep opportunities were from 22:00–08:00 on the first (baseline) and last (recovery) night for the TSD group and on all three nights for the control group. Subjects completed a 4min, computerized DSST twice on day 2 (baseline) and twice on day 3 (TSD or control). At baseline, subjects also completed the Shipley Institute of Living Scale (SILS). The abstraction score was used to categorize fluid intelligence (Gf) as relatively high (≥34, n=36) or low (<34, n=20). Mean DSST throughput (number of correct responses in the 4min task) was analyzed using mixed-effects ANOVA with fixed effects for day (2, 3), condition (TSD, control), and their interaction, with and without Gf category (high, low) as a covariate.

Results: As expected, DSST throughput was significantly reduced by TSD (day by condition interaction: $F[1,166]=27.99$, $p<0.001$). Adding Gf had no effect on the day by condition interaction, and Gf category was not significant as a covariate ($F[1,166]=1.67$, $p=0.20$).

Conclusion: Our results indicate that the Gf measure from the SILS does not capture the aspects of cognition that are influenced by TSD and that lead to a decline in DSST throughput. This is consistent with findings that while the DSST has high sensitivity for cognitive dysfunction in clinical settings, it has low specificity in identifying components of cognition responsible for dysfunction.

Support (If Any): ONR N00014-13-1-0302 and PRMRP W81XWH-20-1-0442.