



The Alarm Clock of Executive Function: An Analysis of Sleep Measures in Correlation to Executive Function

Sarah Drake^{1,2}, Nathan Labora^{1,2}, Caterina Gratton^{1,2}

¹Psychology, ²Neuroscience Program – Florida State University

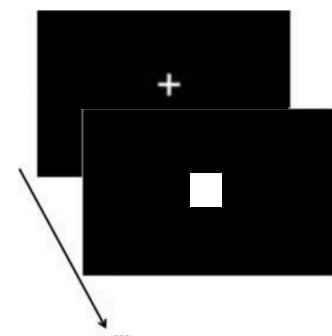


Introduction

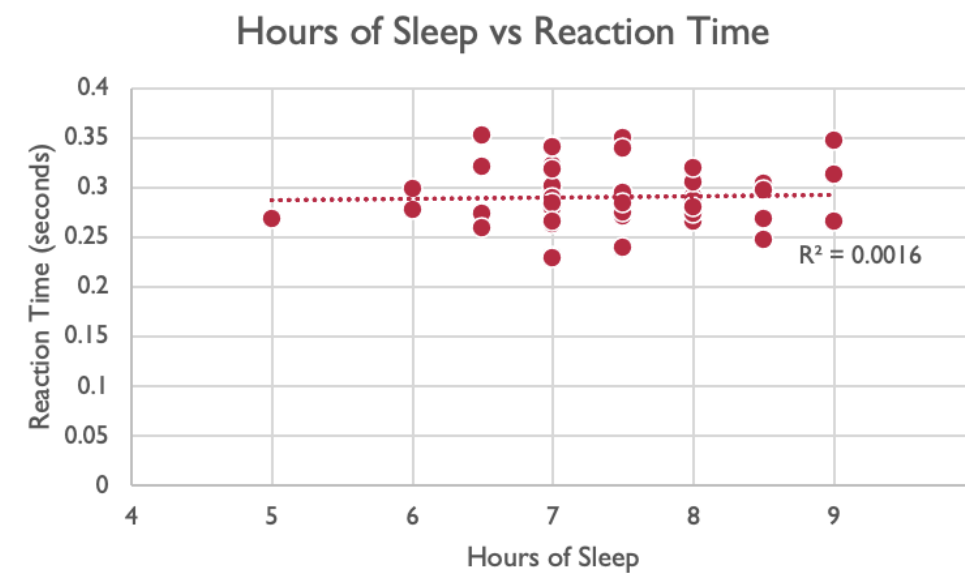
- Sleep is important to a number of brain functions, including how neurons communicate. Sleep also plays a role in removing toxins in the brain that build up during wakefulness
- **Sleep deficiencies are linked to chronic health problems and cause behavioral impairments** leaving individuals vulnerable to attention lapses, reduced cognition, delayed reaction time, and mood swings
- Given these relationships, **we hypothesized that higher amounts of average sleep would correlate with faster reaction times, especially in executive function tasks**

1. No correlation between average nightly sleep and basic reaction time

- The data shows no relationship between the reported nightly sleep and basic reaction time
- The effects of decreased sleep is not captured in this simple reaction time test



A lower level of reported sleep showed no relationship with reaction time



Discussion and Future Directions

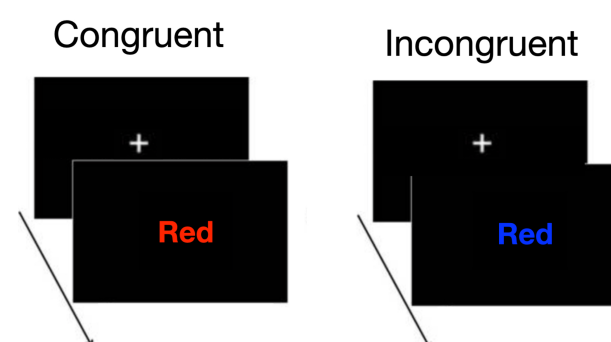
- **We found lower levels of sleep were related to differences in executive function, but not general reaction time**
- Our results are consistent with prior literature showing a decrease in cognitive control performance with an insufficient level of sleep
- When studying sleep, limitations include: overall correlation not directly meaning causation, limitations within outcomes when derived from self-reporting surveys (validity and reliability), participant's caffeine intake and tolerance, sample size and demographics
- Future analyses for the project will include analyzing other tasks to capture different facets of **cognitive control (inhibition, shifting, and updating)**

Methods

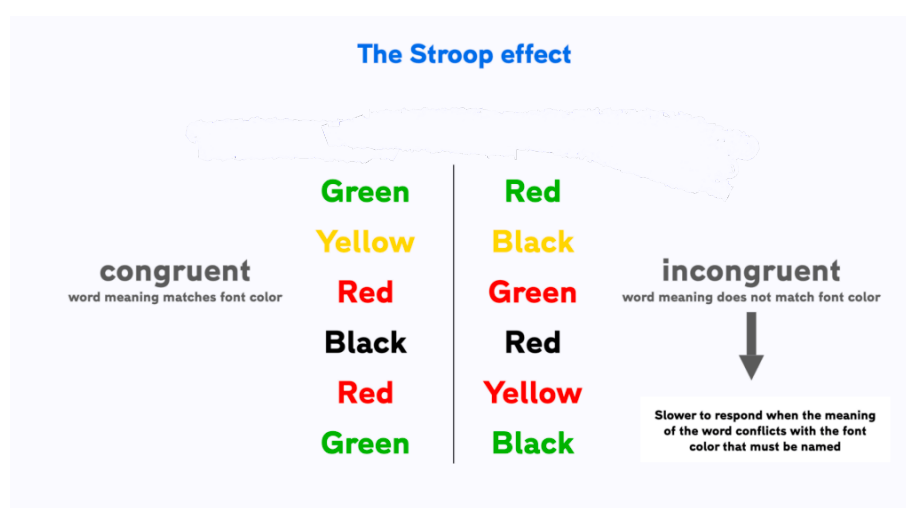
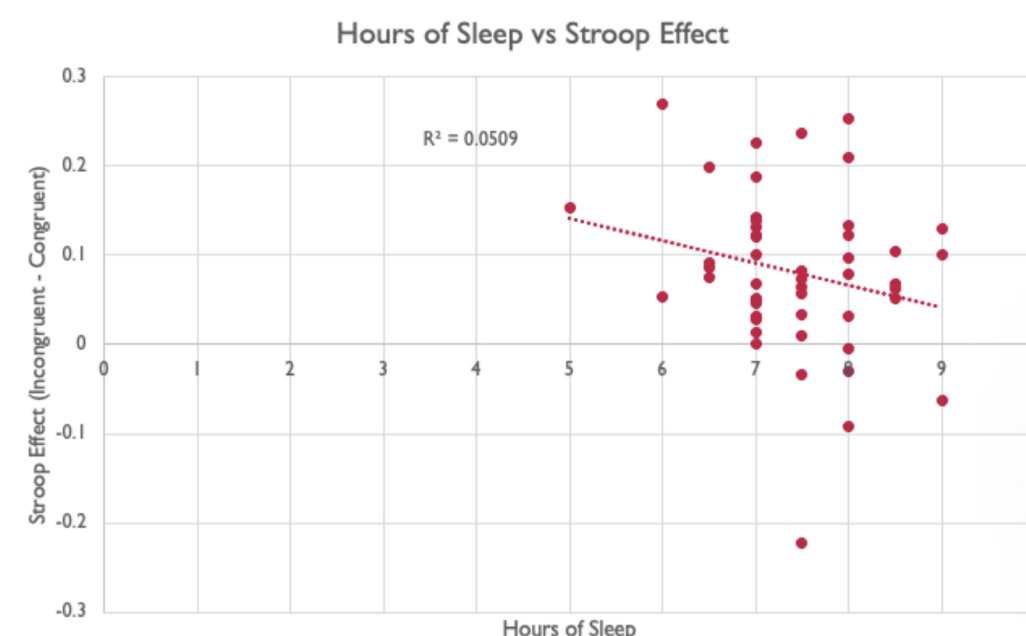
- We collected self-reported information about **sleep, basic reaction time, and executive function** performance from 48 participants (F = 33, ages 18-35)
- Computerized tasks were used to assess executive function performance in the Stroop task
- We calculated a Pearson correlation between a subject's reported daily sleep with their reaction time performance as well as the Stroop effect

2. A higher amount of average nightly sleep is correlated with a smaller Stroop effect

- Results show a negative relationship between Stroop effect and hours of sleep
- Shows correlation of a decrease in executive function performance with decreased sleep



A lower amount of sleep is correlated with a higher Stroop effect



(testable.org, 2021)

References

- Miyake A; Friedman NP; Emerson MJ; Witzki AH; Howerter A; Wager TD; (n.d.). *The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis.* Cognitive psychology.
- Rechtschaffen, A. (2015, January 7). *Current perspectives on the function of sleep.* Perspectives in Biology and Medicine.
- Mayo Foundation for Medical Education and Research. (2023, February 21). *How many hours of sleep do you need?.* Mayo Clinic.