MIND THE SLEEP

Exploring the relationship between sleep duration and control related brain activity

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Research poster from internship at MICC

Introduction

Sleep deprivation has been linked to changes in cognitive control performance and associated brain activity, but might not affect all cognitive processes equally[1]. Moreover, it is unclear if this generalizes to natural sleep variation.

Could differences in habitual sleep duration relate to differences in control related brain activity?

I did an exploratory analysis of the relationship between sleep length and event-related potentials (ERPs), specifically the N2 and P3 during a stop signal task (SST).

Methodology

N = 19 adults did the stop signal task with concurrent EEG. Sleep and activity was extracted from actigraphs worn for 4 weeks.

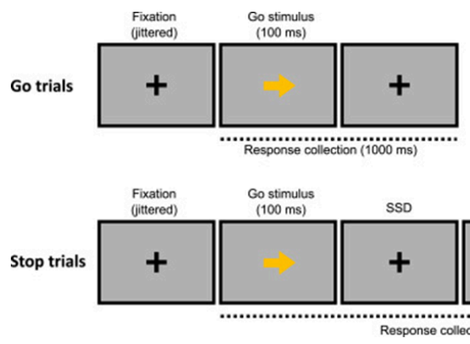

Figure 1: Stop signal task

Preprocessing pipeline

1. High and low pass filter (40Hz, 0.1Hz)
2. Resampled (500Hz)
3. Channel selection
4. Re-reference to earlobes
5. Recode events
6. ICA
7. Epoching
8. Baseline correction

Pearson correlation was done for analysis.

Results

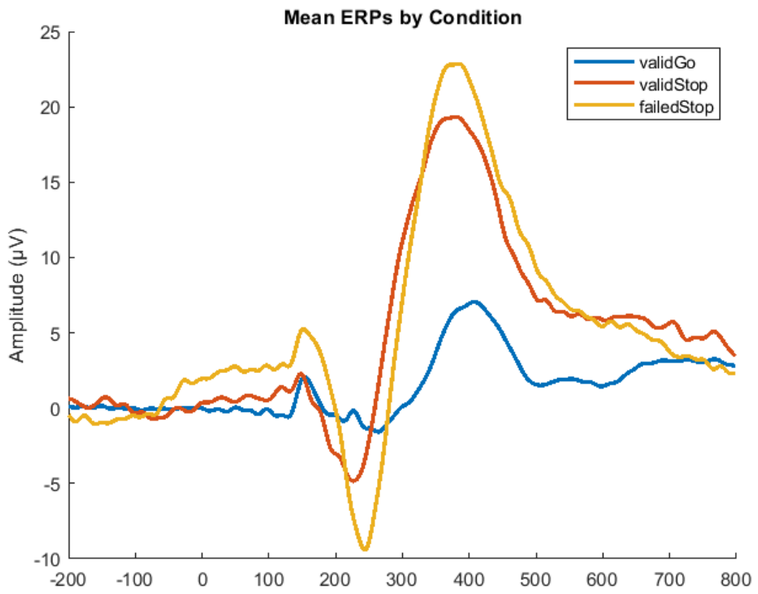

Figure 2: Grand ERP for all conditions

We found no significant association between sleep duration and ERP amplitude or latencies.

Effect sizes for N2 suggest small to moderate reductions in amplitude with shorter sleep.

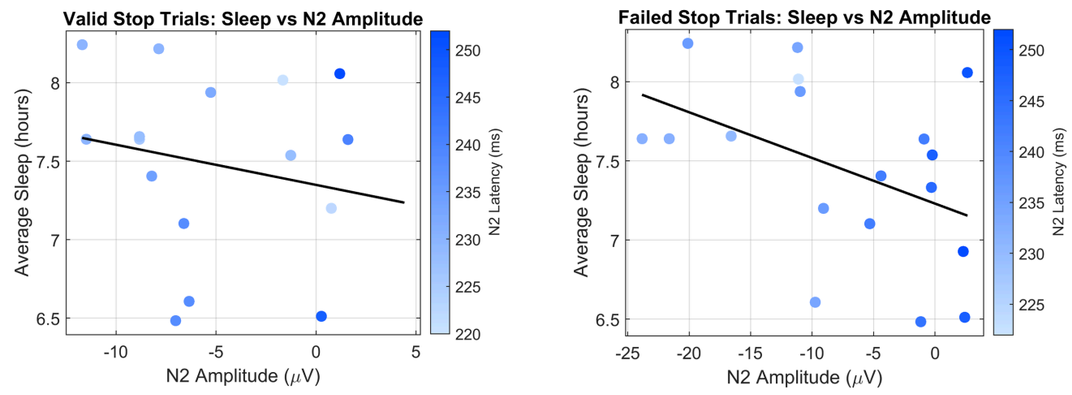

Table 1. Effect size, correlation and number of participants

Condition	r (N2)	p (N2)	n (N2)	r (P3)	p (P3)	n (P3)
Valid Go Trials	0.13	0.614	18	0.05	0.848	18
Valid Stop Trials	-0.24	0.342	18	-0.07	0.791	18
Failed Stop Trials	-0.44	0.065	18	0.11	0.656	18

Conclusion

The N2 amplitude effects I found are opposite to those reported by Kusztor, possibly reflecting differences between low habitual sleep and acute sleep deprivation.

Ongoing data collection in the "Mind the Sleep" project will allow us to further explore these findings, including behavioral measures like reaction time.

References

1. Kusztor, A., et.al. (2019). https://doi.org/10.1093/sleep/zsz016

2. Thunberg et. al. (2024). https://doi.org/10.1016/j.cortex.2024.02.008