SOF Analysis Plan

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**Research Aims:**
Examine the relationship between sleep patterns and sustained attention in aging

**Background:**
The extent to which disruptive sleep affects sustained attention in older adults is unknown. The majority of the research analyzing sustained attention in older adults has primarily consisted of comparing older adults’ performances with younger adults in laboratory settings (1; 3; 4; 6). Results from these studies have shown that older adults tend to outperform younger adults following sleep deprivation on sustained attention tasks specifically, the psychomotor vigilance task (1; 3; 4; 6). While the results have been consistent, the reason for such findings is still under debate (6).

There are two prominent interpretations within the sleep field for why older adults are not as affected by sleep loss compared to younger adults. Some argue that sleep need diminishes with age (5; 6) whereas others argue that it is not the need to sleep, but rather the ability to sleep that declines (2; 8). Regardless, there is limited research examining the relationship between sleep and sustained attention among older adults. To our knowledge, no one has investigated how real world sleep/wake patterns are associated with measures of sustained attention in aging populations. This investigation could provide novel insight into the whether or not optimal sleep patterns contribute to sustained attention or if sustained attention does not rely on sleep.

Preliminary findings from our laboratory have led us to hypothesize that sleep need is important for older adults. We tested 43 healthy older adults between the ages of 60-80 years old. The older adults were prescreened to exclude those with physical or mental health problems including hypertension, depression, and sleep disorders. Each participant wore an actigraph for 10 days and completed the psychomotor vigilance task. Our findings showed that older adults who had greater variability in total sleep time were slower on the fastest 10% of their reaction times on the psychomotor vigilance task (r = .31, p < .05; see Appendix A). These findings suggest that higher sleep stability is associated with better sustained attention performance. Furthermore they demonstrate that older adults benefit from more consistent sleep. The results from our study were limited because we included very healthy older adults who were self-reported good sleepers. The SOF cohort consists of a large sample and provides a vast set of sleep measures such as actigraphy and polysomnography data. Being able to analyze a larger dataset would allow us to examine whether our results generalize to a more diverse aging sample.
We hypothesize that older females who on average maintain a consistent sleep pattern will perform better on the sustain attention task than those with inconsistent sleep patterns. Additionally, we hypothesize that older females who periodically take longer naps (> 55 minutes) will not perform as well on the sustain attention task in comparison to those who do not.

Predictor Variables: Total sleep time, sleep fragmentation, napping variables from actigraphy

Outcome Variables: Psychomotor vigilance task data (raw reaction times or summary variables such as: mean, median, top ten percent, bottom ten percent, false starts, response lapses)

Covariates: age, ethnicity, BMI, physical activity, medication use, major medical illnesses (i.e. Parkinson’s disease, Chronic Obstructive Pulmonary Disease), other cognitive measures (3MS) comorbidities, clinic site

Analytic Plan:
Methods: We will use the actigraphy data and PVT data from Visit 9. To examine sleep characteristics, we will analyze total sleep time based on categories (i.e. <5 hours, 7-<8 hours, etc. as previously defined), and other variables (sleep efficiency, WASO, sleep latency, and napping) either by quartiles or using previously defined categories. We will adjust for age, health, BMI, race, clinic site, and other covariates mentioned above.

Initially, we will use a covariance matrix to determine if there are interactions between the measures mentioned above. From there, we will do additional analyses to test for interactions and mediations, as appropriate.

Mock Tables:

<table>
<thead>
<tr>
<th>Total Sleep Times (in hours)</th>
<th>Mean</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=5</td>
<td>5-6</td>
<td>6-7</td>
</tr>
<tr>
<td>Reaction Time</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References


Appendix A

Variability in Total Sleep Time by Reaction Times

![Graph showing the relationship between Top Ten Percent of Reaction Times and Variability in Total Sleep Time (min). The correlation coefficient is r = .31, p < .05.](image)