



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

<b>Name(s)</b> <b>Ananya Vinay</b>	<b>Project Number</b> <b>J0718</b>
<b>Project Title</b> <b>Disruption of Circadian Rhythm: A Big Price to Pay if We Disregard Nature's Zeitgeber</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives</b> The objective is to see whether there is any correlation between sleep and working memory. The hypothesis is as follows: people who are getting less than the recommended 8 hours of sleep or has other sleep-disrupting risk factors like night shifts or travel across time zones would perform poorly or get low test scores on a test of working memory or short term memory.</p> <p><b>Methods</b> The study was a cross-sectional survey. My subjects were students from my school and class and also some long distance friends, night shift workers (Physicians, Nurses, Other Hospital workers, Call Center Workers), adults employed in non shift work, and subjects with recent transatlantic travel. There were a total of 201 participants. The anonymous online survey included informed consent and collect anonymous data including age, gender, sleep habits, employment etc. All subjects also did a working memory test that involved remembering pictures or figures on the previous screen. This test was chosen as it did not involve any mathematical calculations and also was freely available online without any licensing or cost involved. (<a href="http://opencoglab.org/memtest1/">http://opencoglab.org/memtest1/</a>) .</p> <p><b>Results</b> Subjects who worked night shifts had a significantly lower working memory score than those who did not do night shifts (.37.23 versus 42.53, p value =0.0011). Over all, the subjects who slept &lt;4 hours had a significantly lower score than the subjects who slept more than 7 hours.(33.56 vs 44.39, P value=0.001). In subjects 15 years or younger, the score was significantly lower (p-value= 0.015) for students sleeping less than 7 hours versus students having more sleep.(40.79 and 45.4 respectively). This shows that younger kids were especially vulnerable to sleep deficits. Among the 29 subjects, who had recent transatlantic flights, those who slept more than 7 hours did much better on the working memory test (49.33 versus 36.66, p value=0.001). This pertains to my objective because it proves my hypothesis.</p> <p><b>Conclusions</b> Subjects less than 15 years old had significantly lower scores on the working memory test even at a sleep duration of less than 7 hours. Overall, sleep less than or equal to 4 hours, night shift work, and transatlantic travel, correlated with poor short-term memory. This should be considered in picking course load and extracurriculars in school. These results could be interpreted to suggest that young adults are particularly vulnerable to sleep loss and circadian disruption even at sleep less than 7 hours. It is important to determine whether chronic sleep deficit has long term effects on memory and anxiety or depression.</p>	
<b>Summary Statement</b> My project proved that there is a direct correlation between sleep deficit and working memory. This is especially true in students younger than 15 years.	
<b>Help Received</b> My science teacher :Kay Barrie and my friends ,teachers and neighbors who took the survey	