



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Madison Risk	Project Number S1207
Project Title The Effect of Chronic Sleep Deprivation and Blue Light Using a Nocturnal House Mouse (Year 7)	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This experiment was performed to see if changes in sleep cadence affected the retention of knowledge by mice. This project builds on the previous six years projects; each year I studied the effects of artificial lighting on animals working up the food chain. I looked at sleep deprivation through two different mice learning techniques: the Morris Water Maze and a traditional running maze.</p> <p>Methods/Materials Morris Water Maze (2 sizes), fixed land running maze, 5 mice, 24 light source, iPad to provide blue light. Timed various mice in all mazes over a several week period.</p> <p>Results Morris Water Maze: I recorded 180 maze runs (thirty-six for each mouse) at normal light conditions. When the timed test was similar to their natural light exposure of 12 hours per day, mice on average learned the course and ran it faster. For maze 1, the shortest time ran was 0:03 seconds. The length of time reduction ranged from 1:26 to 0:03. For maze 2, the shortest time was 0:07. The time reduction ranged from 1:08 to 0:07. When the lighting conditions were changed, the length of time that it took each mouse to navigate the maze increased. There was an increase from the last run in normal conditions to the first run in excessive lighting conditions. The average length of time for maze 1 increased from 0:05 seconds to 0:33 seconds. The average length of time for maze 2 increased from 0:09 to 1:17. Fixed Land Maze: I recorded 45 maze runs (nine for each mouse) at normal light. The average time it took for the mice to run the maze went from 3:28 to 0:20. After the blue light period, the mice on average took longer to run the maze; each mouse ran the maze twice in the sleep deprivation/blue light section. From the last (35th) run of the resting stage to the first run of the sleep deprivation/blue light stage, the average time increased from 0:20 to 1:46. Even in sleep deprivation, there were improvements in the length of time it took to run the maze.</p> <p>Conclusions/Discussion Mice are nocturnal. However, they are very adaptable and can learn. When the light changed, the learning patterns of the mice changed as well. At 12 hours of light, the mice learned the water maze; while they learned the maze under excessive light conditions as well, it took them longer. The sleep deprivation and the addition of blue light to the environment of the mice was a dramatic factor in their ability to retain knowledge.</p>	
Summary Statement The learning ability of mice was negatively affected by the sleep cadence alterations from artificial lighting sources.	
Help Received I designed and built the running maze and the platforms in the Morris Water Maze by myself. My mother reviewed my results.	