Sleep Deprivation and Spatial Memory in Mice (Mus musculus): Does Exercise Help?
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**Introduction**

- Sleep is a valuable time when the brain is free of external stimuli and able to fortify newly formed memories (Zagaar et al. 2012). Sleep is also the time to reconsolidate and reorganize memories previously acquired (Borquez et al. 2014).
- Approximately 28% of adults suffer from insufficient sleep 14 or more days a month (CDC 2011).
- Sleep deprivation can cause decreased reaction time and even increased stress (Camilla and Patti 2010).
- Aerobic exercise has beneficial effects on the cognitive function of both humans as well as mice (Zagaar et al. 2013). Exercise improves spatial learning in rodents such as mice or rats (Rhodes et al. 2003).
- Running has also been linked to an increase in neurogenesis which improves memory functions within the hippocampus (Praag et al. 1999).

**Hypotheses**

- Mice that experience no sleep deprivation and live in an exercise environment would perform the best at spatial memory recall.
- Mice that could voluntarily exercise and were sleep deprived would perform better than sedentary mice that experienced no sleep deprivation.
- Sedentary mice that have suffered from sleep deprivation would show the greatest impairment in spatial memory recall.

**Objective**

Test the effects of voluntary exercise compared to a sedentary lifestyle in order to determine the impact that regular exercise has on memory retrieval after sleep deprivation.

**Methods**

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Sedentary Environment n=20</th>
<th>Exercised Environment n=20</th>
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<tbody>
<tr>
<td>Sleep Deprived</td>
<td>Sleep Deprived</td>
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<tr>
<td>Non-Sleep Deprived</td>
<td>Non-Sleep Deprived</td>
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**Results**

- Exercise could combat the affects of sleep deprivation in mice.

**Conclusions**

- All factors (environment, sleep treatment, and an interaction of the two) influenced the ability of mice to spatially recall the correct hole out of the possible 20 in the Barnes Maze.
- Mice in the exercise groups learned the fastest and showed more spatial memory recall than sedentary mice.
- Mice in the sedentary/sleep deprived treatment searched more incorrect holes on test day (30 holes) than exercised/non-sleep deprived mice which searched the least (1.1 holes) before locating the hide-hole.
- In both the time to reach the hide-hole and incorrect hole count the mice from the exercise/sleep deprived treatment performed (24.5 seconds, 4.25 holes) better than the mice in the sedentary/non-sleep deprived treatment (19.1 seconds, 4.3 holes).

**Literature/Cited**


**Acknowledgments**

I would like to thank my mentor Dr. Hengberg for his guidance and advice. I would also like to thank Dr. Hagerty and Joan Carpenter for helping me throughout the entire process.