<u>Rationale</u>

For our project, we propose a study that will examine possible relationships between Autism Spectrum Disorders and Melatonin production. Autism, a social development disorder, has recently become very prevalent in the world, afflicting about 1% of the world's population, translating to about 71 million people with Autism. For this reason, we've designed a study that may help to discover new relations between sleep and Autism to help those who have Autism Spectrum Disorders get adequate sleep each night. Scientists are already conducting studies like these, so this may help them to some extent. Our proposed study will have a control group of 60 people without an ASD and a testing group of 60 people with ASD, and will consist of 3 trials. The group conducting the study will measure both groups' melatonin levels before and after they are exposed to short-wavelength light and calculate melatonin production rates for each test subject. We have identified key parts of this study, which we will elaborate on shortly.

<u>Methodology</u>

We approached the design of this study using the Scientific Method, which we've learned in September. That is to say, we first identified an issue and asked a question, asking if there is indeed a relationship between Autism and melatonin production, then we researched the subject, and then we developed a hypothesis, stating that if the control group and testing group were tested for melatonin levels and melatonin production rates, then the testing group would, on average, have lower melatonin levels and production rates than the group of people without ASDs. Afterwards, we identified the hypothesis, required materials, independent and dependent

variables, a list of control variables, a list of methods, and ways to construct appropriate data tables and graphs. This study requires a wide, spacious room, time, at least 60 people with and without an ASD, each (with equal amounts of men & women in each group), a device that emits short-wavelength light, materials to evaluate people's melatonin levels, tools to record data of the study (pen, paper, computer, etc.), and a device to play calming music. The person conducting the study must also account for age, gender, racial ethnicity, medicines taken, other diseases, or any other factor that may influence sleep patterns.

As mentioned above, we've also prepared a list of instructions for this study. *First,* gather all necessary materials for the study and ensure that your data table accounts for aforementioned control variables. *Second,* at 7:00 p.m. sharp, record the melatonin levels for one third of the test subjects from each group and record these in your data table. *Third,* track the subjects' melatonin levels again at 7:10 (making sure that they are supervised as necessary) and record these too in your data table, and then calculate melatonin production rates for each test subject, recording these down as well. *Fourth,* turn on the short wavelength lighting device and instruct the subjects to focus on this light for 10 minutes, playing calming music during this period. *Fifth,* track the subjects' melatonin levels again, recording these down. Use the previous set of melatonin levels and this new set to calculate repressed melatonin production rates, recording these down as well. *Sixth,* repeat steps 2-6 for trials 2 and 3 on different days, using a different portion of test subjects. *Seventh,* compare all corresponding data between the subjects with an ASD and the subjects without an ASD and evaluate the hypothesis using these comparisons. *Lastly,* thank all the test subjects for participating via an official letter or in person and prepare to present your conclusion to the scientific community, making sure to account for all questions that may be asked at the end. This study should be conducted by a fairly wealthy group that can provide an

incentive for participation and/or compensation for any detrimental effects the test subjects may receive from this study. This study also should probably be conducted in the middle of spring or autumn, when the ratio between daytime and nighttime is most regular.. As for the data table we keep referring to, just make sure that the columns represent which data is being recorded (first, second, or third melatonin level, normal and repressed melatonin production rates) and the rows represent each test subject, making sure to include their name, gender, racial ethnicity, age, whether or not they have an ASD, and other notes you might want to add. For graphs, I would suggest a bar graph (or rather, multiple bar graphs) that compares data for the control group and the tested group.

Our study's design is still a long way from being perfect, so feel free to make any necessary revisions to ensure that our study doesn't violate any research ethics and is as accurate as possible.

Next Steps

From this project, we have learned the concept of circadian rhythms and their effect on our lives, that melatonin plays a key role in these sleep-wake cycles, and that Autism may very well have an effect on melatonin production. We also learned a bit more about experimental design than we had previously learned, mainly refining the ways which we apply that specific knowledge. If we were to be allotted more time for this project, we would refine our experiment's design even further to cohere with moral ethics (as well as learn more about such rules), and to yield more accurate and precise data. We could also do further research about the relationships between Autism and sleep, and about melatonin, circadian rhythms, and their relationships with our lives. Thank you all so much for this opportunity.

Bibliography

Bright Schools Competition. n.d. 18 January 2016.

Facts and Statistics | Autism Society - Autism Society. 26 August 2015. 26 January 2016.

Helping your child sleep - NAS. n.d. 21 January 2016.

http://sleepfoundation.org/sites/default/files/SleepWakeCycle.pdf. n.d. 21 January 2016.

Lamm, Carin. *Sleep | Families and Adults/Health and Wellness | Autism Speeks*. n.d. 21 January 2016.