Introduction

- ASD is caused by improper connectivity and communication between neurons in the cerebral cortex.
- The cerebellum is one of the key brain regions affected by autism; it is essential for movement and learning motor skills, such as how to ride a bicycle. Some of the recognizable symptoms of autism involve control of movement.
- A mutation in the RNF8 gene is speculated to have a correlation with ASD-like traits.
- Ubiquitin-protein ligase RNF8 is an enzyme that in humans is encoded by the RNF8 gene. RNF8 has activity both in immune system functions and in DNA repair. Lacking the gene correlates to a higher chance of a person having autism.
- Neurons that lacked the RNF8 protein formed about 50 percent more synapses than those with the gene. By measuring the electrical signal in the receiving cells, the strength of the signal was doubled in those that lacked the protein.
- Our goal is to figure out the link between the cerebral cortical function and asd behaviors.

Methods

- We modified a computational model of neurons in the cerebral cortex to display the results of the RNF8 gene on cellular activity.
- This simulation was run using MATLAB R2019a and DynaSim; through MATLAB, we programmed a model represented both excitatory and inhibitory, and also lacked randomness.
- Other models could test the effects of increasing the number of synapses between inhibitory cells which affects the neuronal activity.
- The NMDA synapse is an inhibitory synapse, so increasing the number of synapses could cause the excitatory cells to fire less often even when the inhibitory cells are firing less often.
- It is possible that excessive connections between neurons contributes to autism.
- If this is true, then experimentalists can start looking at ways of controlling the number of synapses in autistic patients in hopes of hindering the effects of the mutated RNF8 gene.

References


Acknowledgements

We would like to thank Dr. Kaitlyn Dorst, Justin Lee, Marija Stojanova, Sophia Li, and Johan Sebastian Martinez-Fuentes for guiding us through this project.