



### **Effects of Reward Magnitude on Decision Making**

**Andrew Furash (COL 2018)**

**Advisor: Marc Fuccillo**

Throughout the summer of 2016, I performed research on Autism Spectrum Disorders (ASD). Specifically, I conducted research on Neurexin-1-alpha knockout mice. This gene knockout mouse line is a working model for ASD. The Neurexin protein family are thought to aide in forming and maintaining neuronal connections at the synapse. Perturbations in the gene responsible for the synthesis of these proteins result in behavioral phenotypes such as increased stereotypic behavior and increased fighting. I conducted my research in Dr. Marc Fuccillo's Lab which is principally interested in the striatum, the primary input nucleus of the basal ganglia. This structure is highly implicated in ASD and other psychiatric disease due to its role in goal-directed behavior, voluntary motor function, and associative learning. Neurexin-1-alpha is highly expressed in the striatum, which ties Neurexin's and the Striatum's role in ASD together.

To examine the phenotypic differences between Neurexin knockout mice and their wild-type littermates, I employed an operant, forced-choice behavioral paradigm. Mice were first trained to poke their head in a central magazine for liquid reward. Subsequently, reward was only dispensed after a subject pressed one of two levers that extended into the operant chamber immediately following a magazine head-poke. After mice reached a set responding threshold, they began experimental trials in which each lever was assigned different reward volumes. After a subject reached a specific bias threshold (proportion of choices to the larger reward) the reward contingency was reversed. This means that if the left lever began delivering the large quantity of reward, the right lever would begin delivering the large quantity once the subject chose significantly more left choices over right ones. Designing the experiment in this way allows for comparison of reward sensitivity between mice. That is, if a mouse completes more reward reversals, they biased their responding quickly and are thought to be more sensitive to differences in reward quantity. Alternatively, this behavioral phenotype could be the result of differences in learning mechanisms.

The design and implementation of my own experiment has provided valuable insight into the neuroscience community. Understanding how the field asks academic questions and the research techniques commonly used to ask them has made the majority of modern neuroscience research accessible in a way unique to me among my peers. Additionally, the experiences I had in my home

lab and especially working with other labs over the summer has demonstrated how integral cooperative competition and discussion of ideas are to any productive research environment.