Research Question

Introduction

- Fear is an evolutionary mechanism developed to protect animals from harm
- Animals must be able to overcome their fear under certain conditions
- Lack of research into changes in brain activity associated with overcoming innate fear
- Robogator has been used in the past as a stimulus for rats through amygdalar-lesions
- Mesoscope created to track brain activity of mice while active

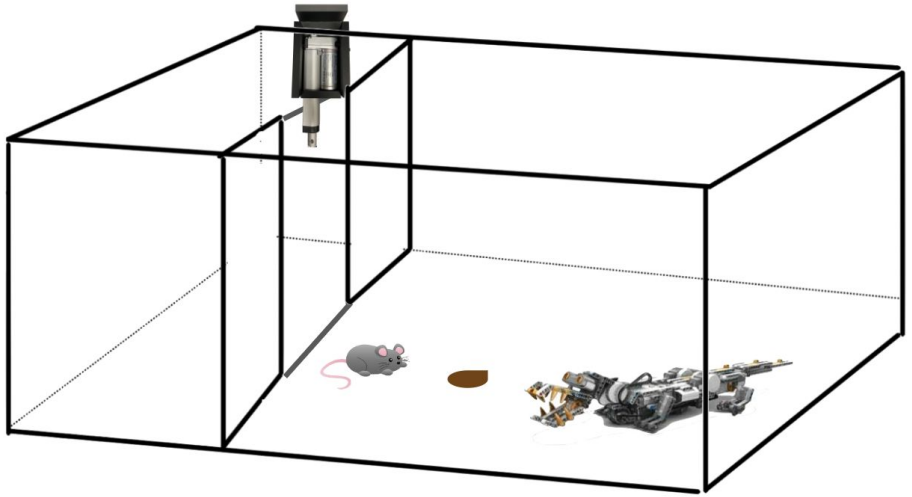
Purpose

- Created a system to test how mice are able to overcome their fears while simultaneously measuring brain activity

Materials/Procedures

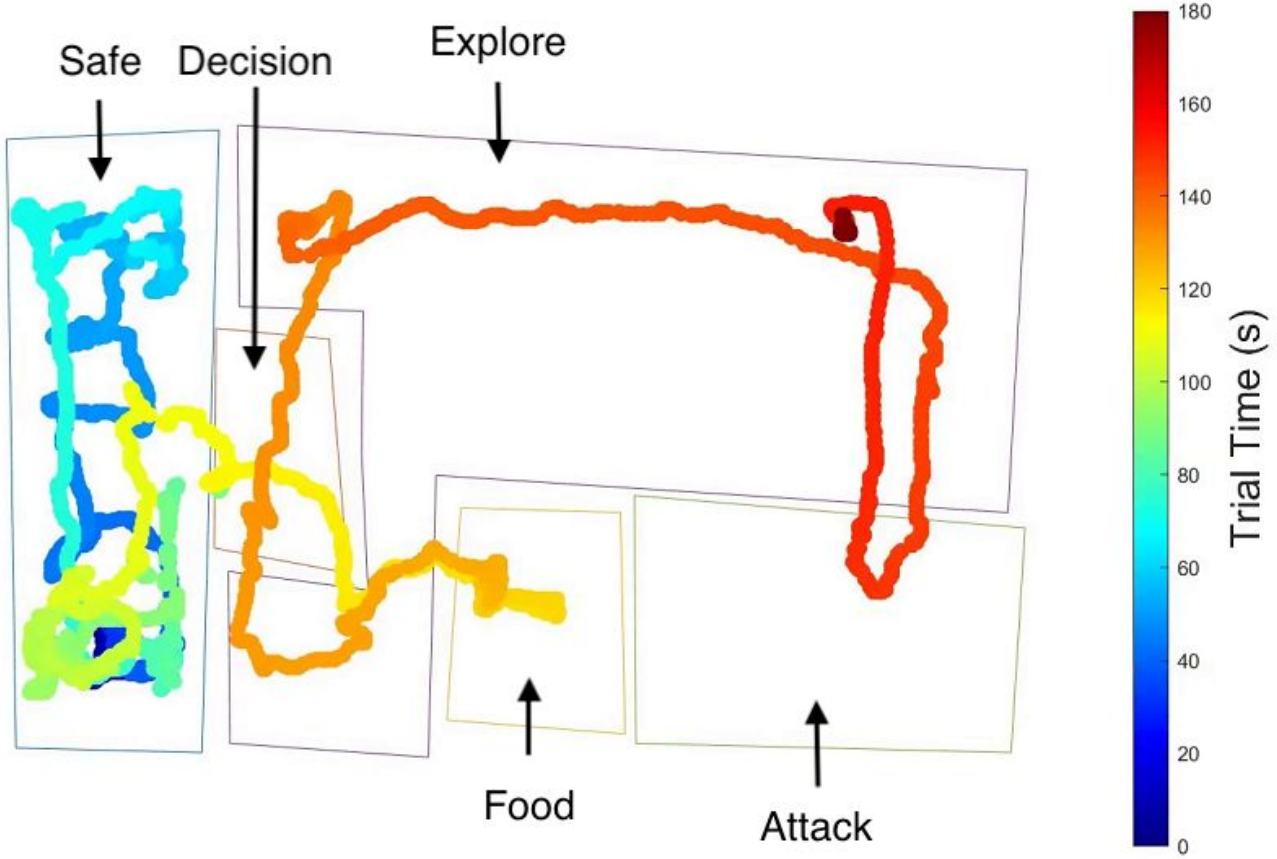
Setup

- Arena: built of acrylic, create controlled environment
- Trapdoor: remotely allow mice into arena, limit human interaction
- Robot: mock predator used to startle mice, guards food pellet
  - Switched from Robogator to RC Car
- Trials: 3 minutes or until food obtained, 3 mice per condition, 7 trials
  - Conditions: control and food-restricted mice



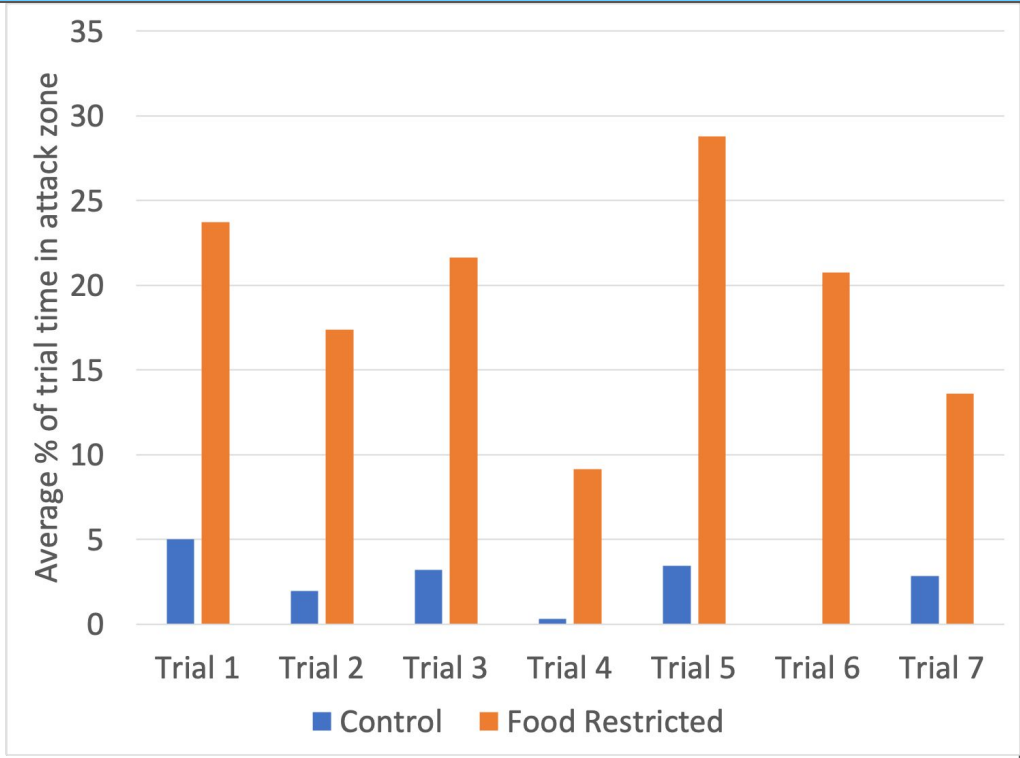
Representative of time spent in each area by mice

- Camera mounted above arena to track movement of the mice throughout trials
- Data analyzed based on time spent in four zones
  - Decision
  - Explore
  - Food
  - Attack



Average percent of trial time in attack zone for control and food restricted mice

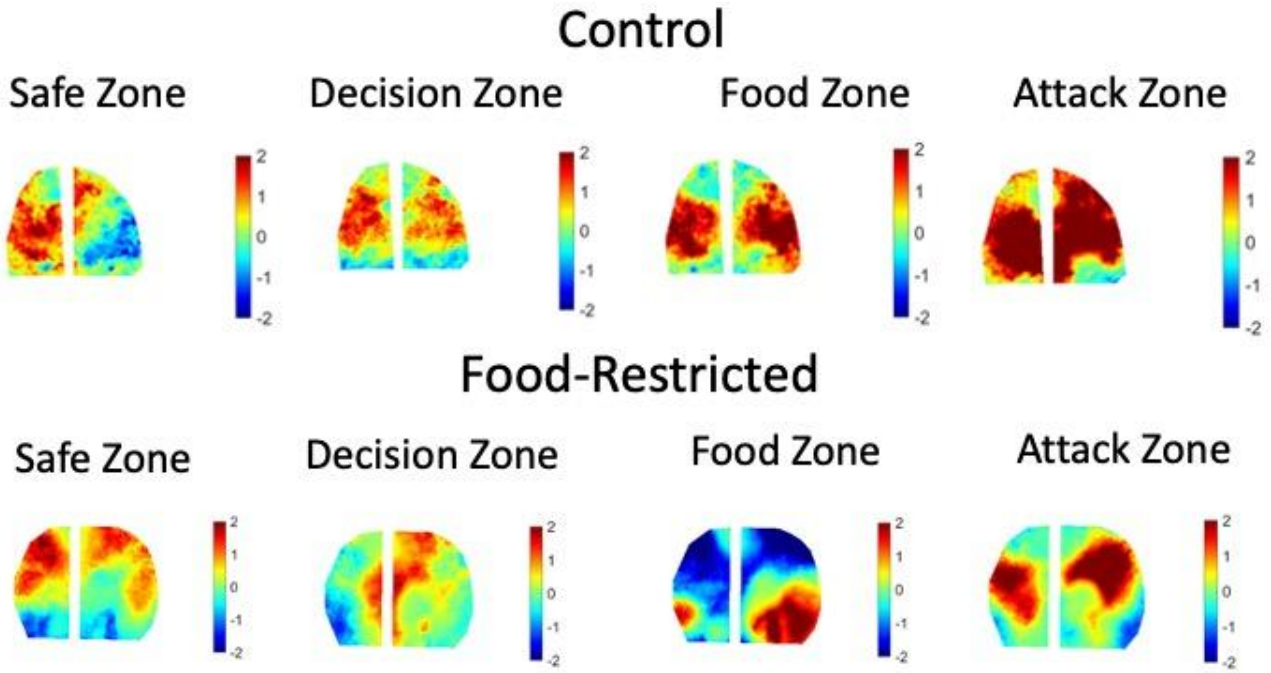
- Food restricted mice spent significantly more time in attack zone
- No significant difference between groups in other zones or between trials within groups
- No significance found in time spent in attack zone between trials



Average percent of trial time in attack zone for control and food restricted mice

Activation of the brain of control and food-restricted mice while residing in each area of the arena

- Brain activity measured in fluorescence with dark red signifying 2% increase and Dark blue signifying 2% decrease
- Notable differences in activation patterns between mice and in different areas of the arena
- Full statistical analysis is required before drawing any conclusions



Discussion

Summary

- Successfully developed a system to record behavior and brain activity in mice as they attempt to overcome innate sense of fear
- Food restricted mice more likely to risk entering attack zone than control mice.
- No habituation of mice to predator after repeated trials
- Preliminary observations suggest differences in brain activity between groups

Limitations

- Tested only three mice per treatment group
- Omitted trial five
- Mice showed familiarity with RC Car
- Controlled environment not matching natural environment
- Only 7 trials performed per mouse

Future Work

- More realistic predator
- Create more natural environment
- Use mice that have been exposed to predation
- Test how competition affects risk-taking
- Testing additional mice
- Perform more trials per mouse
- Analyzing mesoscope data