Creating a Mouse Pain Model to Understand Chronic Human Pain

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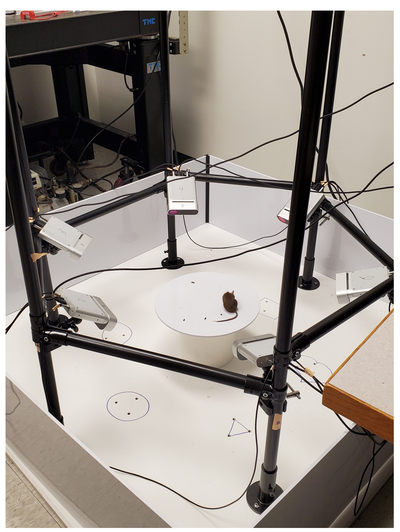
Goal

As it is right now, chronic pain is something that we don't quite understand as much as we would like to in the medical world. Typically, we use rodent models to understand the underlying mechanisms behind pain and to create pain treatments, but this system is not perfect. Since mice are unable to verbally communicate their pain sensations to researchers, it's difficult for us to tell what level of pain the mouse is experiencing. Thus, we aimed to create an automated, objective, and data-driven behavioral assay for rodent pain models with improved sensitivity and specificity that will allow us to further understand the neurobiology of chronic pain experienced by most humans.

3D Arena

We constructed a 3D arena with six cameras facing a 12 in. platform centered in the middle of a wide arena. The cameras were focused on different angles in order to capture the mouse from multiple sides. The arena helped to keep the mouse enclosed and keep from escaping while also giving it space to run if it falls off the platform.

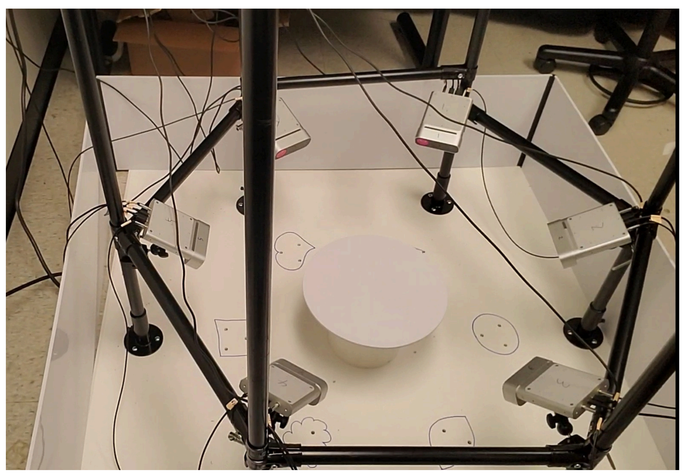


Camera Configuration

In order to configure the cameras, we had to make sure they were detected by the computer. This required us to install Azure Kinect Viewer. This app allowed us to see if the cameras were properly placed in the arena, what type of view they were giving (narrow vs wide, binned vs unbinned), and any errors with camera detection.

Camera Calibration

We wanted to find a way to measure the area around each camera in order to capture the 3D effect of the arena. To do this, we needed to calibrate each camera. This required taking an extra camera and placing it on top of each camera so that it could get the same view as the camera it was in front of order to create a proper image of the 3D screen. We also needed to put patterns around the arena so that the camera calibration could properly detect the placement of the cameras.



Challenges

While we worked on the project, there were times when we encountered issues. A goal we had was to construct a 3D mouse arena with six cameras to capture the mouse from every angle. The first arena we built couldn't hold the mouse because the mouse learned to jump off the small platform we built. After some time, we were able to build a bigger arena that could better contain the mouse, making the research task easier. Of course, there were also some setbacks with technology, in terms of proper calibration, clearing space on the computer to make room for longer videos with larger megabytes, and a lot of waiting during the research but eventually, we were able to get on track and move closer to phase 1.

Future Direction

Our future direction with this project is divided into a short term and a long-term goal. Short term, we hope to apply this mouse model to other experiments that focus on mice pain behavior. Long term, we hope to use what we've learned about mice and apply it to understanding chronic human pain.

Lessons We've Learned

We learned the importance of collaboration in large scale experiments like this. Our fellow researchers at the University of Minnesota provided us with valuable information that allowed us to make major progress with our experiment. We also learned to never overlook the small details because in the end, those little details said a lot about our research,