

The Effects of General Anesthetics on Synaptic and Cognitive Function

Katherine Wang, SEAS 2023

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BACKGROUND

Previous *in vivo* and *in vitro* studies suggest inhalational anesthetics may induce neuronal apoptosis and impair cognitive function in the developing brain via abnormal calcium regulation, potentially a result of the overactivation of inositol 1,4,5-trisphosphate receptor (IP3R) channels. A hemizygous opisthotonos (OPT) mouse model, which has reduced type 1 IP3R protein channels, was exposed to clinically relevant concentrations of isoflurane to study the mediation of calcium release via IP3R. Experimental methods included electrophysiology, behavioral tests, and Western blots.

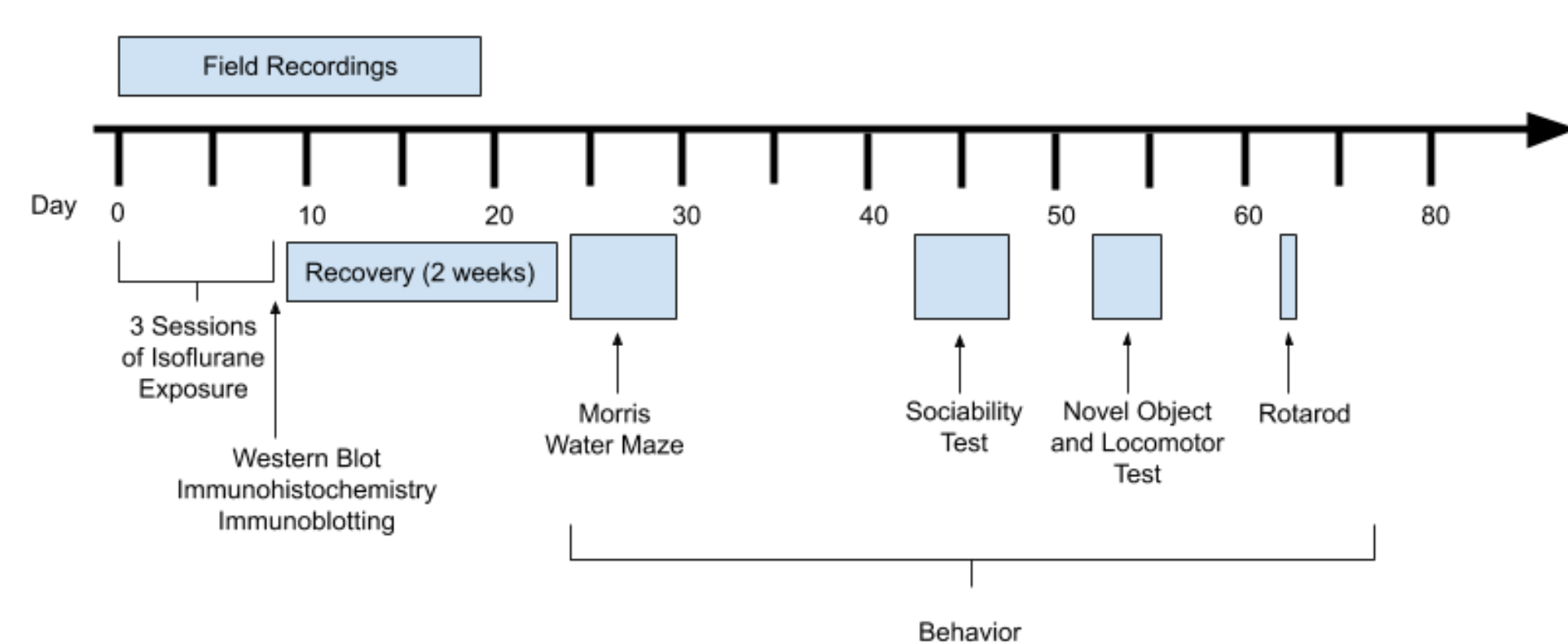


Figure 1. Timeline of Experiment

A chronological representation of the Materials and Methods

OBJECTIVE

Several years ago, the lab conducted an experiment on the effect of isoflurane on IP3 receptors, but the primary investigator moved on and the research was not published. My goal through the duration of this program was to begin the manuscript writing process to summarize the results of the experiment. This process is detailed in the following methods section.

METHODS

1. Read previous lab publications and related papers to build an understanding of the subject and purpose of experiment, prepare and present a journal club on a related paper
2. Draw experimental timeline based on a previously written Materials and Methods (Fig. 1)
3. Collect references from PubMed in EndNote library for the manuscript (Fig. 2)
4. Locate original raw data files on external drives, obtain method details from lab notebooks, organize data into files in google drive (Fig. 3).
5. Reanalyze data in GraphPad Prism, a statistical analysis software, to generate graphs and determine significance of results (Fig. 4)
6. Draft the abstract and results section for the manuscript, edit drafts of other lab papers to become familiar with scientific writing.
7. Create a summary pathway figure in Adobe Illustrator to illustrate the hypothesis of the experiment (Fig. 5)
8. Participate in weekly lab meetings (Fig 6).

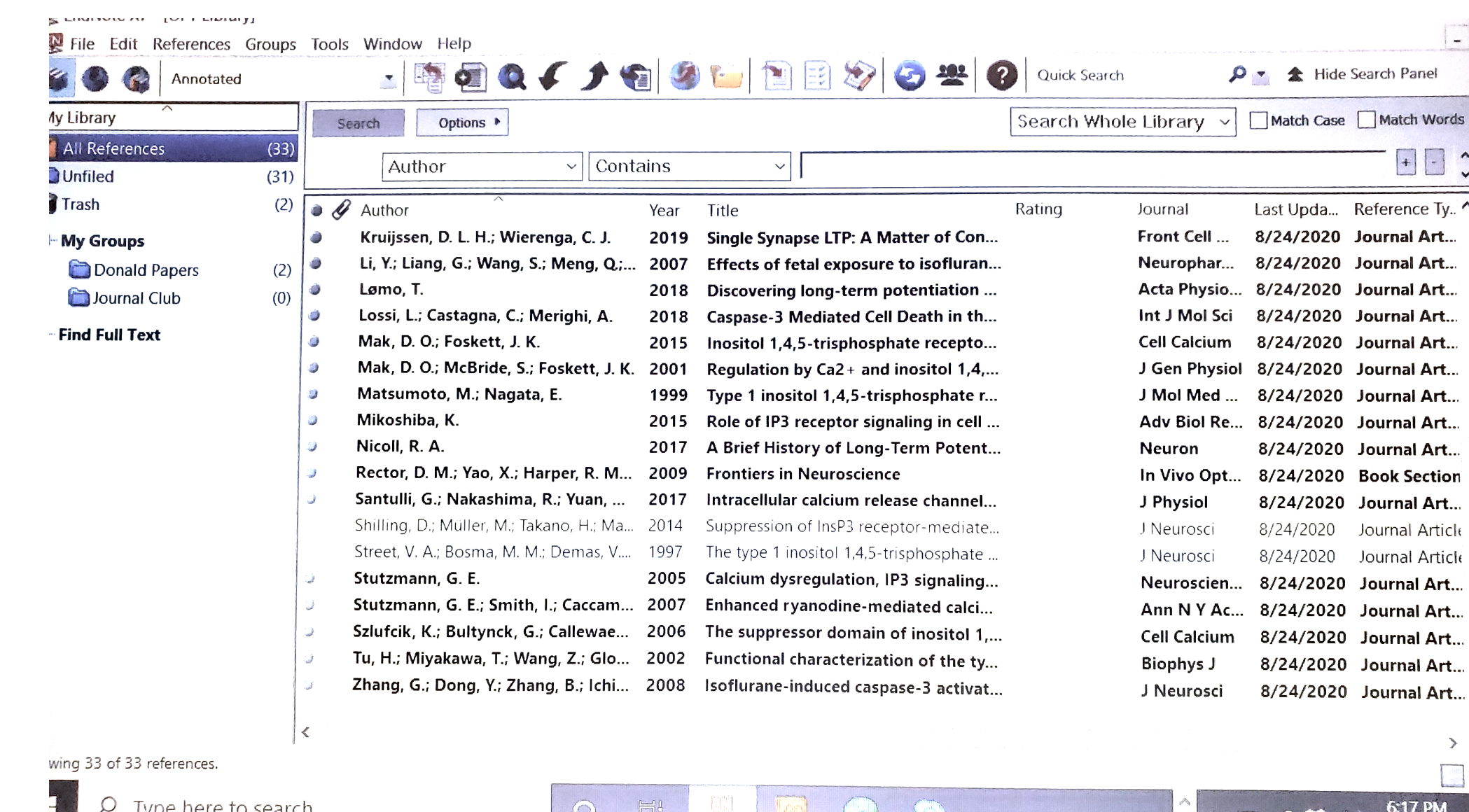


Figure 2. EndNote Library
References collected for the paper

Benchmark's multiple comparisons test	Adjusted P-Value	Adjusted CI of p-Value	Significant?	Summary
HET vs WT	0.772	2.143 to 22.09	No	
D2	0.224	4.889 to 19.14	No	
D3	0.001	2.993 to 4.42	Yes	
D4	0.001	2.969 to 23.28	Yes	
D5	0.001	2.819 to 17.56	Yes	

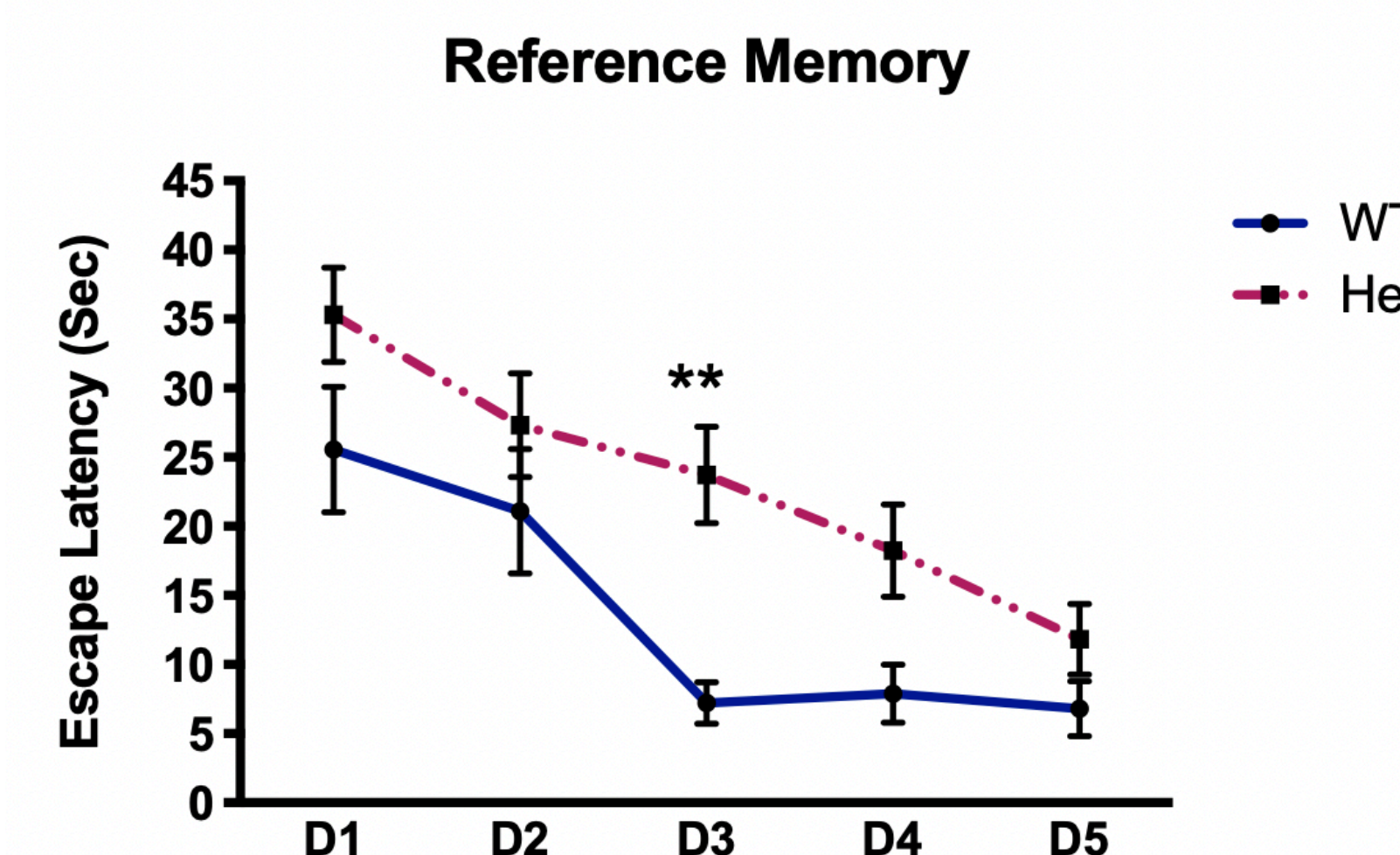


Figure 4. GraphPad Prism Analysis

An example of the statistical analysis done on a set of data and resulting graph

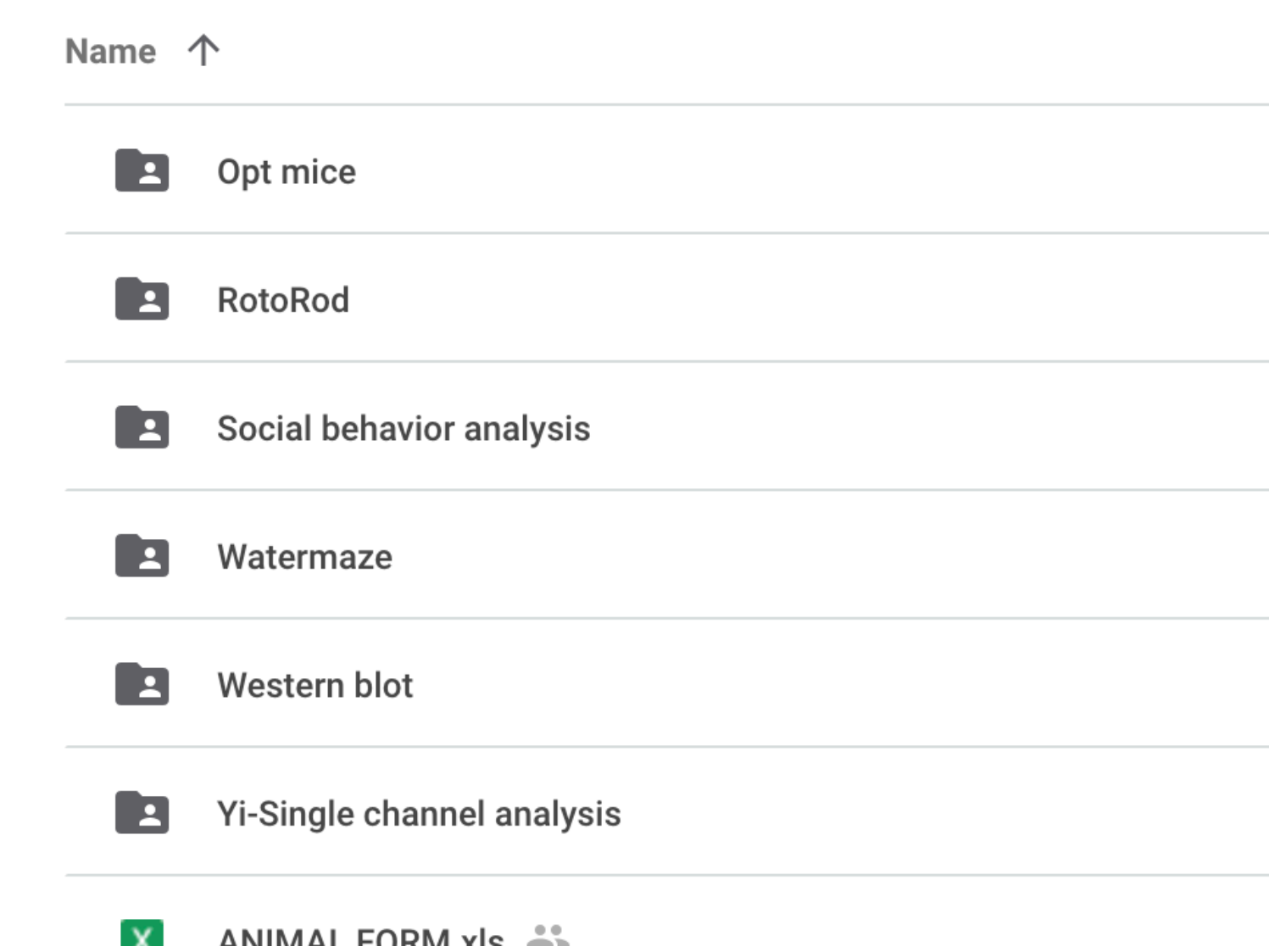


Figure 3. Raw Data File Collection

Uploading and organizing the data files in Google Drive

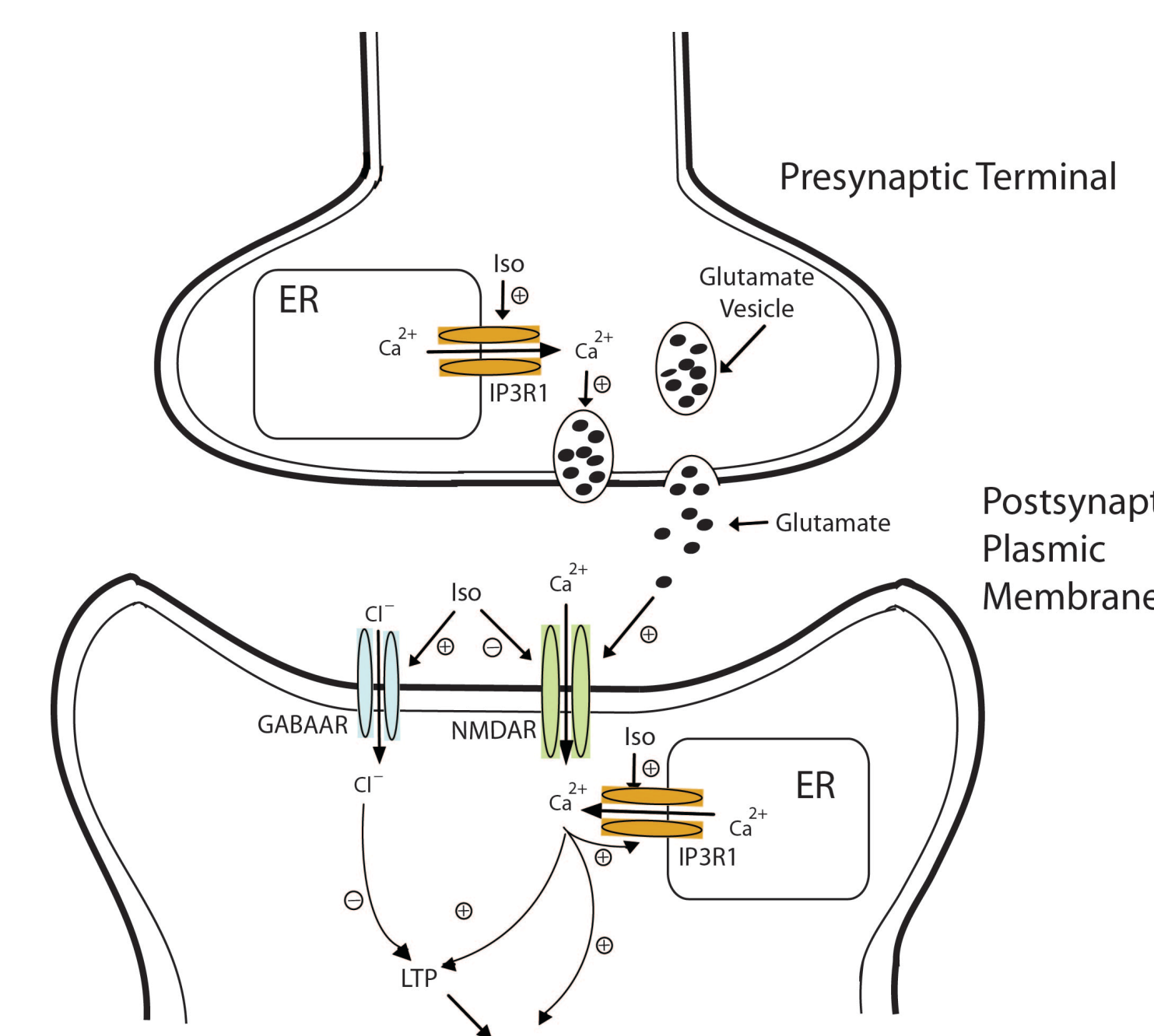


Figure 5. Summary Diagram of Pathways Investigated

SUMMARY

Through the PURM program, I have gained valuable insight into the process of putting together a scientific paper. While unable to learn experimental techniques due to this summer's circumstances, I organized data, conducted statistical analyses and figure preparation, drafted the abstract, results and reference sections. I was in regular communication with my mentors and the original investigator, and presented at weekly lab meetings, including a final presentation. In addition, I have gained proficiency with Adobe Illustrator, EndNote, and GraphPad Prism. Overall, the experience has been productive and educational.

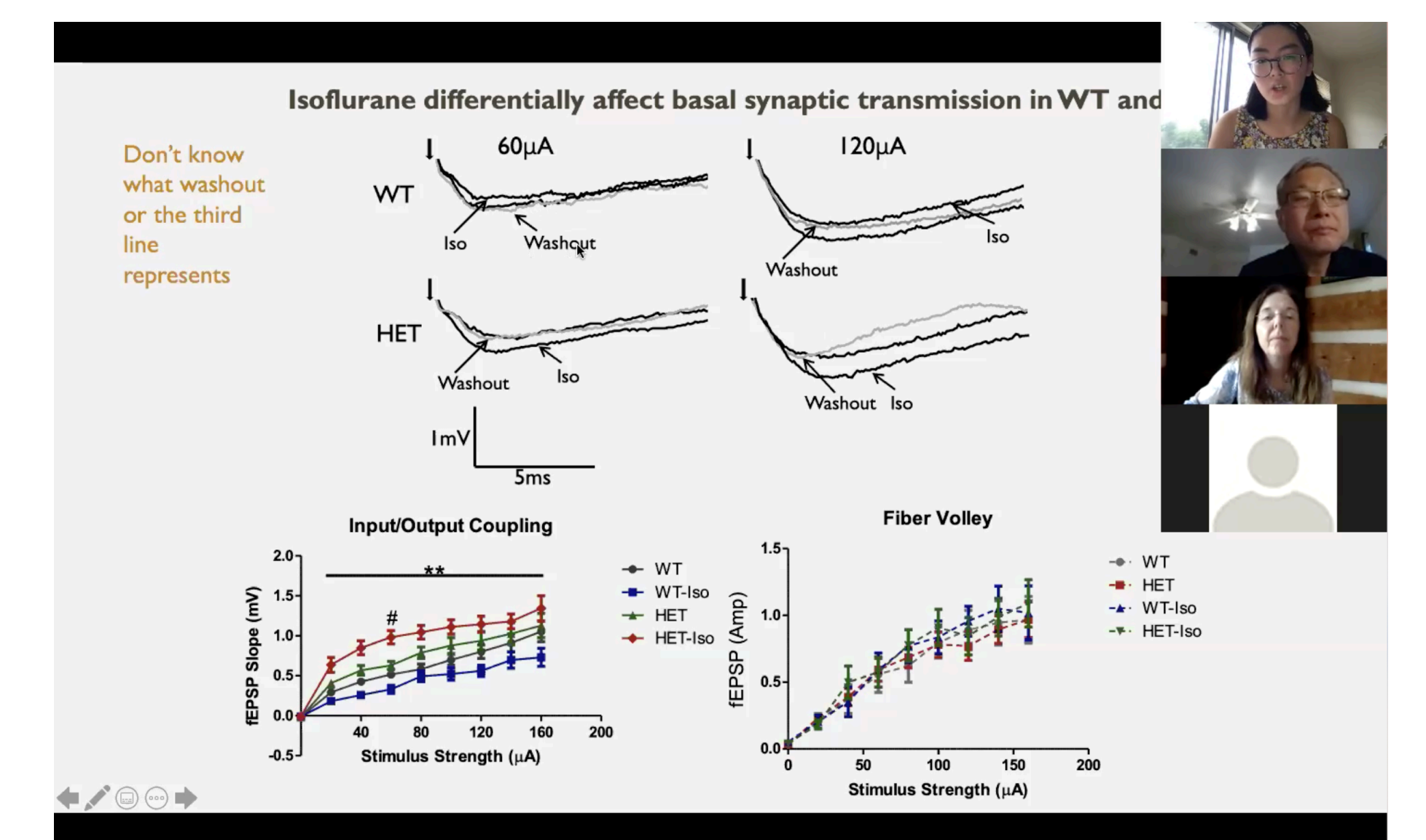


Figure 6. Presentation at a Virtual Lab Meeting

FUTURE

I intend to continue working on the manuscript and see it to completion. This includes correspondence with the primary investigator to recover additional data from the original experiments, finalizing the figures and results section, writing the introduction, discussion, and formatting the paper for submission.