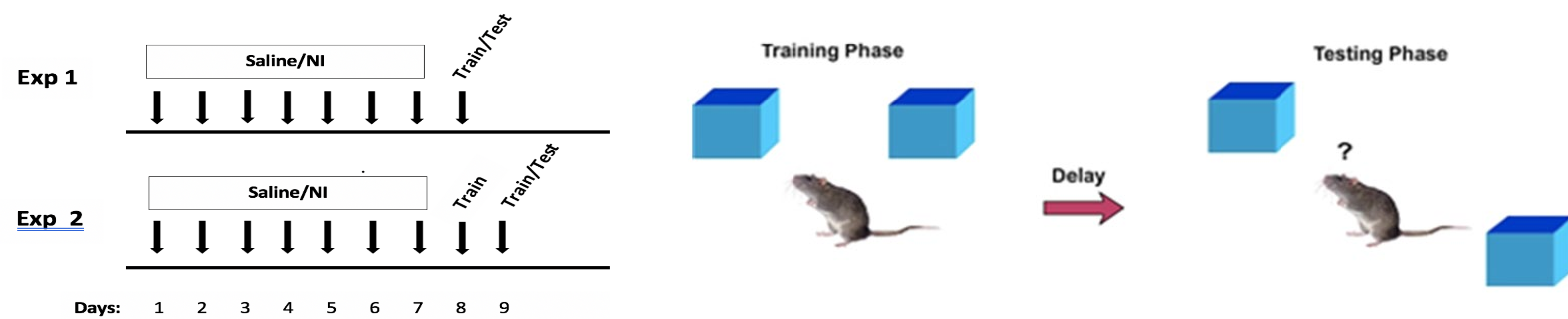


Alzheimer's disease (AD) is often associated with chronic inflammation and cognitive dysfunction. In studying how AD-like pathologies change and affect learning and memory, our lab aims to optimize an object location memory (OLM) testing paradigm in mice. Briefly, a mouse is placed into an arena with two identical objects for a training session. Four hours later, one of the objects is moved to a novel location, and the mouse is placed back into the arena for the testing session. Because mice exhibit a preference for novelty, memory is assessed as the amount of time the mouse spends exploring the moved object divided by the total time spent exploring both objects. Our goal is to identify testing parameters that make this task both accurate and efficient for our lab's use, as we will add this learning paradigm to a battery of behavioral tests to be used in future experiments. In the current study, the OLM protocol will be performed twice according to two different experimental timelines that test the effects of adding an additional training session to the original protocol.

## Introduction

- One of the hallmarks of AD pathology is the loss of normal cognitive function.
- Tasks that can measure cognitive function in animal models of the disease are important tools to track the disease onset and progression.
- Object location memory (OLM) may provide a useful paradigm to measure cognitive function in AD.
- OLM measures preference for novelty over something experienced previously and provides a potential indicator of previous learning.<sup>1</sup>
- Injection of inflammatory agents can interfere with learning, and thus impact OLM performance.
- Here we assessed whether the act of injecting animals would interfere with learning in the OLM paradigm.
- It is hypothesized that injection of saline (non-inflammatory) would not disrupt learning, and thus all animals would show a preference for the novel object location.

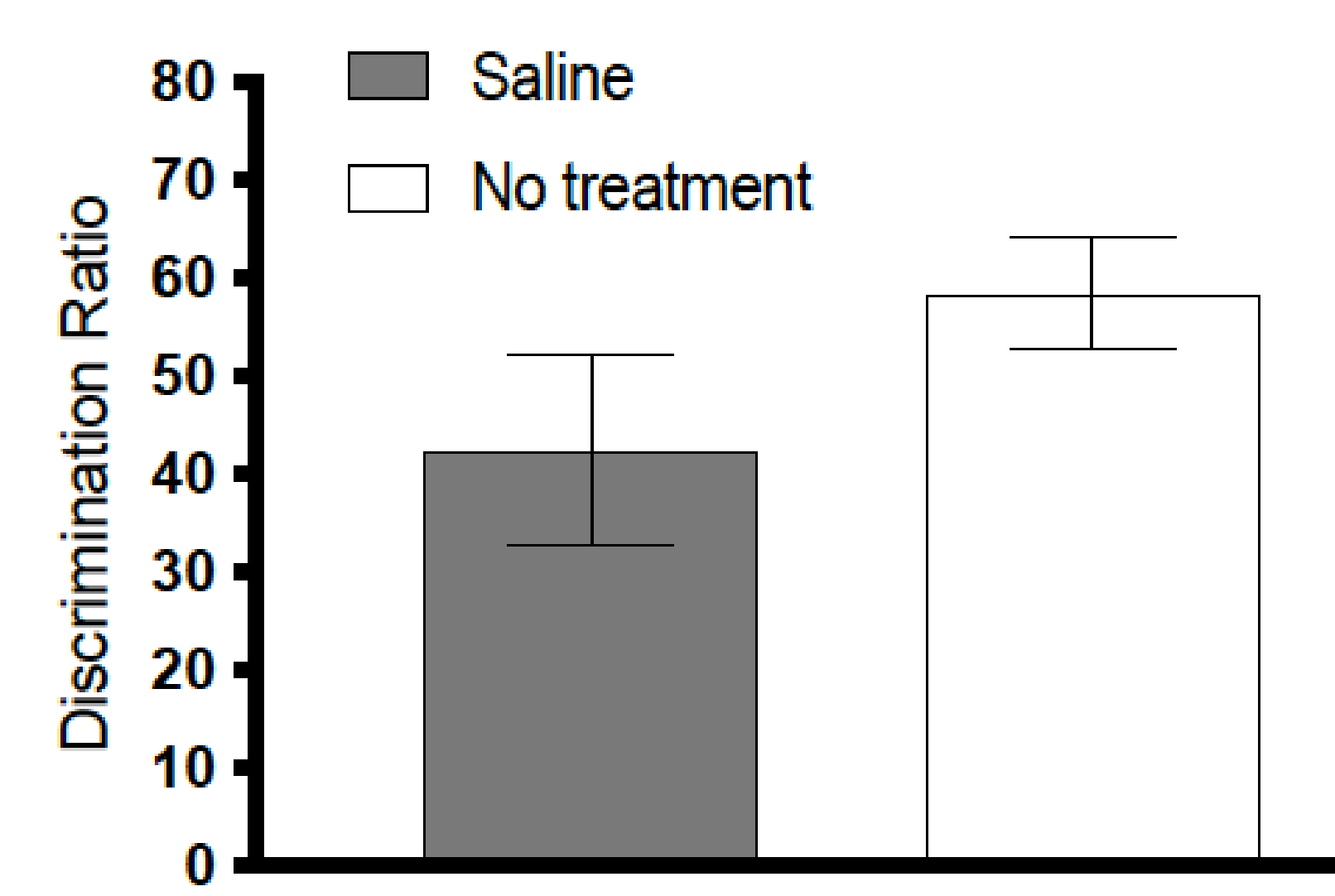
## Methods



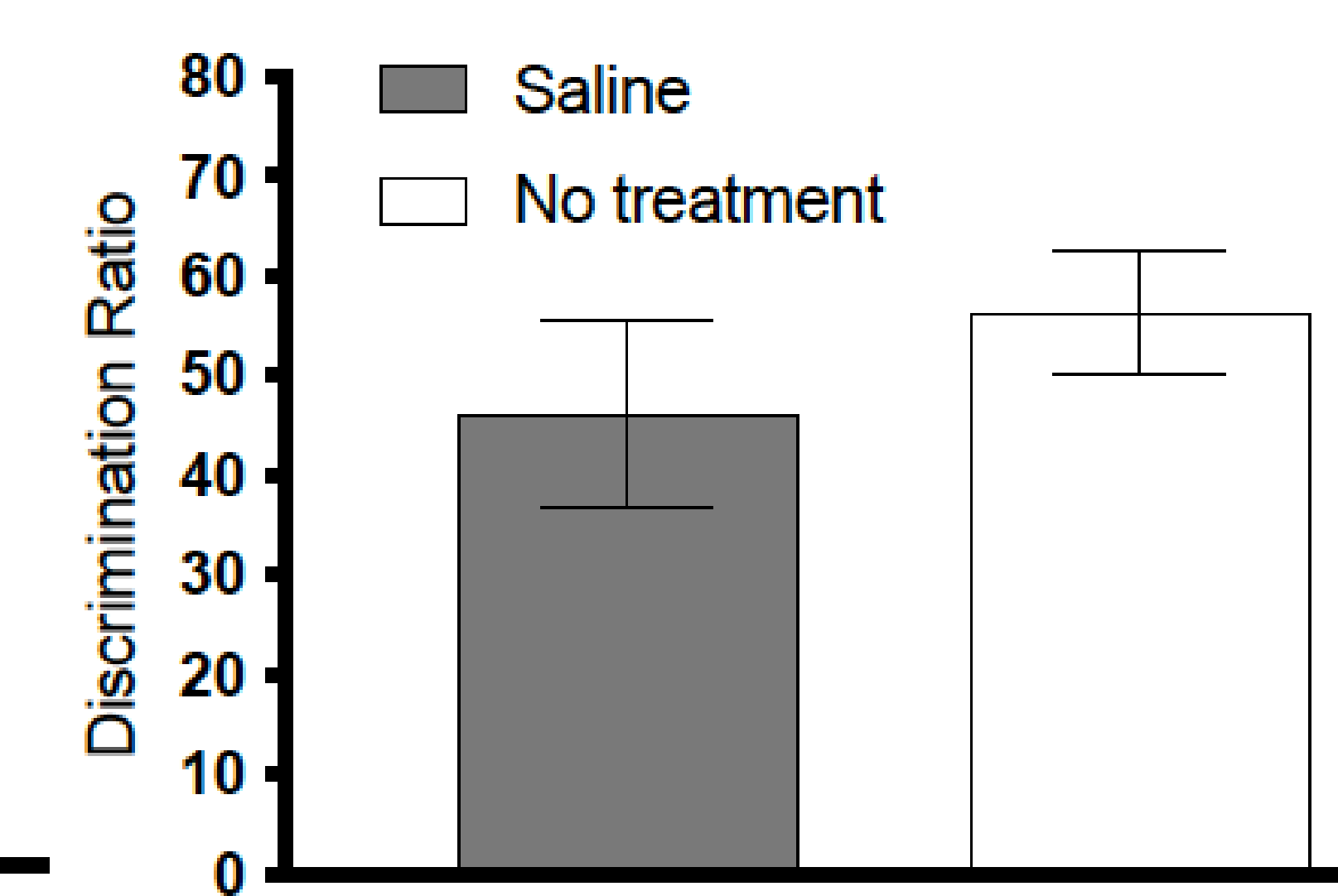
- **Experiment 1:**
  - One training and one testing session performed 4 hours apart on Day 8.
- **Experiment 2:**
  - One training session on Day 8 followed 24 hours later with one training and one testing session, performed 4 hours apart (similar to Experiment 1).
- **Common Procedures:**
  - During training, mice were individually placed into the testing arena to explore two identical objects for five minutes. Object locations and visual cues were counterbalanced.
  - During testing, one object is moved to a different location and exploration was monitored for five minutes.
  - Object exploration was measured using Noldus EthoVision XT tracking software.
  - Learning was calculated as the amount of time the mouse spent exploring the object in the new location divided by the total time the animal spent exploring both objects, multiplied by 100 to obtain a percentage.

## Funding

## Results



**Fig. 1 - Experiment 1.** Discrimination ratio. An independent samples t-test revealed no significant differences. Bars represent +/- SEM (N's 9-10). No significant preference for novel location.



**Fig. 2 - Experiment 2.** Discrimination ratio. An independent samples t-test revealed no significant differences. Bars represent +/- SEM (N's = 10). No significant preference for novel location.



**Fig. 3 - Experiment 2 (Revised).** Discrimination ratio. An independent samples t-test revealed no significant differences. Bars represent +/- SEM (N's 8-10). Two animals were removed from the experimental group due to lack of exploration.

## Conclusion

- No significant difference in percent exploration time of the novel object location between the two experiments.
- The saline injection group explored the novel object location less than chance in both experiments, potentially indicating a reduction in memory.
- Two saline-injected mice in Experiment 2 had diminished locomotor activity that may confound the comparison of exploration. When removed, both groups of mice spent more time at the novel object location than chance.
- Further studies are needed to devise an exclusion criteria for animals that have reduced locomotor activity.

## Future Directions

- Our lab plans to repeat this experiment with criteria to eliminate mice displaying diminished patterns of exploration.
- We will also explore the potential effects of injection stress on OLM. We will perform a similar experiment, but instead of the no treatment group receiving a scruff alone, they would also receive a needle prick, without injection of a substance. This could allow us to assess whether the observed behaviors were due to the stress of the needle poke or the saline itself.

## References

1. Vogel-Ciernia, A., & Wood, M. A. (2015). Examining object location and object recognition memory in mice. *Current Protocols in Neuroscience* 69(8), 1–22, <https://doi.org/10.1002/0471142301.ns0831s69>.