

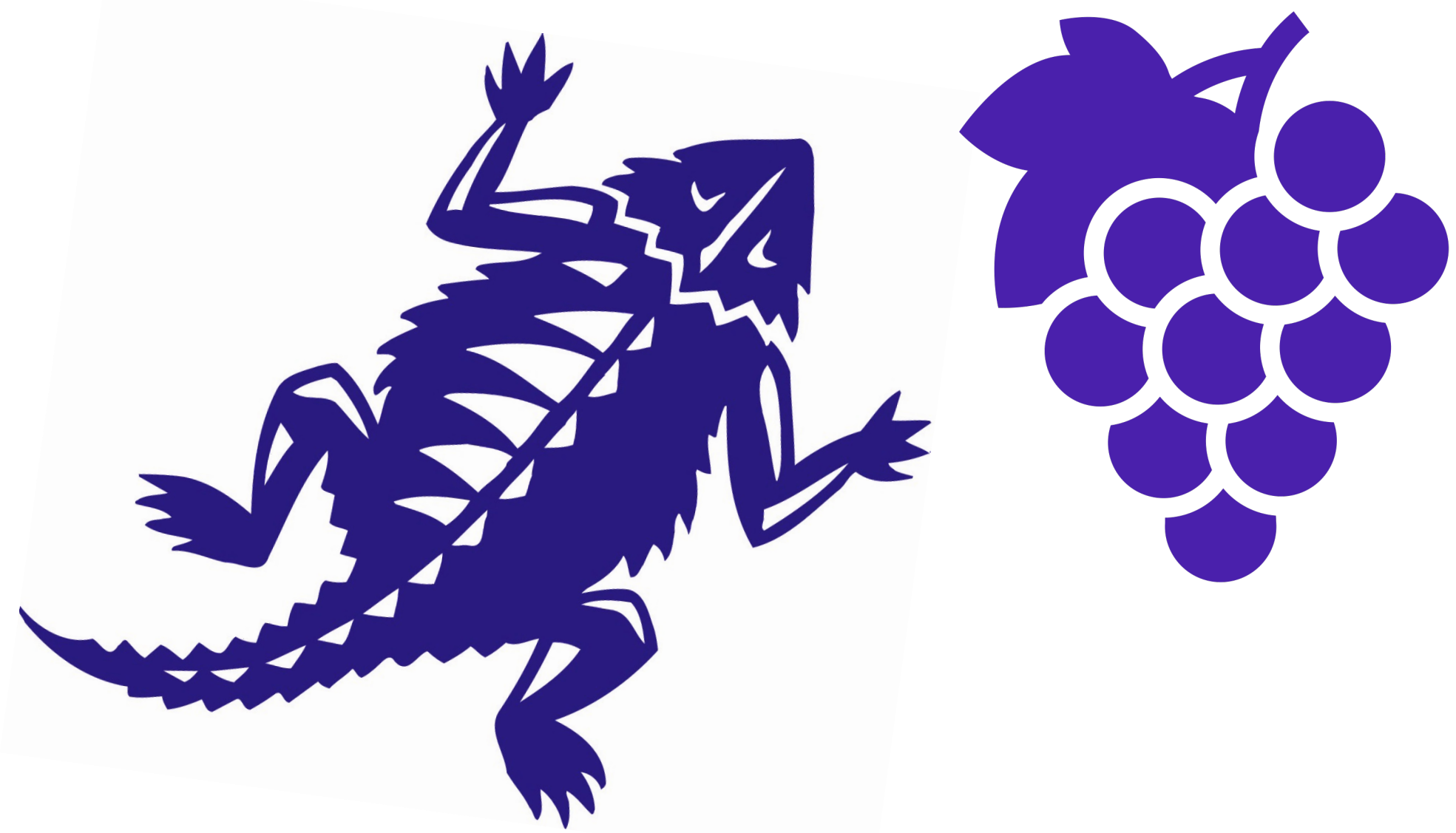


Neurobiology of Aging
Research Lab

Food for Thought: The Mediterranean Diet Provides Neuroprotection in a Hippocampus Dependent Task in C57BL/6J Mice

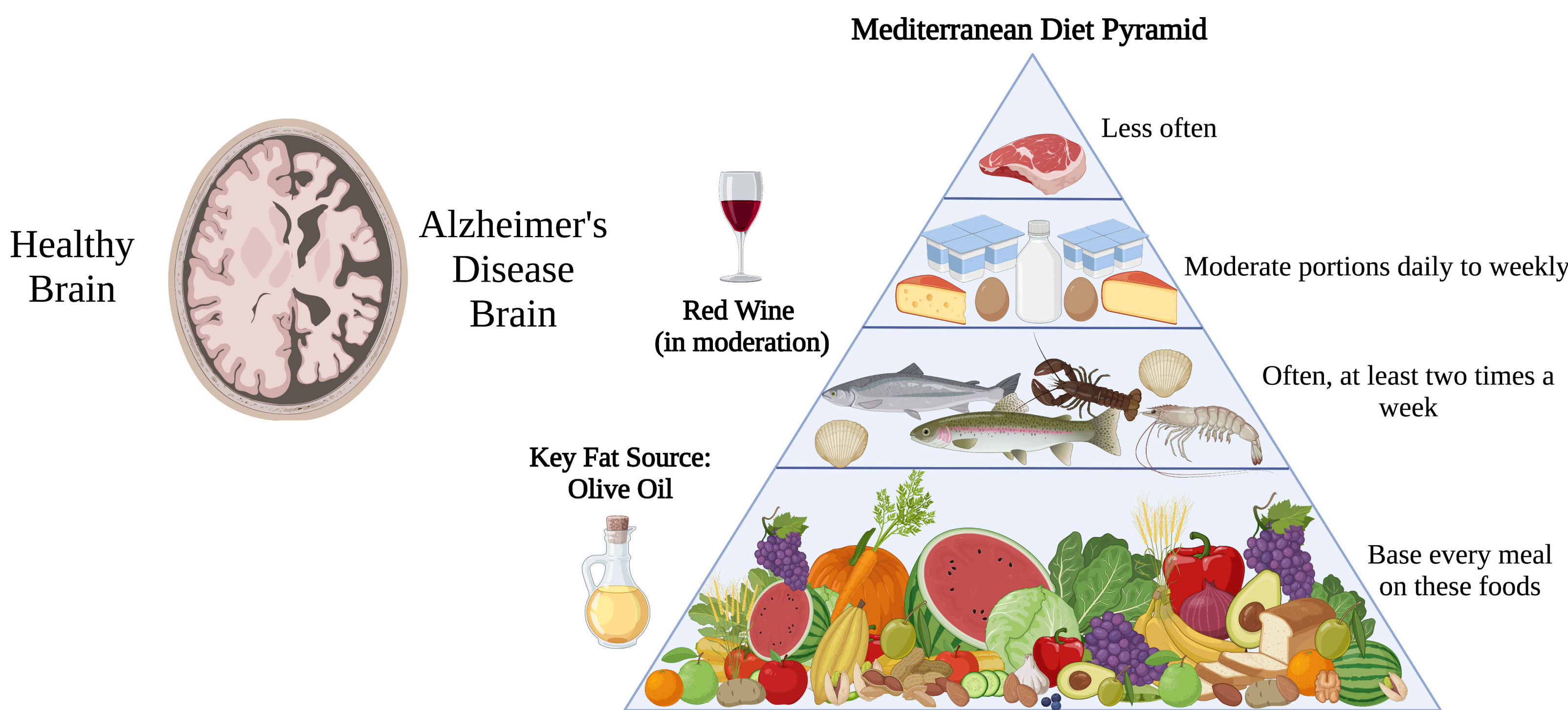
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Introduction

- Alzheimer's disease (AD) induces **cognitive impairment**, memory loss, and in severe cases, physical disabilities (Alzheimer's Association, 2021).
- Diet** could be utilized as a potential prevention or intervention strategy.
- Older adults who consume a Mediterranean diet (MD) have been shown to have **higher** scores on cognitive tests and **reduced** brain atrophy in comparison to adults who consume the Western diet (WD) (Berti et al., 2018; Martinez-Lapiscina et al., 2013; Mosconi et al., 2014).



Methods

Key Dietary Components	Mediterranean Diet	Western Diet
Carbohydrate Sources	Brown rice & wheat starch	Corn starch
Fiber Sources	Cellulose, psyllium, inulin	Cellulose
Fat Sources	Olive oil, fish oil & flaxseed oil	Safflower oil, beef fat & butter
Protein Sources	Egg whites, soy & fish protein	Casein (from milk fat)

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Methods

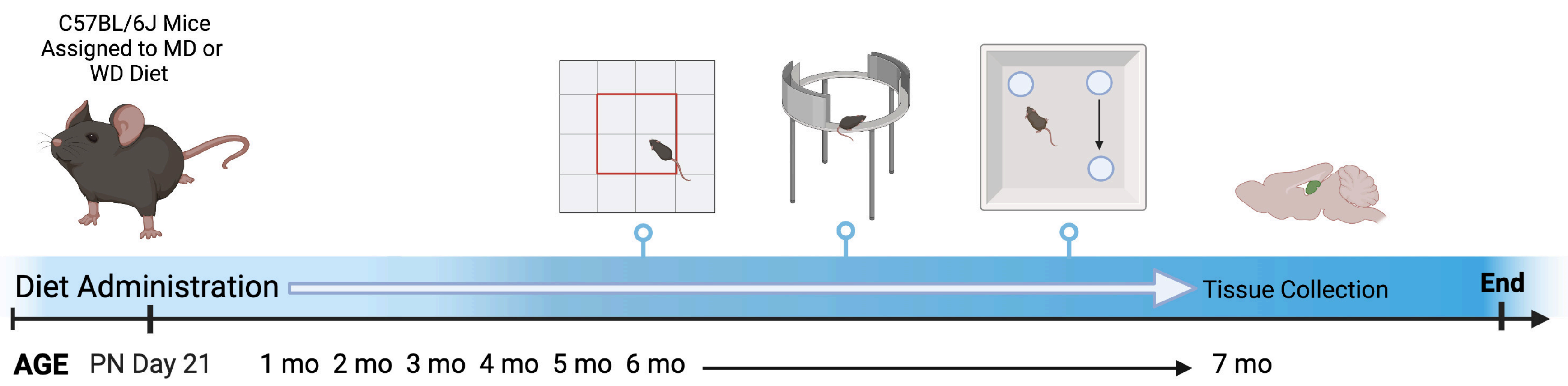


Figure 1. C57BL/6J mice were assigned to a Mediterranean diet (MD) or Western diet (WD) at weaning (post natal day 21), until 7 months of age. Following 5 months of diet consumption, animals were placed in three different behavioral tests, including open field, elevated zero, and object-location memory task. Following behavioral tests, we collected brain tissue from the hippocampus, and peripheral tissue to measure biological markers of AD.

Object-Location Memory Task

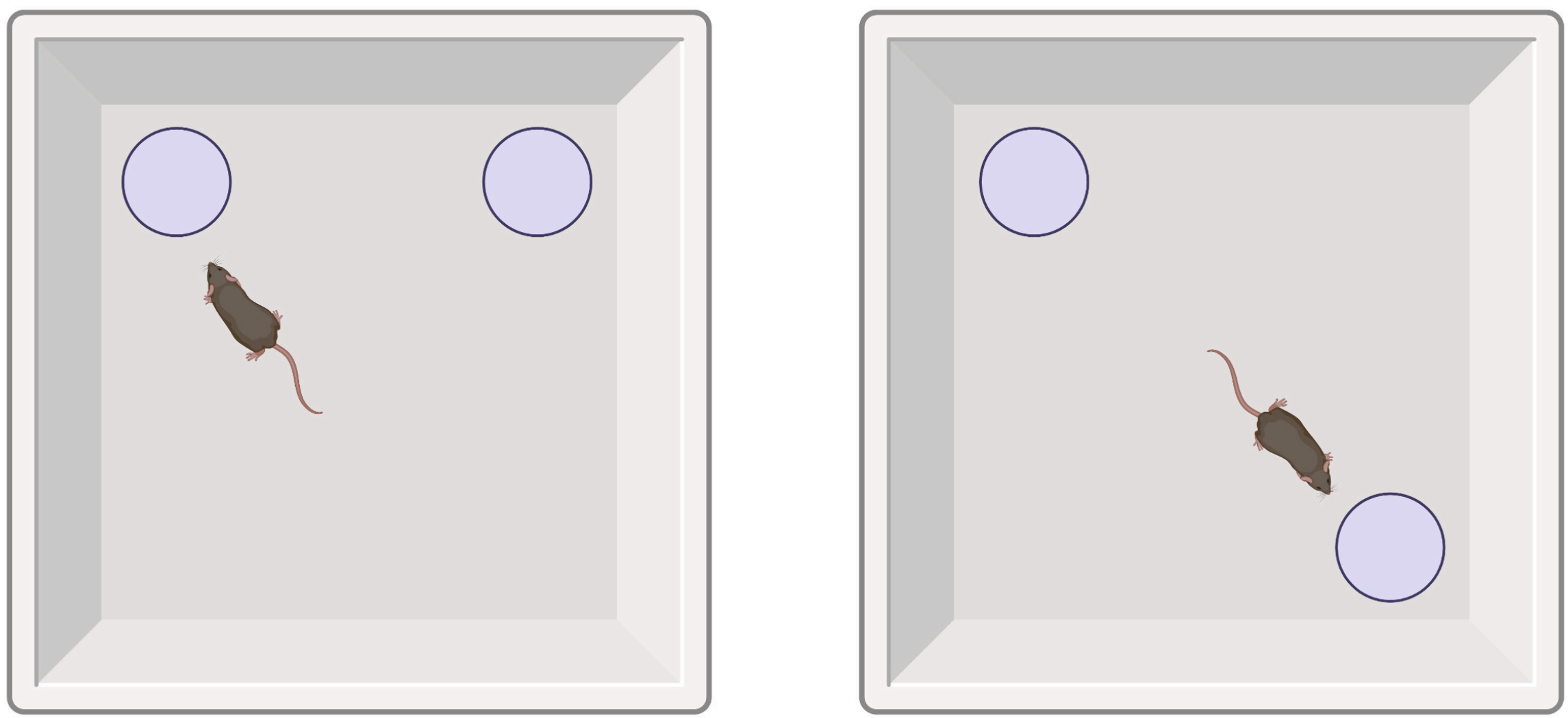


Figure 2. The Object-Location Memory Task. This behavioral test is a hippocampus-dependent task utilized to assess cognition and spatial memory discrimination in rodents.

Training: During training, mice were placed in the arena with two identical objects for 10 minutes. We measured the amount of time the mice spent exploring both objects.

Testing: Twenty-four hours later, mice were placed back in the same arena, where one of the objects was moved to a new corner. We calculated the amount of time spent exploring the object in the old location verses the time spent exploring the object in the new location. If mice spent more time exploring the object in the new location, this suggests that they recognized that the object has been relocated, and thus have strong spatial memory.

Results

Object-Location Results

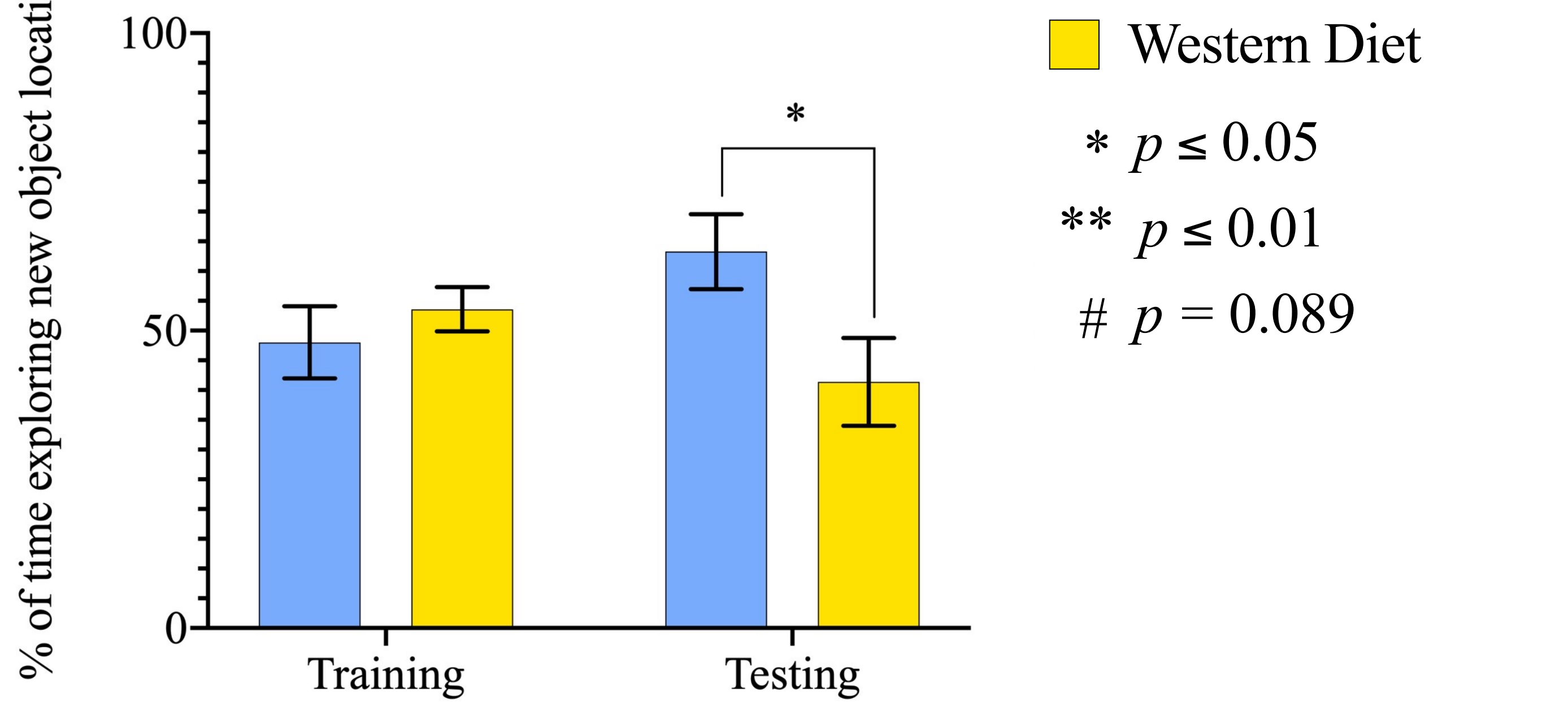


Figure 3. An independent samples t-test revealed a significant difference in the percentage of time exploring the new object location between diet conditions ($p = 0.037$) during testing. Bars represent mean \pm SEM. n's = 10.

Locomotor Activity Results

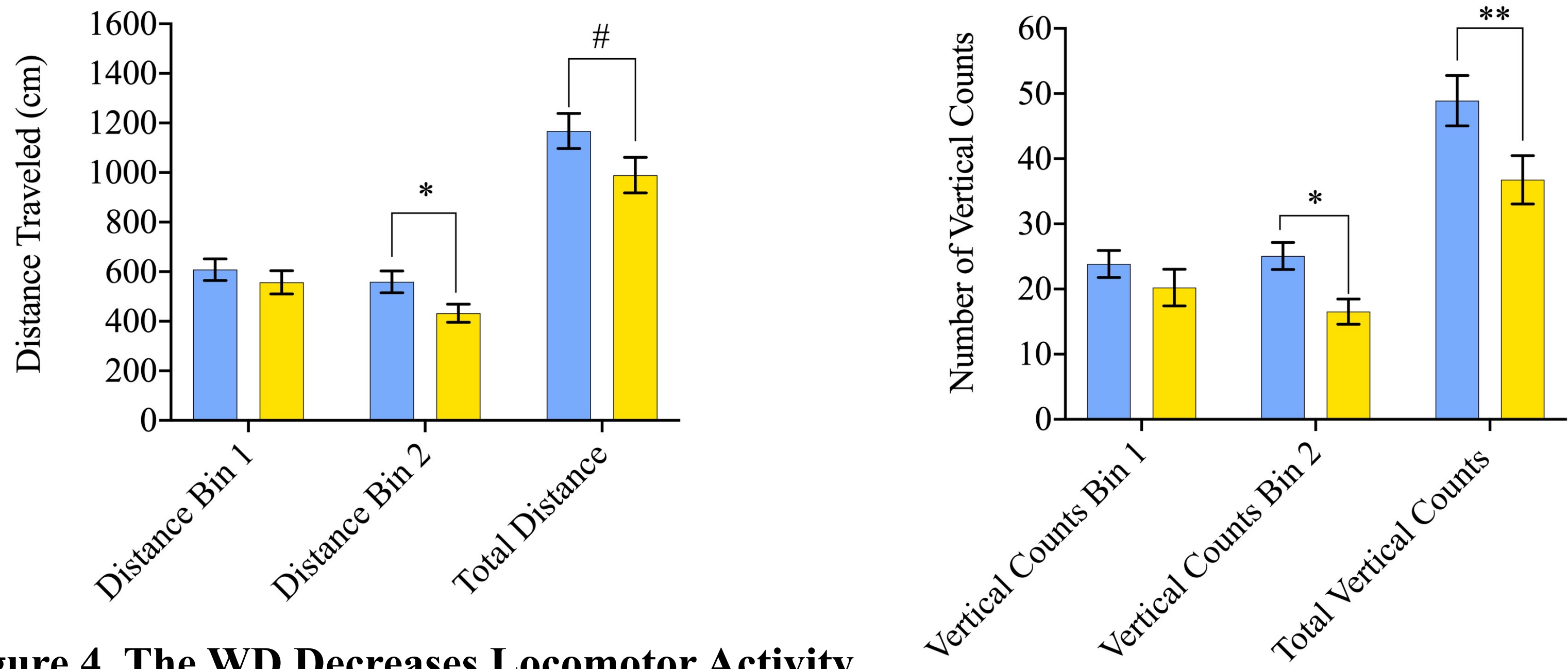


Figure 4. The WD Decreases Locomotor Activity. (A) Mice on the MD traveled farther than those on the WD. (B) Mice on the MD exhibited more exploratory behavior compared to those on the WD.

Conclusions & Future Directions

- Our results suggest that the WD impairs hippocampus dependent spatial memory in comparison to the MD.
- Prior research has demonstrated that the WD impairs cognition in C57BL/6J mice (Heyward et al., 2012; Pistell et al., 2010).
- Additional research has shown that Mediterranean dietary factors improve cognition in mice (Li et al., 2018; Sharman et al., 2019).
- The MD could be used as a potential therapeutic strategy for the prevention or onset of cognitive impairment and AD.
- In future studies, we will assess the potential, neuroprotective effects of the MD on cognition in offspring that were exposed to these two diets throughout gestation and lactation. We hypothesize that the MD could provide protection to the parent generation, and to their offspring.

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