Voluntary exercise does not positively impact hippocampal or amygdala function as measured in a middle-aged rodent model

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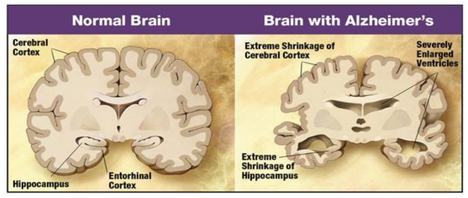
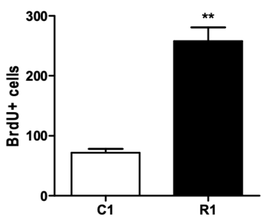
Introduction

- 33% of adults over the age of 65 will die from dementia-related complications (Barnes, 2015).
  - Aging is the greatest risk factor for AD
- 3.8 billion dollars per year put toward dementia research (NIH)
  - No cure or effective pharmaceutical treatments
- Preemptive treatment approaches decrease the risk of developing AD
  - Exercise, sleep, diet, etc
- Deterioration of the hippocampus is responsible for memory loss (Leal et al., 2015).

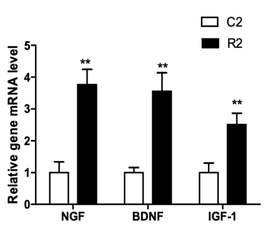


- Dysfunction of the amygdala contributes to AD symptoms such as hallucinations, anxiety, and agitation (Lyketsos et al., 2002).
- Exercise has been shown to improve brain health:

Creation of neurons



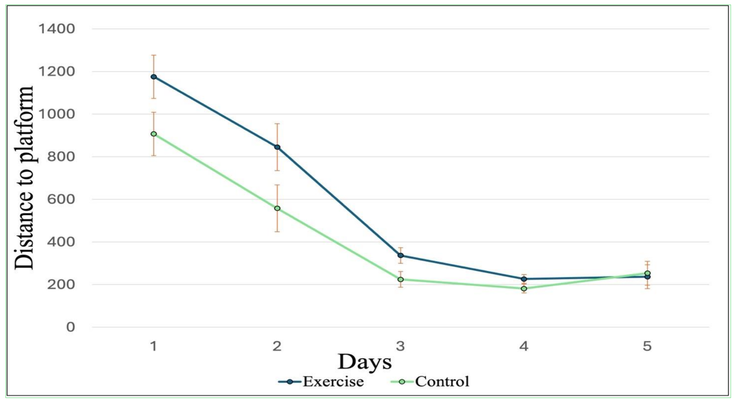
Neurotrophic factors

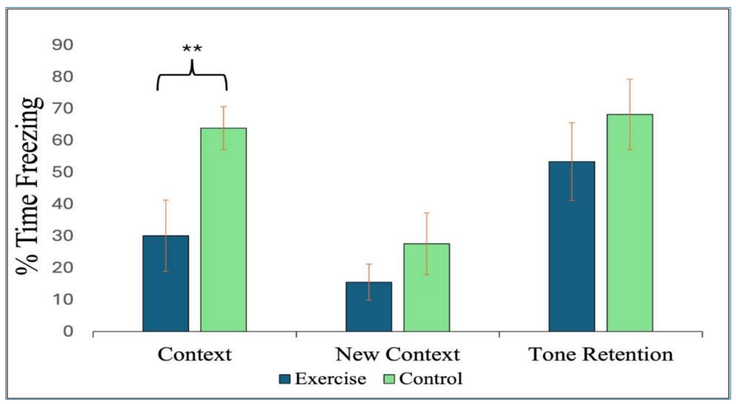


Goal of this Research Study

To examine the efficacy of exercise to reduce neurodegeneration during typical aging in two brain areas affected by AD, the hippocampus and amygdala.

Results





Discussion

- Distance and latency not correlated in MWM
  - Floating or swim speed
- No significant difference in freezing between groups in tone retention
  - Opposes hypothesis but supported by previous literature
  - Did all rats receive shock in training trial?
- Exercise rats may not have utilized running wheel
  - What is the relative amount of running necessary to induce behavioral and neurogenic changes?
    - Measure BRDU, BDNF levels
- Further research is necessary to isolate the effect of exercise on the amygdala

Final Takeaways

- The population is aging and more people are at risk for AD
- Living a healthy lifestyle and engaging in practices such as exercise act as preemptive treatments for AD
- Despite the findings of the present study, exercise is extremely promising as a preemptive treatment
  - Increase BDNF (Nofuji et al., 2012; Marlatt et al., 2012)
  - Exercise more effective than mindfulness or cognitive training (Athar et al., 2021)
- Reduce stress (Yoon et al., 2023)
  - Chronic stress increases risk of AD

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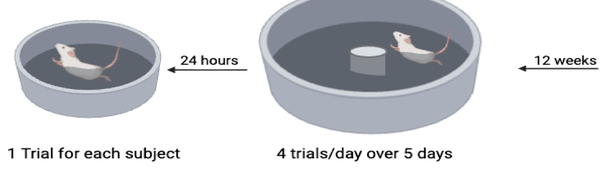
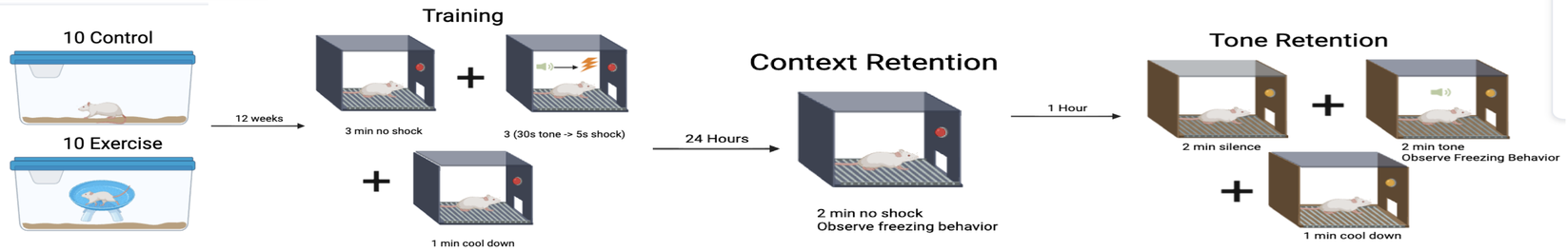
Methods

Hippocampally dependent – Morris water maze



Rat Groups



Hippocampal and amygdala dependent – Contextual fear conditioning