



Kuhl Lab

# Hippocampal Repulsion as a Function of Memory Similarity and Experience

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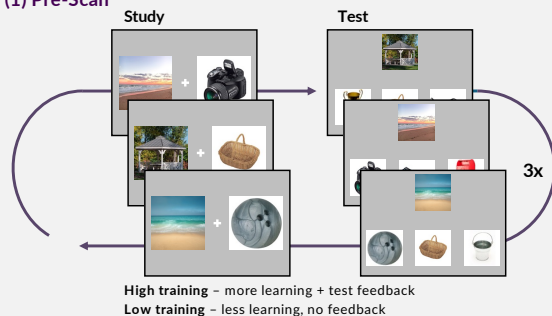
## Introduction

- Event similarity can trigger 'repulsion' of hippocampal activity patterns<sup>[1-5]</sup>.
  - Thought to protect similar memories from interference<sup>[1,6,7]</sup>.
- Repulsion is also experience dependent<sup>[1,2,6]</sup>.
  - But may not linearly increase with experience<sup>[6]</sup>.
- It is not well understood how similarity and experience jointly influence hippocampal repulsion.

Current study: Measure hippocampal repulsion as a function of stimulus similarity and experience

## Study Design (N = 52)

### (1) Pre-Scan



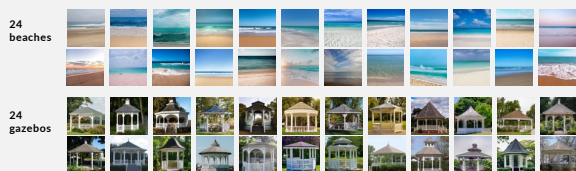
### (2) fMRI Task



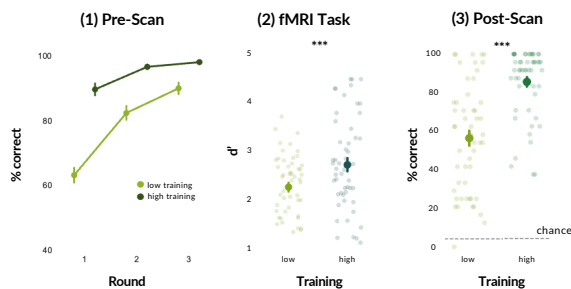
### (3) Post-Scan



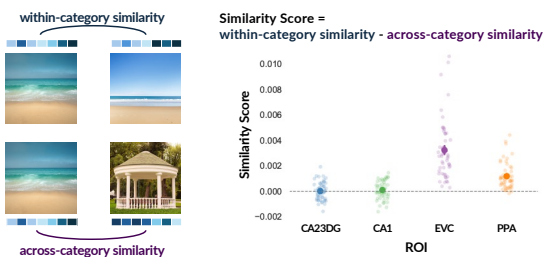
### Scenes



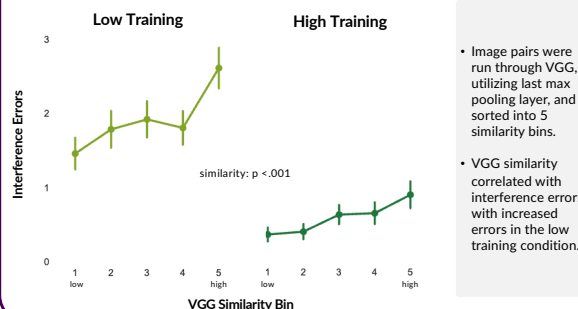
## Behavioral Memory Performance



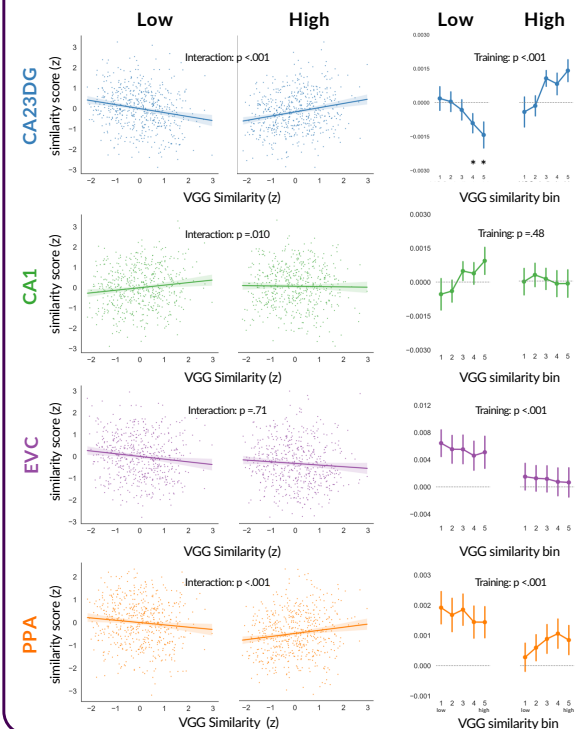
## fMRI Pattern Similarity



## VGG x Interference Errors



## Similarity x Training



## Conclusions

- Stimulus similarity and experience (training) have very different effects on representational structure within hippocampus vs. visual cortical areas.
- Representational similarity decreased with training for EVC/PPA but increased with training for CA3/DG.
- With low training, CA3/DG representations were more distinct as stimulus similarity increased (repulsion). This pattern flipped with high training.
- Findings suggest that CA3/DG selectively—and dramatically—differentiates stimuli when visual cortical areas fail to do so.
  - CA3/DG repulsion is a reaction to input similarity.

References: [1] Favila, S. E., et al. (2016). Nature Communications. [2] Chanales, A. J. H., et al. (2017). Current Biology. [3] Dmsdale-Zucker, H. R., et al. (2018). Nature Communications. [4] Wärmes, J., et al. (2022). eLife. [5] Zhang, L., et al. (2021). Nature Communications. [6] Wanja, G., et al. (2021). Nature Communications. [7] Hulbert, J. C., & Norman, K. A. (2015). Cerebral Cortex.

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