Repulsion of Competing Hippocampal Representations Parallels Learning-Related Reductions in Memory Interference

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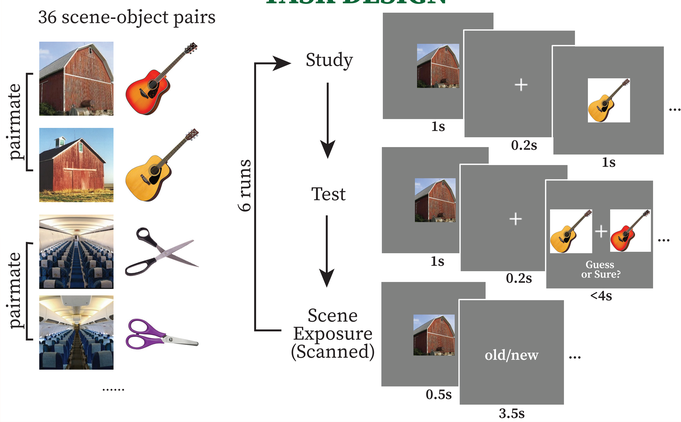
INTRODUCTION

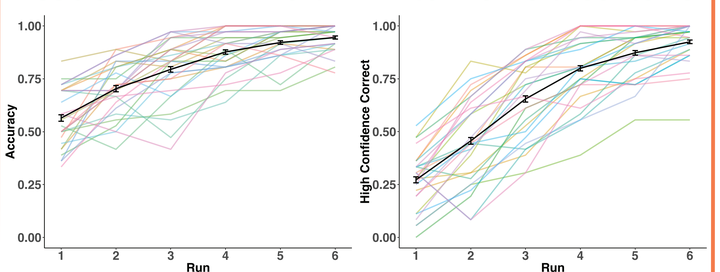
- Overlap among hippocampal representations is related to memory interference[1][2][3][4].
- Similarity between memories can trigger repulsion of hippocampal representations[5][6][7].
- Repulsion of hippocampal representations predicts reduced memory interference[6][8].

Is the timing of repulsion related to the timing of learning?

TASK DESIGN



ASSOCIATIVE MEMORY IMPROVES ACROSS RUNS



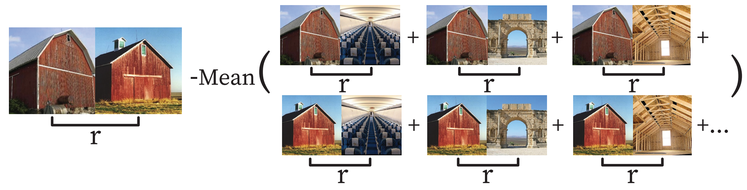
Inflection Point = transition to high confidence, correct associative memory.

				Inflection Point		Post
Run	1	2	3	4	5	6
Accuracy	X	✔	✔	✔	✔	✔
Confidence	X	X	✔	X	✔	✔

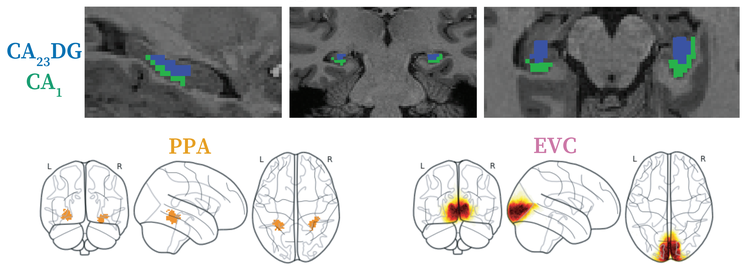
Run	1	2	3	4	5	6
Accuracy	X	X	✔	✔	✔	✔
Confidence	X	X	X	✔	✔	✔

MEASURING NEURAL SIMILARITY

Scene Pair Difference Score[6]

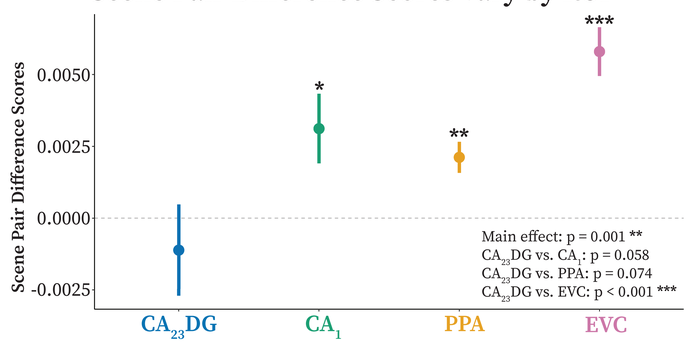


Regions of Interests

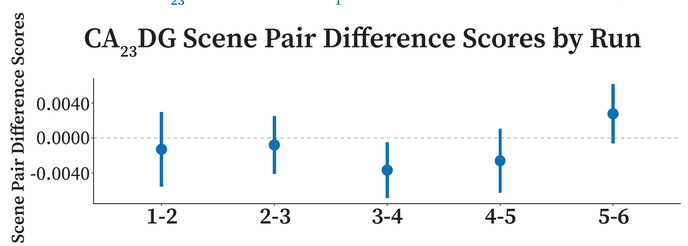


N = 28; Scanned with Siemens 3T Skyra; T1: 1mm isotropic; T2: 0.43mm * 0.43mm * 2mm; EPI: 1.7mm isotropic; Repetition Time = 2s; Echo Time = 36ms; 8 EPI runs (6 scenes + 2 objects)
Preprocessing: fMRIprep1.2.6; Subfield segmentation: ASHS

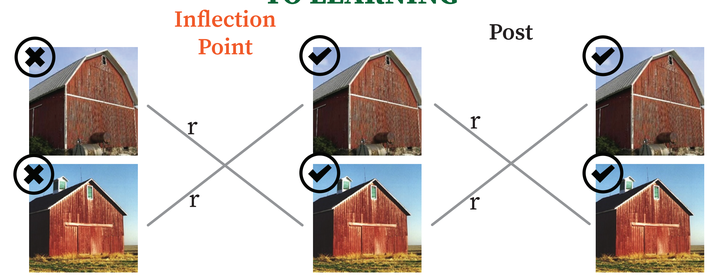
Scene Pair Difference Scores Vary by ROI



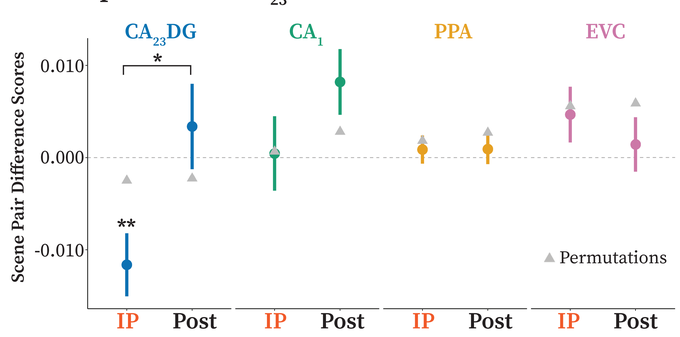
CA23DG Scene Pair Difference Scores by Run



RELATING SCENE PAIR DIFFERENCE SCORES TO LEARNING



Repulsion in CA23DG Occurs at Inflection Point



CONCLUSIONS

- $CA_{23}DG$ exaggerates differences between similar memories (repulsion effect).
- Repulsion was strongest at inflection point: when participants transitioned to high confidence, correct associative memory.
- Repulsion went away after inflection point.

References:
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