Repulsion and sharpening along diagnostic feature dimensions support resolution of memory interference

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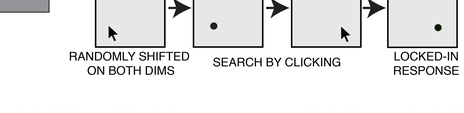
INTRODUCTION

- Memories that share overlapping features can cause interference.
- With learning, competition between overlapping memories subsides.[1,2]
- Reductions in competition are associated with differentiation of neural representations.[3,4,5]

Does competition bias memory for features?



Are memory biases adaptive for learning?

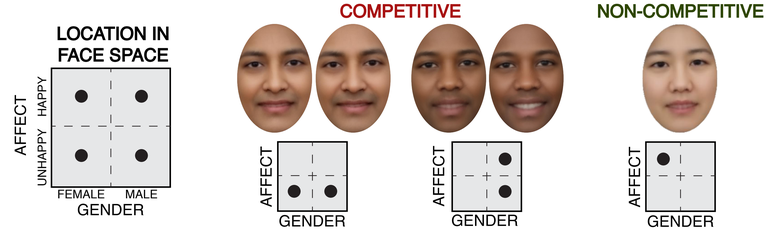
DESIGN

STIMULUS GENERATION

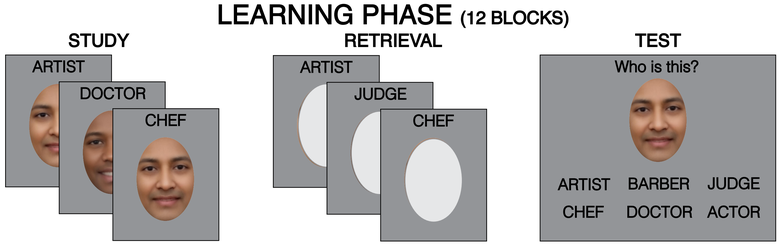
Generated orthogonal face "families":

Competitive pairs (4 total, 2 shown) differed on one ***diagnostic*** dimension and were matched on one ***non-diagnostic*** dimension.

Non-competitive faces (4 total, 1 shown) had no pairmate.

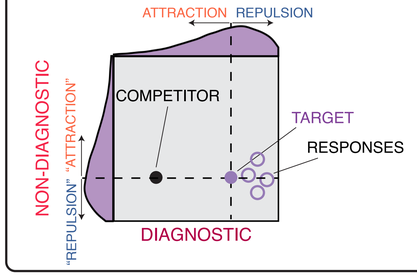


LEARNING PHASE (12 BLOCKS)

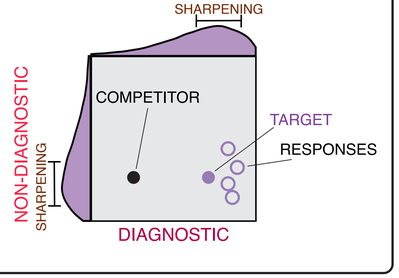


SURPRISE MEMORY RECONSTRUCTION TASK

REPULSION PREDICTION



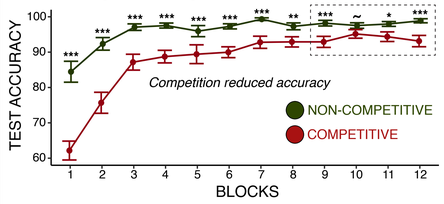
SHARPENING PREDICTION



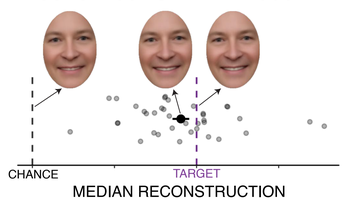
RESULTS

N=37 (4 participants removed for > 20% non-interference related errors on any of final 4 blocks).

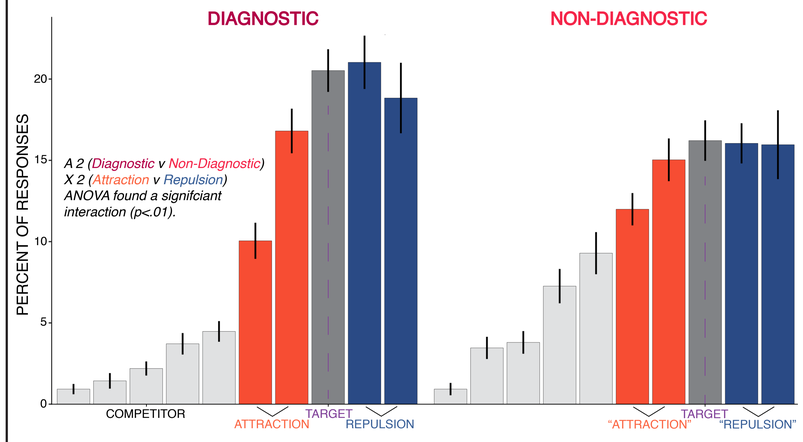
MEMORY IMPROVED WITH PRACTICE



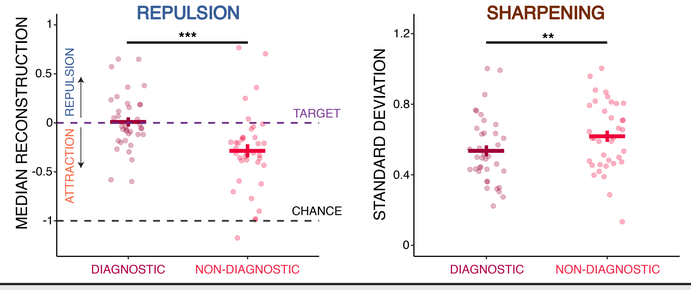
RECONSTRUCTION WERE ACCURATE



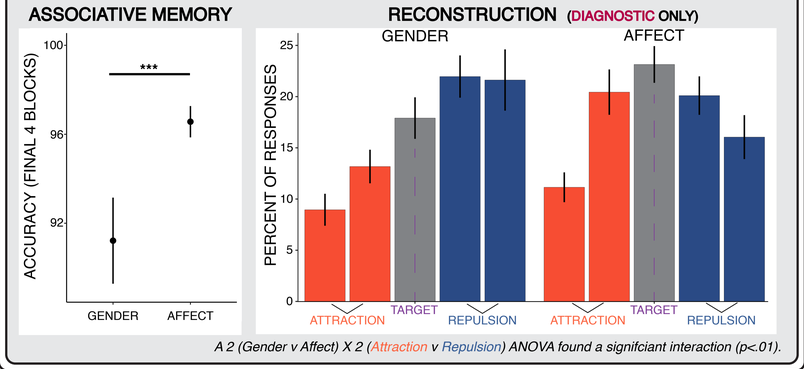
COMPETITION BIASES MEMORY



MEMORY BIAS IS GREATER ON THE DIAGNOSTIC DIMENSION



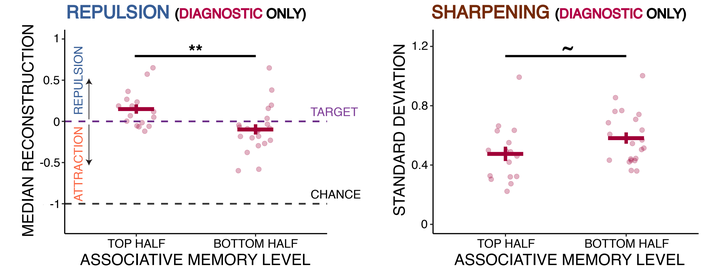
REPULSION DIFFERED FOR GENDER vs AFFECT



MEMORY BIAS IS ADAPTIVE

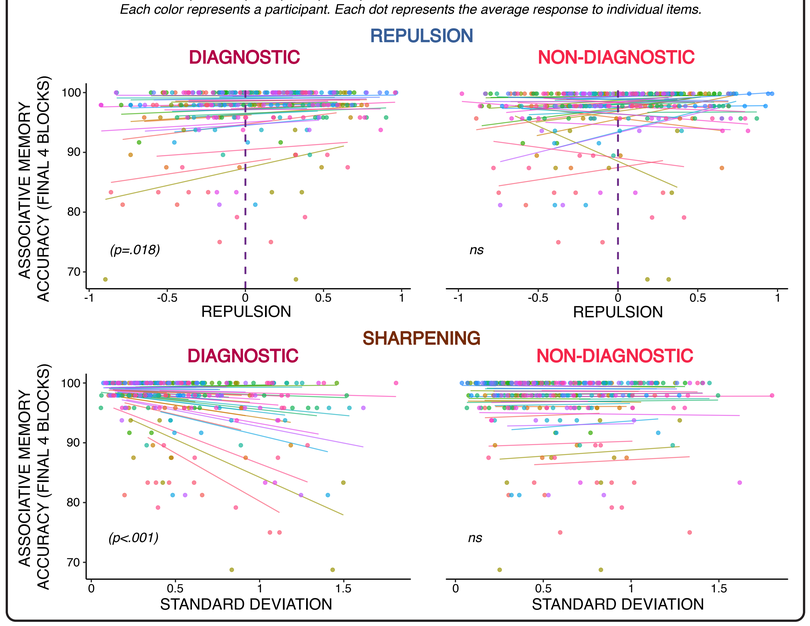
BETTER LEARNERS* HAVE A GREATER BIAS

**Based on performance on the final 4 blocks of the associative memory test.*



WITHIN-PARTICIPANT RELATIONSHIP BETWEEN BIAS AND ASSOCIATIVE MEMORY ACCURACY

Each line represents participant-specific predictions, from a multi-level model.
Each color represents a participant. Each dot represents the average response to individual items.



DISCUSSION

- Competing memories undergo repulsion and sharpening on the diagnostic dimension.
- Repulsion and sharpening on the diagnostic dimension are adaptive.[6]
- Next Steps:

Reconstruct faces from neural activity patterns

How do these biases relate to hippocampal repulsion?

REFERENCES: **1**. Anderson et al. (1994). *J Exp Psychol Learn.* **2**. Norman et al. (2007). *Pschol Rev.* **3**. Chanales et al. (2017). *Curr Biol.* **4**. Favila et al. (2007). *Nat Commun.* **5**. Hulbert & Norman. (2015). *Cereb Cortex.* **6**. Schacter et al. (2011). *Trends Cogn Sci.*

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