

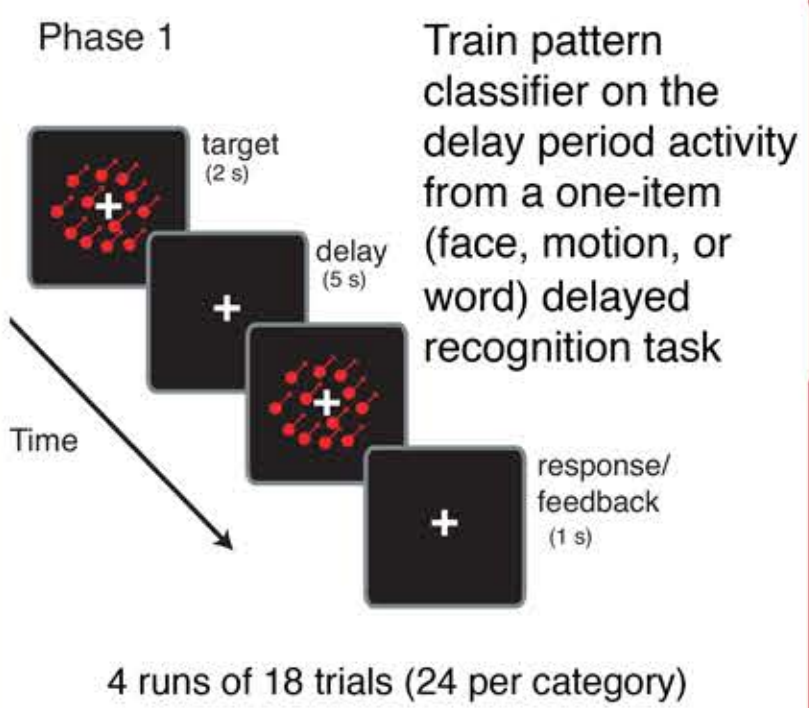
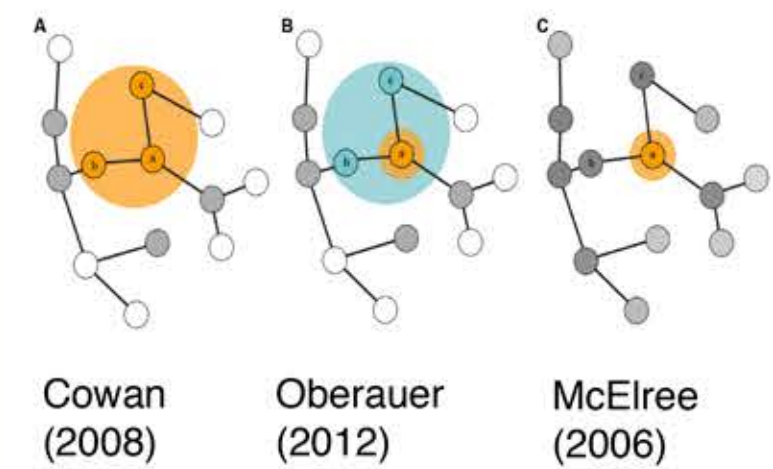


# Are items in working memory stored with long-term memory mechanisms?

Nathan Rose<sup>1</sup>, Emma Meyering<sup>1</sup>, R. Shayna Rosenbaum<sup>2</sup>, Steven Baker<sup>2</sup>, Christa Dang<sup>3</sup>, Bradley Buchsbaum<sup>3</sup>, Bradley Postle<sup>1</sup>

<sup>1</sup>University of Wisconsin-Madison, <sup>2</sup>York University, <sup>3</sup>Rotman Research Institute at Baycrest

## Models of WM

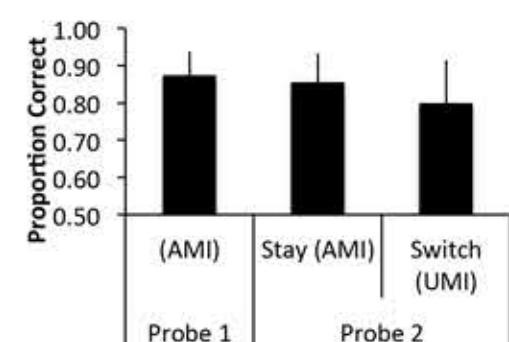


## Phase 2

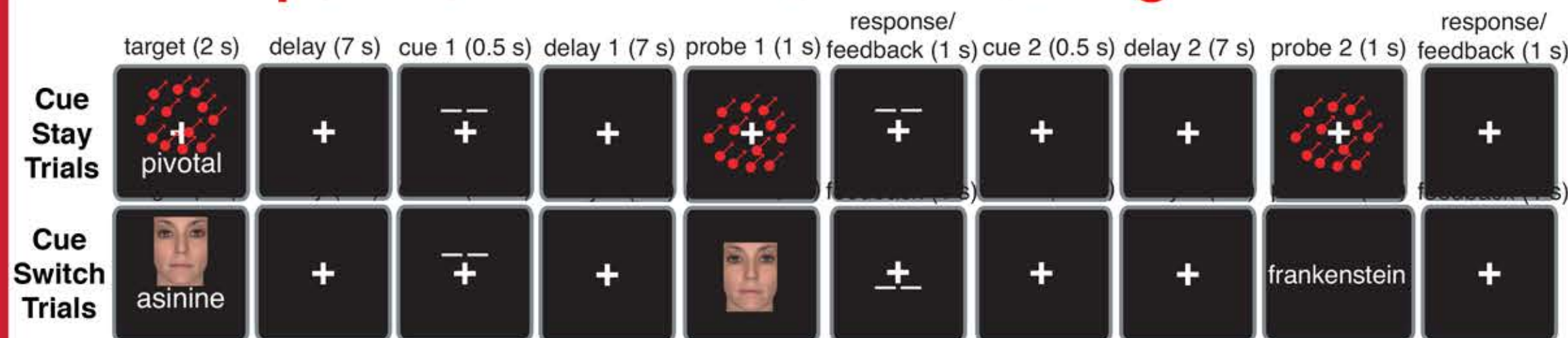
Test the classifier on a two-item delayed recognition task with prioritization cues

- 3 runs of 24 total (24 per category)
- Leave-one-trial-out, *k*-fold cross-validation with L2 regularized logistic regression ( $\lambda$  penalty term = 25)
- Voxels identified by the omnibus F-test or voxels in AFNI's Talairach & Tourneaux atlas for the hippocampus and parahippocampal gyrus

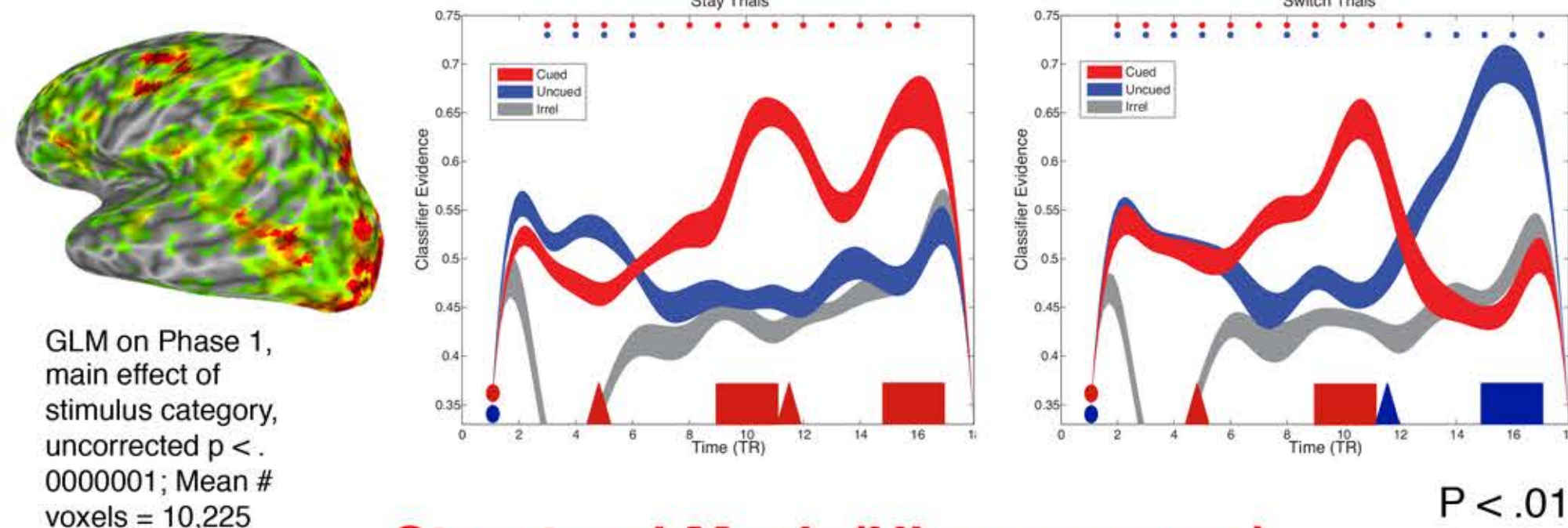
## Phase 2 Behavioral Performance



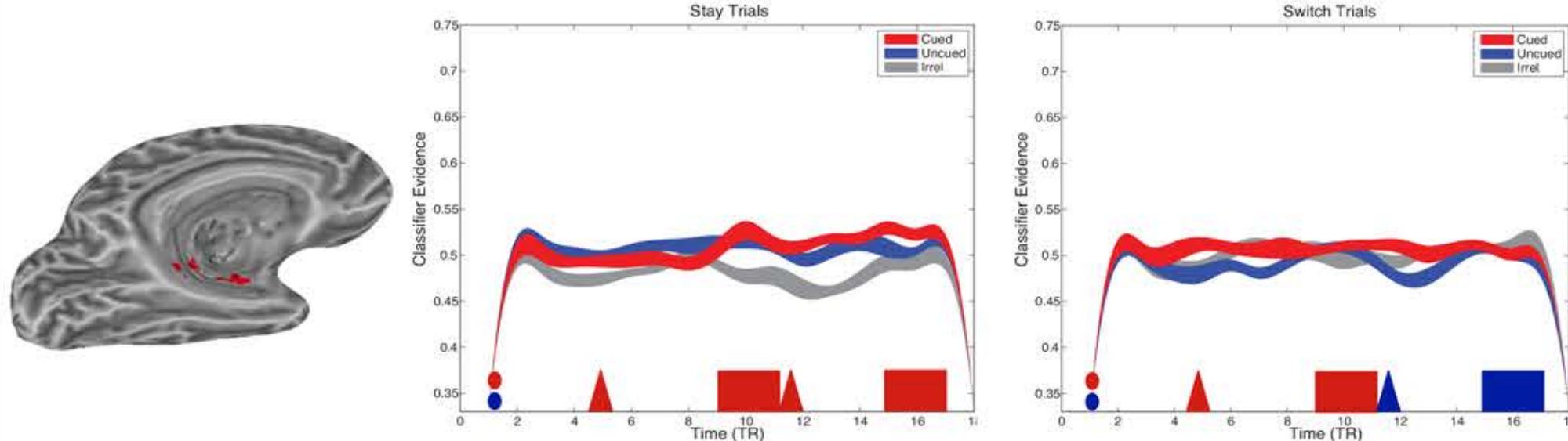
## Experiment 1: MVPA of fMRI during WM



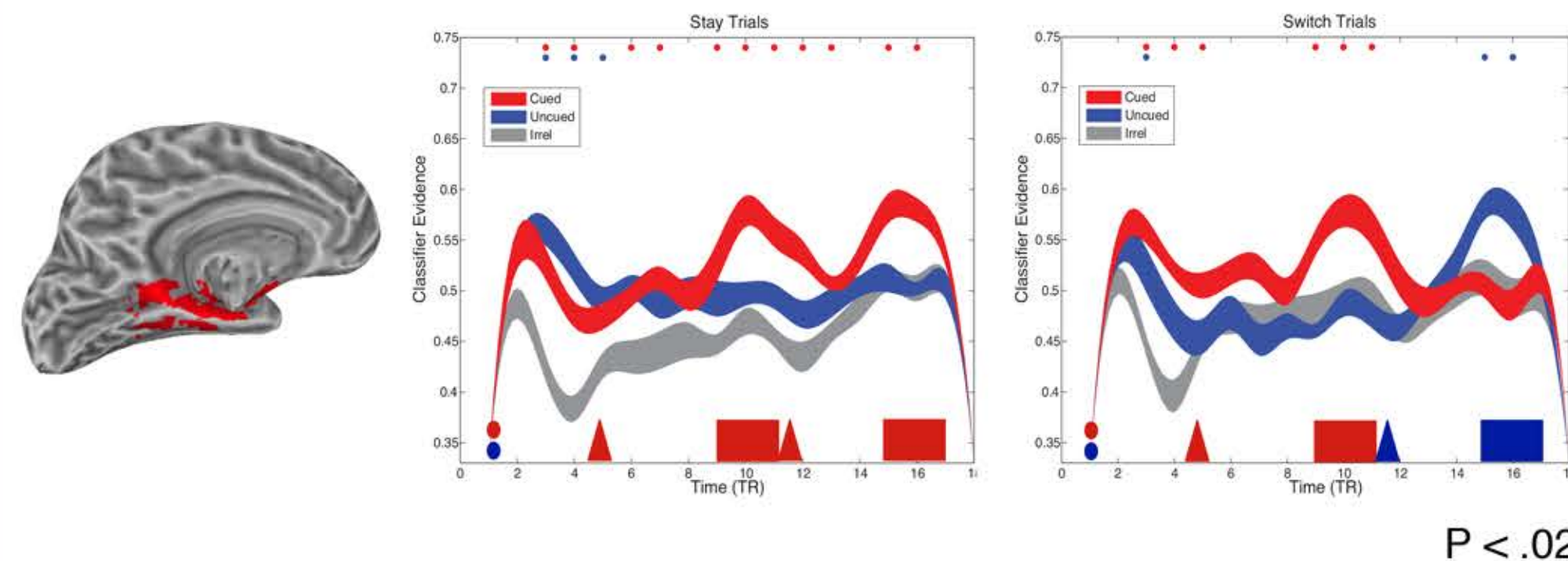
## Functional Mask (Voxels Sensitive to Stimulus Category)



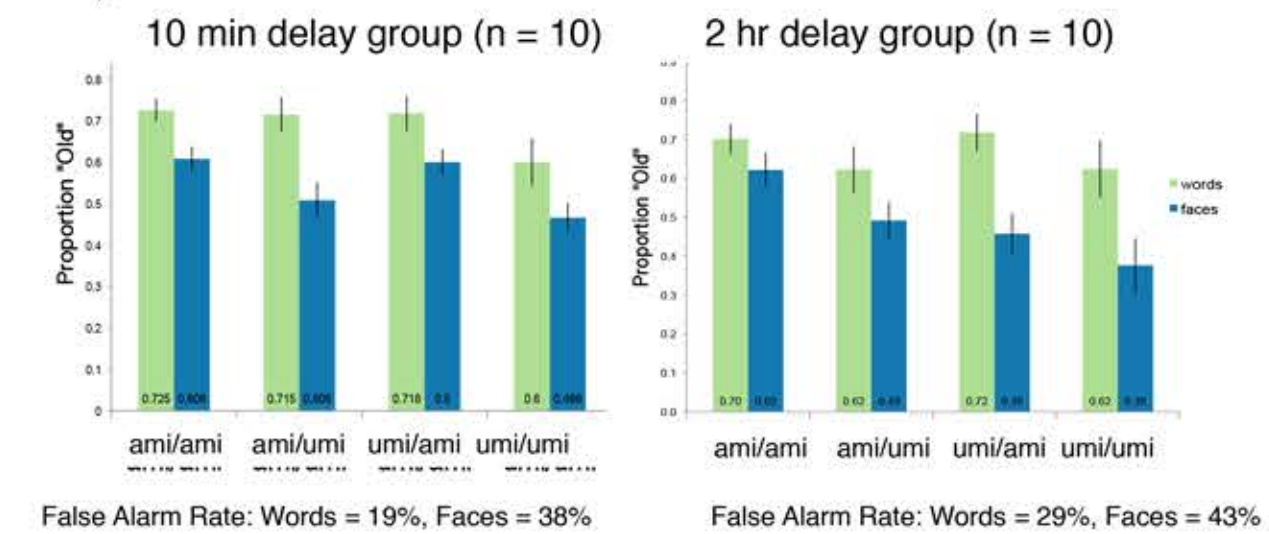
## Structural Mask (Hippocampus)



## Structural Mask (Parahippocampal Gyrus)

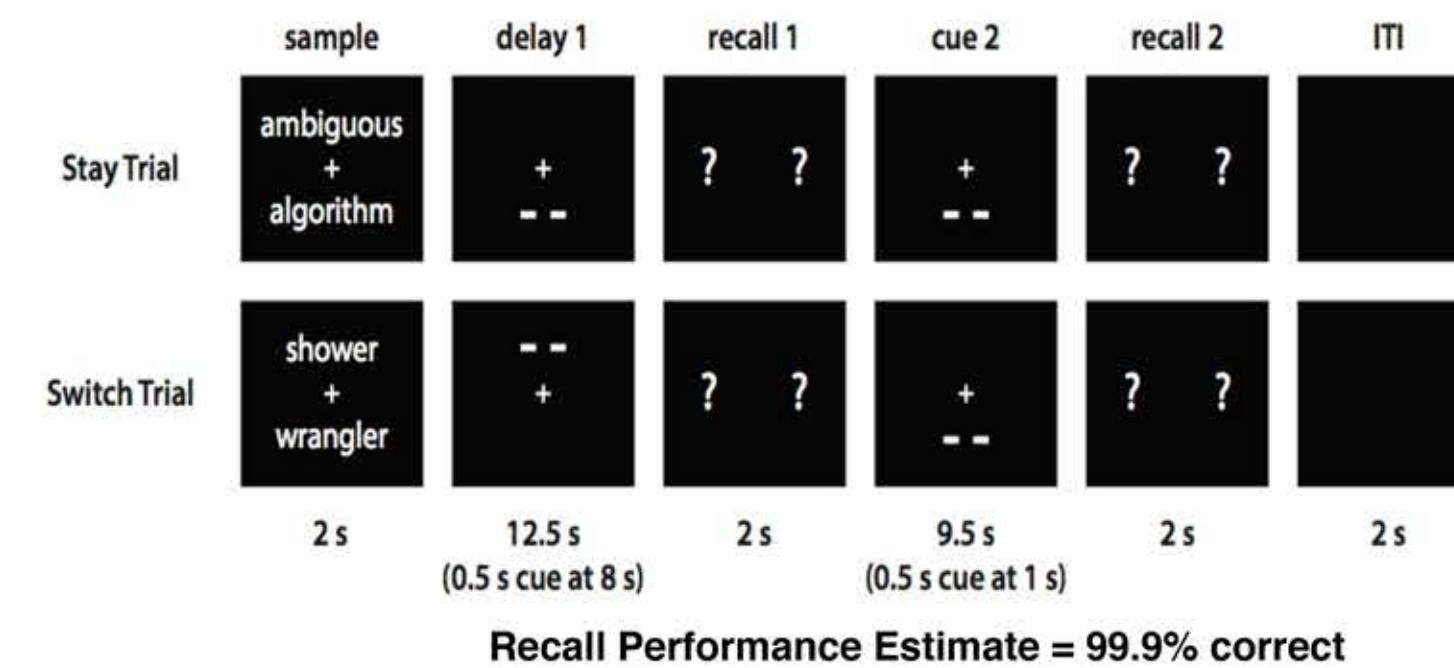


## Experiment 1: Surprise Subsequent Recognition

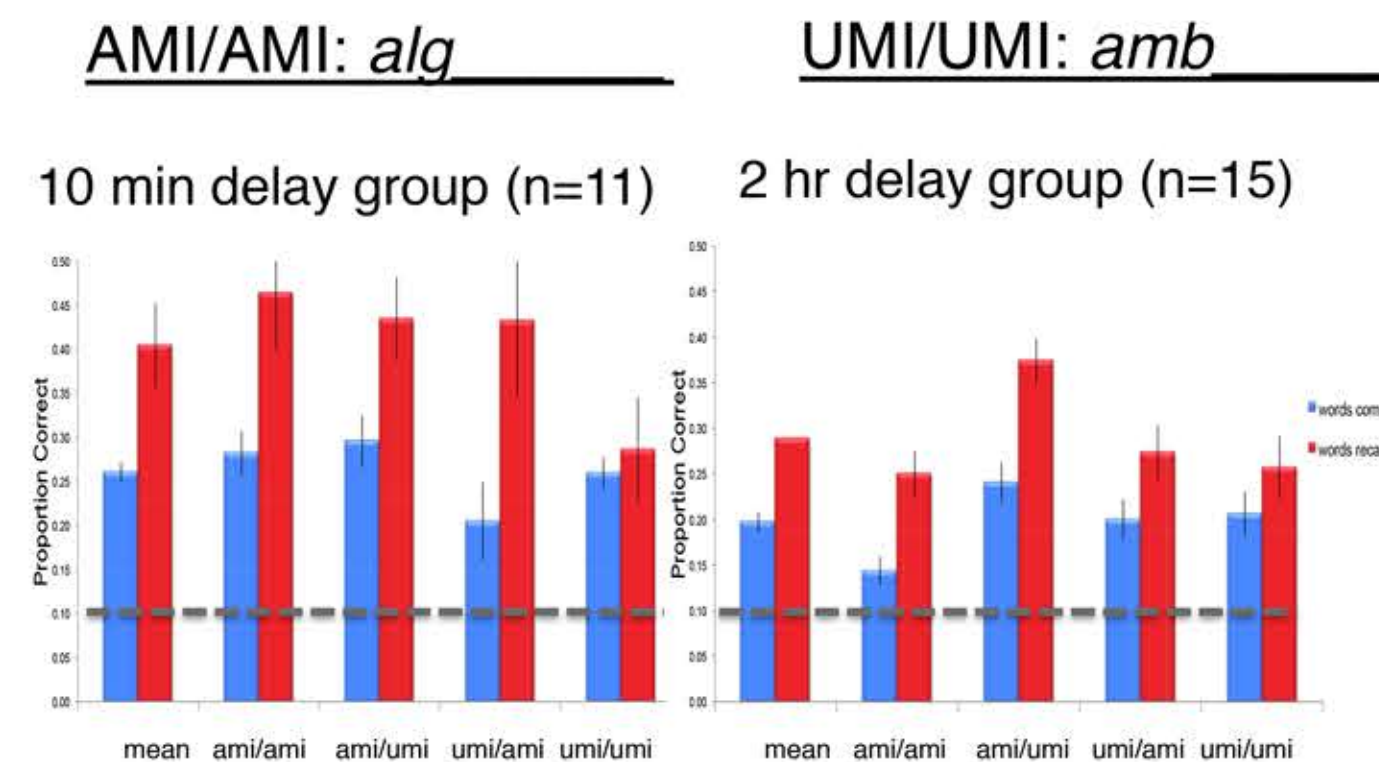


## Experiment 2: WM Task

Two-item delayed recall task with prioritization cues

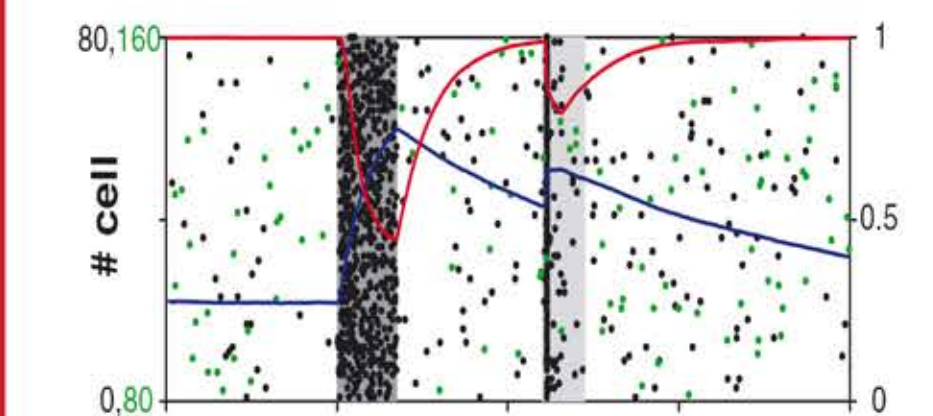


## Subsequent Word-Stem Completion and Cued Recall



## Conclusions

- MVPA evidence for only the item(s) in focal attention (AMIs); no evidence for UMIs.
- Information about stimulus category was not present in the hippocampus at any time point; information was present in the parahippocampal gyrus, primarily during encoding and retrieval.
- Subsequent *declarative* LTM was not better for UMIs than AMIs; it was better for items that were cued/tested at least once than for items that were uncued/untested (umi/umi) (see also, LaRocque et al., in press, *Memory & Cognition*).
- Subsequent *nondeclarative* LTM was insensitive to cueing or delay.
- Unattended memory items are not preferentially represented in LTM.



Results are consistent with the Synaptic Theory of WM (Mongillo, Barak, & Tsodyks (2008) *Science*; Itskov, Hansel, & Tsodyks (2011) *Front. Comp. Neuro.*)

## References

- Cowan, 2008, *Progress in Brain Research*
- LaRocque et al., 2013, *J. Cog. Neuro.*
- LaRocque et al., in press, *Mem. & Cog.*
- Lewis-Peacock et al., 2012, *J. Cog. Neuro.*
- McEree (2006) *Psych. of Learning & Motivation*
- Oberauer & Hein, 2012, *Curr. Dir. Psych. Sci.*