



# Medial temporal lobe and the left inferior frontal gyrus jointly support interference resolution in verbal working memory

Ilke Öztekin<sup>1</sup>, Clayton Curtis<sup>1,2</sup> and Brian McEree<sup>1</sup>

<sup>1</sup>Department of Psychology and <sup>2</sup>Center for Neural Science, New York University (ilke.oztekin@nyu.edu)

## Introduction

- Neuroimaging studies of verbal working memory (WM) have investigated interference effects that arise from episodic familiarity.

∴ Enhanced activation in left inferior frontal gyrus (LIFG) for a recently studied lure compared to an unstudied probe (e.g. D'Esposito et al., 1999).

Does LIFG support interference resolution in general?

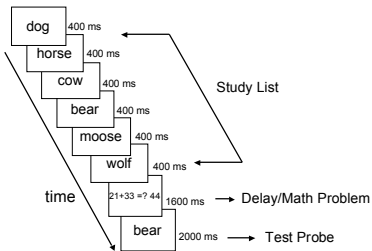
- Behavioral work has focused on a more general type of interference induced by semantic similarity.
- Both types of interference effects can be resolved with similar compensation mechanisms: Recollective processes that access episodic information (Öztekin & McEree, 2007).

Do the neural bases of interference resolution extend to regions that support episodic retrieval?  
⇒ The medial temporal lobe

## Experimental Design

- Conjointly applied proactive interference (PI) with semantic similarity and episodic familiarity.

### Trial Sequence



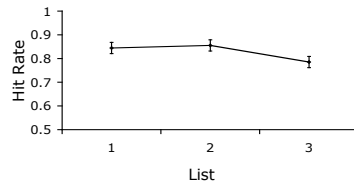
### PI Manipulation

PI	Positive Probe	Negative Probe
1	monkey cat dog horse cow elephant → List 1	monkey DN: rat
2	pig moose rabbit giraffe bear donkey → List 2	donkey DN: goat RN: cow
3	sheep lion zebra deer wolf hamster → List 3	deer DN: squirrel RN: donkey

## Behavioral Results

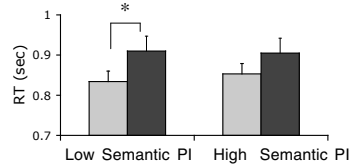
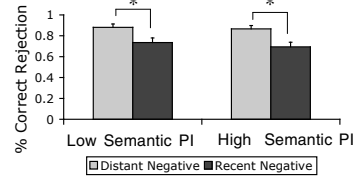
### Semantic Similarity Interference

- Performance decreased as PI built up.



### Episodic Familiarity Interference

- Lower performance for recent negative probes compared to distant negatives.



## FMRI Methods

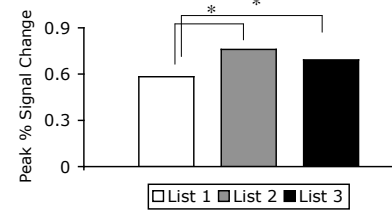
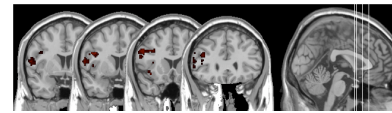
- 15 participants
- 3T Siemens Allegra scanner
- Rapid event-related design
- TR = 2 sec
- Pre-processing and statistical analyses using SPM2
- Regions of Interest (ROI) analyses using MarsBaR

## FMRI Results

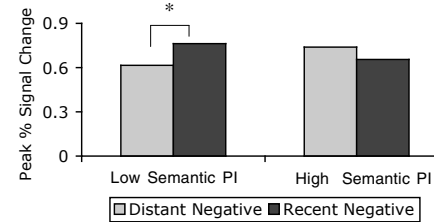
- ROIs defined from task effect contrasts.
- 20 most active voxels in each region included in each participant's ROI.

Thanks to APA Dissertation Research Award

## A. LIFG ROI



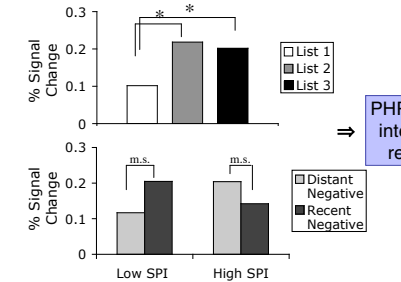
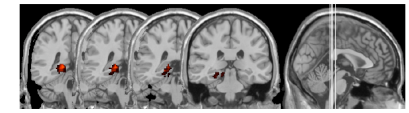
⇒ LIFG supports resolution of PI induced by semantic similarity



⇒ Semantic similarity interference interaction with episodic familiarity

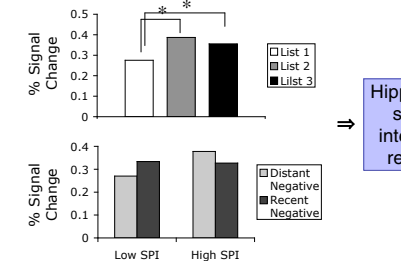
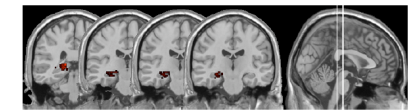
## B. MTL ROIs

### Left Parahippocampal gyrus (PHP)



⇒ PHP supports interference resolution

### Left Hippocampus



⇒ Hippocampus supports interference resolution

## Summary

- LIFG and MTL jointly support proactive interference resolution in verbal working memory.
- Findings provide further support for the importance of MTL in WM processes (e.g. Öztekin, McEree, Staresina & Davachi, in press).
- Results converge with previous work suggesting interference resolution can be achieved via episodic retrieval (e.g. Badre & Wagner, 2005; Öztekin, & McEree, 2007).

## References

- Badre, D., & Wagner, A.D. (2005). Frontal lobe mechanisms that resolve interference. *Cerebral Cortex*, 15, 2003-2012.
- D'Esposito, M., Postle, B.R., Jonides, J., & Smith, E. (1999). The neural substrate and temporal dynamics of interference effects in working memory revealed by event-related functional MRI. *PNAS*, 96, 7514-7519.
- Öztekin, I., & McEree, B. (2007). Proactive interference slows recognition by eliminating fast assessments of familiarity. *Journal of Memory and Language*, 57, 126-149.
- Öztekin, I., McEree, B., Staresina, B.P., & Davachi, L. (in press). Working memory retrieval: Contributions of left prefrontal cortex, left posterior parietal cortex and hippocampus. *Journal of Cognitive Neuroscience*.