

## Introduction

### Phenomenon: Ambiguous Phrases

- phrases with more than one possible meaning

- [furry tiger] painting vs. furry [tiger painting]

### Question: How does context influence the comprehension of these ambiguous phrases?

- Global context vs. local context

**Theory 1 Minimalist Hypothesis<sup>2</sup>:** global contextual info is only used when there is a local incongruency

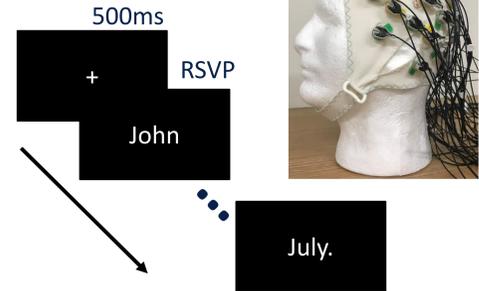
**Theory 2 Multiple-Cause Intensified Retrieval (MIR) Hypothesis<sup>3</sup>:** global contextual info can be utilized regardless of local congruence

**Previous Results:** sentential-level meaning can override or attenuate local associative context effects<sup>4,5</sup>

## Methods

**Participants:** 24 healthy right-handed native English-speakers

### Procedure:



Comprehension questions after ~25% of trials

**EEG-setup:** 64-channel active Electrodes actiCAP, placed with 10-20 system, recording at 200Hz

**Preprocessing:** Re-referenced to linked mastoid, ICA for ocular correction, band filtered from 0.1Hz to 30 Hz, notch filter at 60 Hz. Artifact rejection at 100mV min-max difference, Baseline-correction at -200-0ms to target onset

### Design: 2 Global Context (Left, Right) x 4 ambiguous phrases (Distinct Unbiased, Equivalent Unbiased, Left Biased, Right Biased)

Left Global Context: *John saw the painting of a furry dog.*

Right Global Context: *John saw the dog painting that is furry.*

Ambiguous Sentence: *Amy saw the furry tiger painting in July.*

Ambiguous phrases: Structurally ambiguous with different semantic properties.

	Left Branching	Right Branching
<b>Left Biased</b>	[furry tiger] painting <i>painting of a furry tiger preferred!</i>	furry [tiger painting] <i>tiger painting that is furry</i>
<b>Right Biased</b>	[wrecked commuter] ship <i>ship of wrecked commuters</i>	wrecked [commuter ship] <i>commuter ship that is wrecked preferred!</i>
<b>Distinct Unbiased</b>	[tall wheat] tractor <i>tractor for tall wheat</i>	tall [wheat tractor] <i>wheat tractor that is tall</i>
<b>Equivalent Unbiased</b>	[automatic copying] machine <i>machine for automatic copying</i>	automatic [copying machine] <i>copying machine that is automatic</i>

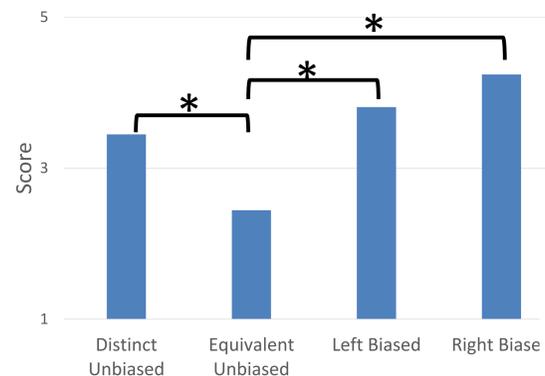
### Pretesting:

2<sup>nd</sup> and 3<sup>rd</sup> words of each phrase are matched regarding:

- Word length
- Bigram frequency using COCA corpus (1<sup>st</sup>+2<sup>nd</sup>, 2<sup>nd</sup>+3<sup>rd</sup>, 1<sup>st</sup>+3<sup>rd</sup> words)

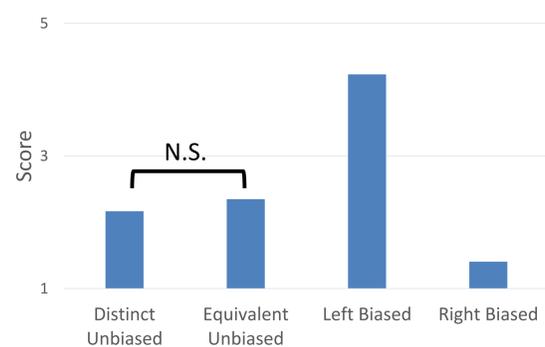
### Semantic Difference Survey: N = 46

- Equivalent Unbiased phrases have a smaller difference in meaning in comparison to other stimuli ( $p < .0001$ )
- 1 = no difference



### Bias Survey: N=60

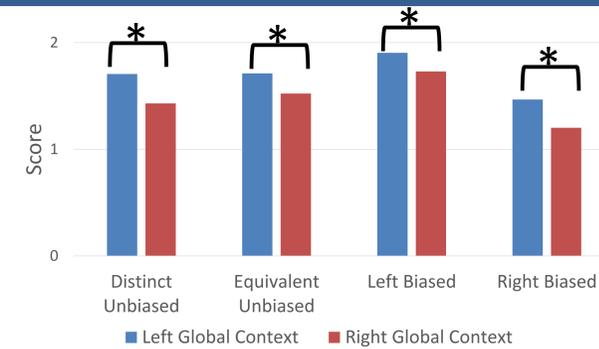
- preferred interpretation for biased stimuli ( $p < .001$ )
- but not for unbiased stimuli ( $p = .31$ )
- 3 = neutral



## Materials

### Pretesting Continued: Global Context Effect Survey: N = 40

- global context influenced how readers interpret the ambiguous phrase ( $p < .001$ )
- 2 = Left Branching Interpretation



## ERP Results

Repeated measures ANOVA: 2 Global Context (Left, Right) x 4 Ambiguous Phrases (Distinct Unbiased, Equivalent Unbiased, Left Biased, Right Biased)

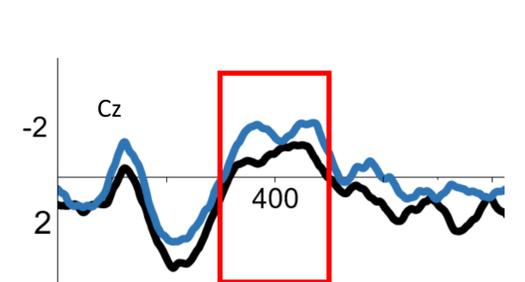
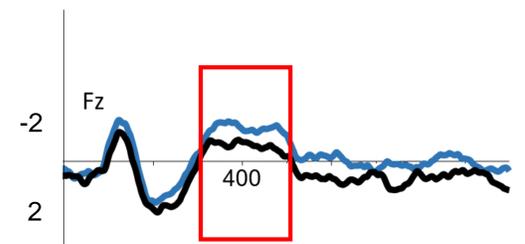
ERP generated at 2<sup>nd</sup> & 3<sup>rd</sup> word of ambiguous phrase

**2<sup>nd</sup> word: main effect of Global Context**  
N400:  $F(1,23) = 7.735$ ,  $p < .01$  from 300-500ms

**Anterior negativity:**  $F(1,23) = 7.735$ ,  $p < .05$  from 300-500ms

Preceded by:  
**Right Global Context:**  
*dog painting that is furry incongruent*

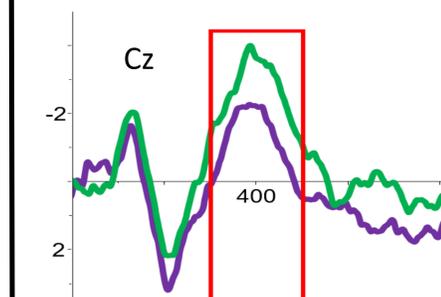
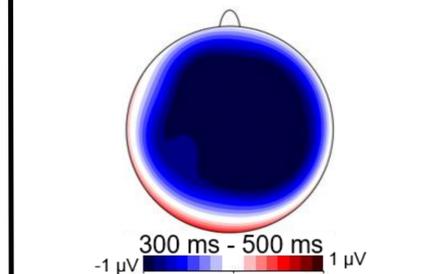
**Left Global Context:**  
*painting of a furry dog congruent*



**3<sup>rd</sup> word: main effect of Local Context**  
N400:  $p = .033$  with Holm-Bonferroni correction for multiple comparisons

**Left Biased: congruent combo + 3<sup>rd</sup> word**  
*furry tiger + painting*

**Right Biased: incongruent combo + 3<sup>rd</sup> word**  
*wrecked commuter + ship*



## Discussion

### Global context info plays a key role

- readers use global info to anticipate up-coming material
- predictions facilitate reading
- strongest early but fades with time
- suppresses sensitivity to local incongruencies

Results are consistent with the MIR Hypothesis

- global context is used immediately regardless of local incongruencies in meaning

**Implications:** discourse and world knowledge impact linguistic structure processing and mental computations generally

## Acknowledgement

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## References:

- [1] Kutas, M., & Federmeier, K. D. (2011). Thirty years and counting: finding meaning in the N400 component of the event-related brain potential (ERP). *Annual review of psychology*, 62, 621-647.
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- [4] Van Petten, C., Coulson, S., Weckerly, J., Federmeier, K. D., Folstein, J., & Kutas, M. (1999). Lexical association and higher-level semantic context: An ERP study. *Journal of Cognitive Neuroscience Supplement*, 46.
- [5] Coulson, S., Federmeier, K. D., Van Petten, C., & Kutas, M. (2005). Right hemisphere sensitivity to word-and sentence-level context: evidence from event-related brain potentials. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 31(1), 129.