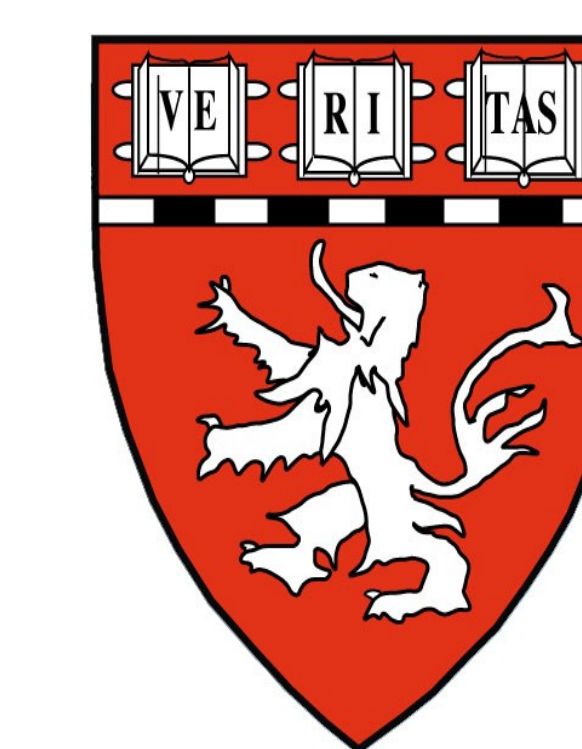




# Distinct neural processes engaged during temporal sequencing and coherence building in discourse

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## Introduction

In the real world, causes always come before effects. During communication, however, events can be described in either this canonical temporal order using causal connectors such as “and so”, or in non-canonical order using connectors like “because”. Using event-related potentials (ERPs), we determined when causal coherence is established for events presented in and out of canonical sequence, during online discourse processing.

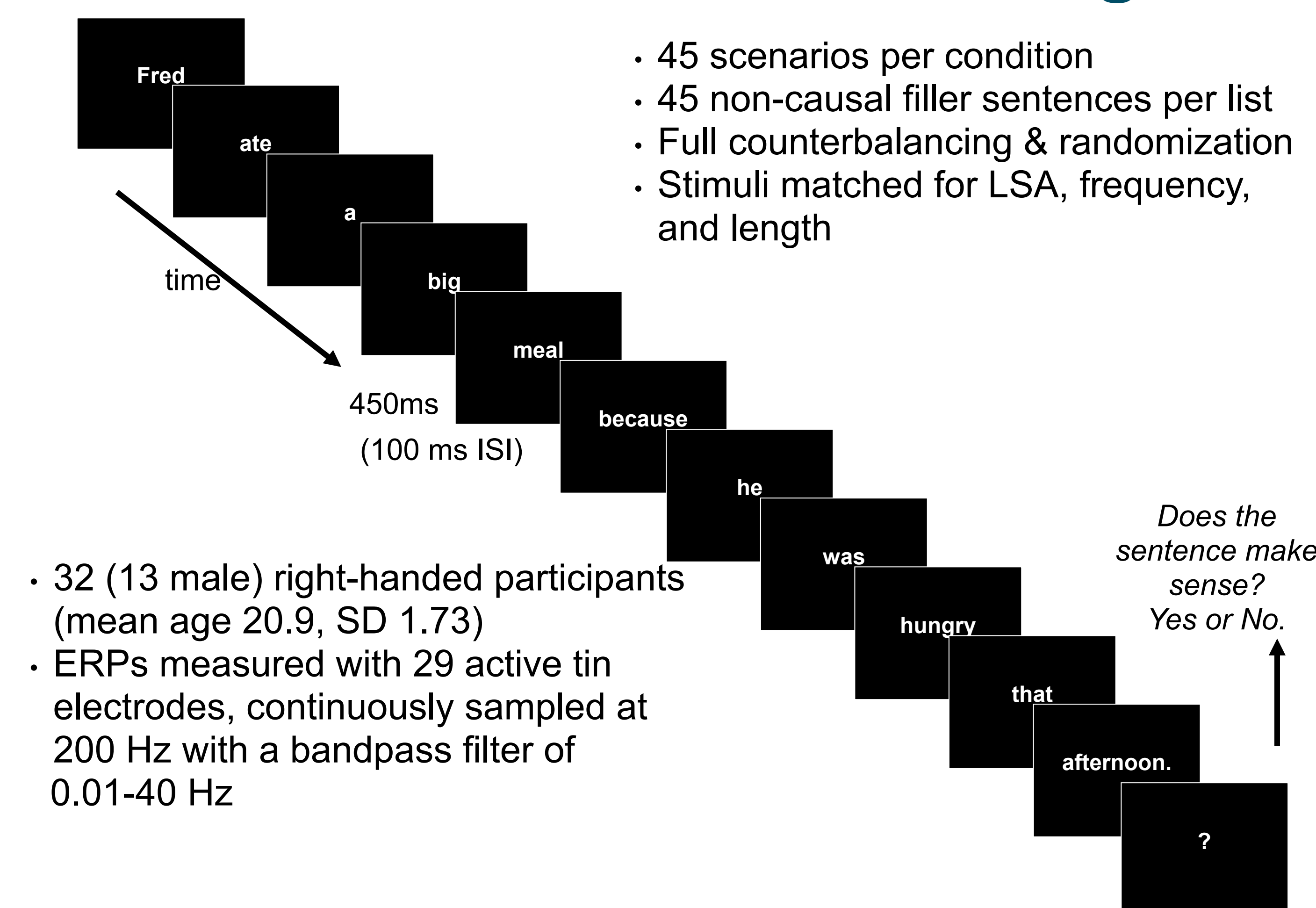
### Our Questions:

1. Does causal coherence, established at the situation level, influence lexico-semantic processing of upcoming words?
2. Are the mechanisms that establish causal coherence<sup>1,2</sup> and temporal ordering<sup>3</sup> across events distinct from one another?
3. Are either of these mechanisms specifically influenced by readers' general verbal working memory capacity?

## Design

Stimuli:	Canonical Order:	Noncanonical Order:
Causally Coherent:	Fred was hungry and so he had a meal that afternoon.	Fred had a meal because he was hungry that afternoon.
Causally Incoherent:	Fred was hungry because he had a meal that afternoon.	Fred had a meal and so he was hungry that afternoon.

## Presentation & Recording

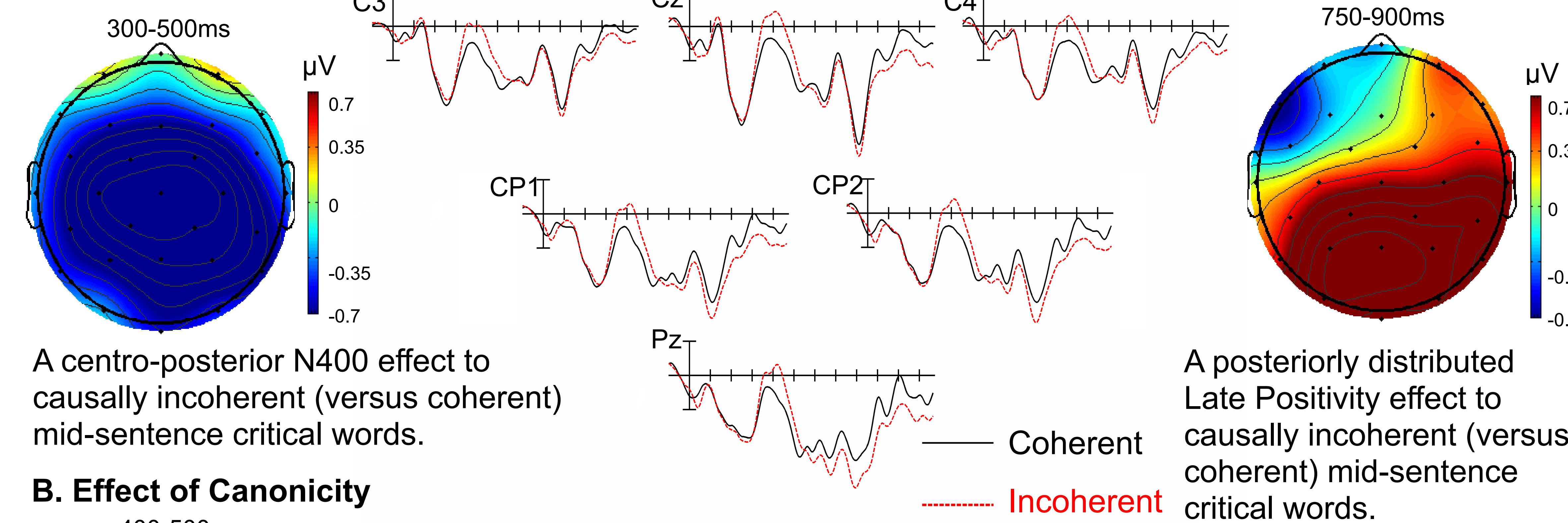


After ERP recording, participants' working memory span was measured with a modified Automated Reading Span (RSPAN) Task<sup>4</sup> using letter recall accuracy as a dependent measure.

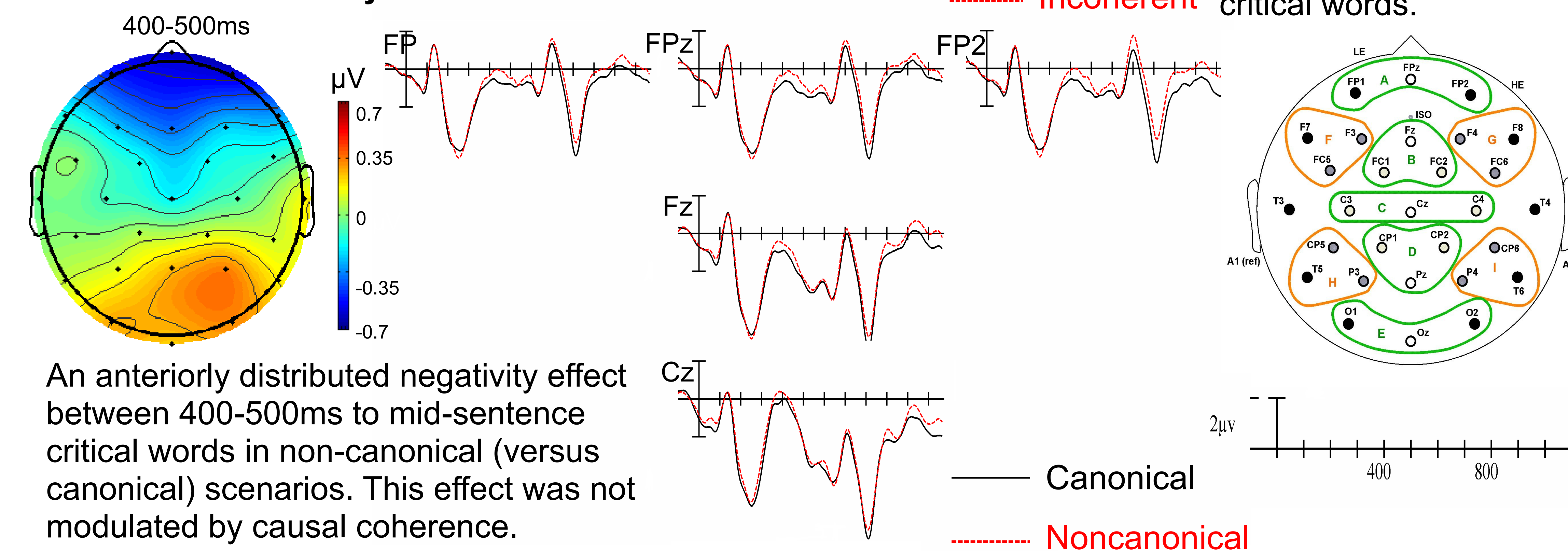
## Results

### Critical Word

#### A. Effect of Coherence

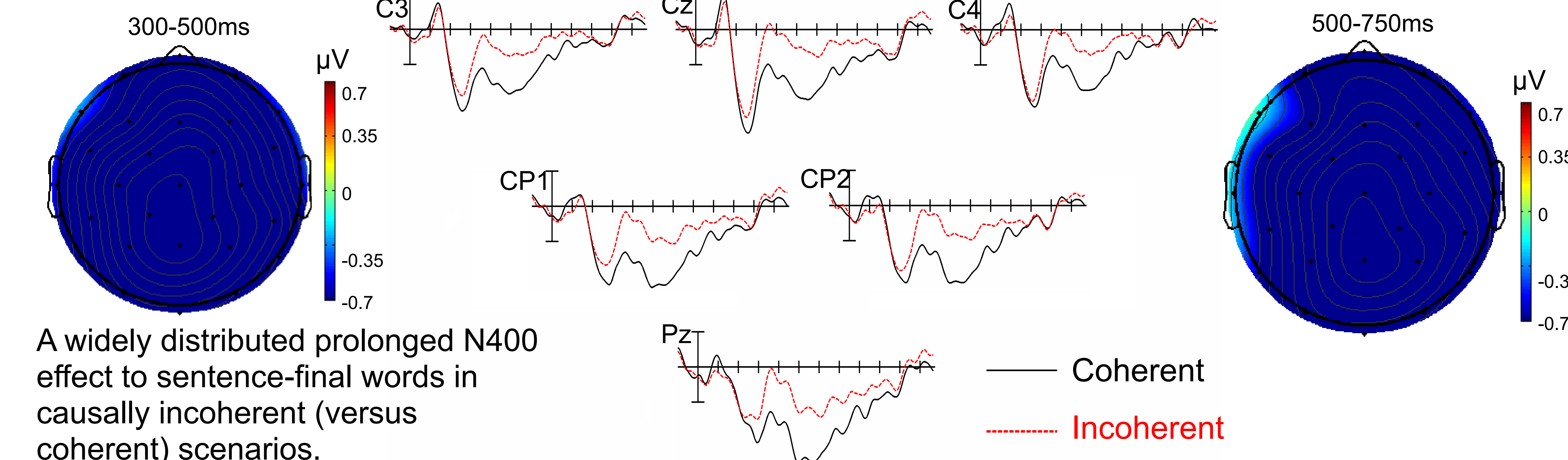


#### B. Effect of Canonicity

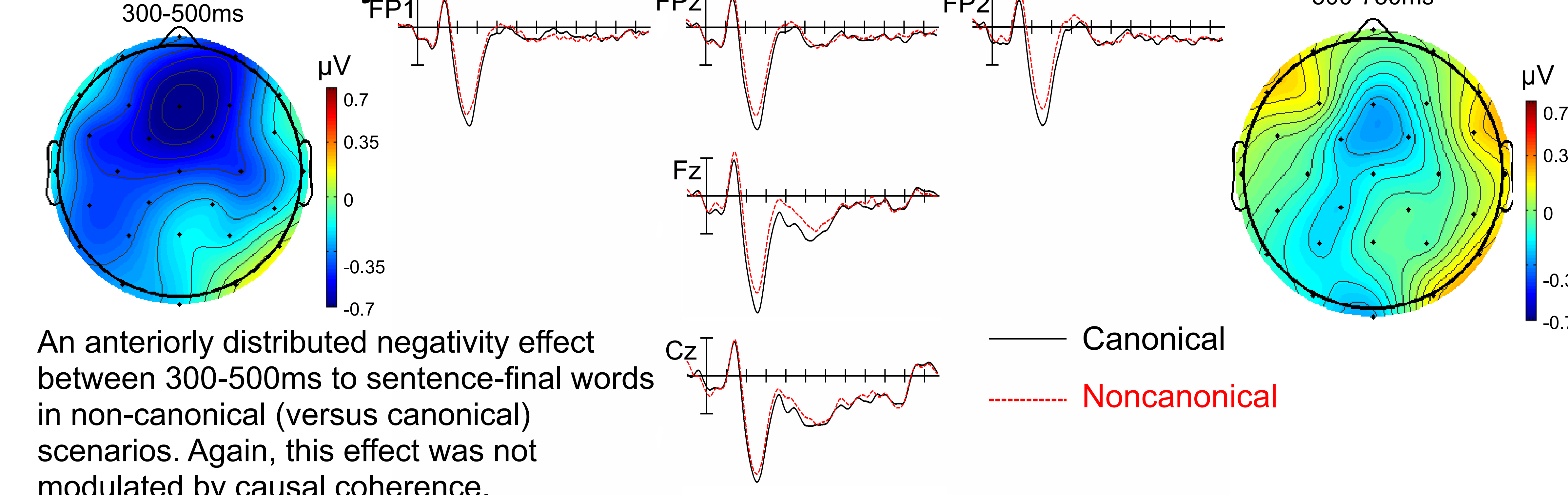


### Sentence Final Word

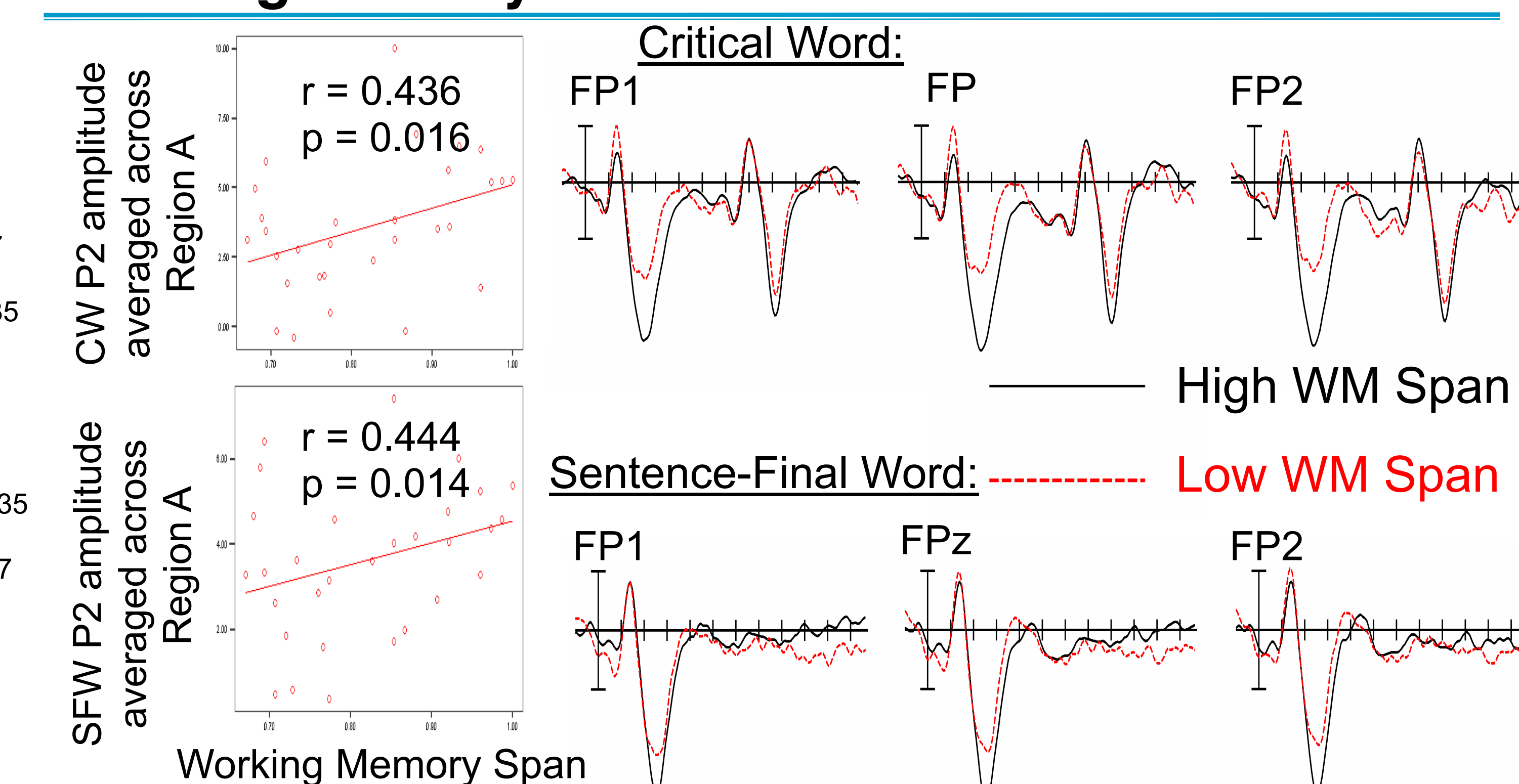
#### A. Effect of Coherence



#### B. Effect of Canonicity



### Working Memory



Working memory span predicted the amplitude of an anteriorly distributed positivity between 200-300ms (the P2), averaged across electrodes within the prefrontal region of interest. This effect was seen on both the critical word and the sentence-final word. It was not modulated by either Canonicity or Causal Coherence.

## Conclusions

1. Causal coherence, established at the situation level, influences lexico-semantic processing of upcoming words during word-by-word discourse comprehension. Additional neurocognitive processes are recruited when causal incoherence is unambiguously established using a causal connector.
2. The neurocognitive mechanisms that establish causal coherence and temporal ordering across events are distinct and do not interact with one another.
3. Neither of these mechanisms are specifically influenced by readers' general verbal working memory capacity. Rather, increased working memory capacity may more generally enhance top-down attentional influences on perceptual processing of upcoming words in discourse.

## References

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