



# N400 to P600: Discourse Context Modulates the “Semantic P600”



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## Introduction

### “Semantic P600” Findings

- Challenge clean mappings between N400–semantic difficulty and P600–syntactic difficulty [e.g., 1-6]

*The hearty meal was ~~devouring~~... → P600*  
*The dusty table tops were devouring... → N400*

- Effects modulated by multiple, interacting factors [6-7]
- Accounts consistent with streams-based architecture
  - Cues processed by parallel, interactive streams
  - Vie for interpretative dominance [4,7-10]
  - “Core” levels provide constraints on interpretation [11]

→ Context may sometimes dominate syntactic cues [12]

### Context Effects [13]

Context<sup>1</sup>

*A tourist wanted to bring his huge suitcase onto the airplane. However, because the suitcase was so heavy, the woman behind the check-in counter decided to charge the tourist extra. In response, the tourist opened his suitcase and threw some stuff out. So now, the suitcase of the resourceful tourist weighed less than the maximum twenty kilos.*

Critical Sentence<sup>1</sup>

*The woman told the **suitcase**...* → P600 (in context)  
 → N400 (no context)<sup>2</sup>

<sup>1</sup>English equivalent of Dutch stimuli; <sup>2</sup> Separate, unpublished study

- Explained as “semantic illusion” [14-16]

*When an airplane crashes on a border with debris on both sides, where should the survivors be buried?*

- Temporary failure to register ‘survivors’ or ‘suitcase’ as anomalous, therefore no enhancement of N400

→ Account leaves P600 unexplained

## Hypothesis

### “Discourse-Expectedness”

- Words encountered in discourse generate bias to treat future appearances as contextually appropriate
- Discourse activates structured event-representations [18-20]
- Exert anticipatory effects on downstream processing to strongly constrain combinatory possibilities

→ Conflict between syntax-discourse triggers combinatory reprocessing rather than semantic difficulty

### Specific Questions

- Can discourse context modulate the P600 within subjects?
- How are “semantic P600s” related to classic P600s?

## Experiment 1

### Example Stimuli

#### No-Mention Context<sup>1</sup>

The smell of **bacon** was overwhelming.

#### Previous-Mention Context<sup>2</sup>

The kids woke up to the smell of **bacon** and coffee. Their dad was already **leaving** for work.

### Critical Sentences

The bacon was **leaving**... Anomaly<sup>3</sup>

The bacon was **frying**... Control

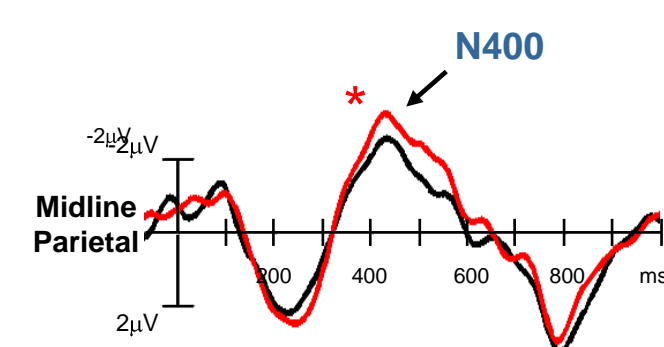
<sup>1</sup>Mean length: 6.9 words; <sup>2</sup>Mean length: 21.0 words;

<sup>3</sup>Minimal prior semantic association between noun and verb (mean LSA cosine = 0.10)

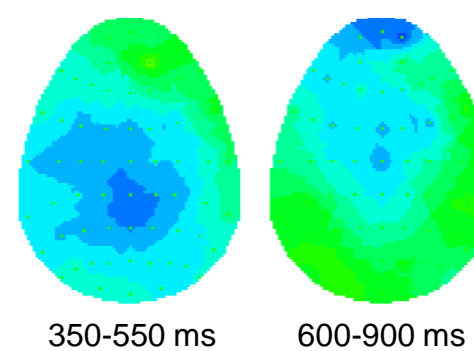
→ Previous-Mention Context creates a “discourse attraction”

### Results

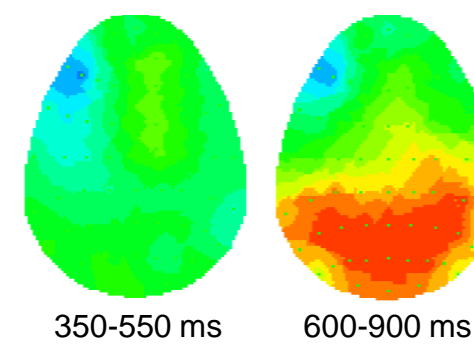
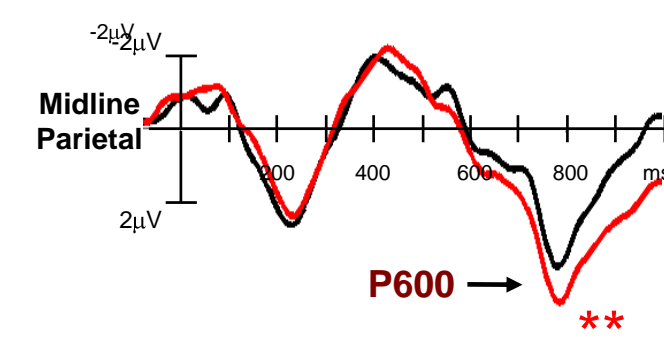
Following No-Mention Context:



Difference Topographs  
Anomaly minus Control



Following Previous-Mention Context:



## Experiment 2

### Example Stimuli

#### No-Mention Context<sup>1</sup>

The astronomy student observed the night sky through a telescope. She was looking at a particularly radiant **planet**.

#### Previous-Mention Context<sup>2</sup>

The astronomy student **carried** the heavy telescope outside. She was looking for a particular **planet**.

### Critical Sentences

The planet was **carrying**... Anomaly<sup>3</sup>

The planet was **glowing**... Control

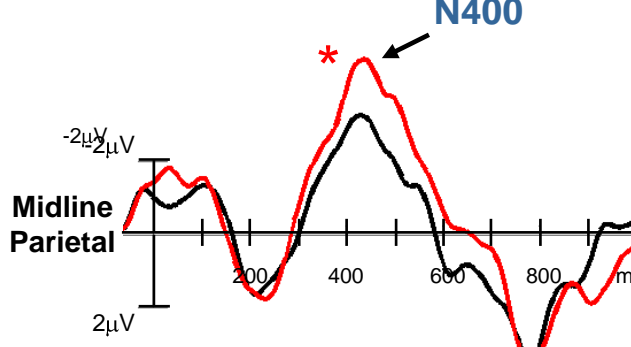
<sup>1</sup>Mean length: 6.9 words; <sup>2</sup>Mean length: 21.0 words;

<sup>3</sup>Minimal prior semantic association between noun and verb (mean LSA cosine = 0.09)

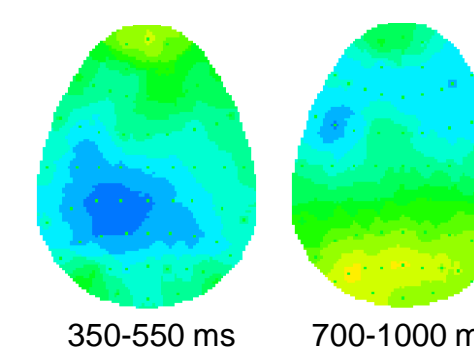
→ Previous-Mention Context creates a “discourse attraction”

### Results

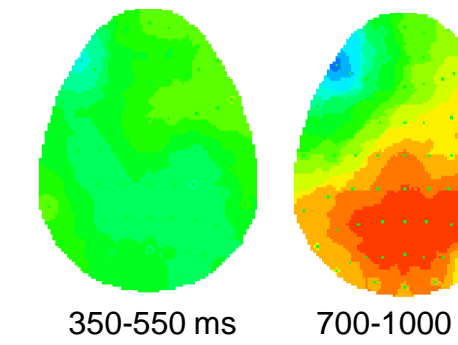
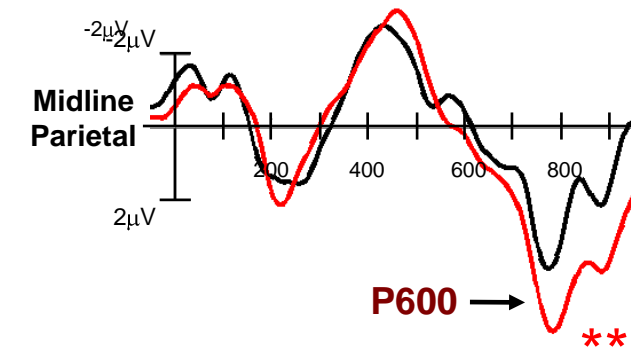
Following No-Mention Context:



Difference Topographs  
Anomaly minus Control



Following Previous-Mention Context:

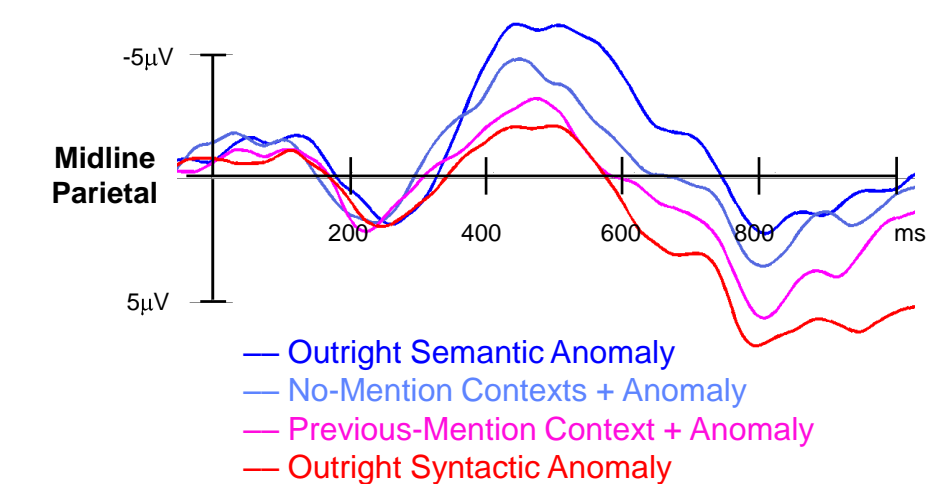


## Discussion

### Conclusions

- “Discourse attraction” generates bias to treat future appearances as contextually appropriate
- Constrains combinatory possibilities to that which is plausible given current event representation
- Influences competition between processing streams
- Modulates the “semantic P600” effect

### Parametric Effects – “Tipping the balance”



→ Classic ERP effects may index extremes of interpretive continuum

## Future Directions

### A Pure Lexical Priming

*planet carrying*

### Semantic Frame

The astronomy student **lugged** the heavy telescope outside. She was looking for **Jupiter**.

The planet was **carrying**... Anomaly

The planet was **glowing**... Control

### B Single Referent

The kids woke up to the smell of **bacon** and coffee. Their dad was already **leaving** for work.

### Multiple Referent

Johnny woke up to the smell of **bacon** and coffee. Dad was **leaving** for work, Mom was **leaving** for her morning run, and Sally was **leaving** for school.

The bacon was **leaving**... Anomaly

The bacon was **frying**... Control

## Methods

### Experiment 1

- 40 right-handed native English speakers
- 21 female, mean age = 19.9
- Comprehension task following 1/3 of trials

### Experiment 2

- 16 right-handed native English speakers (to date)
- 8 female, mean age = 19.3
- Each trial followed by either comprehension task or acceptability judgment

### Stimuli Design

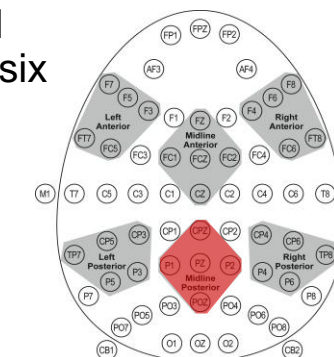
- 120 stories (30 per condition) intermixed with 120 filler stories
- 50% well-formed, 50% anomalous

### Visual Presentation

- Context presented in full (self paced)
- Completion sentences presented RSVP
  - Non-critical words: 380 ms + ISI (20 ms/ch)
  - Critical words: 380 ms + ISI (140 ms)

### EEG Recording

- 64 Ag/Ag-Cl electrodes (Neuroscan QuickCaps)
- Voltages averaged for analysis within six 5-channel groups



## References

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