Modulation of ERP responses by predictability of information in negated contexts

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2024

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Modulation of ERP responses by predictability of information in negated contexts

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Introduction

- Language comprehension is incremental and we make predictions about upcoming information [1].
- Studies have shown that when predictions are confirmed, processing is facilitated in the form of a reduced N400 [2], but when predictions are disconfirmed, a cost is incurred. This cost shows up in the form of two different post-N400 positivities [3–4]:
  - Anterior positivity to unpredictable but plausible alternatives
  - Posterior positivity to unpredictable and implausible alternatives
- Most studies have focused on predicting affirmative information and little is known about predicting negated information (but see [5–6]).
- Previous research is inconclusive as to whether negation is integrated into sentence comprehension in an incremental manner [7–8].

Research questions:

- Is the processing of confirmed and disconfirmed predictions in negated contexts the same as in affirmative contexts?
- Is negation integrated into sentence comprehension in an incremental manner in highly constraining (i.e. predictable) contexts?

Conclusion

- Processing confirmed and disconfirmed predictions in negated contexts shows similar patterns as in affirmative contexts.
- Despite these similar patterns, the current setup cannot answer whether negation has been integrated in an incremental manner. See below.

Open questions

How do we know that negation has been integrated? Are these effects simply driven by semantic similarity?

- If negation is not integrated incrementally, both high and low cloze alternatives should create incongruencies in the sentence and elicit large N400s. However, there is no baseline condition to compare these potential large N400s against.
- How can we determine whether the elicited effects are driven by predictability or semantic similarity?

a) Latent semantic analysis?

b) Follow-up study? Including a comparable affirmative sentence with a high cloze ending. Similar N400 amplitudes for negated high cloze and affirmative high cloze conditions can then suggest incremental processing of negation.

Method

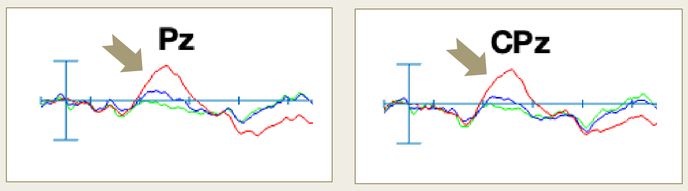
- 27 English native speakers (8 males; mean age = 28.03)
- 120 sentence contexts pretested for predictability and plausibility
- Three conditions: High cloze (HC), Low cloze (LC), Violation (VL)
- Word-by-word presentation for the final sentence: 300 ms presentation, 200 ISI
- ERPs time-locked to target words proceeding negator *not*
- Neuroscan Easycap, 32 channels, Impedance below 5Ω
- offline reference to average of two mastoids, filters of 0.01/40 Hz, ocular artifact rejection by ICA, epochs of 1000 ms (100 ms baseline)
- Mean trial number per condition: 1065

Findings

After the operation, the nurse went into the patient's room to check on him. The anaesthetic was still affecting him and he was in a deep sleep. Even 5 hours after the surgery, the patient was not …

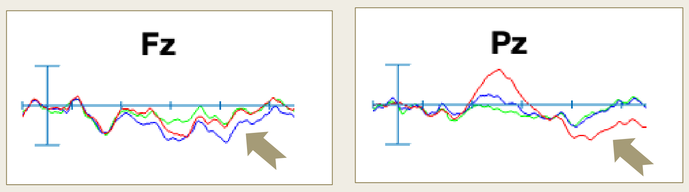
awake [high cloze]
responding [low cloze]
commercial [violation]

N400



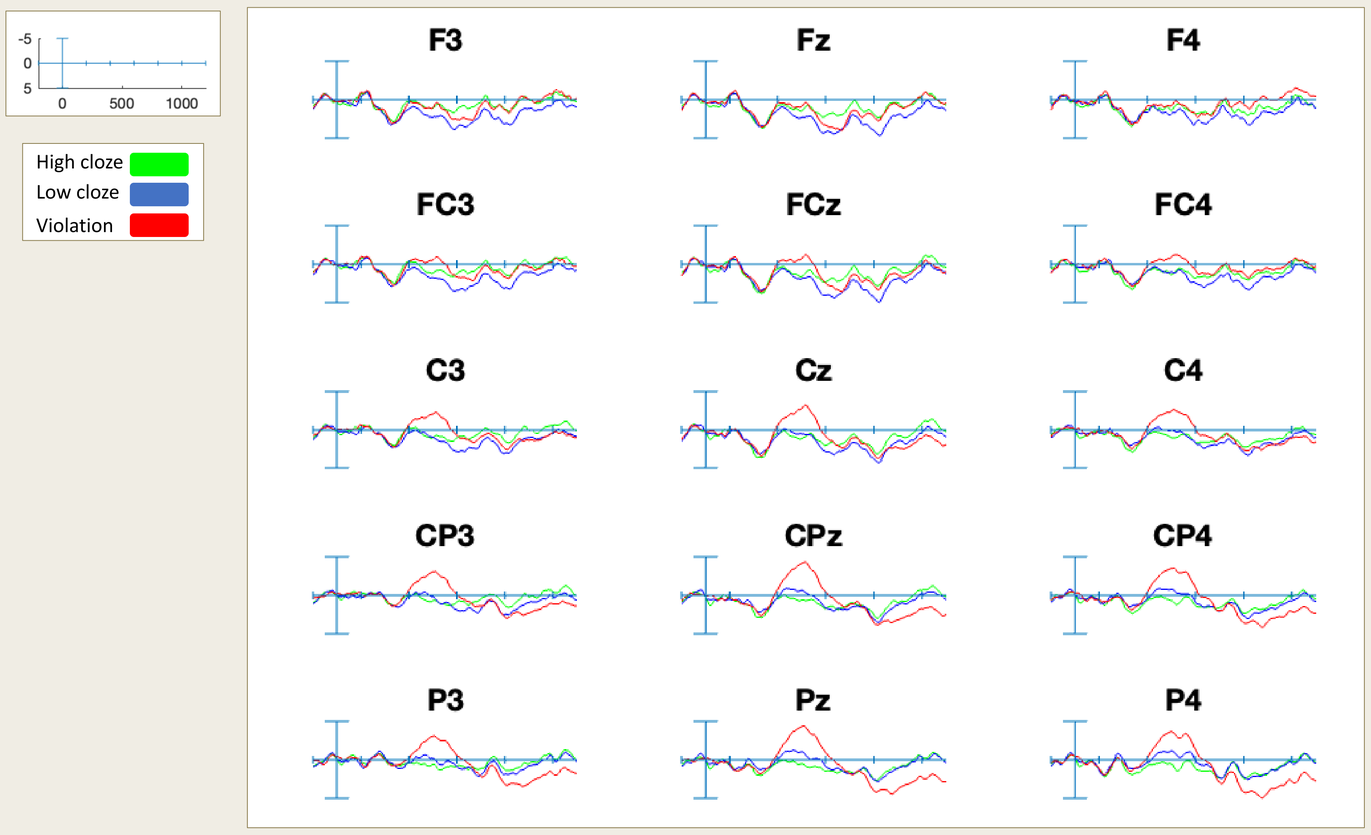
Larger N400 to violations, low cloze and high cloze conditions, in that other

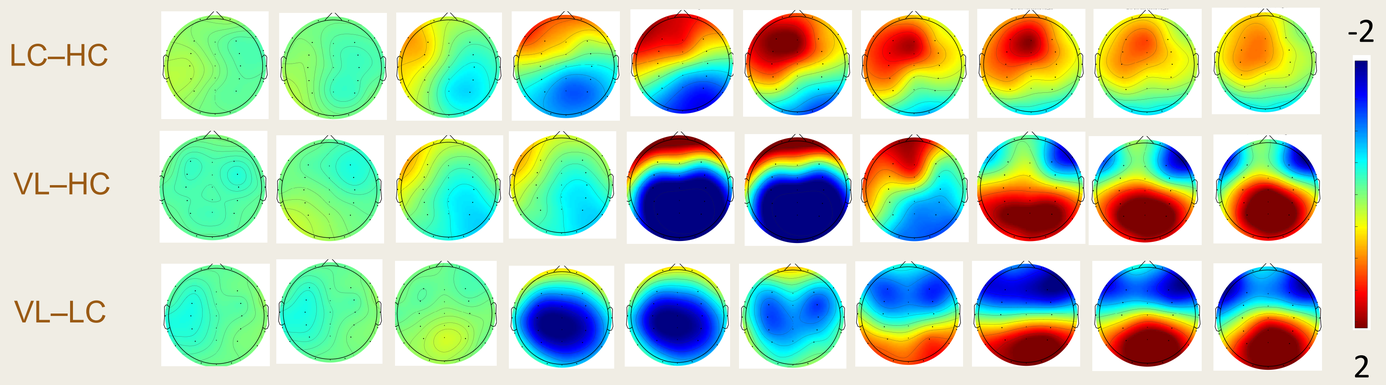
Post-N400 positivity



Anterior positivity to unpredictable but plausible condition

Posterior positivity to unpredictable and implausible condition





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Information

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Presented at Highlights in the Language Sciences Conference
Nijmegen, Netherlands, July 8-11, 2024