

Background

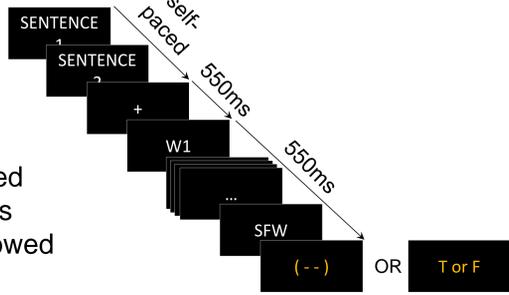
Our question: When and how is the neural activity evoked by incoming words influenced by their predictability and plausibility in relation to their prior discourse context?

- The processing of incoming words whose semantic features have been pre-activated in context is often facilitated during online processing. For example, the amplitude of the **N400** response (300-500ms) is reduced for semantically predictable words relative to plausible but unpredictable words^{1,2}.
- Highly predictable words can also show facilitation on an earlier ERP component—the **N250**^{3,4}, which is thought to reflect facilitated access to a word's lexical form⁵.
- Recent work suggests that the **N400** is also sensitive to a word's plausibility, over and above its lexical predictability (as assessed by cloze probability)⁶. However, this has not been examined in a design that explicitly manipulates plausibility across a wide range of values.
- Words that violate strong predictions can produce prolonged neural responses beyond the N400 time window:
- Plausible words that violate highly constraining contexts can evoke a **late frontal positivity** effect^{7,8}. This effect is not seen to semantically anomalous words. It is thought to reflect a large shift associated with successfully updating an earlier high-certainty interpretation to a new *plausible* interpretation after encountering an unexpected word.
- Semantically anomalous words evoke a **late posterior positivity/P600** effect, which is thought to be triggered by an initial failure of interpretation, triggering second-pass attempts to reanalyze the input⁸⁻¹⁰. However, it remains unclear whether this effect is graded by degree of implausibility, or whether it is only evoked by words that are initially interpreted as *impossible* with respect to the prior context.

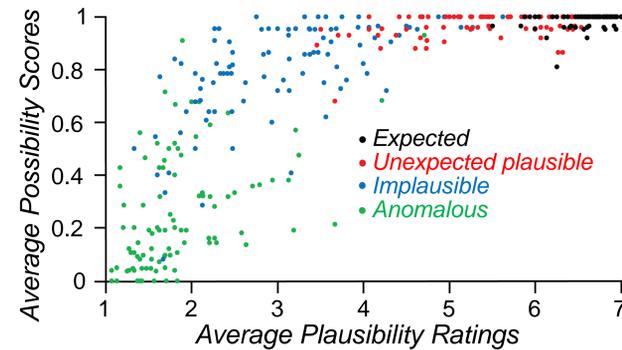
Design and Stimuli

Discourse context	Critical word	Scenario type	Plausibility rating	Possibility score
Eleanor was thrilled about turning eight. Her parents helped her plan a great birthday party. That afternoon, she invited her...	friends	Expected	6.7 [0.3]	0.99 [0.03]
	teammates	Unexpected plausible	5.5 [0.9]	0.97 [0.05]
	accountant	Implausible	3.1 [1.0]	0.81 [0.18]
	projector	Anomalous	1.9 [0.7]	0.26 [0.22]

- Three-sentence discourse scenarios: all constrained strongly for a particular event/critical word in the third sentence
- The same critical words were fully counterbalanced across the three zero-cloze conditions
- 31 native English-speaking participants (aged 18-34; 11 male)
- 25 discourse scenarios per condition, randomly interspersed with 50 plausible filler scenarios
- Comprehension questions followed 50% of trials



Plausibility Norming

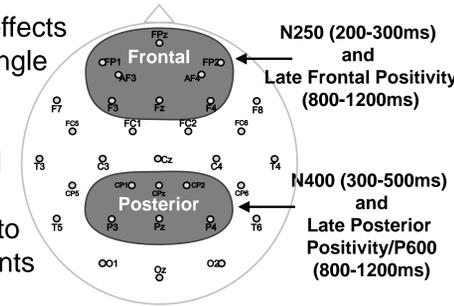


Plausibility ratings: 1-7 Likert scale (1: least plausible)
Possibility ratings: binary possible/impossible judgment (mean possibility scores averaged over items: range 0-1 with 0 being completely impossible)

Statistical Analysis

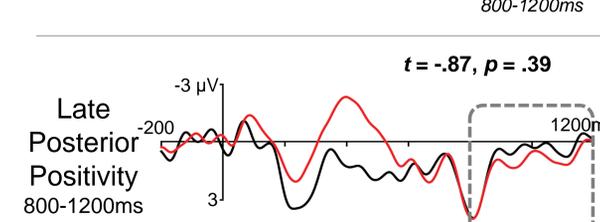
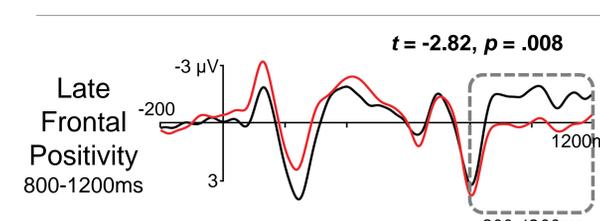
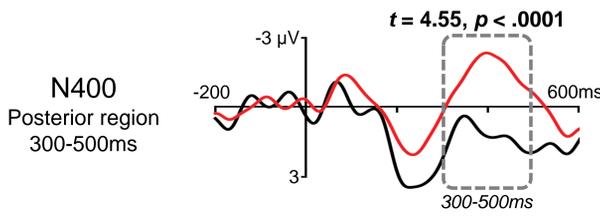
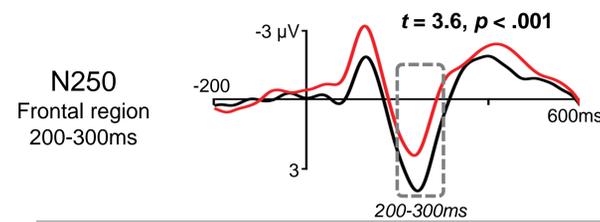
Linear mixed effects analyses on single trial ERP data within spatiotemporal regions that corresponded to ERP components of interest

- Planned contrast between *Unexpected plausible* and *Expected* critical words
- Linear effects of *plausibility* across the zero-cloze words

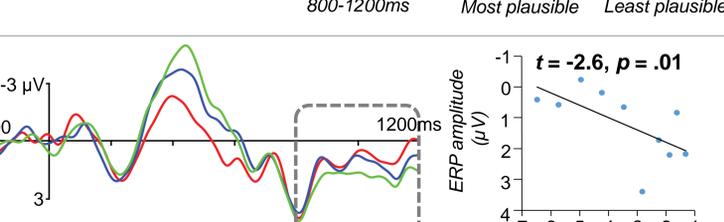
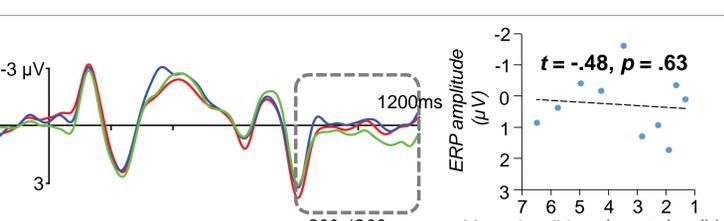
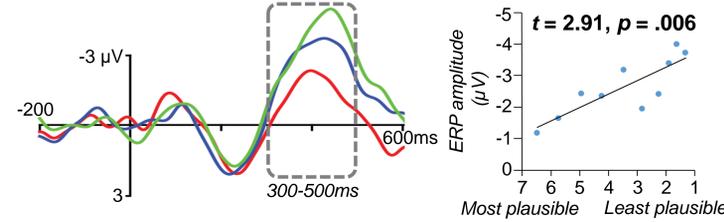
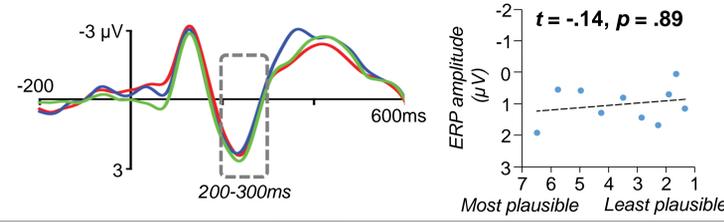


Results

Effect of Predictability (Unexpected Plausible vs. Expected)



Effect of Plausibility (Unexpected Plausible vs. Implausible vs. Anomalous)



Discussion

- Multiple stages of word processing are differentially sensitive to different aspects of the prior context
- Effects of *predictability* within the **N250** time window may reflect facilitation due to the pre-activation of lexical form
- Effects of *predictability* within the early **N400** time window may reflect facilitation due to the pre-activation of semantic features
- Effects of *plausibility* within the **N400** time window may also reflect facilitation due to the pre-activation of semantic features that are not necessarily tied to a specific lexical item¹¹. It may also reflect effects of top-down feedback¹² as comprehenders retroactively attempt to match the semantic features of the critical word with the discourse context
- Effects of *predictability* on the **late frontal positivity** may reflect process of successfully updating to a new plausible interpretation after encountering an unexpected word.
- Effects of *plausibility* on the **late posterior positivity/P600** may reflect second-pass attempts to make sense of the incoming word in relation to the prior context (e.g. through reanalysis at lower levels of representation, with the likelihood of engaging in reanalysis depending on the degree of perceived implausibility).

References and Acknowledgments

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