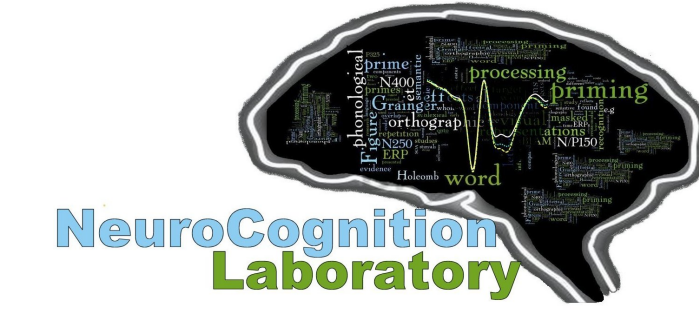




Parafoveal Semantic Integration Eliminates the N400 of Foveal Semantic Violation

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Background

ERP measures of Sentence Comprehension

- Semantic anomalies: N400 (Kutas & Hillyard, 1980)
A negative-going deflection in ERPs that peaks around 400 milliseconds after stimulus presentation
- Syntactic anomalies: P600 (Osterhout & Holcomb, 1992)
A positive-going deflection in ERPs that peaks around 600 milliseconds after stimulus presentation

N400 to an unexpected target word in the parafovea, and the effect was mitigated when target words were foveated (Stites, Payne, & Federmeier, 2017)

Research Question:

1) How do readers process words that carry more semantic vs. syntactic information?

Content Words	Function Words
Rich Semantic Information	Little Substantive Meaning Grammatical Relationship
nouns, lexical verbs, adjectives, some adverbs cat, run, red, quickly	auxiliary verbs, pronouns, articles, conjunction, prepositions, etc. can, he, the, and, in, little, that

2) What about the time course (parafovea vs. fovea)?

Methods

Participants

24 right-handed English monolinguals

Materials

120 critical sentences in 3 conditions + 40 filler sentences

Control

The employee needs to prepare the document for **his boss** this morning.

Content word replaced

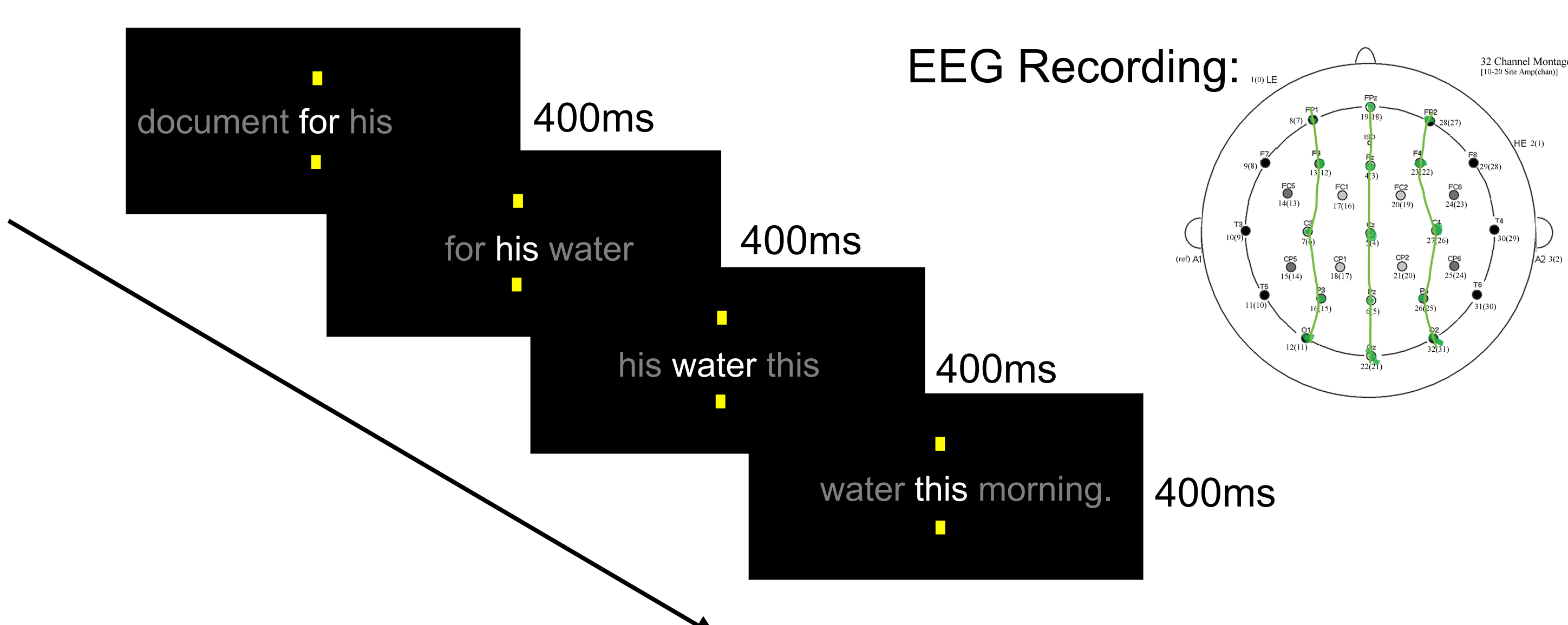
The employee needs to prepare the document for his **water** this morning.

Function word replaced

The employee needs to prepare the document for **on** boss this morning.

Procedure

A visual hemi-field flanker RSVP paradigm

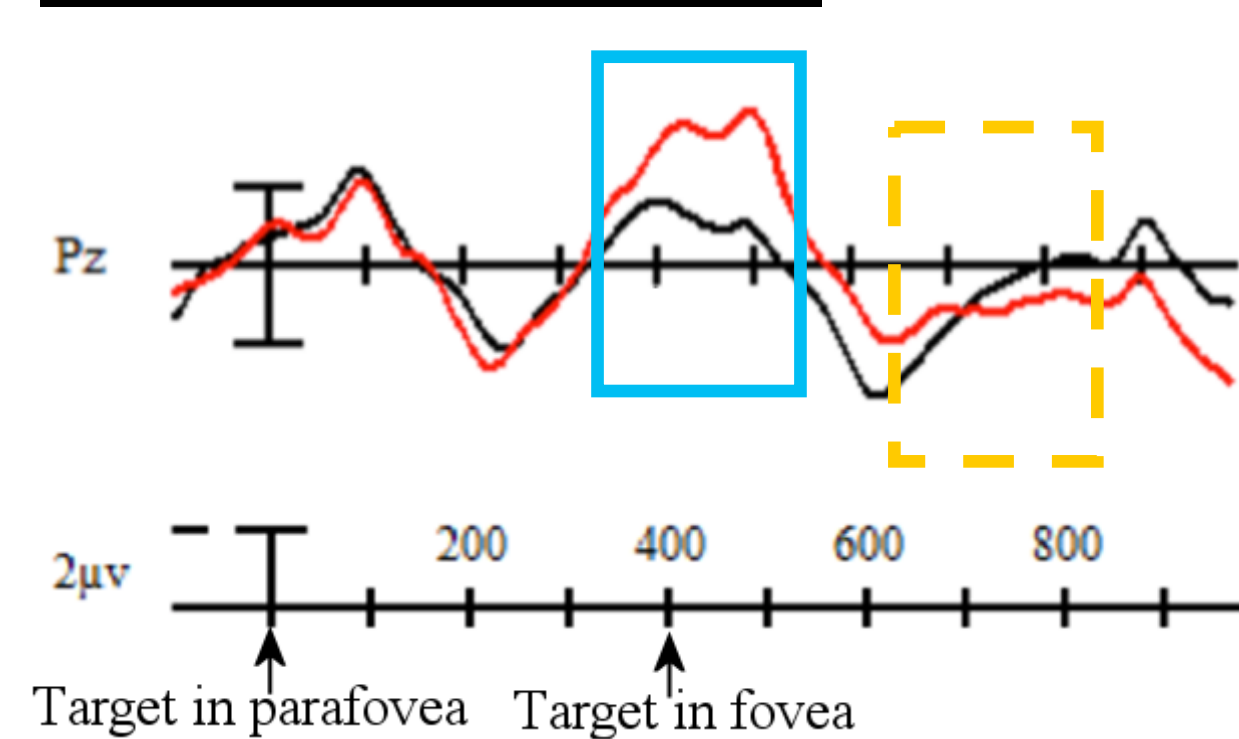


At the end of each sentence, judged whether it made sense or not (yes vs. no). Acc > 85%

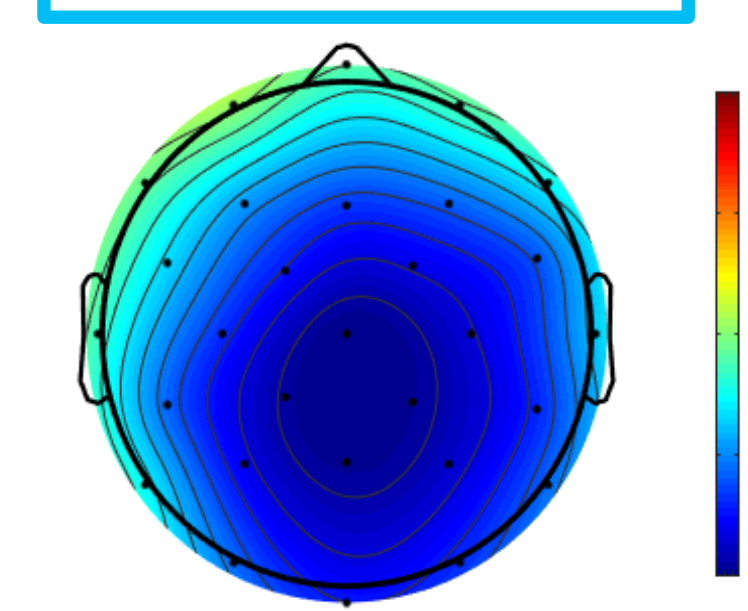
Results

Target Words in Parafovea

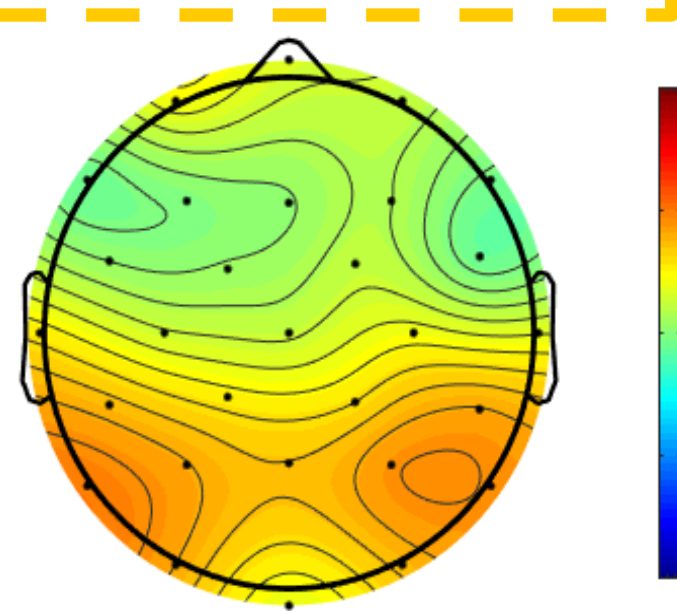
Content Words



350-550ms



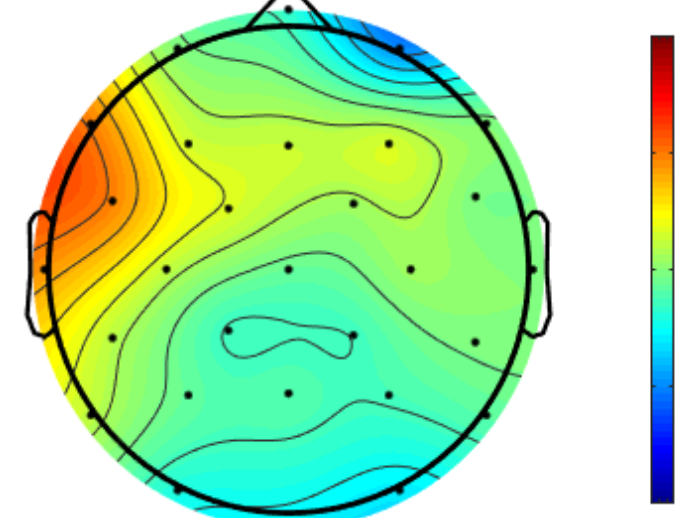
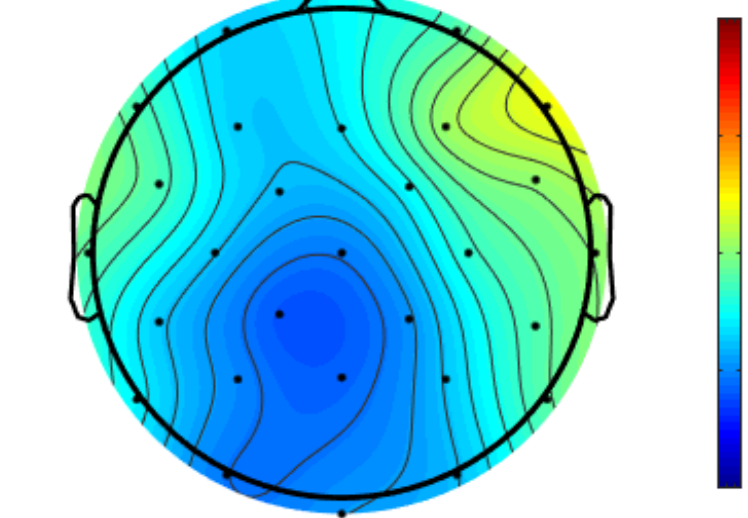
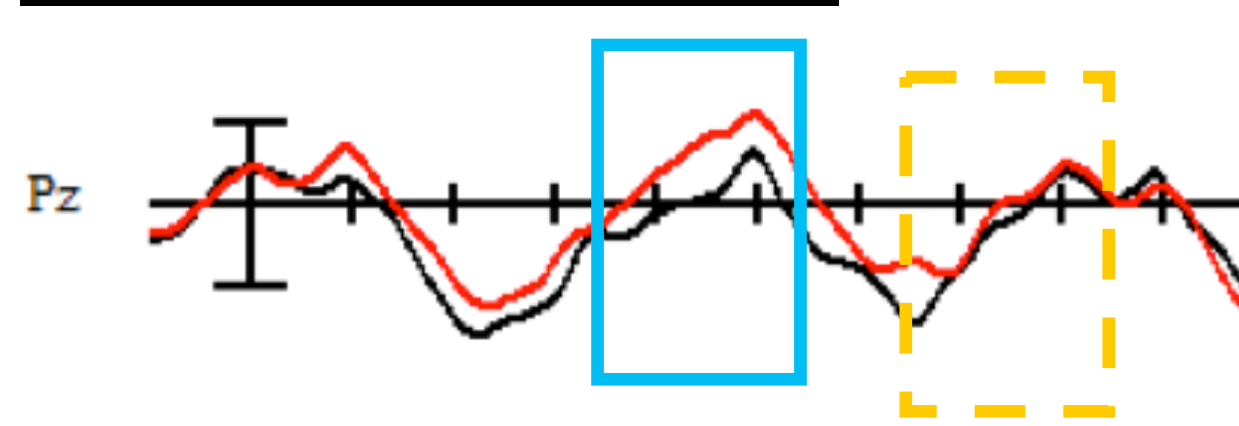
650-950ms



— Control (his/boss)

— Violation (on/water)

Function Words



N400 for both content and function word replacement

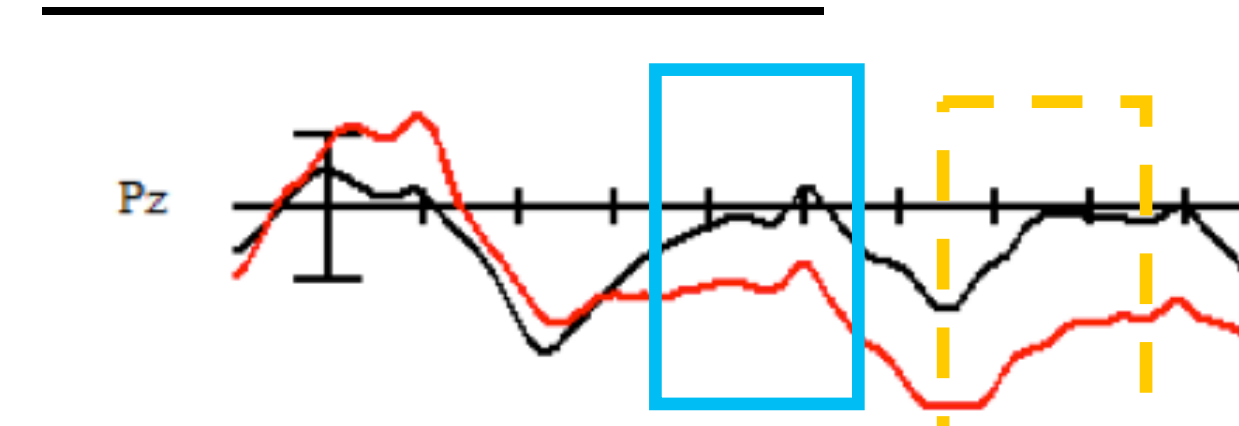
Interaction with laterality

- Content word: whole scalp; slightly toward the right
- Function word: no N400 on the right

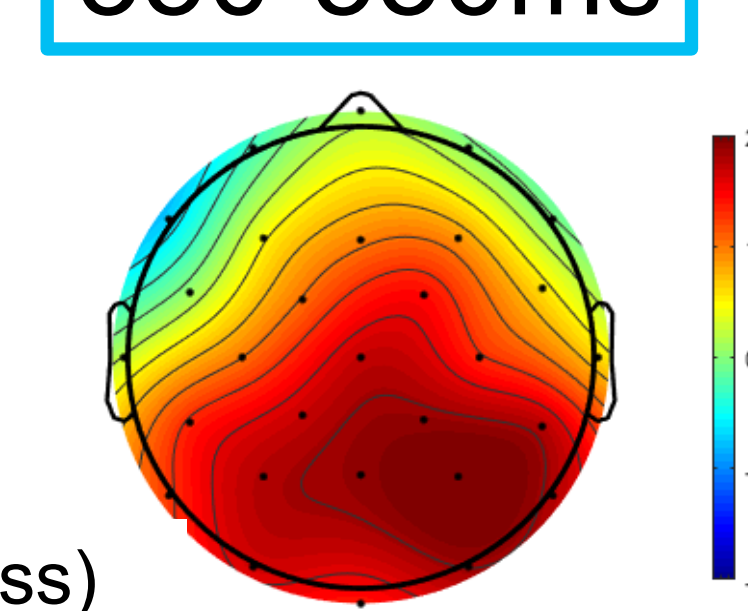
No sign of P600 for either

Target Words in Fovea

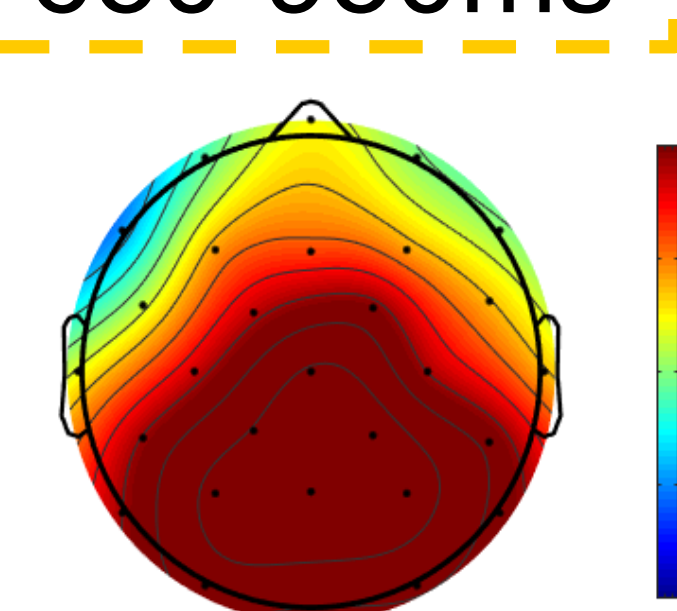
Content Words



350-550ms



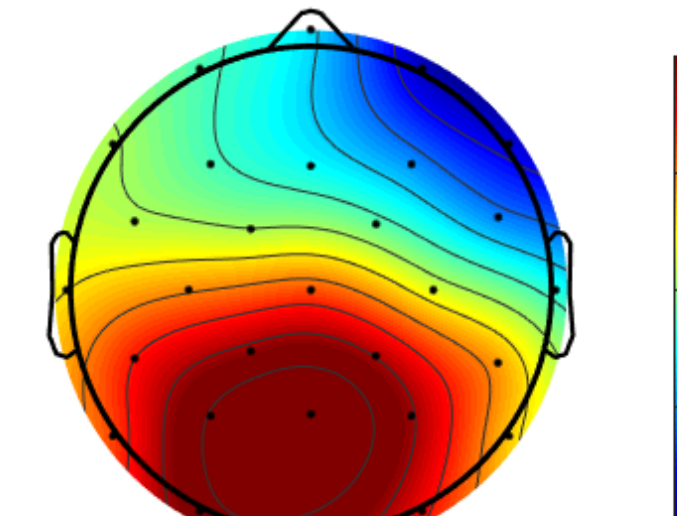
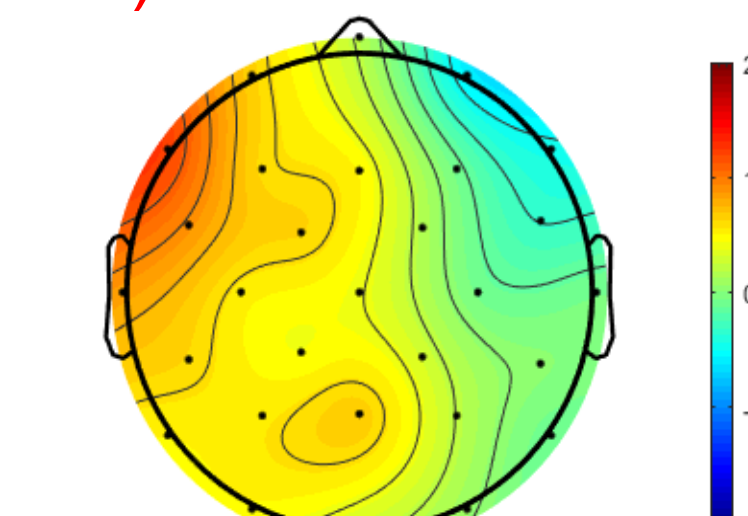
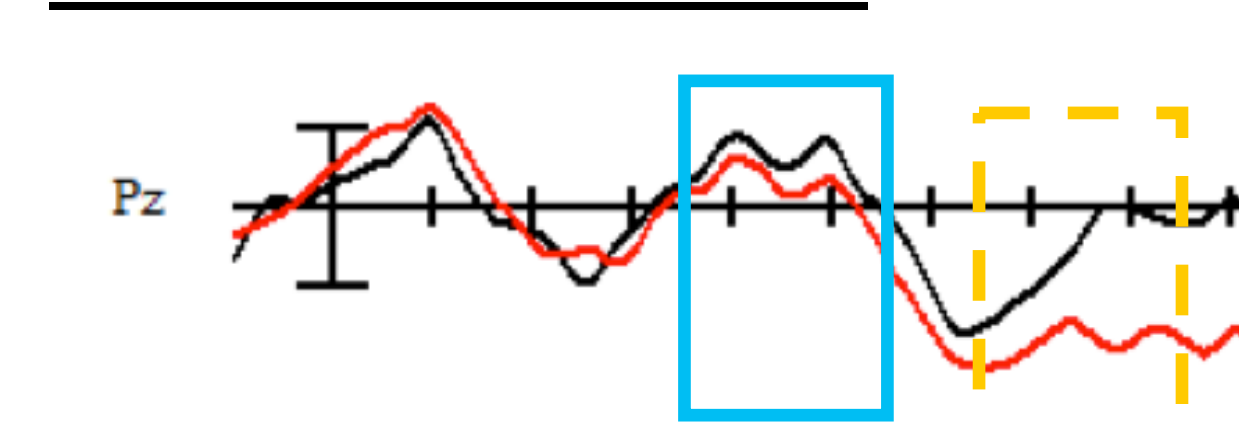
650-950ms



— Control (his/boss)

— Violation (on/water)

Function Words



No sign of N400

Positivity for both content and function word replacement

- Content word: a broadly distributed positivity after parafoveal N400; may be a long-lasting cost of semantic anomaly
- Function word: Later onset of P600

Summary

Unexpected content and function words in parafovea both lead to N400, suggesting early semantic processing (before eye fixation)

The right hemisphere is less sensitive to unexpected function words, probably a sign of less reliance on sentence level semantic integration (also see Coulson et al., 2005; Wlotko & Federmeier, 2013)

No N400 but long-lasting positivity for foveated content targets; probably reflecting the effort to use later context to fix the big semantic anomaly problem

P600 for function words until following words are visible; suggesting the importance of complete context for syntactic processing