Predicting the *foreseeable future*: MEG evidence for lexical preactivation

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Introduction

- Predictable words elicit reduced N400 responses (Kutas & Hillyard, 1984)
- Recent studies suggest that predictability effects are at least in part due to the preactivation of the predictable word (Delong et al., 2005)
- What happens when a specific word is preactivated? Are the same processes involved as when the word is accessed in other contexts?
- Specifically, frequent words elicit reduced neural signals (Rugg, 1990) and take longer to produce (Jescheniak & Levelt, 1994)
- Does the frequency of a predicted word affect neural responses as the prediction is generated?

Procedure

- 475 adjective-noun pairs, varying continuously in transitional probability (TP)
- In half of the trials, the adjective was followed by its most likely continuation:

barbed	wire	(TP = 0.79)
vicious	cycle	(TP = 0.09)
angry	mob	(TP = 0.005)

- In the other half, the noun was a plausible but not the most likely continuation: *full ~~moon~~ time*
- Serial presentation (SOA=600 ms)
- Task: lexical decision on the noun
- 16 right-handed native English speakers

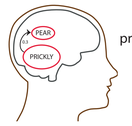
Analysis

- MNE used for calculating distributed source solutions
- Region-of-interest analysis of activity in the left middle temporal gyrus
- Linear mixed-effects regression on averages over 100 ms time windows

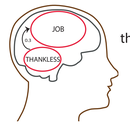
Results

Continuation frequency effect on adjective

good

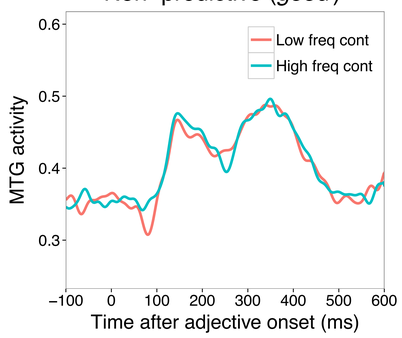


prickly

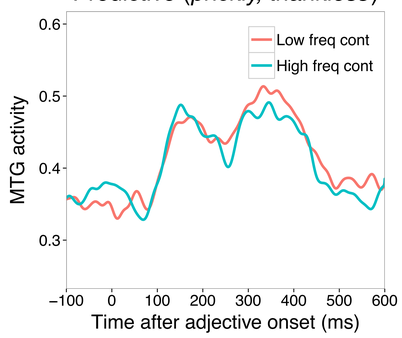


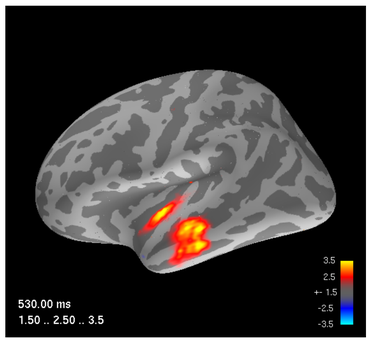
thankless

Non–predictive (*good*)

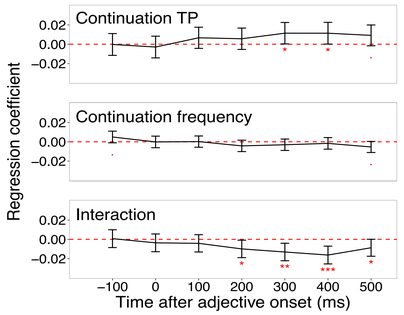


Predictive (*prickly, thankless*)

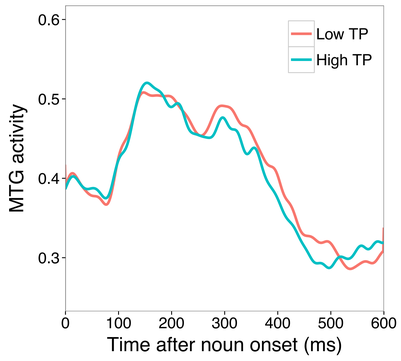


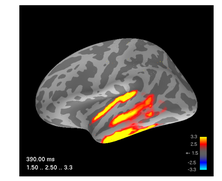


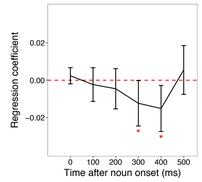
Continuation frequency effect in top 50% predictive adjectives



Noun predictability

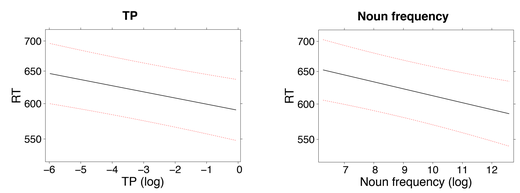






TP effect on noun

Reaction times



Conclusions

- When a specific prediction is licensed by context, the frequency of the predicted word affects neural activity as soon as the prediction can be generated
- This work presents a direct neural measure of prediction, prior to the presentation of the predicted word
- Frequency effects in comprehension reflect more than just the recognition of a visual form

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