Can Prediction Error Explain Predictability Effects on the N1 during Picture-Word Verification?

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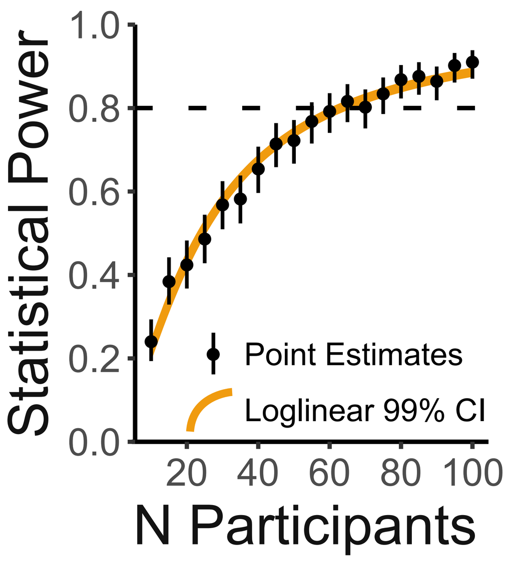
Introduction

- Previous findings suggest the N1 ERP component elicited by words is sensitive to prediction effects, with smaller N1s for predicted words. [1,2,3]
- This pattern may be explained by a simple *predictive coding* model, where N1 amplitude scales with prediction error. [4]
- We tested this account via the interaction between context congruency (*prediction magnitude*) and predictability (*prediction certainty*). [5]

Power Analysis

Monte-Carlo simulations predicted >80% power for N=68 participants



Preprocessing

- 0.1-40 Hz 4th Order Butterworth filter (double-pass, zero-phase).
- Artefact Subspace Reconstruction to remove non-stationary artefacts (σ=20). [6]
- FastICA [7] and ICLabel [8] for automated eye and muscle artefact removal (>80% thresh.).

Conclusions

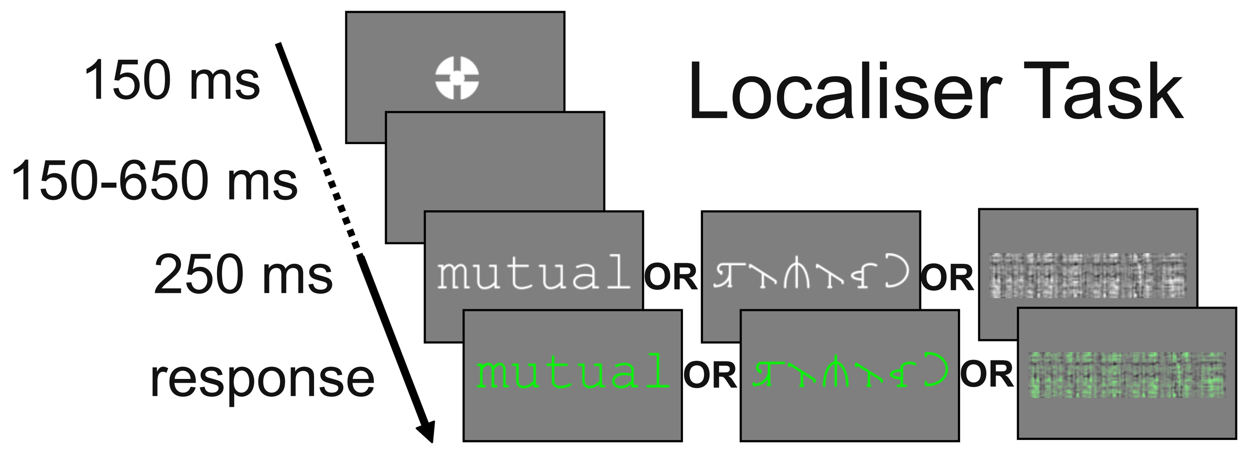
Planned analyses failed to find evidence for the simple Predictive Coding hypothesis.

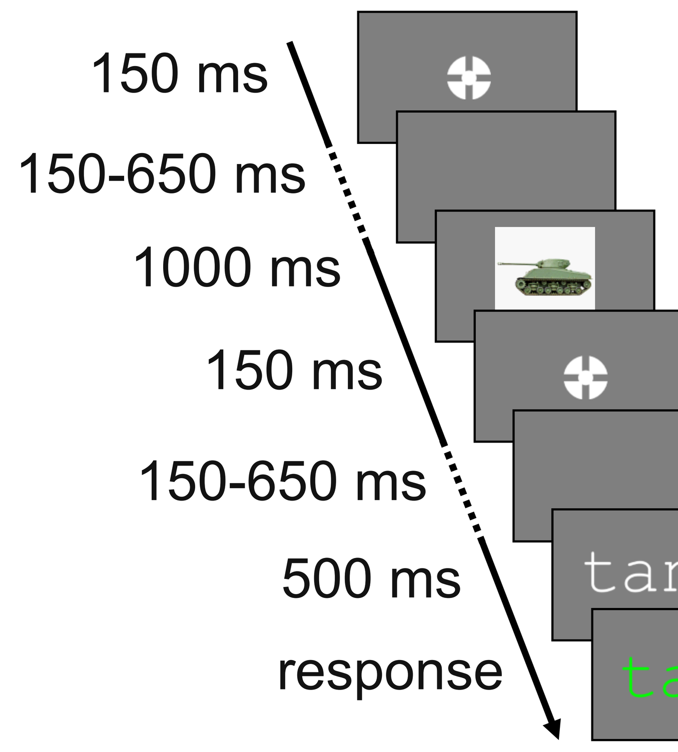
Exploratory analysis found strong evidence against this account.

A simple Predictive Coding account, without elaboration, is insufficient to account for the word N1.

Tasks

N=68 participants completed two tasks while EEG was recorded (64-Channel BioSemi Actiview at 512 Hz).

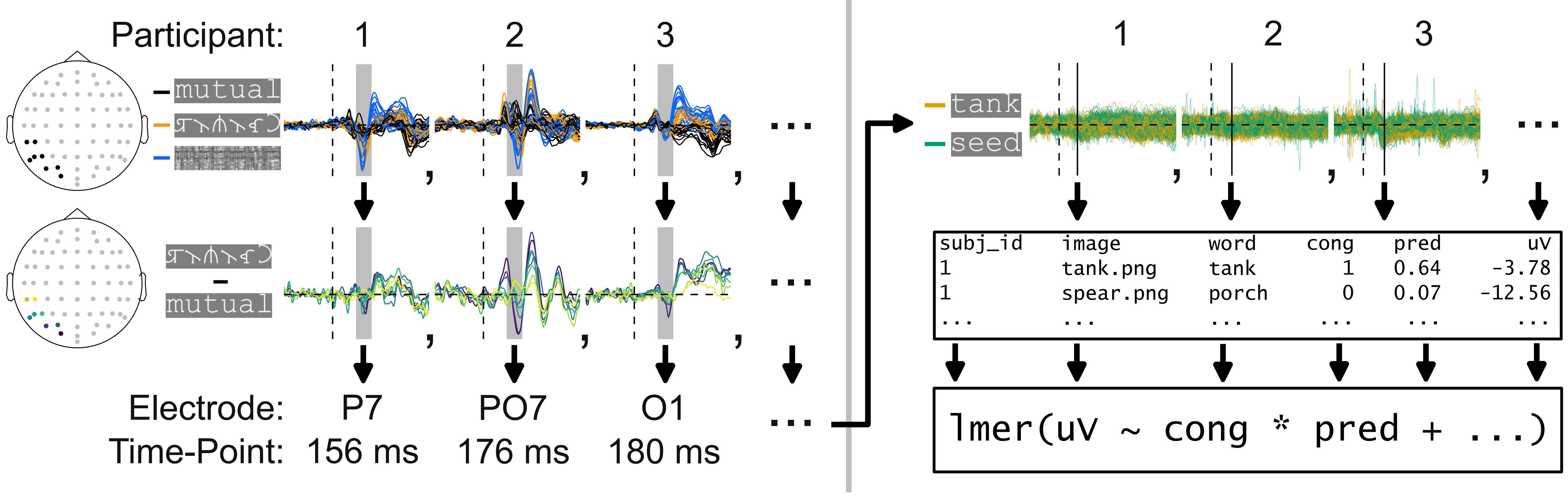


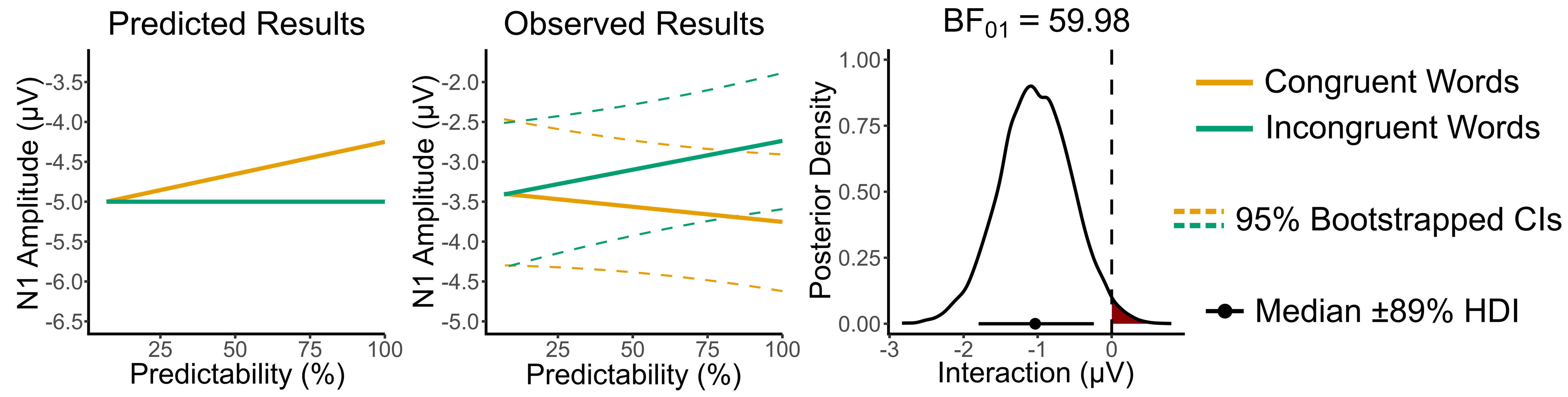


Planned Analysis

Identify Per-Participant Maximal Electrodes and Time Points from Localiser Task

Extract and Model Trial-Level N1 Amplitudes from Picture-Word Task

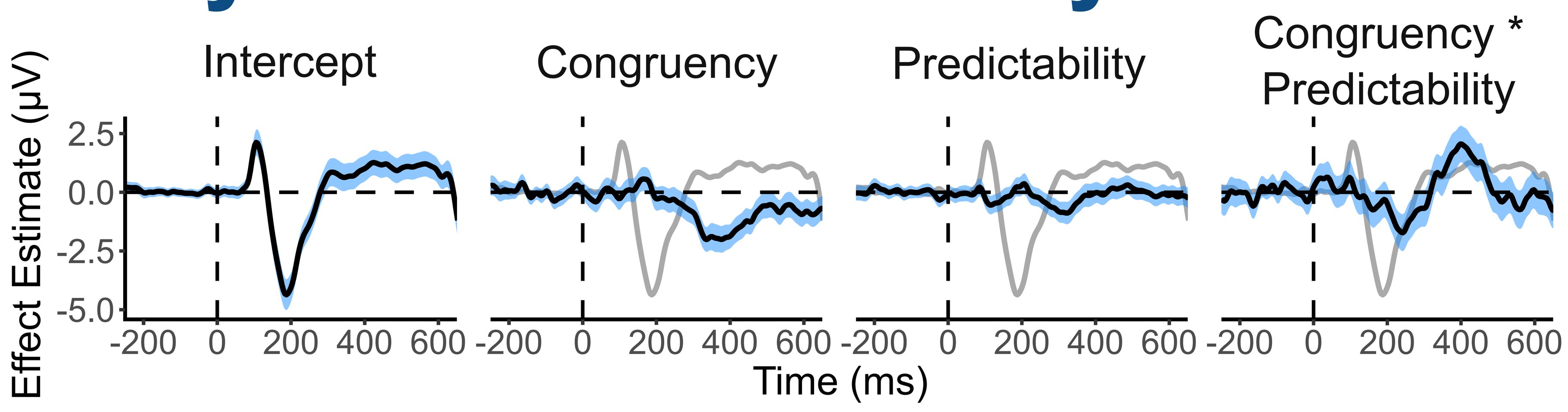


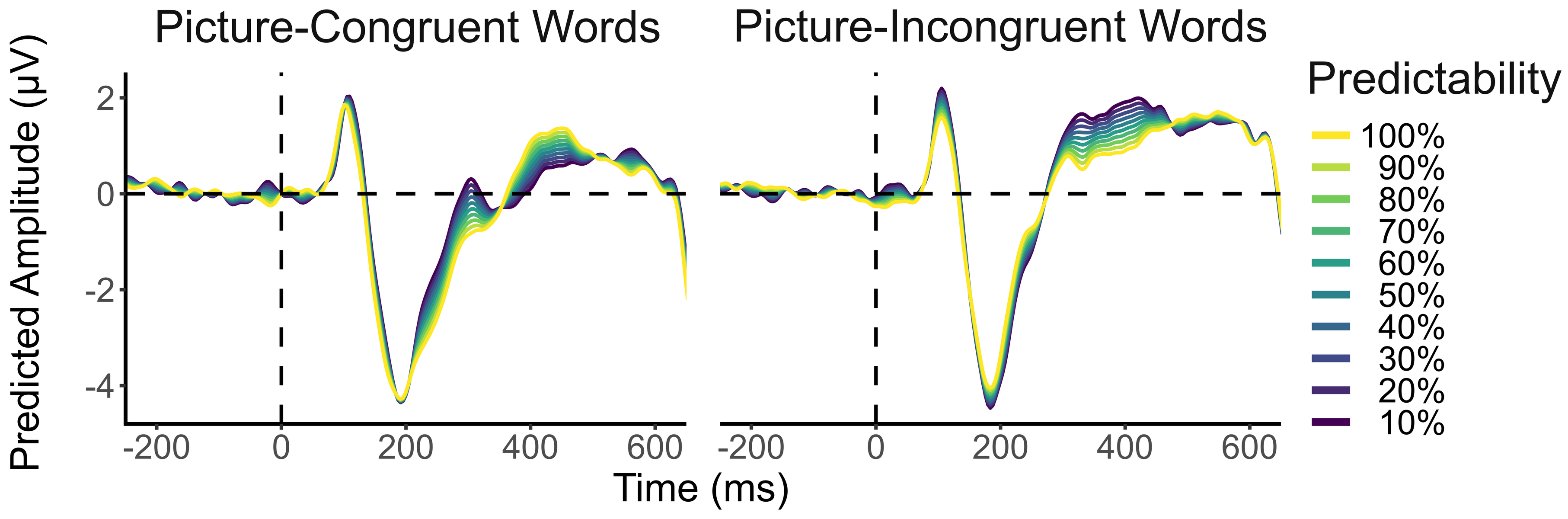


- Pre-registered analyses failed to support the predictive coding hypothesis.
- Exploratory Bayesian analysis found strong evidence against the hypothesis.

Exploratory Timecourse Analysis

- We fit per-sample mixed-effects models to all data from the left occipitotemporal ROI.
- Consistent with the planned analysis, the interaction remained negative throughout the N1.





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