Semantic interference and phonological facilitation in picture-word interference

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BACKGROUND

- Language production is effortless and efficient, despite complexity of the task. Models assume different processing stages, among which are lexical (lemma) selection and phonological encoding (e.g. Levelt, Roelofs, and Meyer, 1999)
- Several researchers have suggested that at least some of these processing stages involve the recruitment of general domain cognitive functions, such as executive control (e.g. Shao, Meyer, and Roelof, 2013) and sustained attention (Jongman, Roelofs, and Meyer, 2015)

AIMS & GENERAL APPROACH

Aims

- Better understand inter-individual variability in word production, and the link between general-domain cognitive functions and processing stages of word production

General approach

- Participants perform a production task (Picture-Word Interference, i.e., PWI) and a battery of non-linguistic cognitive tasks
- Use of distractors to index encoding processes: semantically related to picture name to index lexical access (e.g. Levelt et al., 1999; but see Mahon et al., 2007) and phonologically related to picture name to index phonological encoding (e.g. Meyer and Schriefers, 1991)
- Determine temporal markers of lexical access and phonological encoding with event-related potentials (ERPs), and characterize these markers at the individual level
- Relate variability of the temporal markers and naming latencies to general domain cognitive functions

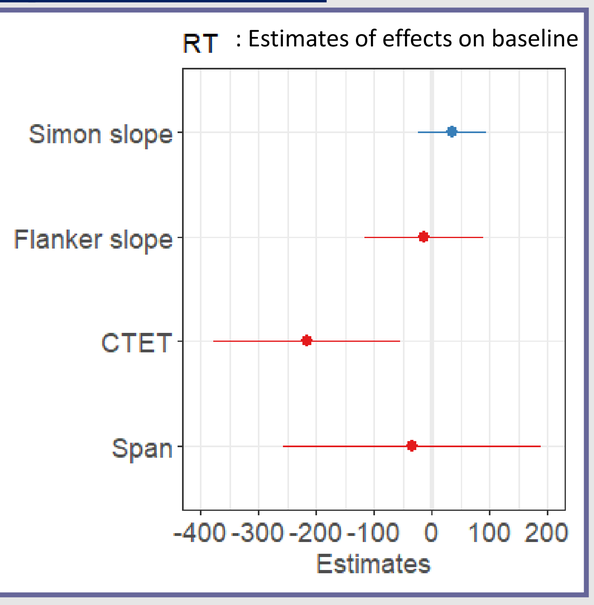
EXPERIMENT

48 participants

Session 1: PWI coupled with EEG	Session 2: General domain cognitive tasks
Material: 90 pictures, each associated with 5 distractor conditions: - Baseline (B; e.g. *Bett-Xxxxxx*) - Phonologically related (PR; e.g. *Bett-Berg*) - Phonologically unrelated (PU; e.g. *Bett-Tuba*) - Semantically related (SR; e.g. *Bett-Sofa*) - Semantically unrelated (SU; e.g. *Bett-Granate*)	- **Inhibition**: Flanker task, Simon task, Stop signal reaction task; - **Working memory** : Operation span task, Symmetry span task, Rotation span task => Mean span - **Sustained attention**: Conjunctive continuous performance task, Continuous time expectancy task

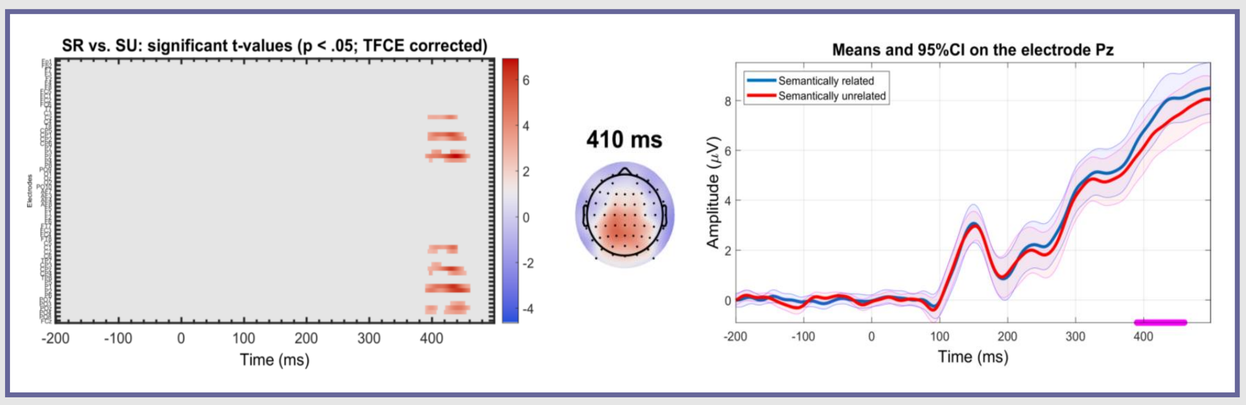
RESULTS: Response times

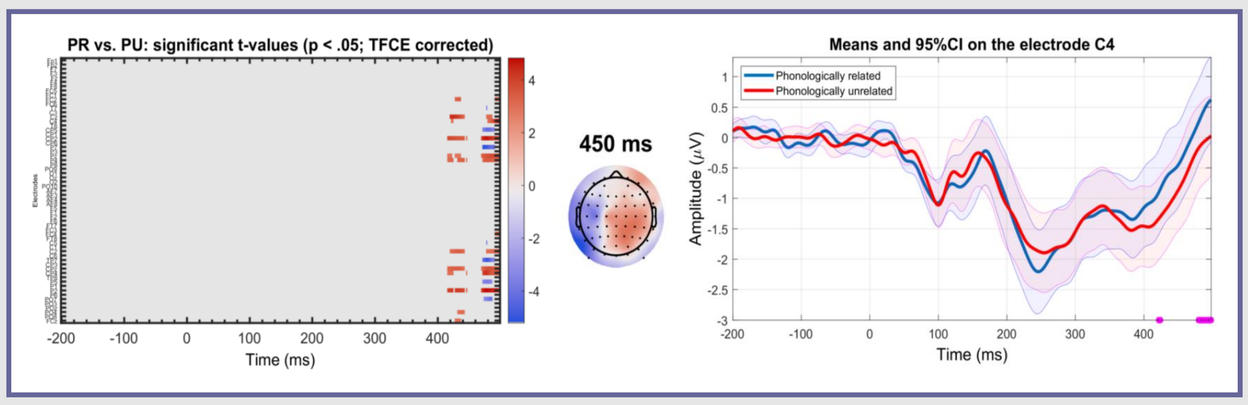
- Phonological facilitation (b = 29, $p < 0.001$) and semantic interference (b = 51, $p < 0.0001$) effects replicated
- Shorter response times overall (and for the baseline) for high CTET scores ($p < 0.05$)
- Participants with high CTET scores show less of a semantic interference effect ($p < 0.05$)

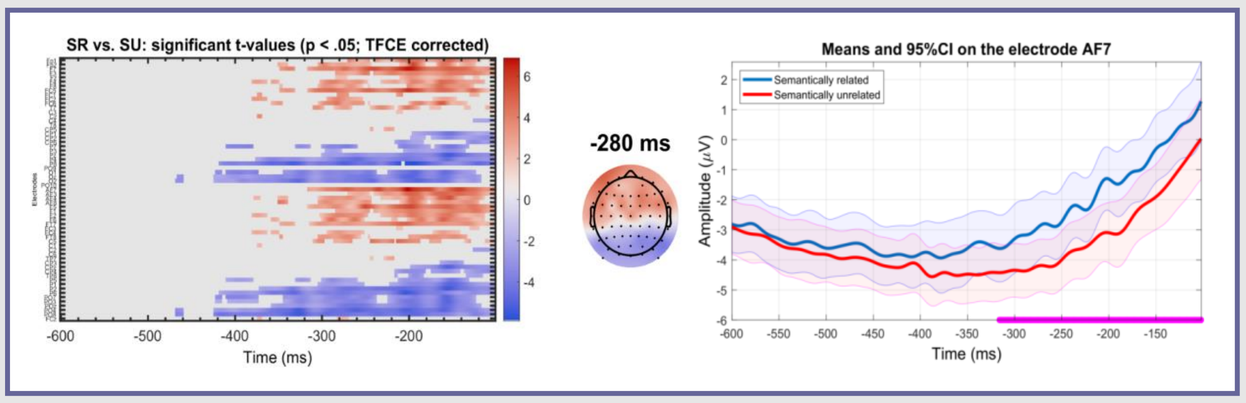


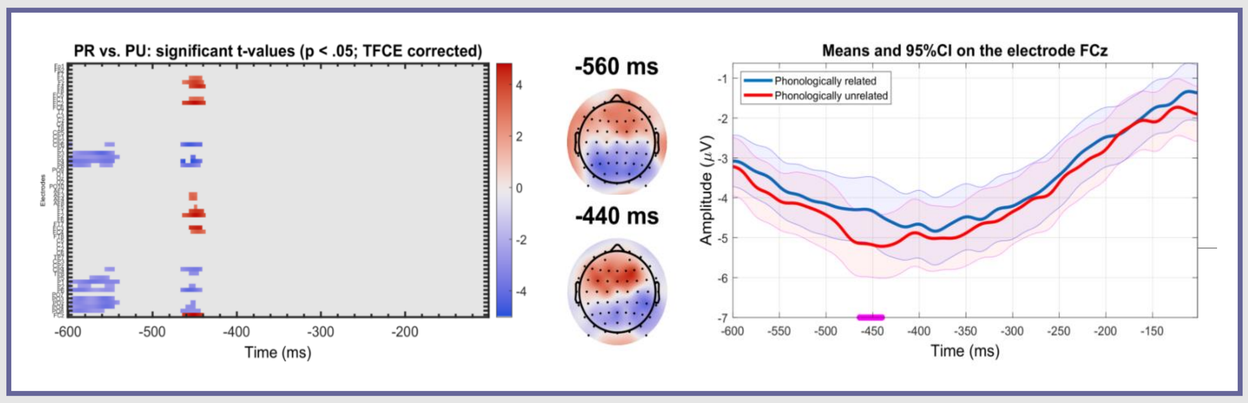
RESULTS: ERPs

Group level (no effect at the individual level)









DISCUSSION

- Semantic interference and phonological facilitation effects in response times replicated
- Sustained attention found to modulate response latencies and semantic interference effect
- Semantic interference and phonological facilitation effects observed in group analysis of the ERPs, temporal order of these effects at odd with lexical account of semantic interference. Could these effects reflect post-lexical encoding (response exclusion hypothesis)?
- No semantic or phonological relatedness effect found at the individual level in ERPs
- On-going exploratory analyses on distributions of RTs (ex-Gaussian analysis and delta plots) and to relate metrics of non-linguistic functions to ERPs
- To what extent do PWI effects, induced by explicit distractors, reflect encoding processes in simple naming?

References

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