Encountering an unexpected particle should be very surprising and may therefore be lexically predicted. Target analysis, anterior region (FC1-Fz-FC2): PNP; to unexpected words in high- vs. low-constraint contexts. [2-4] In a previous experiment, we observed a larger PNP at unexpected, implausible particles when constraint was strong. [1] This was surprising, because amplitude of the PNP should only be affected by constraint if the unexpected word is still plausible. [2-4] We attempted to replicate our surprising result in a large study.

2. Design

German particle verb sentences were divided into two constraint conditions:

- **Condition (a):** Context strongly constrained for only 1 plausible particle, implausible particle presented.
- **Condition (b):** Context moderately constrained for at least 2 competing plausible particles, implausible particle presented.

ERPs were analysed at implausible particles (a vs. b).

Control sentences with plausible particles were compared with the implausible conditions as a sanity check that the expected N400/P600 ERPs were analysed at implausible particles, implausible particle presented.

In a previous experiment, we observed a larger PNP at unexpected, implausible particles when constraint was strong. [1] This was surprising, because amplitude of the PNP should only be affected by constraint if the unexpected word is still plausible. [2-4] We attempted to replicate our surprising result in a large study.

3. Methods

- 32-channel EEG
- 54 length-matched, plausible particle verb control sentences
- 100 participants
- 25 target items per condition
- 108 fillers
- RSVP 190 ms/word + 20 ms/letter, target particle 700 ms, 300 ms ISI
- Comprehension questions after each sentence
- Bayesian LMM with maximal random effects structure modelled by-trial interaction of condition, constraint and particle type
- Waveforms were compared using a Bayesian LMM, with a significance threshold of 0.05.

4. Results & Conclusions

Although the direction of the PNP effect appeared to have reversed (Fig. 2), the Bayes factor was 7.1 in favour of the null hypothesis that there was no difference in amplitude associated with the constraint manipulation. \( \hat{\beta} = -0.42 \mu V, 95\% CI = [-0.97, 0.12] \mu V. \)

**What did we learn?**

- We did not replicate our CUNY 2019 result, but provide a large-sample, conceptual replication of findings that constraint does not influence PNP amplitude at implausible words. [2-4]
- Since the PNP was not sensitive to our constraint manipulation with implausible particles, we cannot tell whether readers predicted the particle in condition (a) vs. (b).

5. Exploratory analysis

- Previous research suggests that the PNP is not affected by constraint at implausible words, but also that it is not elicited by implausible words at all. [2-4]
- In contrast, there was a reliable difference in waveforms elicited by plausible and implausible particles in our replication experiment. \( \hat{\beta} = 0.57 \mu V, 95\% CI = [0.22, 0.92] \mu V. \)
- This may suggest that our region of interest was too posterior, as this finding is more consistent with a posterior P600. [4]
- We therefore combined data from both experiments and compared ERPs at plausible and implausible particles in a more anterior region. [4]

**Figure 2.** Target analysis, anterior region (FC1-Fz-FC2): PNPs elicited by implausible particles (coloured), original and replication experiments. ERPs for plausible particles (grey) are displayed for reference.

**Figure 3.** Sanity check, posterior region (Cz, CP1, CP2, Pz): Implausible particles elicited the expected N400 and P600 relative to plausible particles in both the original and replication experiments.

**Figure 4.** ERP from a more anterior region, Fp1-Fpz-Fp2.

- There was a trend in the expected direction, but the result was inconclusive. \( \hat{\beta} = 0.26 \mu V, 95\% CI = [-0.11, 0.62] \mu V. \)
- The inconclusive plausible/implausible difference may reflect more variable cloze probability among plausible particles, or that implausible verb particles are not as implausible as the anomalous nouns used in previous research. [2-4] A more controlled experiment is needed.

**Bibliography and links**


@stonekatem Chat with Kate Friday, 12-2pm EDT