1. What did we do?

- Many German verbs take particles (e.g. to fill something out), which can be separated by long distances; much longer than English.
- But the meaning of the verb cannot be fully interpreted until the particle is seen, unless it is predicted in advance.

**Hypothesis:** Readers will predict the verb particle in advance, but only when they are very certain of its identity.

**Prediction:** Violating a lexical prediction will result in greater processing difficulty (larger N400) than when no specific prediction has been made.

2. Design

- Particle verb sentences constrained for either 1 particle, or at least 2 competing particles.
- ERPs measured at ungrammatical particles to test for prediction failure.

Example item, shortened for brevity:

Der Gastgeber füllte das Getränk [...] sehr vorsichtig...

- a. aus, um den kleinen...
- b. auf, um den kleinen...

The applicant filled the form [...] very carefully out/at in order to...

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- a. Aus, um den kleinen...
- b. auf, um den kleinen...

The host filled the drink [...] very carefully up/at, in order to...

3. Methods

- 32-channel EEG
- 44 target items
- 50 participants
- 62 filler sentences
- 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 mean amplitude 250-500 ms at electrode Pz.

**Exploratory analysis:**
- The same LMM was fitted to mean by-trial amplitude 600-900 ms at electrode Cz.
- Larger late positivity for 1-particle than 2+particle violations (b > d), \( \hat{\beta} = -0.25 \mu V, 95\% CI = [-1.21, 0.72] \mu V, Pr(\hat{\beta} < 0) = 0.71 \).
- Larger late positivity for 1-particle than 2+particle violations (b > d), \( \hat{\beta} = 0.96 \mu V, 95\% CI = [-0.20, 2.11] \mu V, Pr(\hat{\beta} > 0) = 0.95 \).

4. Results

- Deviations from the pre-registration; 10 extra subjects (no data were analysed prior to extending recruitment); no Bayes factors used due to vague priors.
- A visual check established that violations elicited the expected N400 and late positivity (grammatical vs. ungrammatical particles):

5. Conclusions

We propose that:
- When there was only 1 plausible continuation (a/b), a lexical prediction was triggered.
- This prediction enabled a richer representation of the sentence to be built.
- When the violation was encountered, attempts at integration or repair were made (7, 10, 11).
- The late positivity reflects this cost.

Tentatively: German native speakers make long-distance lexical predictions if constraint is not just high but also strongly favors a single lexical item.

6. Bibliography

[1] Lif t et al. (2018)