Relative clause processing in a flexible word order language: Evidence from Hungarian

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Objectives

Use the flexible word order of Hungarian to tease apart expectation-based vs. memory-based accounts of relative clause (RC) processing.

Background

- Important case study in the processing of syntactic complexity: RCs.
- Asymmetry between the English subject-extracted RC (1a) and object-extracted RC (1b). ORC is harder to process than SRC.

1. The engineer who annoyed the analyst wrote a report about the project.
2. The engineer who the analyst annoyed wrote a report about the project.

Competing classes of accounts:

- Memory-based accounts: predict general locality preference – shorter filler-gap dependencies are preferred (Gibson, 1998; Lewis & Vasishth, 2005).
- Expectation-based accounts: attribute greater processing cost to less expected structures (e.g. surprisal, Hale, 2001; Levy, 2008).

In English, the predictions of both accounts converge, since English SRCs instantiate a shorter filler-gap dependency than ORCs, and they are also more frequent.

Experiment 1: extraction site × locality

In Hungarian, extraction site and locality (i.e. the length of the relevant filler-verb dependency) can be varied independently.

SRCs: either VO = local (2a) or OV = non-local (2b). Cf. English VO.

2. A mérnök, aki idegesített az elemzőt... the engineer, who annoyed the analyst.
   b. A mérnök, aki az elemzőt idegesített... the engineer, who the analyst annoyed...

ORCs: either VS = local (3a) or SV = non-local (3b). Cf. English SV.

3. A mérnök, aki idegesített az elemzőt... the engineer, who the analyst annoyed...

Self-paced reading: extraction site (SRC vs. ORC) × locality (local vs. non-local).
- 81 monolingual speakers of Hungarian (aged 18-35).
- A comprehension question followed each sentence. In order to avoid an event plausibility confound, nouns (e.g. engineer, analyst) were counterbalanced to occur in both head NP and RC NP positions.

Leyv et al. (2013), in a similar manipulation in Russian, found an advantage for local sentences at RC verb. Memory and Expectation have the same prediction for Russian.

References


Predictions

- Memory: Word orders with local/shorter filler-verb dependencies less costly (2a, 3a) than non-local ones (2b, 3b), irrespective of SRC/ORC.
- Expectation: Different predictions, based on probability estimates.
  - Local structures more costly to process. \( \text{RC} \rightarrow \text{SRC} \)
  - General advantage for SRCs. \( \text{RC} \rightarrow \text{relative pronoun} \)


Experiment 2: context manipulation

- No effect of expectation at RelPr. RCs are so infrequent that the surprisal of an RC parse obscures the SRC/ORC difference?
- Support: RT on RelPr was the highest in the whole sentence in Exp. 1.
- Prior research: RC-biasing contexts are known to help avoid ambiguity with main clause interpretation (see i.a. Gibson & Wu, 2013).

Context story: Mary is working together with two engineers on a project. She received a report on Sunday, but didn’t know which engineer wrote it. She asked her secretary.

SPR: The secretary replied: The engineer who annoyed the analyst for many years was the one who wrote a report about the project.

Same experimental setup. 67 native monolingual participants.

Results of Exp. 1

- Trials with incorrectly answered comprehension questions were excluded.
- RCfinal regions represent PPs.
- RCNP appears pre- and post-verbally on the plot, depending on condition.

Discussion

- When participants are already biased towards RC structures: shorter filler-gap dependencies are easier to process – locality effect.
- Otherwise, complexity is dominated by incremental probabilistic update.
- Two potential directions:
  - More fine-grained probability estimation under context are needed.
  - Another possibility is that online probabilistic update and online dependency building are two independent mechanisms.

Conclusion

Hungarian RCs tease apart the predictions of Expectation and Memory accounts: both capture RC processing, but under different conditions.
- In the absence of context, Expectation prevails.
- However, in RC-biasing contexts, Memory is supported.