Comprehending Anaphoric Presuppositions Involves Memory Retrieval too

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Memory in Processing Presuppositions?

Anaphoric presupposition triggers such as again and too are thought to establish a dependency relation between the trigger and its presupposed content.


Like other anaphoric dependencies, establishing presuppositional dependencies likely relies on memory processes. There are three possibilities:

1. Discourse content may be actively maintained in working memory.
2. Previous experimental work suggests that the processing of presuppositions exhibits a locality bias (Kim 2015), suggesting a serial search retrieval mechanism.
3. However, presupposition triggers like again have been reported to rapidly sensitive to presupposition violations (Tiemann et al., 2011), suggesting a direct access retrieval mechanism.

Hypotheses & Predictions

These three possibilities may be distinguished by differences in the availability and retrieval speed of the presupposed content.

- If actively maintained → there should be no difference in either availability or retrieval speed as dependency length increases.
- If retrieved → availability should be reduced as dependency length increases.
- If not via direct access → retrieval speed should be slowed as dependency length increases, indicating serial search (McElree, 2000).

Pilot Study

Replication of Martin & McElree (2011)

- Martin & McElree (2011) reported that distance had no effect on the time for memory access in the processing of sluicing constructions.
- They suggested that antecedents are retrieved via a cue-based direct-access mechanism that is susceptible to general memory variables.
- Using DDM, we replicated their findings for sluicing, manipulating Distance and Acceptability:
  - Near-Grammatical: Michael slept and studied, but he didn’t tell me what.
  - Far-Grammatical: Michael studied and slept, but he didn’t tell me what.
  - Near-Ungrammatical: Michael slept and studied, but he didn’t tell me which.
  - Far-Ungrammatical: Michael studied and slept, but he didn’t tell me which.

Speeded acceptability judgement (N = 64) on MTurk

An experimenter-paced, phrase-by-phrase sentence reading task RSVP presentation.

Followed by an end of sentence acceptability judgment with binary choices.

Results:

- DDM revealed no effect on τ or α, suggesting that memory access during the processing of sluicing constructions is not a serial search mechanism.
- This is in line with Martin & McElree’s (2011) report of needing only a single intercept parameter (and multiple asymptote parameters, similar to our findings for significantly different βs).

The Current Study: too

The pilot study suggests that DDM can be used to model speed-accuracy tradeoffs during memory retrieval in sentence processing.

Specifically, a difference in τ or α can be used to infer whether a serial search or a direct access retrieval process is at play.

Drift Diffusion Model

Drift Diffusion Modelling (DDM) has been used to analyse two alternative forced choice experimental designs:

- We use DDM as an alternative to Multiple Response SAT, a methodology that dissociates memory access from retrieval speed and availability.
- Advantage of DDM: it provides convergent evidence to SAT, and has advantages in requiring fewer response time measurements to recover meaningful parameters.

DDM jointly models accuracy and response time distributions with parameters that reflect distinct underlying memory retrieval processes.

We focus on three parameters:

- τ, nondecision time, the time required for memory access (similar to the SAT intercept);
- α, boundary separation, the retrieval speed (similar to the SAT rate);
- δ, drift rate, the asymptotic accuracy reflecting the quality of the memory trace (similar to the SAT asymptote).

Because we are modelling accuracy, we assume that response bias β = 0.5.

Results & Analyses

Accuracy data:

- Participants were more accurate at resolving the presupposition dependency in the Near condition, suggesting availability differences.
- There was a main effect of Distance (t = 4.769, p < .001) and Context (t = 3.604, p < .001).
- Their interaction was non-significant (t = 0.671, p = .502).

Reaction time data:

- There was a main effect of Context (t = 2.755, p = .007) with only a marginally significant interaction between Distance and Context types (t = 1.799, p = .079).
- However, planned comparison revealed no effects of Distance within the Context types.

DDM Analysis:

- DDM revealed an effect of Context on τ, but not Distance, and no effect on α.
- We found no significant effects of Distance in terms of speed of retrieval.
- This is consistent with a cue-based direct access model of memory retrieval.

General Discussion

Key findings:

- Our results support the idea that the processing of the anaphoric trigger too involves memory retrieval processes.
- More specifically, the comprehension of the presupposition of too favors a local antecedent in terms of accuracy but not retrieval speed, supporting a content-addressable, direct access mechanism.
- Comprehenders are able to directly access the representation of a presupposed content that has been established in the discourse, without searching through irrelevant intermediate material before finding the desired representation in memory.

Implications:

- Retrieval of the presupposed content of too by a direct access mechanism fits well with evidence for other types of linguistic dependencies, such as pronoun resolution (Foraker & McElree, 2007), VP ellipsis (Martin & McElree, 2008), and sluicing (Martin & McElree, 2011).

- These findings contribute to a growing body of empirical evidence suggesting that the memory representations of discourse dependencies formed during comprehension are content-addressable and retrieved with a direct-access process.

- It has been proposed that triggers may be “hard” or “soft” depending on the possibility of accommodation (Abusch, 2010), raising the question of whether different triggers behave differently with regards to memory retrieval.

- The answer may be directly related to memory retrieval mechanisms.

- For instance, a direct-access retrieval mechanism may be best suited for “hard” triggers during the processing of presuppositions, since these require exhaustive search of context which would be burdensome for a search-based mechanism.

Remaining questions:

- What “cues” are being exploited to retrieve the memory representations of presupposed content?
- Certainly not morph-syntactic cues, e.g. person/number/gender for pronoun resolutions.
- Discourse cues? How are they represented?
- How should distance be represented when the antecedent that satisfies the presupposition is not in the same sentence as the trigger?
- A theory of the hierarchy of discourse content (e.g. Q10) may provide a solution to this question
- What are the processing costs for memory retrieval and context update? How are these related to presupposition accommodation, where memory retrieval fails but the context can still be updated?

Selected References


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