

Memory Retrieval in the Processing of Anaphoric Presuppositions

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Memory in Presupposition?

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

e.g. Beck (2007), Heim (1992), Kripke (1990/2009), van der Sandt (1992), among others.

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 be rapidly sensitive to presupposition violations (Tiemann et al, 2015), 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).

Experiment 1: Again

Speeded acceptability judgement (N = 34) on MTurk

- 96 items: Content (Explicit vs Inferred), Context (Different vs Same VPs), Distance (Zero vs One vs Two)
- Sample items:
 - **Explicit:** Beth went diving/#swimming yesterday. [...] [...] Today, she went diving **again**.
 - **Inferred:** Beth got divorced/#fired ten years ago. [...] [...] This year, she got married **again**.

d' Analysis

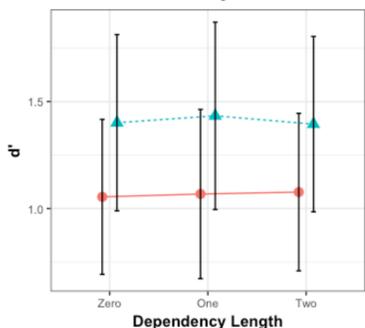


Fig. 1: Model d' estimates of Explicit vs. Inferred content across dependency lengths

Diffusion model

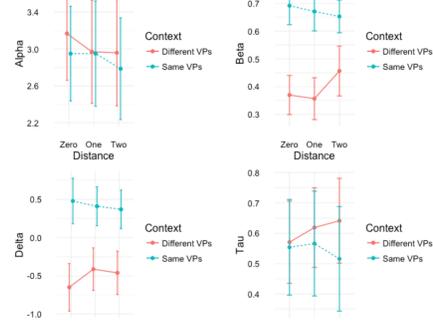


Fig. 2: Diffusion model for the Explicit content

d' score analysis:

- Participants were more accurate at resolving the presuppositional dependency with Explicit content compared to Inferred content ($t = 2.661, p < .010$).
- But the critical factor of distance played no role, suggesting no *availability* differences.

Diffusion model analysis:

- No differences in *availability* (Explicit: $t_\alpha < 1.408, t_\delta < 1.006$; Inferred: $t_\alpha < 1.004, t_\delta < 0.926$).
- Hint of *retrieval speed* differences (Explicit: $t_\tau = 2.423, t_\beta < 0.562$; Inferred: $t_\tau < 1.872, t_\beta < 0.926$).
- Taken together, these interaction between Distance and VP type lend mixed support for memory retrieval in the processing of *again*.

Confounds:

- The use of pronouns in the final clause may have already activated memory search.
- Maximised presupposition & temporal adverbials → upcoming materials may be predictable.

Experiment 2: Too

Acceptability judgement (N = 60) on MTurk

- Based on a 7-point Likert scale
- 64 items: VP (Different vs Same), Distance (Near vs Far), Trigger (Too vs No Too)
- Sample items:
 - **Different:** If the editor *plagiarized*, then [everyone at the publishing house would be shocked to hear that] the critics (#)resigned (**too**).
 - **Same:** If the editor *plagiarized*, then [everyone at the publishing house would be shocked to hear that] the critics *plagiarized* (**too**).

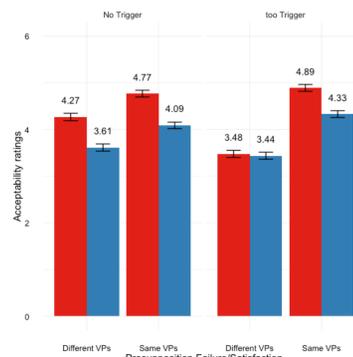


Fig. 3: Acceptability rating

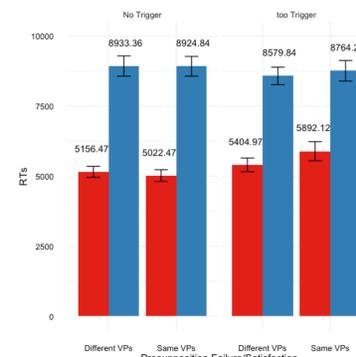


Fig. 4: Reaction times

Acceptability ratings:

- A significant interaction between distance and context ($t = 3.366, p < .001$).
- No Trigger: main effects of distance ($t = 10.837, p < .001$) and context ($t = 7.953, p < .001$).
- Too Trigger: a distance effect only in the Same VP condition ($t = 6.348, p < .001$), but not in the Different VP condition ($t = 0.476, p = .634$).
- This finding of distance effects suggests that there are memory retrieval processes at play.

Reaction times:

- In the Near condition, sentences with *too* elicited longer response times (~870 ms) compared to sentences without *too* in the Same VP condition, where the presupposition is satisfied.
- This suggests that successful presupposition retrieval and subsequent discourse update may be costly.

Experiment 3: Too

Speeded acceptability judgement (N = 64) on MTurk

- Same materials as Experiment 2
- An experimenter-paced, phrase-by-phrase sentence reading task followed by an end of sentence acceptability judgment

Accuracy analysis:

- In No Trigger conditions, accuracy reduced as a function of distance, but *too* Trigger conditions maintained higher accuracy across distance.
- Overall, participants were more accurate at resolving the presuppositional dependency in the Near condition:
 - All two-way interactions were significant
 - Significant distance effects in the *too* Trigger condition with Same VPs ($z = 3.008$), and the No Trigger conditions (Same VPs: $z = 5.171$; Different VPs: $z = 4.153$).
 - The No Trigger conditions showed the most loss accuracy as the distance increases.
- The data suggests that anaphoric triggers like *too* seem to have a differential effect on distance.

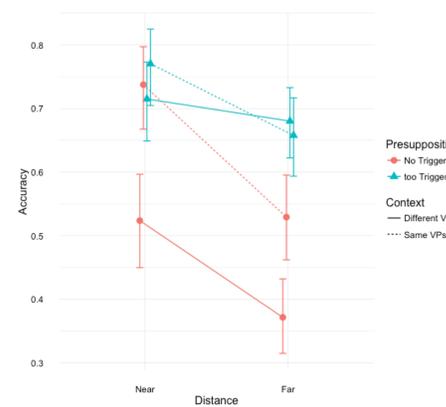


Fig. 5: Accuracy rates across dependency lengths

Diffusion model analysis:

- A significant effect of distance in terms of *availability* ($t_\alpha = 1.979, t_\delta = 2.298$).
- Marginal effects of distance in terms of *retrieval speed* ($t_\tau = 0.842, t_\beta = 1.976$).

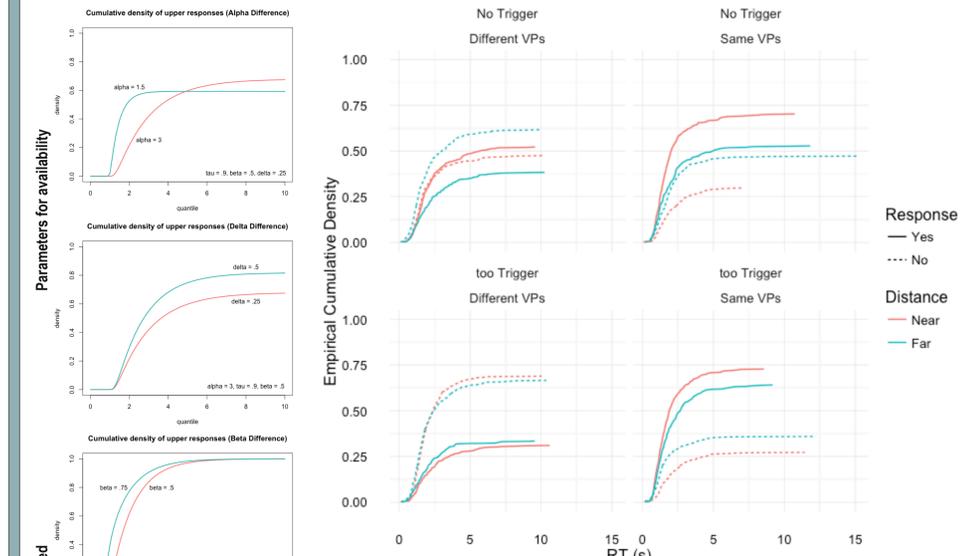


Fig. 6: Model estimates for each parameter

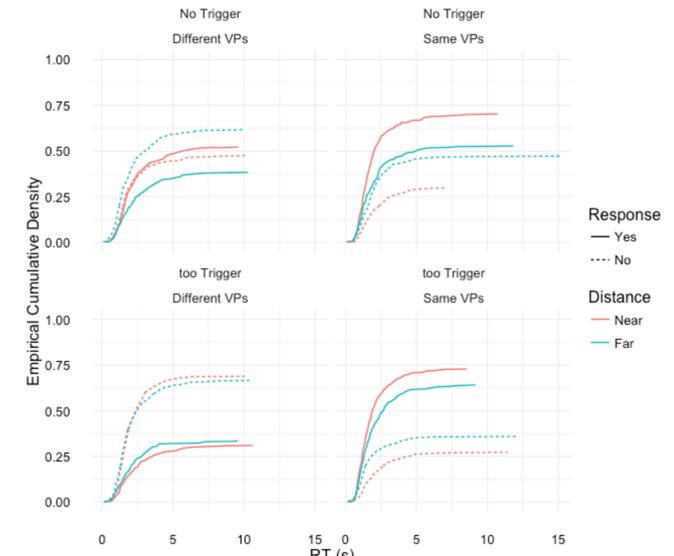


Fig. 7: Diffusion model of Empirical Cumulative Density over reaction times

Parameter	Distance	Context	Presupposition	Context * Presupposition
Alpha	1.979			
Tau		3.596		1.802
Beta	1.976		2.521	2.316
Delta	2.298	1.866	4.004	

Table 1: t values for (marginally) significant parameters

Presupposition	too Trigger		No Trigger	
	Same	Different	Same	Different
Context				
Distance	Near	Far	Near	Far
Alpha	3.3	2.8	3.0	2.9
Tau	0.85	0.80	1.02	0.93
Beta	0.59	0.52	0.59	0.58
Delta	0.82	0.31	0.39	0.27
			0.53	0.03
			0.07	-0.33

Table 2: mean values for parameter fits

General Discussion

Key findings:

- Our results support the idea that the processing of anaphoric presupposition triggers involve memory retrieval processes.
- In particular, 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.

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 experimental work on the processing of discourse dependencies and raise questions of whether other types of presupposition triggers also initiate the same memory retrieval process.

Remaining questions:

- What cues are being used during the retrieval process of *too*?
- Are the hints of difference in the β parameter ephemeral, or are they related to memory processes? If the latter, are they related to memory access via serial search, or do they indicate memory retrieval of the stored content (Wagers & Phillips, 2014)?
- What are the processing costs for memory retrieval and presupposition update? How are these related to presupposition accommodation, where memory retrieval will fail but the context can still be updated?

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