

Memory retrieval is sensitive to discourse status: through the lens of pronoun resolution

While the mechanism of working memory (WM) support for language comprehension has been extensively studied, it remains an under-explored question of how WM support and discourse constraint interact with each other. The current study, making use of the distinction between appositive relative clauses (ARCs) and restrictive relative clauses (RRCs), investigates how information with a different discourse status is retrieved from WM.

ARCs are commonly known as side comments, separate from the main clause, holding a *subordinate discourse* status; on the contrary, RRCs, as part of the main clause, is considered to belong to the *main discourse* content [1]. Recent studies showed that information inside ARCs (i.e., *subordinate discourse* information) is less prone to memory retrieval interference effect than information inside RRCs (i.e., *main discourse* information), evidenced by the absence of the number agreement attraction or NPI interference effect with ARCs [2-4], or reduced syntactic complexity effects [5-7]. As this previous line of work primarily focused on syntactic dependencies, the current study looks at pronoun resolution, comparing the memory retrieval of grammatically accessible antecedents that belong to either the main or the subordinate discourse content.

Design: A self-paced reading task experiment was conducted in English on native English speakers (subj $n=104$; item $n=32$). Two plural NPs and a 3rd person plural possessive pronoun (*their*) were used in the sentence, where either NP can be the antecedent of the pronoun (1). Each trial was followed by an antecedent choice task with three options: NP1 (e.g., *the violinists*), NP2 (e.g., *the singers*), and *someone else not mentioned in the sentence*. A Clause factor (RRC vs. ARC) was included, as well as the sentential position of the relative clause (Medial vs. Final). In the Medial RRC condition (1a), the two antecedents (NP1 and NP2) both belong to the main discourse content (NP1 in the matrix clause; NP2 in the RRC); but the two antecedents in the Medial ARC condition (1b) have a different discourse status (NP1 in the main discourse; NP2 in the ARC—subordinate discourse). Pronoun resolution in these two conditions involves memory retrieval of two competing antecedents. Competing antecedents have been shown to lead to processing cost/penalty, especially when the experimental task involves deep processing [8]. We predict RTs at the pronoun to be (1a) > (1b), if the two antecedents in (1a) belong to the same discourse layer and compete with each other, while in (1b), the two antecedents have a different discourse status, and the competition is less strong. By contrast, in the other two conditions (1c-1d), by placing the ARC/RRC in the sentence-final position, the two antecedents sit in the matrix clause and share the same discourse status (i.e., main discourse content) in both conditions. We thus do not predict meaningful RT differences between (1c) and (1d) at the pronoun (*their*) region.

Results: For antecedent choice (Figure 1), we found a 2-way interaction of Clause type and Position ($se=0.046$, $z=6.546$, $p<0.001$): a preference for NP2 in the Final conditions and a preference for NP1 in the Medial conditions, where NP1-preference is modulated by Clause type. For RTs (we included the design factors, the antecedent choice, and the RT of the previous region as predictors in the regression model), we found a 2-way interaction at both the critical pronoun ($b=0.129$, $se=0.025$, $t=5.128$) and the spillover region ($b=0.094$, $se=0.029$, $t=3.233$) (Figure 2), where RTs were RRC > ARC only when the relative clause was in the sentence-medial position.

Discussion & Conclusion: The antecedent choice results illustrate a greater tendency to select the NP1 in the Medial conditions and the NP2 in the Final conditions, suggesting a preference for the subject NP within the same clause as the antecedent of the pronoun [e.g., 9]. Crucially, in the Medial RRC (1a) and the Medial ARC (1b) condition, the RT on the pronoun is longer when the two antecedents have the same discourse status (1a), compared to (1b), where the two antecedents have a different discourse status. Furthermore, results show that such processing cost difference is no longer present when the antecedents always share the same discourse status, as in the two Final conditions (1c & 1d), suggesting that the discourse status of the antecedent is crucial for pronoun resolution. Taken together, we found evidence that WM retrieval is sensitive to the discourse status of the retrieval target.

(1) **Examples.** RRC condition without a comma(s). ARC condition with a comma(s); Regions of interest are bold-faced. Two possible antecedents are italicized. The '/' sign marks self-paced-reading regions.

- a. Sentence-Medial RRC
The / violinists / who / admired / *the / singers /* invited / **their / mentors** / to / the / party.
- b. Sentence-Medial ARC
The / violinists, / who / admired / *the / singers,* / invited / **their / mentors** / to / the / party.
- c. Sentence-Final RRC
The / singers / admired / *the / violinists /* who / invited / **their / mentors** / to / the / party.
- d. Sentence-Final ARC
The / singers / admired / *the / violinists,* / who / invited / **their / mentors** / to / the / party.

Figures 1-2.

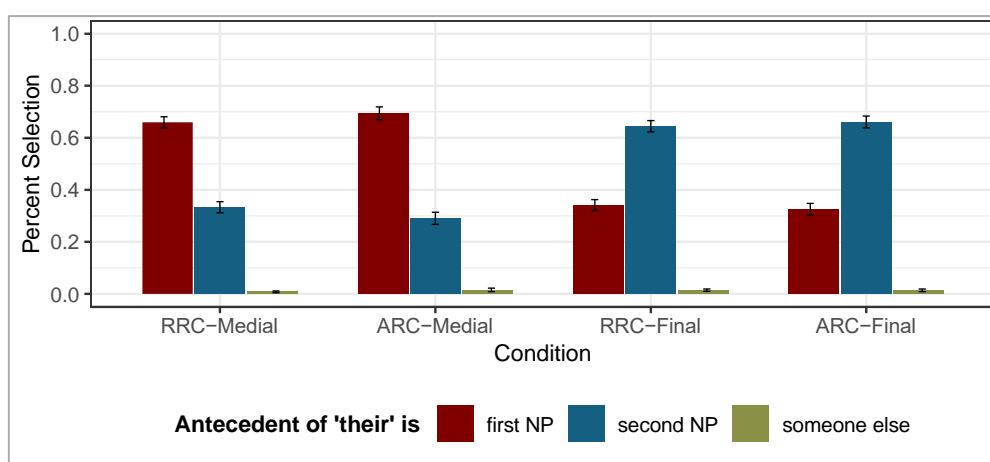


Figure 1.

Percentage of antecedent selection.

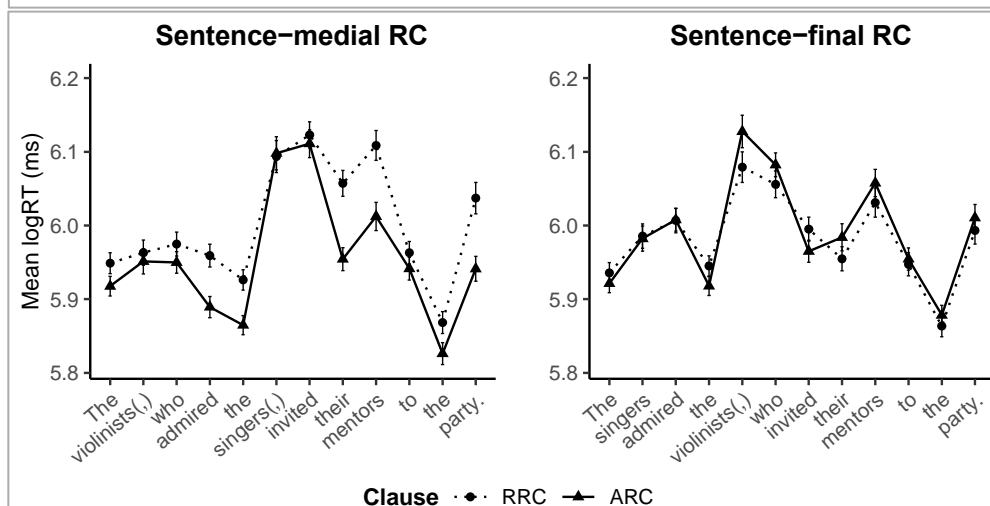


Figure 2.

Mean logRTs. Regions of interest in shaded boxes.

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