Consider Everything Anyway

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A core component of most recent theories of sentence comprehension is the premise that comprehenders consider all likely interpretations of incoming linguistic input, rather than using structural heuristics to eliminate certain possible structures from consideration – particularly when the structure is the most likely continuation. However, Staub et al. (2018) investigated the processing of English relative clauses in an eye-tracking study using sentences containing a temporary ambiguity (e.g., *The announcement that the president is considering…*) such that the continuation can form either a nominal complement clause (e.g., *… an intervention will alarm the citizens*) or a relative clause (e.g., *… will alarm the citizens*). They used their results to argue that comprehenders do not create unforced dependencies by considering relative clause continuations, even when the relative clause continuation is more likely. Put simply, comprehenders do not consider the relative clause analysis when another analysis is available.

Based on the results of three self-paced reading time experiments and a sentence completion norming study, we argue that the Staub et al.'s participants were not failing to consider the relative clause interpretation, but in fact initially considered the relative clause interpretation, rejected the relative clause interpretation due to an insufficient fit between the two NPs and the verb (i.e., presidents don't *consider* announcements, they *make* announcements), and then faced additional difficulty later in the sentence when the relative clause interpretation turned out to be correct.

Experiment 1 (2 conditions, 62 participants) replicates Staub et al.'s Experiment 2 (see Table 1 and Figure 1). The region containing the potential relative clause verb (e.g., *entertained*) was read more slowly (p=.047) when the relative clause interpretation was forced than when both interpretations were available. Staub et al. attributed this slowdown to relative clause formation, we more specifically attribute it to the difficulties of integrating an unlikely verb into the relative clause structure. At the disambiguation regions (e.g., *was criticized*, and *by the judge*), sentences were read more slowly when both analyses were initially available (p=.001; p<.001). We agree with Staub et al. that this slowdown is a result of a garden path caused by participants not considering the relative clause analysis *at this point*.

Experiment 2 (2 conditions, 60 participants) replicates Staub et al.'s Experiment 3 (see Table 1 and Figure 1), with the same basic findings as above. Sentences were read more slowly in the initial regions (e.g., *which/that* and *the witness*) when the relative clause interpretation was forced (p=.036, p<.001). Alternatively, the sentences were read more slowly in the disambiguation regions (e.g., *was criticized*, and *by the judge*) when both interpretations were initially available (p=.010, p=.005).

Experiment 3 (4 conditions, 120 participants) contrasted the items from Staub et al.'s Experiment 3 with alternate items where the original verbs were replaced with ones chosen from the most likely relative clause completions in our sentence completion study (see Table 1 and Figure 2). We found interactions between which verb appeared in the item and whether one or both interpretations was initially available, for both the regions containing the relative clause verb (p=.060) and the disambiguation region (p=.014). An interaction at the relative clause verb indicates participants must have been considering an unforced relative clause analysis.

Overall, our results suggest that comprehenders do initially consider the relative clause interpretation, even when they are not forced to. However, comprehenders may reject the relative clause analysis when a nominal complement clause interpretation is available and the fit between the two noun phrases and potential verb linking them is insufficient (e.g., *president*, *announcement* and *consider*; *assumption*, *witness*, and *entertain*). In other words, comprehenders do consider everything anyway.

Table 1. Sample items from each experiment

Experiment 1: Replication of Staub et al.'s Experiment 2	
RC or NC	The assumption that the witness entertained was criticized by the judge.
RC only	The suspect that the witness entertained was criticized by the judge.
Experiment 2: Replication of Staub et al.'s Experiment 3	
RC or NC	The assumption that the witness entertained was criticized by the judge.
RC only	The assumption which the witness entertained was criticized by the judge.
Experiment 3: Original verbs vs. alternate verbs	
RC or NC (original)	The assumption that the witness entertained was criticized by the judge.
RC only (original)	The assumption which the witness entertained was criticized by the judge.
RC or NC (new)	The assumption that the witness made was criticized by the judge.
RC only (new)	The assumption which the witness made was criticized by the judge.

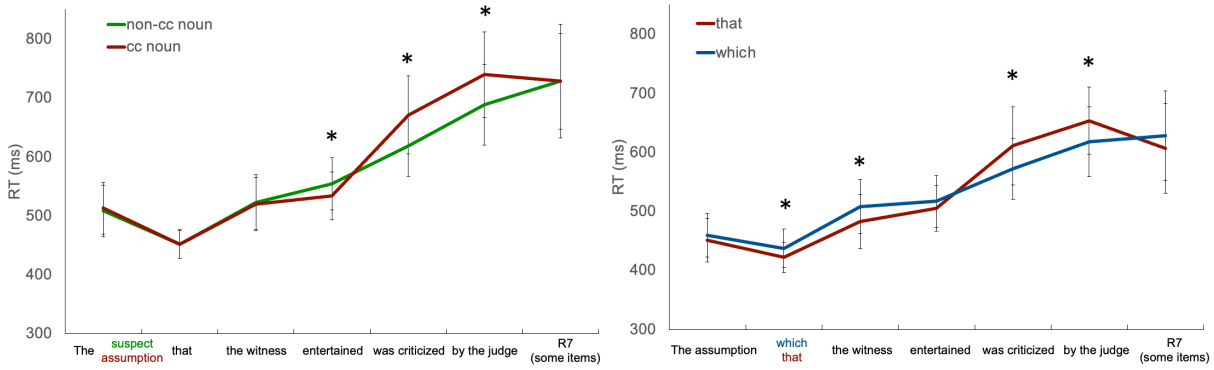
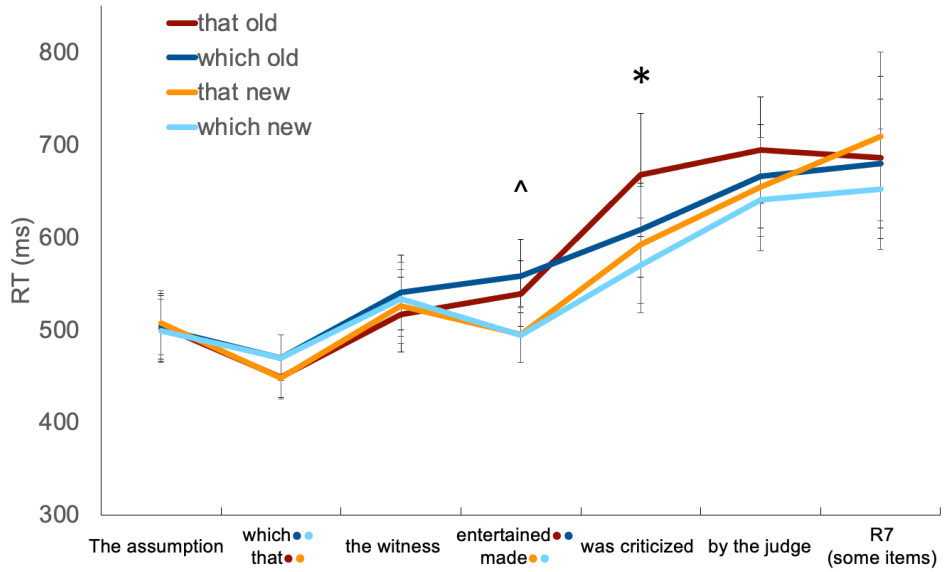


Figure 1. Results from Experiments 1 (left) and 2 (right) (error bars represent 95% CIs).



* Interaction between that/which and old/new item type is significant
^ Interaction between that/which and old/new item type p = .06

Figure 2. Results from Experiment 3 (error bars represent 95% CIs).

References

Staub, A., Foppolo, F., Donati, C., & Cecchetto, C. (2018). Relative clause avoidance: Evidence for a structural parsing principle. *Journal of Memory and Language*, 98, 26-44. doi:https://doi.org/10.1016/j.jml.2017.09.003