Does number interference occur during sentence processing?

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Models of interference in sentence processing (Lewis & Vasishth, 2005; Van Dyke & Lewis, 2003; Van Dyke 2007) claim that object relatives clauses are harder to understand than subject-relatives (2). According to these models an interference effect arises at the verb for object relatives because there are two noun phrases in memory that have to be integrated in contrast to only one noun phrase for subject relatives.

In a cue-based retrieval account, the two noun phrases in object relatives should cause even more interference when they share the same retrieval cues. Thus, object relatives should be more difficult when the preceding noun phrases that can be integrated with the verb have the same retrieval cues than when they have different cues. Processing difficulty with object relatives should therefore be larger when two noun phrases of the same number (1a) than a different number (1b) have to be integrated. Because both the relative clause effect and the number congruency effect are due to interference of the noun phrases when they are integrated with the verb, both effects should occur at the same point in time.

To test this, two experiments manipulated the number of the noun phrases (the two noun phrases were either similar or dissimilar in number) in object (1a-b) and subject (2a-b) relative clauses. We counterbalanced the number of the noun phrases and used eye-tracking because it provides a fine-grained temporal record of comprehension processes.

While Experiment 1 showed that object relatives were harder than subject relative clauses in regression path and total reading times for the regions help the accountant and counted, number congruency did not affect difficulty. This suggests that number congruency does not have a strong effect on the processing of subject or object-relative clauses.

In Experiment 2 we shortened the region following the relative clause (e.g., deleting several times). Like in Experiment 1, object relatives were harder than subject relatives in regression path and in total reading times for help the accountant, for counted and for the money. Most interesting, there was an interaction between relative clause type and number congruency in first-pass time for the final wrap-up region (the money): Object relatives with congruent noun phrases were more difficult than incongruent noun phrases, whereas there was no difference with subject relatives.

The observed delay of the number congruency effect in comparison to the relative clause effect is not consistent with memory interference models. They predict the number congruency effect to occur at the relative clause region, simultaneously with the slow-down for the object relative clause conditions. Instead, the results suggest that the number congruency effect is part of integrative processing that occurs in cases where the sentence is structurally complex.

In conclusion, the effect of number interference appears to be weak and occurs later than the relative clause effect. These results suggest that the initial difficulty with object-relatives is not due to memory interference.

1a. The banker that the accountant helps counted the money several times.
1b. The bankers that the accountant helps counted the money several times.
2a. The banker that helps the accountant counted the money several times.
2b. The bankers that help the accountant counted the money several times.
References: