

The missing VP effect in German: Effects of syntactic position and degree of embedding

Markus Bader (Goethe University Frankfurt)

The missing VP effect is a syntactic illusion that has played a major role in recent discussions of sentence memory and processing complexity (see Futrell et al., 2020 for a recent summary). In contrast to other languages, a missing VP effect has been found for German in some experiments but not in others. This may be due to different syntactic positions in which relative clauses (RCs) exhibiting multiple center-embedding appeared in different experiments, but also to differences concerning experimental procedures and the particular sentence material. In order to better understand the missing VP effect in German, I ran three experiments using the same procedure and similar materials across experiments. All experiments were distributed as paper-and-pencil questionnaires and required participants – students with German as native language – to rate sentences on a scale from 1 (totally unacceptable) to 7 (totally acceptable).

The first experiment tested whether sentences with an incomplete RC are rated as more acceptable when the RC is in center-embedded position than when it is not. To this end, Experiment 1 compared sentences with a complex RC adjacent to its head noun (embedded) to corresponding sentences with the complex RC in extraposed position (see (1) and (2); only adjacent RCs are shown). The complex RC was either complete or missing the VP of the outer RC. In Experiment 1a (47 participants), the modified NP was in sentence-initial position, in Experiment 1b (47 participants), it was in sentence-internal position. The results are shown in Figure 1. When the head NP occurred sentence-initially, complete sentences were rated much better than sentences with a missing VP. When the head NP occurred sentence-internally, in contrast, complete RCs were judged slightly better when extraposed than when center-embedded. Incomplete RCs, in contrast, received very low ratings when extraposed, but were judged as acceptable as complete RCs when center-embedded. Experiment 1 thus confirms former findings that the occurrence of a missing VP effect in German depends on the position of the NP hosting the complex RC: A missing VP effect is observed when the NP and its RC occur sentence internally (Häussler and Bader, 2015) but not when they occur sentence initially (Vasishth et al., 2010).

Experiment 2 (24 participants) compared sentences containing double-center embedding (as in Experiment 1) to sentences with triple center-embedding, with the complex RC always modifying a sentence-initial NP (see (2) and (3)). The results for Experiment 2 are shown in Figure 2. The condition with double center-embedding replicates the finding from Experiment 1. Triple center-embedding, in contrast, showed no longer the pattern formerly found for RCs in sentence-initial position, but the pattern for RCs in sentence-internal position: The acceptability for complete sentences did not differ from the acceptability of incomplete sentences. Thus, under particularly high processing load, a missing VP effect is observed even for RCs modifying sentence-initial NPs.

Experiment 3 (40 participants) compared triple center-embedding in sentence-initial position (as in Experiment 2; see (3)) to triple center-embedding in sentence-internal position (combination of (1) and (3)). The results for Experiment 3, shown in Figure 3, reveal similar ratings for sentences with sentence-initial and sentence-internal RCs: Sentences with a missing VP received acceptability ratings that were slightly, although not significantly, below those for complete sentences. Thus, when processing load is sufficiently high, the position of the complex RC does no longer matter.

The above experiments show that in German a missing VP effect is observed across syntactic contexts, with the exception of doubly center embedded RCs modifying a sentence initial NP, for which no missing VP effect was found. The computational theory of Futrell et al. (2020) accounts for the complexity effect found for sentence-initial RCs, but fails to account for the missing VP effect found for double center-embedded RCs in sentence-internal position. The interference theory of Häussler and Bader (2015) is only informally stated so that no firm conclusions are possible. I will discuss how the two theories can be joined in order to account for the full range of data.

Sample sentences from Experiments 1-3; the bold-faced verbs were missing in the condition “Missing VP”.

- (1) *Sentence-internal complex RC, double-embedding (Experiment 1)*
 Ich glaube, dass der Musiker, den der Dirigent, der das Konzert mit vielen berühmten Solisten planen soll, **unterstützt hat**, interviewt wurde.
 ‘I believe that the musician who the conductor who has to plan the concert with many soloists supported was interviewed.’
- (2) *Sentence-initial complex RC, double-embedding (Experiment 1 and 2)*
 Der Musiker, den der Dirigent, der das Konzert mit vielen berühmten Solisten planen soll, **unterstützt hat**, wurde interviewt.
 ‘The musician who the conductor who has to plan the concert with many soloists supported was interviewed.’
- (3) *Sentence-initial complex RC, triple-embedding (Experiment 2 and 3)*
 Der Musiker, den der Dirigent, der das Konzert, das auf nächstes Jahr verschoben wurde, planen soll, **unterstützt hat**, wurde interviewt.
 ‘The musician who the conductor who has to plan the concert that had to be moved to the upcoming year supported was interviewed.’

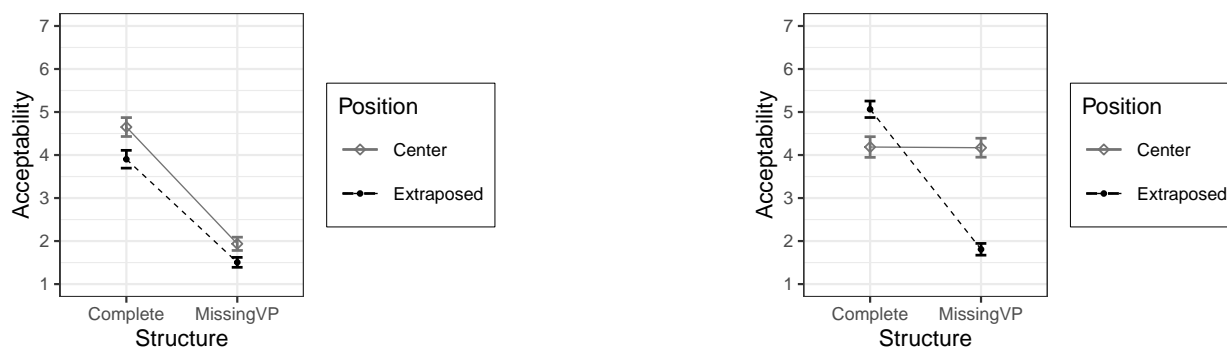


Fig. 1: Acceptability ratings in Experiments 1a (sentence-initial RC) and 1b (sentence-internal RC).

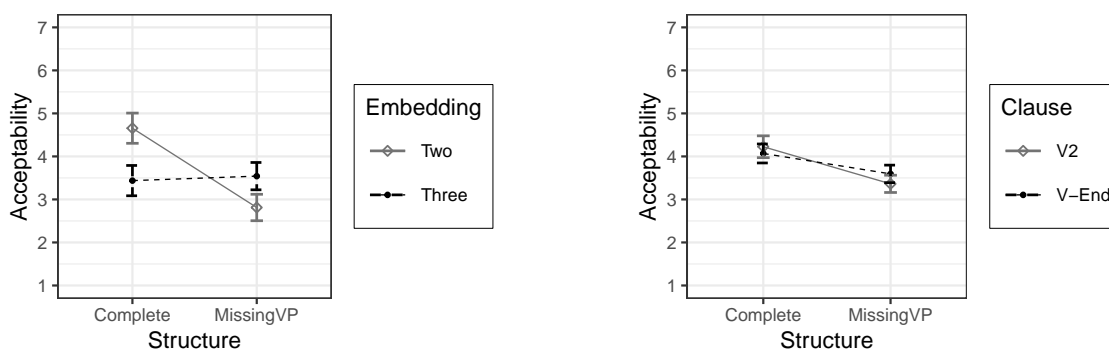


Figure 2: Acceptability ratings in Experiment 2.

Figure 3: Acceptability ratings in Experiment 3.

References

- Futrell, R., Gibson, E., and Levy, R. P. (2020). Lossy-Context Surprisal: An Information-Theoretic Model of Memory Effects in Sentence Processing. *Cognitive Science*, 44(3):e12814.
- Häussler, J. and Bader, M. (2015). An interference account of the missing-VP effect. *Frontiers in Psychology*, 6:1–16.
- Vasishth, S., Suckow, K., Lewis, R. L., and Kern, S. (2010). Short-term forgetting in sentence comprehension: Crosslinguistic evidence from verb-final structures. *Language and Cognitive Processes*, 25(4):533–567.