

Missing-VP effects: Headedness does not matter

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We address the question of whether working memory constraints on sentence processing depend on the headedness of a language. The particular phenomenon we are concerned with is the so-called *missing-VP effect* which has been thoroughly documented for SVO languages (e.g., Gibson & Thomas, 1999; Christiansen & MacDonald, 2009; Vasishth et al., 2010) but is a matter of dispute for SOV languages.

Vasishth et al. (2010) investigated the missing-VP effect also in the SOV language German. They tested sentences as in (1) in a self-paced reading and an eye-tracking experiment and concluded that readers of German are immune to the missing-VP effect. Vasishth et al. (2010) hypothesize that the difference between English (SVO) and German (SOV) is experience-based, with the expectancy for the VP being higher in German than in English.

The findings for (1), in which the incomplete relative clause is located in the clause-initial topic position (specifier of CP = SpecCP) of a verb-second main clause, contrast with earlier findings for sentences as in (3) in which the incomplete relative clause is contained within the VP of an embedded verb-final clause. For (3), experiments making use of speeded grammaticality judgments yielded evidence for a missing-VP effect in German (Bader et al., 2003).

In order to resolve this issue, we ran two experiments. The first experiment investigated sentences as in (3) with a self-paced-reading procedure (24 participants, 20 sentences). In accordance with earlier studies of this construction, but in contrast to Vasishth et al. (2010), this experiment provides evidence for the missing-VP effect in German: the verbal complex of the superordinate clause (*erhalten wird*) was read about 100ms faster when VP2 was missing than when VP2 was present. In a second experiment (34 participants, 30 sentences), we used the method of speeded grammaticality judgments for directly comparing the three constructions in (1), (2), and (3). Sentences with the relative clauses in SpecCP received the highest acceptance rate among the complete sentences and the lowest acceptance rate among the missing-VP sentences.

The experimental results are supported by evidence from an ongoing corpus study of doubly center-embedded relative clauses in German. Overall, the number of doubly center-embedded relative clauses was highest for the SpecCP context (1), followed by the VP of embedded clauses (3), followed by the VP of main clauses (2). The corpus study also revealed a number of missing-VP sentences, thus showing that this phenomenon is not restricted to language comprehension but also occurs during language production.

In sum, the missing-VP effect occurs in the SOV language German in both comprehension and production, its rate being subject to the particular syntactic context. We propose that the missing-VP effect results from general constraints on working memory that are not tuned to properties of particular grammars. Instead, this effect arises because of difficulties in distinguishing between interfering attachment sites.

(1) **SpecCP:**

Der Polizist, der den Verbrecher, der die Bank überfallen hatte, ~~gefasst hat~~, wird eine Auszeichnung erhalten.
the policeman who the criminal who the bank robbed had arrested has will a award receive
'The policeman who arrested the criminal who robbed the bank will receive an award.'

(2) **VP main clause:** Vermutlich wird der Polizist, der den Verbrecher, der die Bank überfallen hatte,
presumably will the policeman who the criminal who the bank robbed had
~~gefasst hat~~, eine Auszeichnung erhalten.
arrested has a award receive

'Presumably, the policeman who arrested the criminal who robbed the bank will receive an award.'

(3) **VP embedded clause:** Ich weiß, dass der Polizist, der den Verbrecher, der die Bank überfallen hatte,
I know that the policeman who the criminal who the bank robbed had
~~gefasst hat~~, eine Auszeichnung erhalten wird.
arrested has a award receive will

'I know that the policeman who arrested the criminal who robbed the bank will receive an award.'