

The effect of scope of negation on the choice of word order during sentence production

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In two experiments using the production-from-memory paradigm, we investigated how German sentences with an indefinite object in the scope of negation are linearized. Memorized sentences had either canonical order (negation and indefinite determiner contracted to “kein/no”) or non-canonical order, either a clause-medial object before the negation (S-O-neg) or a clause-initial object before the negation (O-S-neg). Participants recalled non-canonical sentences often with canonical order, but S-O-neg sentences were also recalled as O-S-neg, especially when the object stood in a poset relation to the preceding context.

1 Introduction

A large body of language production research has been concerned with the choice between canonical and non-canonical word orders during syntactic encoding. So far, this research has focused on how conceptual accessibility (e.g., animacy, givenness) affects the choice of word orders, a recurrent finding being that more accessible referents tend to be produced before less accessible referents (e.g., McDonald, Bock, & Kelly, 1993). In this study, we go beyond conceptual accessibility by investigating the effect of scope relations on the choice between canonical subject-object (SO) and non-canonical object-subject (OS) order in German. The scope relation under investigation is the relation between an existential quantifier in the scope of negation ($\neg\exists$). The most common way to express this relation is by contracting *nicht* ‘not’ and *ein* ‘a’ to *kein* ‘no’, as illustrated in (1a).¹ However, corpus data show that $\neg\exists$ is sometimes also produced with inverse order of negation and quantifier, as in (1b), although this is clearly less common than the variant with *kein*. Finally, the object in the scope of negation may also be fronted to the sentence initial position, as in (1c), resulting in a sentence with OS order. In this case, the negation must stay in situ because fronting “*kein* N” is not licit here.

- (1) Der Dozent ist mit der Seminarvorbereitung schon weit fortgeschritten.
the lecturer is with the seminar-preparation already far proceeded
‘The lecturer is already done with the preparation of the seminar.’
- a. Vermutlich wird er kein Skript bereitstellen.
presumably will he no script provide
‘Presumably, he will provide no script.’ SO-*kein*
- b. Vermutlich wird er ein Skript nicht bereitstellen.
presumably will he a script not provide
‘Presumably, he will not provide a script.’ SO-*ein*
- c. Ein Skript wird er vermutlich nicht bereitstellen.
a script will he presumably not provide
‘A script, he will presumably not provide.’ OS-*ein*

Work on quantifier scope ambiguities in general (Kiss & Pafel, 2017) and on scope in German in particular (e.g., Pafel, 2006; Wurmbbrand, 2006) has revealed a preference for surface scope, as captured in the Scope Transparency Principle of Bobaljik and Wurmbbrand (2012, 3):

- (2) Scope Transparency (ScoT)
If the order of two elements at LF is A»B, the order at PF is A»B.

¹An indefinite NP following the negation without contraction results in constituent instead of sentence negation.

As a violable constraint, Scope Transparency can be offset by other constraints favoring a surface order with inverted scope. In (1b) and (1c), realizing the indefinite object in front of the negation is weakly motivated insofar as the object's referent is situationally given by the prior context (e.g., preparing for a class often involves distributing a script). Furthermore, clause-medial fronting of an indefinite object (within the so-called middlefield) is more restricted than fronting to the clause-initial position. Thus, although sentence (1c) involves a non-canonical OS structure, it should be preferred to sentence (1b) with its canonical SO structure. In sum, we hypothesize the preference ranking in (3) for the three structures in (1):

- (3) Ranking of $\neg\exists$ structures:
 SO-kein \gg OS-ein \gg SO-ein

Experiment 1 investigated this hypothesis using the production-from-memory (PfM) paradigm, which has a long tradition in language production research. Beginning with Bock and Warren (1985), PfM has been a major tool in establishing the central role of conceptual accessibility for fixing the order of arguments and/or grammatical function assignment. In PfM experiments, sentences with non-canonical word/argument order are often recalled with canonical word order, whereas the reverse pattern occurs only rarely when at all. Experiment 2 is like Experiment 1, but strengthens the discourse relation between the object and the preceding discourse by means of a *partially ordered set relation* (poset; e.g., Ward & Prince, 1991), indicated by the adjective *weiteres* 'further' in (4). For German, corpus research has shown that poset elements occur preferentially in clause-initial position (e.g., Speyer, 2010).

- (4) Der Dozent hat schon mehrere Skripte im Seminar verteilt.
 the lecturer has already several scripts in-the seminar distributed
 'During the seminar, the lecturer already distributed several scripts.'
- a. Vermutlich wird er kein weiteres Skript bereitstellen.
 presumably will he no further script provide
 'Presumably, he will provide no further script.' SO-kein
- b. Vermutlich wird er ein weiteres Skript nicht bereitstellen. SO-ein
- c. Ein weiteres Skript wird er vermutlich nicht bereitstellen. OS-ein

Like Experiment 1, Experiment 2 should find evidence for the ranking in (3). In addition, due to the use of a poset relation, the number of sentences with non-canonical structure should increase.

2 Experiments

2.1 Method

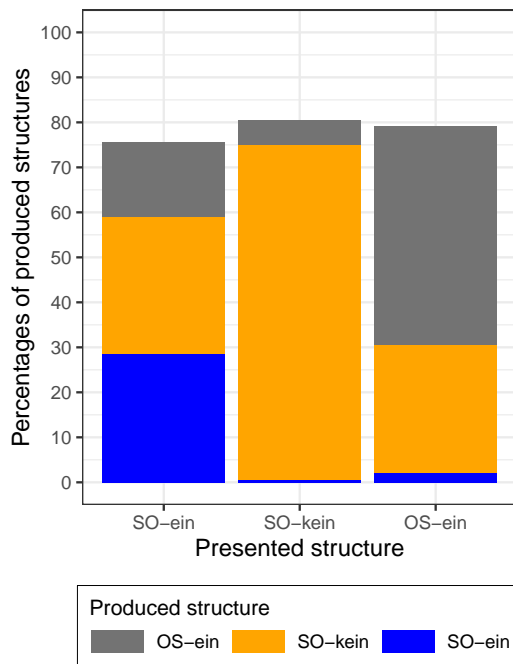
2.1.1 Participants

24 native speakers of German were recruited via Prolific for each experiment.

2.1.2 Materials

We created 18 experimental item sets consisting of a context sentence, which was identical across all conditions and served as later recall prompt, and a target sentence, which had to be recalled and varied depending on the factor *Structure* (see (1) for Experiment 1 and (4) for Experiment 2). In Experiment 1, the context sentence set up a scene including an animate referent. This referent was always taken up in the second sentence with the subject pronoun *er* 'he' that occurred immediately after the finite verb in verb-second position. The object of the second sentence was an inanimate NP of varying form. In condition "SO-kein", the object was of the form *kein N* 'no N' and followed the subject. The sentence-initial position was filled by an adverbial. In condition "SO-ein", the object had the form *ein N* 'a N' and again followed

Experiment 1



Experiment 2

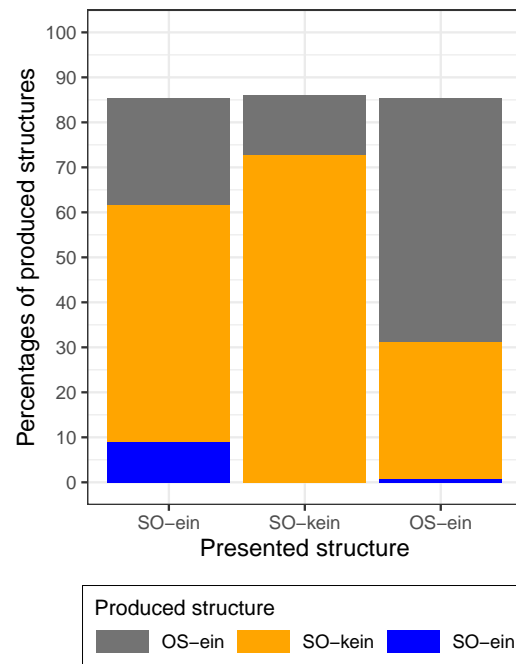


Figure 1: Percentages of produced structures depending on presented structures

the subject. This condition also contained the negation word *nicht* ‘not’ following the object. In condition “OS-*ein*”, an object of the form *ein N* occurred clause-initially and the negation *nicht* occurred at the same position as in condition “SO-*ein*”. The clause-initial adverbial of the other two conditions now occurred after the subject. In Experiment 2, the first sentence also set up a scene, but now contained an inanimate object in addition to the animate subject. The inanimate noun was repeated across the first and the second sentence. In each condition, the second sentence was identical to the one of Experiment 1 with the exception that the object now also contained either the adjective *anderes* ‘other’ or *weiteres* ‘further’. The 18 experimental sentences were combined with 54 fillers for a total of 72 sentences.

2.1.3 Procedure

The 72 sentences were randomly distributed onto 12 blocks of 6 sentences, each including 1 or 2 experimental sentences. Sentences were presented according to a Latin Square design. Each block consisted of a learning phase followed by a recall phase. In the learning phase, the six sentence pairs of a block were presented one-by-one on a single screen for reading; reading was self-paced with a 10 sec deadline. In the recall phase, the first sentence of each pair was presented and participants had to write down the second sentence from memory. Items were presented in different orders in the learning and the recall phase. The study was conducted online via *PCIBexFarm* (Zehr & Schwarz, 2018). All sentences were scored according to the following categories (i) SO-*kein* (ii) SO-*ein* (iii) OS-*ein* (iv) other, including omissions and non-target like syntactic structures.

2.2 Results

Figure 1 shows how often each structure was produced in Experiment 1 and Experiment 2 depending on the structure of the memorized sentence. The bars do not sum to a 100% because of a certain amount of missing responses and responses that did not preserve the meaning of the memorized sentence (e.g., omission of the object or the negation). The results were analysed using generalized linear mixed-effects models (not shown for reasons of space). SO-*kein* sentences were most of the time recalled as SO-*kein* sentences, as expected given that this structure can be considered as canonical structure. OS-*ein* sentences were recalled

with OS-*ein* in the majority of cases, but were also restored to SO-*kein* in about a third of all cases. Most deviations from the memorized structure were found for SO-*ein* sentences, which were most of the time recalled as canonical SO-*kein* sentences. However, they were also produced with OS-*ein* structure in a number of cases, thus switching from canonical SO to non-canonical OS order. For all three structures, OS-*ein* sentences, that is, sentences with non-canonical OS word order, were produced more often in Experiment 2 where the object was related to the preceding context sentence by a poset relation. In a mixed-effects model fitted to both experiments with experiment as fixed effect, this effect was marginally significant with $p = .051$. For SO-*ein* sentences, the rate of SO-*kein* was even higher than the rate of SO-*ein* in Experiment 2.

3 Discussion

Two production-from-memory (PfM) experiments investigated syntactic encoding of sentences with an indefinite NP in the scope of negation. The results provide evidence for the structure ranking in (3). Surface scope (neg before indefinite, realized as *kein*) is the canonical structure and was produced most often. Sentences with the indefinite object in sentence-initial position were also produced with some regularity, even when not given in the input, showing that non-canonical orders can be triggered for scope reasons. SO-*ein* were only produced when this was the input structure. An object in a poset relation to the context increased the number of OS sentences, confirming that poset-given objects favor the production of non-canonical structures. In sum, our experiments show that PfM can be used to investigate syntactic encoding beyond conceptual accessibility.

Because our experiments involved written sentence presentation and production, prosody could not be taken into account. According to our intuition, neither of the sentences in (1) requires any kind of special intonation (e.g., rise-fall contour, emphatic stress on the negation). We assume that participants assigned a default prosody during reading and therefore computed the readings with the indefinite in the scope of negation. Experiments in the spoken modality are currently in preparation to test these assumptions.

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