**Surface position and base-generated position jointly determine quantifier scope readings: A cross-linguistic investigation in German and Turkish**

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**Background:** In English, doubly quantified sentences such as "A waiter cleaned every table." are ambiguous. For these sentences, there are two possible interpretations:

(i) Surface reading: There was a single waiter who cleaned multiple tables.

(ii) Inverse reading: For each table, there was a (potentially different) waiter who cleaned it.

Languages with flexible word order are reported to restrict inverse readings more strongly than rigid word order languages [2]. This observation is explained by a tendency to express inverse readings directly in surface structure by employing a movement operation such as scrambling when available. Under this assumption, fronting the object "every table" over the subject, consequently resulting in OS word order, should lead to the reading (ii) following the surface position. However, inverse readings, albeit generally dispreferred and more costly to process, have been shown to be available in canonical word order in numerous rigid and flexible word order languages such as English [1], German [4], and Greek [3]. However, it still remains unclear whether OS constructions preferentially receive the reading (ii) from surface position or reconstruct back to the base-generated position resulting in the reading (i), and whether this preference depends on the type of movement operation. To this end, we investigated two typologically distinct flexible word order languages: German and Turkish.

**Method:** We conducted two experiments on PCIbex, manipulating word order (SO and OS ordering) in German (n=73) and Turkish (n=42). In order to indirectly tap into quantifier scope preferences, we employed a new method named numerical estimation task. In this task, participants read contexts and target sentences containing a subject existential quantifier and an object universal quantifier (*ein* and *jeder* in German and *bir* and *her* in Turkish). They were then asked to indicate how many entities corresponding to the subject NP were involved in the scenario (see example (2) and (3)). A response of 1 indicates a singular interpretation of the existential quantifier as in (i), whereas any number higher than 1 indicates a plural interpretation, i.e. reading (ii). For the German experiment, an additional condition for position was included, which we do not report because it was not significant.

**Results:** The data were analysed using binomial mixed-effects logistic regression models with word order as a fixed effect and maximal justified random-effects structures. As can be seen in Figure 1, there was a robust main effect of word order both in German ($\beta = -2.85$, $z = -10.13$, $p < .001$) and in Turkish ($\beta = -2.58$, $z = -5.96$, $p < .001$), indicating that participants were substantially less likely to provide a singular response in the OS word order condition compared to the SO word order.

**Discussion:** Our study show that flexible word order languages do not strictly adhere to a general surface scope strategy. Overt movement of the object increases the likelihood for the existential quantifier to be interpreted as plural (reading (ii)), as predicted by the preference for surface structure (O $>$ S). However, for OS sentences inverse scope interpretations (S $>$ O) occurred even more often than surface scope interpretations (see Fig. 1). In sum, not only the surface position but also base generated position contributes to the interpretation of quantified noun phrases.

## References


[1] C. Anderson. *The Structure and Real-Time Comprehension of Quantifier Scope Ambiguity*. PhD thesis, Northwestern University Evanston, IL, 2004.

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## Figures and Tables

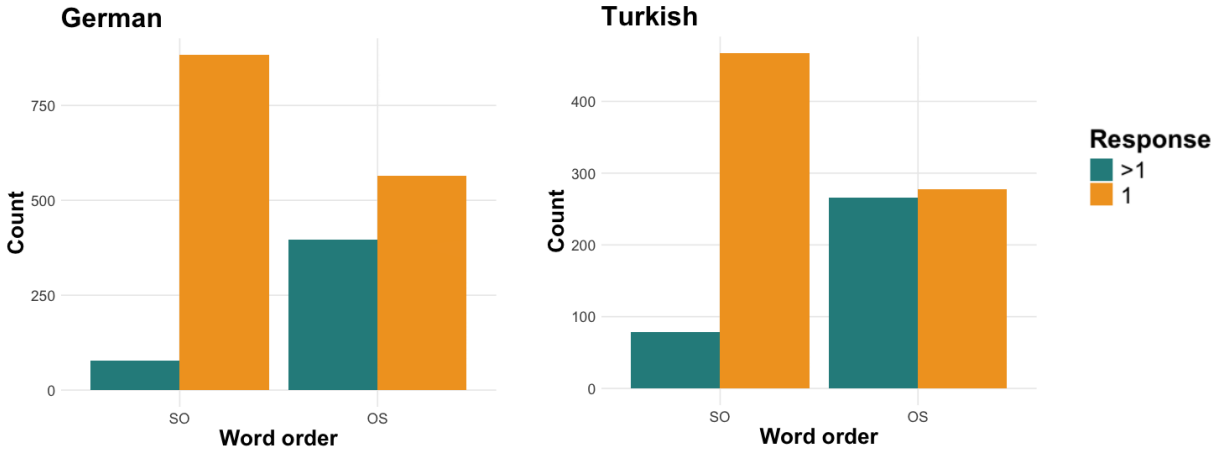


Figure 1: Distribution of responses by word order in German and Turkish Experiments

## Optional Supplemental Information

**The possible readings for the doubly quantified sentence:**

(1) A waiter cleaned every table.

(i) Surface scope: ($\exists > \forall$)
There was a single waiter who cleaned multiple tables.
$\exists$x [waiter (x) $\wedge$ $\forall$y [table (y) $\rightarrow$ clean (x, y)]]

(ii) Inverse scope: ($\forall > \exists$)
For each table, there was a (potentially different) waiter who cleaned it.
$\forall$x [waiter (x) $\rightarrow$ [table (y) $\wedge$ clean (x, y)]]

**Below example experimental items for German and Turkish are given. Subjects are marked in blue and objects in orange.**

**German**

*Scenario*: Es war ein langer Tag im Restaurant.
'It was a long day at the restaurant.'

(2) a. **SO-midfield:** Am Ende des Tages hat ein Kellner jeden Tisch sauber gemacht.
At end of day has a waiter every table clean made.
'At the end of the day, a waiter cleaned every table.'

b. **OS-midfield:** Am Ende des Tages hat jeden Tisch ein Kellner sauber gemacht.

c. **SO-prefield:** Ein Kellner hat jeden Tisch am Ende des Tages sauber gemacht.

d. **OS-prefield:** Jeden Tisch hat ein Kellner am Ende des Tages sauber gemacht.

**Question:** Wie viele Kellner waren an dem Szenario beteiligt?
'How many waiters were there in the scenario?'

**Turkish**

*Scenario*: Restoranda uzun bir gün olmuştu.
'It was a long day at the restaurant.'

(3) a. **SO-order:** Günün sonunda bir garson her masayı temizledi.
Day end.of a waiter every table cleaned.
'At the end of the day, a waiter cleaned every table.'

b. **OS-order:** Günün sonunda her masayı bir garson temizledi.

**Question:** Kaç garson masa temizledi?
'How many waiters cleaned table(s)?'