

On the interpretation of German *einige*: The effect of tense and cardinality

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Introduction. Scalar Implicatures (SIs) have been a research interest since Horn in 1972 (see Breheny, 2019 for an overview). However, to our knowledge, the effect of tense on SIs has only once been experimentally investigated in a study on the exclusivity inference of *or* (Chierchia et al., 2000). In line with these previous results, we hypothesize that the SI *not all* is less likely drawn in future than in past tense sentences involving *einige* ‘some’. Differences in the question under discussion (QUD) (Roberts, 2012) are argued to strongly influence the computation of SIs (Kuppevelt, 1996 and Zondervan, 2011). We assume that probabilities of questions to be the immediate QUD differ between past and future tense. For the past, a QUD inquiring about details is more likely as receiving precise information is likely as well. Therefore, the SI is drawn for past tense, see (1-b). With the future being inherently uncertain, a more general QUD asking for rough estimations can be argued to be more likely. Therefore, (1-a) can be interpreted without the SI.

- (1) a. John will eat some apples.
interpreted as: ‘John will eat some or all the apples.’
- b. John ate some apples.
interpreted as: ‘John ate some and not all apples.’

More concretely, we hypothesize that in contexts that violate the SI, sentences like (1-a) receive higher acceptance rates than sentences like (1-b). Besides investigating this hypothesis, we tested sets of varying size as representatives of German *einige* ‘some’ in our experiment. Previous experiments on English *some* (van Tiel/Geurts, 2013, Degen/Tanenhaus, 2015) suggests that higher cardinalities are regarded as more typical representatives of a phrase like *some N* than smaller cardinalities (≤ 3). Based on these data and introspection, we expect a prototypicality effect, such that larger numbers are more typical representatives of *einige* than smaller numbers. That is, we expect sentences like in (1), interpreted with the SI, to be more acceptable in a context in which John ate 6 apples than in a context in which he ate only 2. We also expect singleton sets to be particularly bad due to the plurality inference of the plural NP that serves as the first argument of *einige* (Tieu et al., 2014). We employed an experimental paradigm, which aims to foster rational behavior in participants by financially rewarding them for choosing the optimal response to each stimulus.

Method. We tested 32 participants (mean age = 23.8 years, SD = 5.5 years, 15 female and 17 male participants), who saw 20 test items and 30 fillers, of which some served as controls. The target sentences were conditional statements containing the scalar term *einige*. They were presented in the context of a story about 9 candidates in a reality show who did activities together. The stimuli had the form of bets about activities to happen on the show and the participants’ task was to decide on whether if were won, thereby judging the truth of the target sentences. Each judgement had a direct impact on the budget they received in the beginning of the experiment. Figure 1 is a example of a stimulus for past tense. We had an additional hypothesis about upward and downward entailing environments that we will not report on due to a procedure error that happened on the level of participant instruction which turned part of the data invalid. For this reason, only the unaffected data with the scalar term in the conditional is analysed and shown. The stimuli were shown along with a table which indicated for each candidate whether she was involved in the activity in question with the candidate number of positives ranging from 0 to 9 (‘cardinality’ in the following). The 0-context yields a false target sentence, the 9-context yields an SI-violation and the numbers 1 – 8 constitute different manifestations of *einige*. Additional context resolved the antecedent of the conditional as true. Besides the item manipulations, participants

<p>Bet – Front Side</p> <p>If the group was instructed to prove its patience, some participants finished a puzzle with 1000 parts.</p>	<p>Context – Back Side</p> <table border="1"> <thead> <tr> <th>Person</th> <th>Finished a puzzle with 1000 parts</th> </tr> </thead> <tbody> <tr><td>Alice</td><td>Yes</td></tr> <tr><td>Bella</td><td>Yes</td></tr> <tr><td>Diana</td><td>Yes</td></tr> <tr><td>Flora</td><td>Yes</td></tr> <tr><td>Gabi</td><td>Yes</td></tr> <tr><td>Helena</td><td>Yes</td></tr> <tr><td>Ida</td><td>Yes</td></tr> <tr><td>Clara</td><td>No</td></tr> <tr><td>Elsa</td><td>No</td></tr> </tbody> </table> <p>The group was instructed to prove its patience.</p>	Person	Finished a puzzle with 1000 parts	Alice	Yes	Bella	Yes	Diana	Yes	Flora	Yes	Gabi	Yes	Helena	Yes	Ida	Yes	Clara	No	Elsa	No
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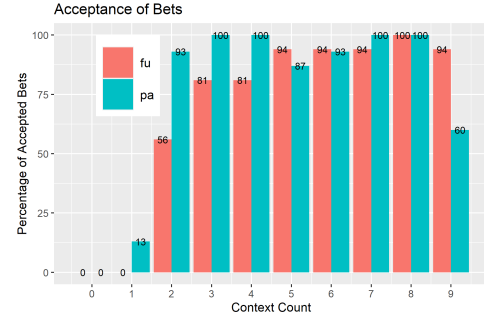


Figure 1: example bet - English translation

Figure 2: results

were assigned one of two tense levels for which all bets appeared in the according tense.

Results and discussion. Figure 2 shows the acceptance rates of bets by *cardinality* and *tense*. It can be seen that SI-violations are more strongly penalized in past tense than in future tense. Furthermore, the graph shows cardinality 1 in particular and low cardinalities in general to be bad representatives of *einige*. This seems to be the case especially in future tense. For the inferential statistical analysis, we used the software R (R Core Team, 2017). We constructed three binomial regression models to test our three hypotheses. Model 1 tested whether the interpretation of scalar terms depended on factor tense. For this, we assumed a 2-level factor *SI support* with the levels [+support] (the union of cardinalities 1 – 8) and [-support] (cardinality 9). We found a significant main effect of *tense* ($p < 0.05$) along with an interaction of *tense* and *SI support* ($p < 0.01$), which confirms that in the past tense, more SIs are computed. Model 2 tested the hypothesis that higher cardinalities are better representatives of *einige*. In this model, we included the factor *cardinality* with levels corresponding to the cardinalities 1 – 8 (cardinalities 0 and 9 were excluded as they do not represent *einige*) and the factor *tense*. There was a significant main effect of *cardinality* ($p < 0.01$) as well as a main effect of *tense* ($p < 0.05$). The same effects occur when we change the levels of *cardinality* from 1 – 8 to 2 – 8. Other than the descriptive results suggest, there was no significant interaction between the two factors. Model 3 tested whether cardinality 1 is a significantly worse representative of *einige* than the other numbers. For this, we assumed a 2-level factor *plurality* with [+plurality] (the union of cardinalities 2 – 8) and [-plurality] (cardinality 1). A main effect of *cardinality* was found ($p < 0.001$) along with a main effect of *tense* ($p < 0.01$), no interaction was found. To sum up, we found that tense influences whether an SI is drawn or not and that higher cardinalities are better representatives of *einige*. These findings add a new dimension to the discussion on scalar implicatures. Future work should replicate the findings concerning the effect of tense. Moreover, it would be interesting to investigate this effect for English comparing *will*- and *going to*-future forms which differ in the certainty with which an event is said to occur.

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