

*Less*-comparatives must be less ambiguous than *exactly*-differentials, experimental data shows

**Introduction:** According to [1] and contrary to previous conclusions, e.g. in [2], scope mobility of comparative operators does after all surface in a narrow class of cases where intensional verbs are combined with *less*-comparatives or *exactly*-differentials, as in (1). According to this view, (1) has the two readings in (1-a/b) and its less prominent, inverse scope reading in (1-b) imposes no upper limit on the paper’s length but only a minimal requirement of 15 pp. Though not uncontroversial and dependent on notoriously subtle judgments, this type of ambiguity influenced subsequent compositional analyses of comparatives (e.g. [3–5], among many others) and was also used as a diagnostics for scope mobility of the comparative operator in cross-linguistic studies, e.g. [6]. We use judgment data from forced-choice experiments to empirically test the availability of this ambiguity in German and we discuss theoretical implications of our findings.

- (1) (This draft is 10 pages.) The paper must be exactly 5 pages longer than that.
- a. linear scope:  $\forall w \in Acc : \max\{d : \text{long}_w(p, d)\} = 15pp$
  - b. inverse scope:  $\max\{d : \forall w \in Acc : \text{long}_w(p, d)\} = 15pp$

**Methods:** We conducted two web-based questionnaire studies, Exps.1 & 2, recruiting participants via `prolific.co`. 12 German items were constructed as exemplified in (2) and (3). All items start with a sentence in which gradable adjectives (e.g. ‘long’) are degree-modified by exactly-differentials (e.g. ‘exactly 10 pages longer than ...’) or *less*-comparatives (e.g. ‘less long than ...’). In half of the conditions (e.g. (2-a/c)), comparatives are combined with the modal verb ‘must’. By hypothesis, the presence of ‘must’ should cause the purported ambiguity to emerge. Sentences without modals (e.g. (2-b/d) in Exp.1) were used as unambiguous controls against which responses to the modal conditions can be compared. All of these sentences are followed by the same short post-context sentence (also illustrated in (2)). Each sentence doublet is, furthermore, paired with yes-no comprehension questions as shown in (3). There are two types of questions: *Matching* questions probe for the preferred or (in case of the controls) only possible reading, whereas the *mismatching* questions ask about propositions that are incompatible with the preferred readings and would thus receive a “no”-response if this was the only available reading (pairing indicated by the labels in (3); e.g. (2-a) is paired with the matching question in (3-a-m) and mismatching question in (3-a-mm)). Altogether, we thus manipulated the factors MODIFIER TYPE (*exactly* vs. *less*), MODAL (*absent* vs. *present*) and QUESTION (*match* vs. *mismatch*), yielding eight conditions in a  $2 \times 2 \times 2$  design. The complete set of experimental items comprised 96 pairs of assertions and questions distributed (together with 48 fillers) over eight lists using a Latin square. Exp.2 was a follow-up, in which *exactly*-controls of Exp.1, e.g. (1-b), were also put into comparative form, e.g. (2-e), because the positive form in Exp.1 led to almost flawless performance, complicating the interpretation of the results. Exp.2 was thus a quasi-replication testing whether the results of Exp.1 reflect differences between the two types of comparatives or were due to characteristics of the controls.

**Results:** After applying predefined exclusion criteria, data from 62 and 65 (out of 87 and 87) participants were passed on to the statistical analysis of Exps.1 & 2, resp. Although the comparative *exactly*-controls in Exp.2 did in fact lead to a few more errors as compared to Exp.1, as we expected, the general pattern of results was the same in both experiments. Descriptive results are shown in Figure 1. In the modal conditions, questions matching the preferred linear scope interpretation were overwhelmingly answered with “yes” (Exp.1: 94.1%; Exp.2: 88.6% ) and mismatching questions with “no” (Exp.1: 83.3%; Exp.2: 91.3% ). A logit mixed effects model analysis revealed a significant three-way interaction in both experiments (Exp.1:  $z = -2.99, p = .003$ ; Exp.2:  $z = -2.05, p = .041$ ) which we resolved by conducting separate analyses for the two modifier types. In the *exactly*-conditions, we found the predicted MODAL  $\times$  QUESTION interaction (Exp.1:  $z = 3.21, p = .001$ ; marginal in Exp.2:  $z = 1.58, p = .064$ ), whereas no such interaction was found in the *less*-comparatives (Exp.1:  $z = -0.30, p = .767$ ; Exp.2:  $z = -0.9, p = .37$ ).

**Discussion:** Across both experiments, indication of the purported ambiguity was limited to *exactly*-differentials. We suggest that our results might best be explained by accounts that derive ambiguity from properties of the measure phrases in *exactly*-differentials. For example, the proposal of [7] accounts for the ambiguity in (1) in terms of scope mobility of the measure phrase rather than the comparative operator (contrary to, e.g. [1, 4, 5]). To rule out unattested scope interaction, e.g. with nominal quantifiers (cf. [1, 2, 5, 8]), it can be complemented along the lines of [5] (following [9]) by restrictions that derive from the underlying algebraic structure of degrees. Our data on German invites deliberation about cross-linguistic variation in this sphere. We thus also collected data on the ambiguity in English and addressed potential criticisms of our German data (replaced definite descriptions in the *than*-clause (e.g. *the draft*) with a demonstrative (e.g. *that*; cf. (1)), removed *also* from the comprehension questions in (3-a-mm,c-mm) and embedded items in contexts supportive of the inverse reading). The results for German are replicated in English.

(2) Target sentences and post contexts

- a. Das Papier muss genau 10 Seiten länger sein als der Entwurf. So lautet die Vorgabe der Zeitschrift.  
The paper must exactly 10 pages longer be than the draft. So sounds the guideline of the journal  
'The paper is required to be 10 pages longer than the draft. That's what the journal's guideline says.'
- b. Das Papier ist genau 10 Seiten lang. Das haben die Autoren gesagt.  
The paper is exactly 10 pages long. That have the authors said  
'The paper is exactly 10 pages long. That's what the authors said.'
- c. Der Entwurf muss weniger lang sein als das Papier. So lautet die Vorgabe der Zeitschrift.  
The draft must less long be than the paper. So sounds the guideline of the journal  
'The draft is required to be less long than the paper. That's what the journal's guideline says.'
- d. Der Entwurf ist weniger lang als das Papier. Das haben die Autoren gesagt.  
The draft is less long than the draft. That have the authors said  
'The draft is less long than the paper. That's what the authors said.'
- e. Das Papier ist genau 10 Seiten länger als der Entwurf. Das haben die Autoren gesagt.  
The paper is exactly 10 pages longer than the draft. That have the authors said  
'The paper is exactly 10 pages longer than the draft. That's what the authors said.'

(3) Comprehension questions (no translation provided if identical to gloss)

- a-m Soll das Papier 10 Seiten länger sein als der Entwurf?  
Should the paper 10 pages longer be than the draft  
'Should the paper be 10 pages longer than the draft?'
- a-mm Darf das Papier auch 15 Seiten länger sein als der Entwurf?  
May the paper also 15 pages longer be than the draft  
'Is the paper also allowed to be 15 pages longer than the draft?'
- b-m Ist das Papier 10 Seiten lang?  
Is the paper 10 pages long
- b-mm Ist das Papier 14 Seiten lang?  
Is the paper 14 pages long
- c-m Soll der Entwurf kürzer sein als das Papier?  
Should the draft shorter be than the paper  
'Should the draft be shorter than the paper?'
- c-mm Darf der Entwurf auch länger sein als das Papier?  
May the draft also longer be than the paper  
'Is the draft also allowed to be longer than the paper?'
- d-m Ist der Entwurf kürzer als das Papier?  
Is the draft shorter than the paper
- d-mm Ist der Entwurf länger als das Papier?  
Is the draft longer than the paper
- e-m Ist das Papier 10 Seiten länger als der Entwurf?  
Is the paper 10 pages longer than the draft
- e-mm Ist das Papier 14 Seiten länger als der Entwurf?  
Is the paper 14 pages longer than the draft

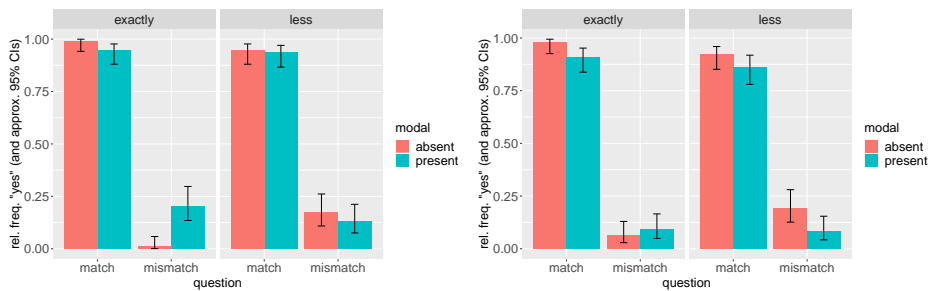


Figure 1: Relative frequency of "yes" responses across conditions in Exps.1 (left) and 2 (right).

**Selected References:** 1. Heim, I. *Degree operators and scope* in *Proceedings of SALT 10* (2000), 40–64. 2. Kennedy, C. *Projecting the Adjective: The Syntax and Semantics of Gradability and Comparison* (University of Chicago, 1997). 3. Bhatt, R. et al. Late Merger of Degree Clauses. *Linguist Inq* 35, 1–45 (2004). 4. Breakstone, M. Y. et al. *On the Analysis of Scope Ambiguities in Comparative Constructions: Converging Evidence from Real-Time Sentence Processing and Offline Data* in *Proceedings of SALT 21* (2011), 712–731. 5. Lassiter, D. *Quantificational and modal interveners in degree constructions* in *Proceedings of SALT 22* (ed Chereches, A.) (2012), 565–583. 6. Beck, S. et al. Crosslinguistic Variation in Comparison Constructions. *Linguistic Variation Yearbook* 9, 1–66 (2009). 7. Oda, T. *Degree constructions in Japanese* (University of Connecticut, 2008). 8. Beck, S. DegP scope revisited. *Nat Lang Seman* 20 (2012). 9. Szabolcsi, A. et al. Weak islands and an algebraic semantics for scope taking. *Nat Lang Seman* 1, 235–284 (1993).