

An experimental study of the pragmatic influence on the interpretation of multi-quantifier sentences

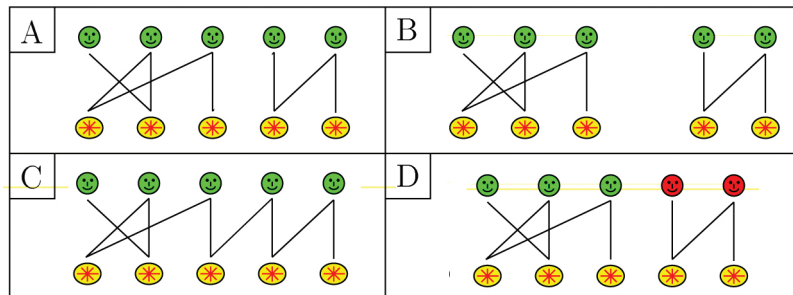
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The interpretations of multi-quantifier sentences are constantly puzzling. One of the important questions is how subjects identify witness sets for quantifiers. A standard answer is that the reading of a sentence is computed from the cardinality of all relevant items, so-called ‘global interpretation’ (see, e.g., [Schein, 1993](#)). However, recently it has become clearer that the witness sets might be actually identified among subsets of the universe by means of pragmatic inferences, so-called ‘local interpretation’ (see, e.g., [Brasoveanu, 2012](#)). The present paper provides empirical support for the pragmatic influence on quantifier interpretation.

We present the results of an on-line questionnaire. 20.901 participants (56% female, mean age was 24 years with $SD = 8$) judged the truth-value of sentences of the form: ‘ Q_1 boys eat Q_2 pizzas’ against the pictures representing various relevant situations. For instance, subjects were asked to decide the truth value of sentence:

- (1) Exactly three boys ate exactly three pizzas.

The sentence could be accompanied by one of the following figures:



According to the global interpretation the sentence is false in all the scenarios. However, if one considers the local interpretation, then it is possible to find witness sets making the sentence true. Depending on the the subject’s answer (true or false) we classified her sentence’s interpretation as local or global.

Figures associated with the sentences differed with respect to the following pragmatic factors. The idea was the the factors may suggest natural division of the universe into subsets, facilitating local interpretation.

Color: All boys had the same color, or groups were marked by different colors (B vs. D)

Crossings: Relation either suggested an existence of a group or not (A vs. C).

Distance: Distances between boys were similar or groups were spaced apart (A vs. B)

Our hypothesis was that the pragmatic factors should influence sentence interpretation. Specifically,

- Introducing color and distance should favor local interpretations.
- Adding crossings should suggest global interpretation.

Our predictions were confirmed to a large extent. We fitted logistic *linear mixed-effects* models, to account for random variation due to *individual differences*, *test items*, and *language of the participant*. Fig. 1 depicts the mean proportion (across participants)

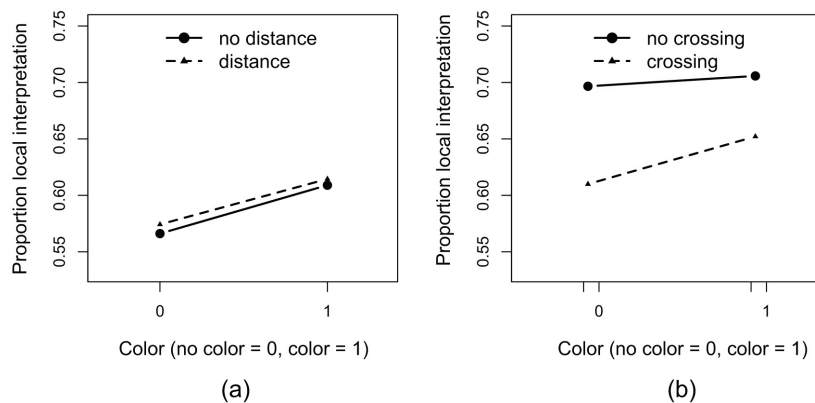


Figure 1: Mean proportion of local interpretations, and the effects of distance (a), crossing (b), and color (a and b). Standard errors were too small to depict.

of local interpretations. It clearly shows an effect of color. In fact, the main effect of color was significant, $\beta = .19$, $z = 15.27$, $p < .001$. The proportion of local interpretations was highest if the groups of boys were depicted in distinct colors. The proportion of local interpretations was slightly lower if there were no distinct colors indicating separate groups of boys. The mean difference was 4.2%. The main effect of distance was significant, $\beta = .03$, $z = 2.67$, $p = .007$. The proportion of local interpretations was just slightly higher if the groups of boys were depicted with greater distance between them. The mean difference in the proportion of local interpretations, between the no-distance versus distance conditions, was 0.6%. As can be seen in Fig. 1, there was no significant interaction between the factors color and distance. Fig. 1b clearly shows an effect of crossing. The mean proportion of local interpretations decreases if the connections between boys and pizzas cross between subgroups of boys. This main effect was significant, $\beta = -.4$, $z = -13.1$, $p < .001$.

We hope that our work throws some light on the pragmatic-semantic interplay by contributing some empirical observations to the the theoretical discussion on the interpretation of multi-quantifier sentences.

References

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