Presuppositions in Spatial Relational Assertions

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We take a spatial relational assertion like (1) to be understood as a linguistic localization of one object, *the locatum*, relative to another object, *the relatum*. In (1), the grammatical subject, 'the cow', denotes the locatum and the prepositional object, 'the rabbit', denotes the relatum. The prepositional phrase as a whole denotes the place of the locatum.

(1)   *The cow is above the rabbit.*

In the experiments reported below, assertions describe the relative placement of pictures and we assume a *deictic* or *viewpoint-dependent* interpretation of the spatial preposition (but see Exp. 4 below). Hence, (1) means that the picture of the cow is displayed higher than the picture of the rabbit. Participants judged, for example, whether or not the spatial arrangement of a picture pair matched the assertion they had read before. One picture was displayed first in the centre of the screen; the second picture was added after a delay of one second. This task should be easier if the picture of a presupposed object is displayed first rather than second.

Based on the linguistic localization account, Logan (1995) proposed his theory of visual attention (VAT). In matching pictures against a spatial relational assertion, a spatial reference frame must be imputed onto the relatum to be able to judge the relative position of the locatum. Thus, judging the place of the locatum presupposes the display of the relatum. As for (1), the rabbit is presupposed and should be displayed first.

Greenspan and Segal (1984) addressed presuppositions within their topic-comment model (TCM) of sentence-picture verification. TCM identifies the preverbal constituent as the presupposed topic of a spatial relational assertion. The rest of the statement is the comment asserted about the topic. Greenspan and Segal reported evidence that in a sentence-picture matching task the visual search proceeds from the presupposed topic towards the object which forms part of the comment. According to TCM, the cow in (1) is presupposed and should be displayed first.

VAT and TCM make opposite predictions on what is presupposed if the locatum expression is in preverbal position and the relatum expression, which forms part of the prepositional phrase, follows the verb. If constituent order of (1) is switched, as

in (2), VAT and TCM both identify the rabbit as presupposed. According to TCM, (2) asserts about the place above the rabbit that it is inhabited by the cow.

(2)   *Above the rabbit is the cow.*

We ran four experiments in German to investigate whether VAT or TCM correctly predicts the presupposition object in a spatial relational assertion. In particular, we assessed whether presuppositions depend on constituent order, as assumed by TCM. In Experiment 1, we employed a sentence-picture matching task (cf. Oberauer and Wilhelm, 2000). On each trial, participants read a spatial relational statement. Then the first picture appeared in the centre of the display and the second picture was added after one second. We measured the time it took to judge the picture pairs. Four conditions resulted from manipulating whether the picture displayed first showed the locatum or the relatum and whether it showed the topic or non-topic. They are illustrated in (3) for a trial in which the picture of the rabbit was displayed first.

RABBIT DISPLAYED FIRST
   a. *Die Kuh ist über dem Hasen.*
      'The cow is above the rabbit.'

   b. *Der Hase ist unter der Kuh.*
      'The rabbit is below the cow.'

   c. *Über dem Hasen ist die Kuh.*
      'Above the rabbit is the cow.'

   d. *Unter der Kuh ist der Hase.*
      'Below the cow is the rabbit.'

We speak of a VAT-effect if judgements are faster with the relatum displayed first (3a/c). We speak of a TCM-effect if judgements are faster with the topic displayed first (3b/c). Note that (3c) is easy and (3d) is difficult on either account. We found both a VAT- and a TCM-effect, as well as an interaction. Condition (3.d) was more difficult than the other three conditions, which did not differ from another. Interestingly, the effects developed differently as revealed by separate analyses of the first and second half of the trials. In the first half, there was a VAT-effect but none of TCM; in the second half, there was a TCM-effect but none of VAT.

In Experiment 2, we used a picture placement task (cf. Huttenlocher and Strauss, 1968) with the same four conditions as in Experiment 1. One of the pictures was displayed first in the centre of the screen. Participants indicated by means of a joystick the direction in which the second picture had to be added. Condition (3.d) was again more difficult than the other three conditions. As in Experiment 1, a VAT-effect was only obtained for the first half of the trials; a TCM-effect only showed up for the second half of the trials.

In Experiment 3, we implemented a picture-pair placement task (cf. Huttenlocher and Weiner, 1971). Participants read the sentence and then correspondingly placed both

pictures by means of a mouse. We examined which picture was placed first with constituent order as an independent variable. VAT predicts that the relatum is placed first; TCM predicts that the topic is placed first. We found only a TCM-effect in this experiment. In order to show that overt behaviour in this task is responsive to the experimental manipulations we performed Experiment 4.

Experiment 4 manipulated the importance of the relatum by comparing the deictic with the intrinsic interpretation of spatial prepositions. The intrinsic interpretation is viewpoint-independent and relies of the intrinsic sides of the relatum and hence its orientation. Imagine that the relatum in (1), the rabbit, is displayed upside-down. On the deictic interpretation, the cow must be placed higher in the display than the rabbit; on the intrinsic interpretation, the cow must be placed lower in the display than the rabbit. In Experiment 4, a spatial relational statement involved a girl's and a boy's name and participants placed the drawings of girls and boys relative to each other. In half of the trials, the relatum was not displayed in upright posture. Half of the participants were instructed to interpret prepositions deictically; the other half to interpret them intrinsically. The stimuli were identical for all participants. We predicted that the relatum is placed more often first with an intrinsic than with a deictic interpretation. We found a VAT-effect as well as a TCM-effect. In addition, an intrinsic interpretation led to more first placements of relata compared to a deictic interpretation. This effect did not interact with constituent order.

To conclude, our results confirm that presuppositions vary with constituent order of spatial relational assertions. We will discuss our present findings in relation to previous research on constituent order and discourse status (givenness) in spatial relational assertions.

References

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