

Experiments on the role of the Question under Discussion for Ambiguity Resolution and Implicature Computation in Adults

This paper investigates the role of the Question under Discussion (QUD) in how adults process two different linguistic phenomena: scope ambiguities and scalar implicatures. The relevance of the QUD for scope resolution is suggested by a recent study by Hulsey et al. (2004). The study by Hulsey et al. developed a new model of scope resolution to explain children's interpretation of sentences containing quantifiers and negation such as (1) and (2).

- (1) The troll didn't deliver some pizzas
- (2) Every horse didn't jump over the fence.

The Question-Answer requirement (QAR) model proposed by Hulsey et al. is based on a common assumption in theories of communication, namely that every assertion is understood as an answer to a contextually relevant question (the QUD). According to this model, children and adults select the scope assignment that allows them to address the question under discussion. In the case of scope ambiguities, according to Hulsey et al. (2004), a good answer to a question is a proposition that entails an answer to that question. Numerous experimental studies have shown that the QAR model makes the right predictions when it comes to the resolution of scope ambiguities in children. The next step is to extend this research to adults.

The present study examines the predictions of the QAR model on adults' interpretation of scopally ambiguous sentences. To illustrate, 31 adult speakers of English participated in a Truth Value Judgment task experiment in which they were asked to interpret (3) as an answer to either the question in (4a) or the one in (4b) relative to a story in which two pizzas out of four get delivered. To make sure the questions in (4) were contextually relevant, they were asked directly to the puppet that produced the target sentence.

- (3) All the pizzas were not delivered
- (4) a. Were all the pizzas delivered?
- b. Were some pizzas delivered?

The prediction of the QAR model is that the interpretation accessed by adults would be influenced by the preceding question. In particular, the prediction is that adults should select the inverse scope interpretation of (3) when that sentence is presented as an answer to the question in (4a), since the inverse scope interpretation of (3) entails an answer to that question and makes the sentence true. By contrast, adults are expected to select the surface scope interpretation of (3) when that sentence is presented as an answer to the question in (4b) since only the surface scope interpretation entails an answer to that question. The results are striking. The 15 adults who heard (3) as an answer to (4a) accepted it consistently (98%), whereas the 16 adults who heard (3) as an answer to (4b) only accepted it 23% of the time. Thus, adults interpret (3) on its true inverse scope interpretation, when it follows (4a), but they interpret it on its false surface scope interpretation when it follows (4b).

The results show that when an overt question is provided, adults rely on that question. Adults, just like children, try to make the speaker's contribution relevant, before they try to make it true. Finally, the findings show that the QUD plays a role in resolving scope ambiguities in adults.

The next question we would like to address is whether the QUD exerts an effect on other phenomena. One such phenomenon is constituted by sentences that contain a scalar term like *some* or *all*. A sentence containing *some*, for example, can have a *some but not all* reading or a *some and possibly all* reading, depending on whether a scalar implicature is calculated (see Grice, 1975). We call the first reading the 'semantic' interpretation, and the second reading the 'pragmatically enriched' interpretation.

While it is well known that the calculation of scalar implicatures is blocked in particular constructions, i.e., downward entailing environments, little is known about the role

played by the context. Recent work by Zondervan (2007) revealed that the QUD of the context has an effect on the calculation of scalar implicatures, an effect that was predicted by authors such as Van Rooij (2002) and Van Kuppevelt (1996). In a Truth Value Judgment task, 36 participants were presented with a number of stories in which a character brought two objects (e.g. Harry brought bread and chips). In one condition, the story was tailored to trigger a subject-oriented QUD, and in the other condition an object-oriented QUD. The stories were followed by the corresponding explicit question-answer pair, examples are given in (5) and (6):

- (5) A: “Who brought bread or chips?”
B: “Harry brought bread or chips.”
- (6) A: “What did Harry bring?”
B: “Harry brought bread or chips.”

Participants were asked to judge whether speaker B’s answer was true, relative to the story. A difference in scalar implicature calculation was predicted because only in the second condition the scalar term (or) was in the part of the sentence that actually answered the QUD (the part that has focus), while in the first condition it was not. As expected, the percentage of scalar implicatures in condition 2 was significantly higher (73%) than in condition 1 (55%), reflecting the effect of the QUD on scalar implicature calculation.

Our research question is whether this effect of QUDs on scalar implicatures is also triggered by the yes/no-questions that have been found to affect scope resolution in the experiment above, possibly uncovering a common underlying mechanism for these two apparent distinct phenomena. For this purpose we conducted a Truth Value Judgment task. 16 adult speakers of English divided in two groups participated in the experiment. One group was asked to evaluate (7) as an answer to the questions in (8a), against a context in which all the hot-dogs have been delivered. The other group was asked to evaluate (7) as an answer to the question in (8b). As in the first experiment, we overtly asked the questions in (8) to the puppet.

- (7) I think some hotdogs were delivered
- (8) a. Were some hot-dogs delivered?
b. Were all the hot-dogs delivered?

Our prediction was that the calculation of scalar implicatures will be affected by the Question under Discussion. In particular we predict that subjects will calculate the scalar implicature – and thus reject the target sentence--to a lesser extent when asked to evaluate the target sentence in (7) as an answer to (8a) than as an answer to (8b). The reason is the following: the semantic interpretation of (7) constitutes a good answer to the question in (8a), i.e. it entails an answer to the QUD. Thus, there is no need to engage in the calculation of the relevant implicature. Differently, if we ignore the contribution of implicatures, (7) is not a good answer when it comes to the question in (8b). Subjects are then lead by the inappropriateness of the resulting discourse to look for a more congruent answer to the QUD, an answer that can be easily obtained by calculating the relevant scalar implicature. Once the implicature is factored in, (7) implicates an answer to the QUD in (8b). The results confirmed our prediction. While the group of adults who evaluate (7) as an answer to (8a) accepted it 95% of the time, the group who evaluate (7) as an answer to 8(b) never did. Moreover all of the subjects in this latter group commented that ‘all the hot-dogs were delivered’ thereby showing that the scalar implicature had been calculated.

The results support the claim that adults rely on the QUD for the calculation of scalar implicature and for the resolution of scope ambiguities.