Logical or Pragmatic, as Long as it Suits our Convenience: Scalar Inferences in a Pro-and Contra-attitudinal Context

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Abstract

In the present study we propose a context wherein the endorsement rate of the scalar inference from 'some' to 'not all' either increases or decreases. It is known that people tend to interpret the quantifier 'some' as 'not all', though logically some means 'some and possibly all'. However, we argue that this tendency to derive the scalar inference is variable and depends on the attitude of the reader or listener. When the 'not all' interpretation implies a confirmation of one's attitude, we expect a higher endorsement rate of the inference. On the other hand when the 'some and possibly all' interpretation contains pro-attitudinal information, we expect a decrease in endorsement rate. These predictions are derived from Kunda's theory of motivated reasoning (1990) and are supported by the data. Theoretical implications and suggestions for further research along this line are discussed.

Keywords: Scalar inferences; Motivated reasoning; Attitudes; Relevance theory.

Introduction

Understanding utterances requires knowledge about grammar and the semantics of words, but also about non-linguistic properties such as the speaker's intentions and the context in which the utterance is expressed. The interpretation of utterances has been studied extensively and belongs to pragmatics (Sperber & Wilson, 1986). Within the field of pragmatics one can distinguish different topics such as deixis, presupposition, speech acts, implicatures (Levinson, 1983). However, in the present paper we will only focus on the latter. An implicature, a term introduced by Grice (1975), is what is suggested by an utterance though not explicitly stated nor logically deducible. Consider the following classic example:

(1)   They got married and had a baby.

Here, it is suggested that they first got married and then had children (i.e., the implicature), though logically the sequence of events could also be reversed. A lot of research has been devoted to a subclass of implicatures called scalar implicatures. When a weaker term (e.g., 'some') is used to imply the negation of a more informative, stronger term

(e.g., 'all'), it is called a scalar implicature. For instance, when confronted with a sentence like (2), people tend to interpret 'some countries' as 'not all countries'. Although logically, 'some countries' could mean 'all countries', people rarely take this possibility into account.

(2)   Some countries are poor.

The explanation for this tendency can be found in Grice's cooperative principle (1975, 1989). According to this principle, people should make their contributions such as it is required, when they interact. For that purpose, he proposed four maxims, enabling people to communicate effectively. One of these maxims, the maxim of quantity, states that any contribution to a conversation should be as informative as possible. Returning to the example, if the speaker knows for a fact that all countries are poor, he would have used the stronger quantifier 'all'. However, the speaker employed the weaker term 'some', which is taken to mean that the stronger term is not appropriate (either because the speaker knows that not all countries are poor or because he is unsure that all countries are poor).

Looking through the literature, one can find two contradicting opinions concerning the mechanism underlying the production of scalar inferences (Noveck & Reboul, 2008). The neo-gricean account (e.g., Levinson, 2000) assumes that the 'not all' interpretation (also called the pragmatic interpretation) is derived by default. A logical interpretation of 'some' may be possible, but only when the pragmatic interpretation is cancelled in a certain context. Chierchia (2004) has also proposed a default theory in which he argues that scalar inferences are derived by default except when the scalar term occurs in a downward entailing context. These contexts include negations, question forms and antecedents of conditionals (Noveck & Reboul, 2008). On the other hand, there are theorists who argue against the default character of scalar inferences. Instead, they defend a contextualist view, which comprehends that the narrowing from 'some' to 'not all' is entirely determined by the context. The best known of these theories is probably Relevance theory (Sperber & Wilson, 1986, 1995; Wilson &

Sperber 2003). This theory states that people will only derive a scalar inference when it yields sufficient positive cognitive effects. To interpret an utterance as (2), listeners and readers are thought to follow a path of least effort in computing cognitive effects and to stop when their expectation of relevance is satisfied.

Evidence from different experimental studies seems to favour Relevance theory. Studies involving response time measures showed that a logical interpretation of underinformative utterances like 'some oaks are trees' takes less time than a pragmatic interpretation (Bott & Noveck, 2004; Noveck & Posada 2003). Also when participants were instructed to respond quickly, they produced less scalar inferences (Bott & Noveck 2004). Moreover, De Neys and Schaeken (2007) found that people made more logical and fewer pragmatic interpretations under high cognitive load. Breheny, Katsos and Williams (2006) took another approach and manipulated the context wherein the implicature was embedded. They found longer reading times in an upper-bound context (i.e., a context that warrants the scalar inference) than in a lower-bound context (i.e., a context that makes the inference inappropriate). Recently, two studies examined the computation of scalar inferences using a visual world paradigm (Grodner, Klein, Carbary & Tanenhaus, 2010; Huang & Snedeker, 2009). Where Grodner et al. (2010) report that the scalar inference is computed immediately, Huang & Snedeker (2009) found a short delay in the computation of the scalar inference. Since the latter is in line with Relevance theory and other experimental studies (Bott & Noveck, 2004; Noveck & Posada, 2003), we can conclude that most of the experimental evidence favours Relevance theory.

As already mentioned, Relevance theory states that the scalar inference from 'some' to 'not all' is highly dependent on the context. Some theorists have tried to identify contexts in which the availability of the scalar inference varied (Bonnefon, Feeney & Villejoubert, 2009; Breheny et al., 2006). Two of them, the lower-bound and upper-bound contexts, were already discussed above. Furthermore, Bonnefon et al. (2009) established that the endorsement of the inference declines in face-threatening contexts. In this paper we propose a different context wherein the occurrence of the scalar inference depends on one's attitudes. Such a context is more subjective (compared with more objective upper/lower-bound and face-threatening contexts) since scalar inferences here depend on feelings and motives of people.

In the literature, one can find many examples of how reasoning is affected by beliefs and attitudes. Performance on the Wason selection task for instance improved significantly when the task rule was contra-attitudinal because participants were motivated to look for disconfirmation, which leads to the correct solution to the task (Dawson, Gilovich & Regan, 2002). Kunda (1990) developed a theory that explained how reasoning might be influenced by attitudes. The theory of motivated reasoning, as it is called, postulates that when one is motivated to

arrive at a particular conclusion, one applies certain strategies that are considered most likely to yield the desired conclusion. Put differently, if confronted with contra-attitudinal information, one is motivated to reject this information (i.e., disconfirmation bias). On the other hand if the information is consistent with one's attitude, one is inclined to believe in it (i.e., confirmation bias). With this in mind, it should be possible to design a context where the scalar inference is either appropriate or inappropriate. Consider the following example:

(3)   a. in countries where the death penalty is applied, crime has decreased.
    b. in some countries where the death penalty is applied, crime has decreased.
    c. not all countries applying death penalty experience decreasing crime.
    d. some and possibly all countries applying death penalty experience decreasing crime.

Depending on someone's attitude towards the death penalty, the utterance (3a) is either pro-or contra-attitudinal. For people in favour of the death penalty (3a) is in line with their attitude whereas for people opposed to death penalty it is contrary to their beliefs. If the utterance were prefaced by the scalar "some" as in (3b), it can be interpreted either pragmatically (3c) or logically (3d). The logical interpretation, which is consistent with (3a), is pro-attitudinal for people in favour of death penalty but contra-attitudinal for people opposed to it. The reverse is true for the pragmatic interpretation. Therefore we predict, based on the theory of motivated reasoning, that people are inclined to interpret the scalar pragmatically when they are against the death penalty and logically when they are sympathetic to it. Note that these predictions apply only to the current example. If the word 'decreased' were to be replaced by 'increased', we would predict the opposite pattern. Furthermore, it is possible that one holds a neutral attitude towards the death penalty. This neutral condition serves as a baseline against which the effect of the pro-and contra-attitudinal context is evaluated. In general, given that the content of the utterance (i.e., 3a) is pro-attitudinal, we expect more logical interpretations while for contra-attitudinal utterances we expect more pragmatic interpretations compared with neutral utterances. In other words, we expect the endorsement rate of the scalar inference in the neutral condition to lie somewhere in between those of the pro-attitudinal and the contra-attitudinal condition.

Methodology

Participants

The study has been carried out in two different groups of participants. One group consisted of 73 12th grade students at the Groenendaalcollege in Merksem (34 men, 39 women, mean age 17,2), who participated voluntarily. The other participants were 197 first-year psychology students of the

University of Leuven (26 men, 171 women, mean age 18,5), who participated in return for course credit. In the analysis data from both groups are combined because results for each group were very similar.

Materials and procedure

We used a self-constructed questionnaire to gauge participants' attitudes towards different issues. We asked them to indicate how they felt about e.g. the death penalty, more police on the streets, legalization of soft drugs,… on a scale from 1 to 5, 1 meaning *strong in favour* and 5 meaning *strong in disfavour*. They also had to indicate on a similar scale how certain they felt about their answers, with 1 meaning *not sure at all* and 5 *very sure*. The item assessing one's attitude towards the death penalty was the crucial item of the questionnaire. The other items were merely fillers.

To measure whether or not the subjects derived the scalar inference, we took a similar approach as in Bonnefon et al. (2009). Half of the subjects received the following story:

> *A research group of sociologists and criminologists did a large-scale study into the relationship between death penalty and crime. From this research has become clear that in some countries where the death penalty is applied, crime has decreased.*
> *Do you think then that it is possible that in all countries where the death penalty is applied, crime has decreased?*

Subjects were then asked to circle the correct answer (yes or no). The other half got a slightly adapted story in which the word 'decreased' each time was replaced by 'increased'. Subjects received the questionnaire in small groups and were randomly assigned to one of these two versions. Since the experiment was conducted in Belgium, all materials were in Dutch.

Results

Based on their responses to the attitude questionnaire, participants were divided into three groups: in favour of death penalty (4 or 5 on the scale), against the death penalty (1 or 2) and neutral towards death penalty (3). These groups were again divided according to attitude strength.

Table 1: Contingency table of content of the utterance against interpretation of the scalar (percentages are in parentheses).

Participants scoring 4 or 5 on this second scale were thought to be sure about their attitude whereas 3 or less indicates a rather uncertain opinion concerning death penalty. Participants were divided in these two categories because people with uncertain attitudes might attach less importance to the pro-or contra-attitudinal utterance. As a consequence, their interpretations of the scalar term might be less affected (or even uninfluenced) by the context. Therefore, participants who felt uncertain about their beliefs were excluded from the analysis[1].

Crossing the type of story (i.e., crime has decreased versus crime has increased) with attitude towards death penalty yields six combinations which can be arranged in three groups or conditions: a pro-attitudinal condition (i.e., crime decreased and in favour of death penalty + crime increased and against death penalty), a contra-attitudinal condition (i.e., crime decreased and against death penalty + crime has increased and in favour of death penalty) and a neutral condition (i.e., crime decreased and neutral + crime increased and neutral). A chi-square test revealed a significant difference in interpretation of the scalar term between these three conditions ($\chi^2(2, N=225) = 20.14$, $p < 0.001$). As predicted, subjects in the contra-attitudinal condition made more pragmatic interpretations than those who are neutral regarding the death penalty (Table 1). On the other hand, subjects in the pro-attitudinal condition made more logical interpretations compared with the neutral condition. Nevertheless, the tendency to derive the scalar inference seems to be so natural that still two-third of the subjects interpret 'some' as 'not all'. If we look at the data for pro and contra death penalty attitudes separately, we find similar results. For those opposed to the death penalty, the endorsement rate of the scalar inference is 66% in the pro-attitudinal condition and 93% in the contra-attitudinal condition ($\chi^2(1, N=158) = 17.71$, $p < 0.001$). Subjects in favour of death penalty derived the scalar inference in 62% of the instances when they received the pro-attitudinal story and 86% when they received the contra-attitudinal story ($\chi^2(1, N=27) = 2.05$, $p > 0.1$). Although this latter result did not reach significance (due to the small sample size), it is clearly in accordance with the other results.

Discussion

The present research identifies a new context wherein the occurrence of the scalar inference either increases or

Interpretation of the scalar	Content of the utterance			Total
	Pro-attitudinal	Neutral	Contra-attitudinal	
Logical	30 (34.5%)	7 (17.5%)	8 (8.2%)	45 (20%)
Pragmatic	57 (65.5%)	33 (82.5%)	90 (91.8%)	180 (80%)

[1] Including all participants in the analysis had little effect on the results, probably due to the low number of uncertain attitudes (45 on a total 270). Still, we decided to preserve the distinction between certain and uncertain attitudes.

decreases. It is the first study to demonstrate the crucial role of attitudes in the interpretation of the scalar term 'some'. Depending on one's attitude, the scalar is more likely to be interpreted pragmatically, in contra-attitudinal utterances, or logically, in pro-attitudinal utterances, compared with a neutral condition.

These findings are in line with Kunda's theory of motivated reasoning (1990), in that people are motivated to reach a conclusion consistent with one's attitudes and beliefs. Furthermore, they complement previous studies demonstrating that context plays a crucial role in the interpretation of scalar terms.

The present study does not only differ in the *kind* of contextual manipulation, also the *position* of the scalar term relative to the context deviates from previous research. Formerly, the crucial context occurred either before or right after the scalar term. Here, the contextual manipulation (i.e., the word 'increased' or 'decreased') is situated nine words after the scalar 'some' and this has important theoretical implications[2]. Recent studies have shown that the computation of scalar inferences occurs relatively fast (Grodner et al., 2010; Huang & Snedeker, 2009). Also, Hartshorne and Snedeker (submitted) report that the interpretation of 'some' manifests itself nine words after encountering the scalar term. Given these findings, the contextual manipulation in the present study can initially have no effect on processing and interpretation of the scalar term. Before being confronted with the pro-or contra-attitudinal context, participants have already adopted either a logical or a pragmatic interpretation of the scalar. Thus from the perspective of Relevance theory, people will stop at the optimally relevant interpretation of 'some' without being influenced by the contextual manipulation. However, the ultimate interpretation of the scalar is affected by this context as evidenced by the varying number of logical interpretations in the different conditions. This suggests that readers (and listeners) do not necessarily stop at the first optimally relevant interpretation but rather keep on searching for a more relevant interpretation. In other words, people may temporary hold a certain interpretation of 'some' but eventually move to a different one due to the context. Further research should be conducted in order to support this claim, especially because it is inconsistent with an assumption of Relevance theory (i.e., that the reader or listener stops at the first interpretation that satisfies his expectations of relevance).

A recent study of Bonnefon, De Neys and Feeney (2011) regarding face-threatening contexts, actually provides evidence for a "second push towards another equilibrium between effect and effort", as they call it. The authors found that logical interpretations took longer and were more difficult to reach in face-threatening contexts. A possible way to reconcile our findings and those of Bonnefon et al. (2011) with Relevance theory is to allow a reconsideration of the interpretation of the scalar once the meaning of the sentence is fully grasped. This process would only be triggered in certain situations (i.e., pro-or contra-attitudinal context, face-threatening context) and requires processing time and effort. Thus, when people read the word 'increased' or 'decreased' they might revise their initial interpretation of the scalar term but this comes at a cost. Further research should help to determine whether the suggested modification of Relevance theory is valid.

In sum, this study adds to the existing literature in two ways. First, it provides evidence for the existence of a new context wherein the interpretation of the scalar term varies. Second, through the position of the contextual manipulation it challenges the assumption made by Relevance theory that people stop at the first optimally relevant interpretation of the scalar.

Acknowledgments

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[2] Because death penalty is a single word in Dutch, the contextual manipulation occurs nine words after the scalar (not ten words, as it would be in English).

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