The Ballad of *If* and *Since*: Never the Twain Shall Meet?

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Abstract

This paper investigates the processing of conditional sentences and sentences with 'since' in two respects. Firstly, we investigate the clausal implicature originating from the scale <since 'p, q'; if 'p, q'>. Secondly, we investigate how modals can affect the interpretation of these sentences. A reading time experiment is reported which involved these two factors. It appears that 'since' is processed fastest in a context in which the antecedent has been affirmed, whereas 'if' is processed fastest in a context with an uncertain antecedent. The use of modals can speed up or slow down the reading process. Modals help to speed up processing of sentences involving 'if' in a certain context and 'since' in an uncertain context. However, when modals are used with 'if' in an uncertain context or with 'since' in a certain context, they slow down processing of the relevant sentences. The results will be situated in two accounts of implicatures, neo-Gricean and Relevance Theoretic.

Introduction

The introduction will be split up in two parts. The first part treats the interpretation and processing of implicatures. Specific attention will be given to the clausal implicature based on the scale <since 'p, q'; if 'p, q'>. The second part deals with the use of modals and how they can affect the interpretation of a sentence.

Implicatures

In the past few years, attention has been drawn to the processing of implicatures in experimental pragmatics. Experimental psychologists have tested some of the theoretical claims made in linguistic theory. Many experiments have investigated the nature of quantity implicatures. Research topics include the time course, the acquisition of implicatures, which theoretical frameworks are better suited to explain the results gathered so far, … (cf. Bott & Noveck, 2004; Breheny, Katsos & Williams, in press; Noveck, 2001; Noveck & Posada, 2003; Noveck & Sperber, 2004; Papafragou & Musolino, 2003).

Grice was the first to draw attention to the existence of implicatures. They are non-logical inferences people make on the basis of the information that is directly available in discourse. The example most referred to is probably the use of 'some'. Purely logical, 'some' is compatible with 'all', whereas in daily conversation it is often interpreted as 'some, but not all'. For example, when someone says 'some boys are happy' this usually implicates 'not all boys are happy'. This implicature derives from Grices cooperative principle (people in a conversation should be cooperative) and the maxims of conversation (Quantity: 1. make your contribution to the conversation as informative as necessary. 2. do not make your contribution more informative than necessary; Quality: do not say what you believe to be false, do not say that for which you lack adequate evidence; Manner: be perspicuous, and specifically avoid obscurity, avoid ambiguity, be brief, be orderly; Relevance: make your contributions relevant). The quantity implicatures derive more particulary from the first quantity implicature. Levinson (1983, 2000) translated the maxims as heuristics for the hearer. The quantity implicature is translated in the Q-heuristic: what you do not say is not the case (Levinson, 2000). So, if 'some' is said and not 'all', this implicates that 'all' is not the case. In this neo-Gricean view, implicatures arise automatically and involve no extra processing effort (cf. Noveck & Posada, 2003).

An alternative account is the Relevance Theoretic account. According to Sperber and Wilson (Sperber & Wilson Sperber, 1995, 2004; see also Carston, 1998, 2004), human cognition tends to be geared to the maximisation of relevance. There is a subtle balance between cognitive efforts and cognitive effects. The greater the positive cognitive effect, the greater the relevance will be. The greater the processing effort, the less the relevance. The quest for comprehension follows a path of least effort and stops when the expectations of relevance are satisfied. In this view, implicatures generate greater cognitive effects and are thus effort-demanding. In the general discussion we will discuss the implications of this study for the neo-Gricean and Relevance Theoretic accounts.

Apart from <some, all>, many items can be put on 'informational scales' (cf. Gazdar, 1979; Horn, 1972) <always, often, sometimes>, <since 'p, q'; if 'p, q'>, <necessarily p, p, possibly p>, <and, or>, <excellent, good>, <know, believe>, … For all these examples, it holds that if a speaker uses the weaker term on the scale, this usually implicates that she is not in a position to utter the stronger term. The idea is that the speaker always utters the strongest element on the scale for which she has sufficient evidence (Gazdar, 1979; cf. Levinson, 1983, 2000). If she uses the weaker element on the scale, this implicates that she lacks adequate evidence to utter the stronger element (cf. maxim of quantity).

This paper will tackle a specific type of quantity implicature, viz. the clausal implicature of the conditional. In other words, it investigates the implicature resulting from the scale <since 'p, q'; if 'p, q'>. Clausal implicatures are epistemic implicatures that entitle the hearer to infer from an utterance that the speaker is uncertain about the clauses of the sentence he uttered. If someone starts a sentence with 'if' this means that she is not in a position to use the stronger term 'since'. When 'if' is used the speaker does not commit herself to the truth of the antecedent whereas when 'since' is used the speaker does commit herself to the truth of the antecedent. This is in accordance with the claim made in linguistics that in a sentence with 'since' the speaker asserts the antecedent, whereas in a conditional the speaker does not assert the antecedent. "Other causal conjunctions (*since, as*) are used sentence-initially in the same way as *if* is. The essential difference, however, between *if* on the one hand and all causal conjunctions on the other is that causal conjunctions introduce factual, asserted information, while *if* does not" (Dancygier, 1998, p. 84). An utterance 'If A then B', has as clausal implicature that the speaker is uncertain about A, because she should have said 'Since A, B' otherwise. So, it is reasonable to infer that she is uncertain about both A and B. Cf. Akatsuka's claim (quoted in Noh, 2000, p. 184) that '"if" is a marker of uncertainty, and cannot be used to introduce speaker's knowledge'.

The implicature thus has to do with the certainty with which the speaker utters the antecedent. Therefore, we will focus on one type of conditionals in which the certainty of the antecedent can vary widely. This is the class of inferential conditionals (Dancygier, 1998; Declerck & Reed, 2001; Haegeman, 2003; Sweetser, 1990; Verbrugge, Dieussaert, Schaeken & Van Belle, 2004; Verbrugge, Dieussaert, Schaeken & Van Belle, 2006; Verbrugge, Smessaert, & Van Belle, 2005). An example of an inferential conditional is: *'If he goes on holiday to Saint-Tropez twice a year, he must be rich*.' While in regular content conditionals a state of affairs or event in reality is merely described (e.g., *If you heat water, it boils*), inferential conditionals are a blueprint of a reasoning process in someone's mind. The antecedent of an inferential conditional functions as premise, the consequent is the inferred conclusion. Because the speaker can express various levels of belief in the conclusion, 'if' ranges from being very hypothetical to almost factual in inferential conditionals. Contrary to what we have said above, it appears that in inferential conditionals, the speaker sometimes seems to know the truth value of the antecedent, but nevertheless uses a conditional. In this respect, this paper investigates how close 'if' comes to 'since'.

The use of modals

Some other elements may direct the interpretation of the sentence in a particular direction. Traxler, Sanford, Aked and Moxey (1997) showed that the use of modal constructions or expressions like '*says that* [sentence]' or '*thinks that* [sentence]' can help the reader in the direction of a particular interpretation. They conducted a reading time experiment with causal and diagnostic (i.e., inferential) sentences involving 'because' (e.g., causal sentence: *Tina had to walk five miles because her engine stalled on the motorway*; diagnostic sentence: *Tina ran out of gas because her engine stalled on the motorway*). Overall, the processing of the second clauses of diagnostic sentences took longer than the processing of the second clauses of causal sentences. Yet, in their second experiment they report that when a particular modal construction (e.g., *perhaps, maybe, might*) was added (e.g., causal: *Perhaps Jeff got angry at his neighbours because they played their stereo too loud.* Diagnostic: *Perhaps Jeff had inconsiderate neighbours because they played their stereo too loud*), reading times decreased considerably for the second clauses of the diagnostic sentences. They were then as easily processed as causal sentences. Apparently, these modal constructions create a mental space more compatible with a diagnostic interpretation. Diagnostic interpretations become more readily available and are consequently more easily processed. The use of modal constructions did not disadvantage the reading times of the second clauses of causals.

In the present study, we also manipulated this factor. We assume that the usual interpretations come to the surface when no modal is used. Modals can help to create a setting in which unexpected items become more accessible. They can guide the reader in a particular direction because a new mental space is set up (see Traxler et al., 1997). We added the modal 'zal wel' (i.e., *probably*) to cue a relatively certain inferential interpretation. It is supposed to make 'if' more acceptable in contexts in which the antecedent has been affirmed. The difference with Traxler et al. is that in their experiment the modal always occurred before the second clause (mostly in the beginning of the first clause), whereas the modals we used occur in the consequent of the conditional. So we do not assume that the modal will cue a particular interpretation beforehand. We think that a relevant interpretation crops up in a combination of the processing of the connective and the modal. Since we have only measured the reading times of the entire sentences and not of parts, we do not know where exactly the processing of the sentences differed. We will take this into account in future research.

Hypotheses

Based on evidence from previous research sketched above, we hypothesize the following. Concerning the clausal implicature, the interpretation of 'since' is that the speaker is certain of the antecedent. We claim that there is no ambiguity involved in the interpretation of 'since': the certainty belongs purely to the semantics of 'since'. We hypothesize that the usual interpretation for 'if' is that the speaker is not certain of the antecedent. In this experiment we investigate whether this is reflected in the reading times of conditionals and 'since'-sentences. We expect 'since' to be processed faster in a context in which the antecedent has been affirmed because this complies with the semantics of 'since'. When 'since' is used in a context in which the antecedent has not been affirmed, it might take longer because this goes against the semantics of 'since'. As for 'if', we will firstly discuss the hypotheses from a Gricean perspective. In the neo-Gricean account implicatures are thought to arise by default and cost no extra processing time (cf. Noveck & Posada, 2003). On this account, we expect 'if' to be processed faster in a context in which it is unsure whether the antecedent holds. When 'if' is used in a context in which the antecedent has been affirmed, this is contrary to intuitions and we expect the participant to need extra time to withdraw or block the implicature that 'if' means not certain. The hearer thought that the speaker was not in a position to utter the stronger element, now it appears she is, and coming to terms with this may cost extra processing time.

The predictions made by Relevance Theory (cf. Carston, personal communication, 24/01/2006) for the interpretation of 'if' would be that there is no difference between 'if' in a certain and an uncertain context. For the uncertain contexts the preceding context already makes clear that the antecedent is uncertain. Therefore, it is not necessary to derive the implicature that 'if' means that the antecedent is not certain. Because the evidence is already there, it would be pointless to derive the implicature. It would only mean more processing effort and no more positive cognitive effects. For the certain contexts, the preceding context makes clear that the antecedent is certain and as a result, the implicature will not be derived. So in both contexts, Relevance Theory predicts no extra processing costs (and accordingly, no longer reading times).

Concerning the use of modals, we hypothesize that modals can affect the interpretation of 'if' and make it more compatible with an interpretation in which the antecedent has been affirmed. When a modal hinting at the certainty with which you draw a conclusion is used, 'if' might become more acceptable in a certain context. So, we expect the processing time to decrease in this case. In an uncertain context, we think that the modal will not contribute to faster processing of the sentence. Likewise, we hypothesize that modals can affect the interpretation of 'since'. The modal expression we used 'zal wel' hints at relative certainty, but does not convey absolute certainty. In a certain context, the modal is not needed because the semantics of 'since' conveys certainty already and a combination of both may only cause confusion. In an uncertain context, however, the modal is less certain than 'since' and can therefore tone down the certainty of 'since'. So, generally, we could say that where modals are not needed, we think that they will enlarge the differences. When they can help to resolve inconsistencies that have arisen previously, we think that they will bridge the gaps.

Pretest

A pretest was conducted to check for general differences in reading times between sentences starting off with 'if' and 'since'. The program *e-prime* was used to set up and run the experiments. The items were presented to the participants in Dutch, their mother tongue. The Dutch translations of 'if' and 'since' are 'als' and 'aangezien'. The Dutch 'aangezien' only functions as a conjunction of causality. This may make the interpretation less ambiguous than the English alternative.

The 10 sentences that were used as items in the experiment were presented to 50 (26 'if', 24 'since') participants on a computer screen. No context was given. They were asked to read the sentences at their own pace and then press a button. As a check to whether they actually read the sentences, a word was shown on the next screen and the participants had to judge whether that word occurred in the preceding sentence or not. Correct answers were given in 99% of the cases.

The kind of connective (if, since) was manipulated as a between-groups variable. The dependent variable was the time taken in milliseconds to read the sentence. Reading times that deviated by more than two times the standard deviation from the mean were not included in the analysis. Reading times were subjected to log linear transformations. An analysis showed that the reading times of sentences with 'if' and 'since' did not differ significantly. So, if any significant differences occur in the reading times of sentences with 'if' and 'since' in the experiment proper, this is due to different processing of the sentences and not to the normal reading times of 'if' and 'since'.

Experiment

Method

Participants 203 first year psychology students participated in the experiment as a part of a course requirement. All participants were familiar with reading from a computer screen, and had normal or corrected to normal vision.

Materials and Design The items were presented to the participants in Dutch, their mother tongue. Ten items were given to every participant in random order. The ten items comprised different kinds of inferential sentences: sentences

in which the time of the event of the antecedent preceded the time of the event of the consequent (e.g., *If/Since he has read all books on the subject, he will know a lot about it*) and sentences in which the time of the event of the consequent preceded that of the antecedent (e.g., *If/Since they are celebrating, Peter will have won the tennis match*). This was done in order to select a broad mixture of inferential conditionals, and will not be analysed. The variables that were manipulated between subjects were: kind of connective (*if, since*), presence or absence of a modal (e.g., *If/Since he has read all books on the subject, he knows/ will probably know a lot about it*), and the affirmation of the antecedent information in the preceding context. Either the content of the antecedent was confirmed in the preceding content (e.g., *In the morning Peter plays the finals of a tennis championship. In the afternoon, two friends drive past his house and see that people are celebrating*) or it was neither confirmed nor denied (e.g., *In the morning Peter plays the finals of a tennis championship. In the afternoon, two friends are on their way to his house and wonder whether people will be celebrating*). So, in the first context the antecedent was certain and in the second context, it remained uncertain whether the antecedent was fulfilled. Participants were randomly assigned to the different groups.

Procedure The program *e-prime* was used to set up and run the experiments. The participants were tested in groups of approximately 25. They were seated in a computer room, each in front of a computer screen. Absolute silence was requested. First, instructions were given on the computer screen. Then four items were given as an exercise to get used to the procedure. After that, the next screen told the participants they could start with the experiment itself. The order of the trials was randomised. There were ten trials in total per participant.

The procedure per trial was as follows: Every sentence was presented separately on the computer screen. Per trial, there were five screens in total (2 context, 1 item, 1 question, 1 feedback). Participants were asked to read the sentence and press the button when they were ready. Then the next sentence appeared. The first two screens were sentences sketching the content (and affirming or saying nothing about the truth of the antecedent that followed, generating a certain or uncertain context). The third sentence was the item for the analysis (including either 'if' or 'since', modal or not). The dependent variable that will be analysed below is the time taken in milliseconds to read this item. On the next screen a statement about one of the preceding sentences was given and participants had to indicate whether this was true or false. On the next screen feedback was given. Participants solved the statements correctly in 93% of the cases.

Results

The dependent variable is the time taken in milliseconds to read the sentence (recorded between two key presses). Reading times that deviated by more than two times the standard deviation from the mean were not included in the analysis. Reading times were subjected to log linear transformations.

An Anova-analysis was conducted with the transformed reading times as the dependent variable. The kind of connective (if, since), presence of absence of a modal, and the affirmation of the antecedent information in the preceding context were manipulated as between subjects independent variables.

The analysis revealed a main effect of modal $F(1,195)=14.57$, $p<.001$ with the sentence with modal taking longer to read than the sentence without; and a three-way interaction effect between certainty in preceding context, modal and kind of connective $F(1,195)=5.99$, $p<.05$. The three-way interaction was fleshed out by means of planned comparisons. They revealed that 'if' was processed faster than 'since' for the certain contexts when a modal was used $F(1,195)=4.46$, $p<.05$. They revealed that 'if' was processed faster than 'since' in an uncertain context when no modal was used $F(1,195)=4.49$, $p<.05$. They revealed that 'since' was processed faster in a certain context than in an uncertain context when no modal was used $F(1,195)=6.03$, $p<.05$. They revealed that 'since' was processed faster in a certain context without modal than with modal $F(1,195)=17.09$, $p<.001$. They revealed that 'if' was processed faster in a uncertain context without modal than with modal $F(1,195)=4.77$, $p<.05$.

Table 1: Reading time means in milliseconds.

Certain	If-since	Modal	Reading time	SD	N
No	If	Yes	2840	118	24
		No	2487	115	25
	Since	Yes	2975	115	25
		No	2820	115	25
Yes	If	Yes	2799	118	24
		No	2702	111	27
	Since	Yes	3113	111	27
		No	2473	113	26

Discussion

As for the clausal implicature and the interpretations of 'if' and 'since', we observe that 'since' is processed faster in a certain context than in an uncertain context when no modal is used. This is entirely in line with the semantics of 'since'. 'If' was processed faster than 'since' in an uncertain context when no modal was used. This is in line with the claim that the status of the antecedent is uncertain in conditionals.

As for the use of modals, we see that sentences with modals take longer to process than the ones without. Of course, this is simply due to the fact that sentences with a modal contain two words more. 'Since' is processed faster in a certain context without modal than with modal. This difference is not significant for the uncertain contexts,

although exactly as in the certain condition, there are still two words extra in the condition with modal. 'If' is processed faster in an uncertain context without modal than with modal. This may just be due to the two words extra. However, this difference disappears in the certain context. Now no significant differences can be observed anymore between modal and without modal, although there are exactly as in the uncertain condition, still two words extra in the condition with modal. As we sketched out in the introduction, modals hinting at a degree of certainty help to strengthen the interpretation of 'if' to become acceptable/ more easily processed in a certain context and weaken 'since' to become more acceptable/ more easily processed in an uncertain context. The modals do not contribute to a faster processing of 'if' in an uncertain context or 'since' in a certain context, but only seem to cause confusion.

Also the fact that 'if' is significantly processed faster than 'since' in a certain context when a modal is used, supports our hypothesis that modals help to make 'if' more acceptable in a certain context, whereas that does not come into play for 'since' in a certain context.

We would like to draw special attention to these differences in reading times between 'if' with and without modal and to the reading times of 'since' with and without modal. Although the modal condition each time contains two words extra, significant differences disappear in the relevant conditions: certain for 'if' or uncertain for 'since'. Although the sentence with modal comprises two more words, it takes hardly any more time to process. So, our hypothesis that modals help to resolve inconsistencies that have arisen previously rings true (i.e., inconsistency between 'if''s uncertainty and certain context is resolved and inconsistency between 'since''s certainty and uncertain context is resolved, by means of a modal hinting at relative certainty).

General Discussion

This study investigated the differences in processing between 'if' and 'since' with an inferential interpretation in certain and uncertain contexts. In inferential conditionals, 'if' sometimes reaches near certainty. In that respect, we wanted to investigate the nature of the clausal implicature of the conditional, saying that when a speaker utters 'if' he is uncertain about the antecedent.

Since reading times are a reflection of the time it takes to process a sentence, we can draw the following conclusions. The usual interpretation of 'since' is in a certain context. The fastest interpretation of 'if' appears to be in an uncertain context.

We will try to show how the results concerning the clausal implicature of the conditional can be explained in the two main frameworks on implicatures, the neo-Gricean account and the Relevance Theoretic account. As we outlined above, the two theories probably make the same predictions concerning 'since' because it has only to do with the semantics and not with implicature derivation.

An important difference between these two approaches regarding the processing of implicatures is that the "neo-Gricean approach (e.g. Levinson, 2000) assumes that implicatures intrude automatically on the semantics of a term like Some. Relevance Theory (Sperber and Wilson, 1985/96) assumes that implicatures are effortful and not automatic" (Noveck & Posada, 2003, p. 203).

According to Relevance Theory, implicatures only arise when the hearer's need for relevance has not been satisfied. This is in line with the finding that the standard interpretations of 'if' (in an uncertain context) and 'since' (in a certain context) require least processing time. As we said in the introduction about the interpretation of 'if', it is not sure in the uncertain context that the implicature has actually been derived because enough relevance may have been achieved. The uncertainty has already been established in the preceding context, and there is no need to derive the implicature. So there will be no extra processing effort. This is in accordance with the result that we find no significant difference in reading times for 'if' between a certain and an uncertain context.

As for the neo-Gricean account, implicatures arise automatically (cf. Noveck & Posada, 2003). When inconsistent information is found in the context, the implicature can be withdrawn or blocked but that would take extra time. To the best of our knowledge, this means that the processing of 'if' would take longer in certain contexts than in uncertain contexts. In the experiment we found no evidence that the withdrawal of the implicature that 'if' means 'not certain' takes extra time. As said in the preceding paragraph we find no significant difference in reading times for 'if' between a certain and an uncertain context.

This study was also set up to show the effect modals can have on the processing of sentences. Apparently modals help to make particular interpretations more accessible (see Traxler et al., 1997). In the experiment we saw that while there were significant differences between 'if' with and without modal in an uncertain context, this was not the case for the certain contexts. The reverse held good for 'since'. A significant difference was observed in the certain contexts between with and without modal, whereas that was not the case in the uncertain contexts. Relevance Theory can provide us with an explanation why the use of modals can speed up processing of connectives in the relevant contexts. Maybe the expectations of relevance will be met more easily when a modal and a connective are used together. The modal can help to resolve an incompatibility that arose in a combination of a certain context and 'if', a connective hinting at uncertainty; and of an uncertain context and 'since', a connective affirming the antecedent. Because the modal 'will probably' guides the reader to a relatively certain conclusion, it may be the middle course between certainty and uncertainty and resolve previous inconsistencies. In this way, enough relevance is achieved and the processing effort of coming to grips with apparent contradictions is saved.

This was an exploratory study about the clausal implicature of the conditional and the role modal expressions can perform for the interpretation process. A crucial question to be answered concerns clarification of the exact nature of the clausal implicature. While much attention has been devoted to scalar implicatures, linguistic theories and psychological experimental studies remain largely implicit about the interpretation and processing of clausal implicatures. It is an interesting matter for both linguists and psychologists whether clausal implicatures are to be thought about in the same way as scalar implicatures (both are quantity implicatures, Levinson 1983). Future research should address the similarities and differences with scalar implicatures and the link with other clausal implicatures, such as <know, believe>. More particulary, in the case of <since 'p, q'; if 'p, q'>, could the results also be explained by a purely semantic analysis?

In summary, no definite conclusions can be drawn at this point. Further more fine-tuned research should establish how the processing of the clausal implicature of the conditional takes place, which role modals play and which linguistic account is better suited to explain it.

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