

Roots

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Adverbs and sentence topics in processing English

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1. Introduction

Many languages permit considerable flexibility of word order. The importance of information-structure for the placement of arguments in these languages has been widely discussed. When an argument appears in a non-canonical position, typically there are information-structure constraints on its discourse status. Often the change of word order affects the focus-background articulation of a sentence (e.g. Höhle 1982; Abraham 1992; Steube 2000 for German). In German for example, a phrase may be scrambled to a position earlier than its canonical position, but typically the scrambled phrase must be already given in discourse and the clause will receive narrow focus (the focus will not include the scrambled constituent). Experimental evidence for this assumption comes from studies showing that processing locally ambiguous sentences with non-canonical word order (scrambling) requires not only a syntactic reanalysis to be performed, but also a focus structure reanalysis (Bader & Meng 1999; Stolterfoht & Bader 2004). Further evidence for the important role of information-structural constraints is found in processing object topicalization in Finnish. The canonical order in Finnish is SVO. When listeners encounter an OV sentence-beginning, they immediately predict that the (post-verbal) subject will refer to some discourse-new entity (Kaiser & Trueswell 2004).

There is a strong relation between information-structure and word order in flexible word order languages. But what about the information-structuring in a language like English that does not have scrambling or highly flexible ordering of arguments? In the present paper we will focus on whether information-structure constraints found in scrambling languages may also apply in languages like English that do not have scrambling. We will focus on the information-structure constraints conveyed by adverb placement.

Identifying the structural position of arguments is often difficult. However, when the sentence contains an adverb, the adverb may in effect identify a structural position allowing the position of the argument to be determined. The position of adverbs relative to other elements is one traditional

diagnostic in the analysis of phrase structure. Adverbs were often assumed to mark phrasal boundaries, and used as landmarks to demonstrate the movement of other elements across them (e.g. Emonds 1976; Platzack 1983).

It has long been noted that the IP-internal syntax in a scrambling language like German is sensitive to information-structural considerations dependent on the adverb position.

- (1) a. ..., *weil sie immer Briefe aus Europa beantwortet hat.*
 ... since she always letters from Europe answered has
 '... since she is always engaged in answering letters from Europe.'
- b. ..., *weil sie Briefe aus Europa immer beantwortet hat.*
 ... since she letters from Europe always answered has
 '... since she never leaves a letter from Europe unanswered.'

Diesing (1992) and Kratzer (1995) have developed one strong hypothesis, known as the *Mapping Hypothesis*, concerning the relation between the interpretation of a phrase and its syntactic position. A bare plural DP like *Briefe aus Europa* ('letters from Europe') is ambiguous between a generic and an existential reading. According to the Mapping Hypothesis, there is a boundary marked by the adverb *immer* ('always') below which an ambiguous bare plural receives a weak or existential interpretation like in (1a) and above which it gets a strong or generic reading like in (1b). Diesing identified this boundary with the VP boundary and stated that material from VP is mapped into the nuclear scope and material from IP is mapped into a restrictive clause (i.e. Diesing 1992: 10).

However, it appears that the Mapping Hypothesis is inadequate to explain all the facts for German. As Meinunger (1995) pointed out, the definite DP *der Hund* ('the dog') in the examples in (2) has a strong interpretation whether it sits above or below the VP boundary marked by the adverbial *auf einmal* ('all of a sudden') (capitals indicate sentence accents, 'the dog' is given information, see pp. 89).

- (2) a. *Aber als er wieder rauskam war auf einmal der HUND*
 But when he again out.came was at once the dog
verschwunden.
 disappeared.

- b. *Aber als er wieder rauskam war der Hund auf einmal*
 But when he again out.came was the dog at once
verSCHWUNden.
 disappeared.

'But when he came back out, all of a sudden the dog had disappeared.'

But there is still an interpretational difference: 'the dog' is the sentence topic in (2b), but not in (2a). Meinunger accounts for this type of data by assuming that DPs to the left of boundary-marking adverbials occupy the specifiers of Agreement phrases (AgrPs), and by linking Agr to topicality with the feature [+topic] (see also Svenonius 2002).

It has been pointed out that not any type of adverbial marks the VP boundary. Frey (2000) identifies the topic position in the German middle-field above a specific class of adverbials, namely sentential adverbials. According to Frey, sentential adverbials are evaluatives like *erstaunlicherweise* ('amazingly'), evidentials like *offensichtlich* ('obviously') and epistemics like *wahrscheinlich* ('probably'). Sentential adverbials are characterized as the boundary between given and new information (Haftka 1995, 2003) and as having their base position above all other arguments and adverbial classes (Frey & Pittner 1998).

The examples in (3) provide evidence for a specific topic position preceding the sentential adverbial in German. Frey's topic concept is an aboutness topic (in contrast to a familiarity topic) which can be described as an expression about whose referents the sentence predicates or makes a judgment (Reinhart 1981, 1995).

- (3) *Ich erzähl dir mal was von Otto.*

'I will tell you something about Otto.'

- a. *Nächstes Jahr wird Otto wahrscheinlich seine Kollegin heiraten.*
 Next year will Otto probably his colleague marry.

- b. *#Nächstes Jahr wird wahrscheinlich Otto seine Kollegin heiraten.*
 Next year will probably Otto his colleague marry.

'Next year, Otto will probably marry his colleague.'

The subject *Otto* has scrambled to a topic position in front of the sentential adverbial *wahrscheinlich* ('probably') in (3a), which is acceptable. In (3b), the subject remains in its canonical position, which is not acceptable in a context like that in (3), where *Otto* is a clear topic.

In addition to this example, Frey (2000) provides us with an impressive battery of tests to demonstrate the link between the position above sentential adverbials and topicality. One of these tests uses non-referential expressions. As demonstrated in example (4), a non-referential expression cannot fill the topic position preceding the sentential adverbial.

- (4) * *Während des Vortrags hat keiner , anscheinend geschlafen.*
 During the talk has nobody apparently slept

According to Frey, the reason for this is that aboutness topics must have identifiable discourse referents for the addressation of the information about these referents. Non-referential expressions do not provide these addresses. Thus, they cannot fill the position above the sentential adverbial.

A syntactic approach for capturing these observations for German and similar phenomena in other Germanic languages has been proposed by Bobaljik & Jonas (1996). The authors argue that languages like German and Icelandic have two subject positions within the IP, one in the specifier of the Agreement Phrase (SpecAgrSP) which is linked to topicality, and one in the Specifier of the Tense Phrase (SpecTP). Sentential adverbials are attached to TP and separate these two positions. In contrast, languages like English and Danish do not contain a position for topics, but have only one subject position (SpecAgrSP) which is not sensitive to, at least not dictated by, the information-structural status of the subject (see also Svenonius 2002).

To conclude, languages with flexible word order like German and Finnish are sensitive to information-structural constraints with regard to the order of arguments. In addition, adverb position may help to identify structural positions which in turn indirectly convey information-structure constraints. In contrast, the grammar of languages like English seems not to be sensitive to these information-structural constraints.

The question to be addressed here is whether English really is not sensitive to information-structure constraints conveyed by adverb placement. We report an experiment we conducted to investigate the interaction of adverb placement and the discourse status of the subject argument.

2. The experiment

The experiment addresses the question of whether adverb placement in a language like English with a relatively fixed word order influences assumptions about topichood in a manner similar to that proposed for scrambling languages.

For answering this question, we used the test proposed by Frey (2000) and looked at sentences with non-referential DPs above and below a sentential adverbial in comparison to sentences with referential DPs.

- (5) a. *The envoy said that presumably no king defeated the knights.*
b. *The envoy said that no king presumably defeated the knights.*
c. *The envoy said that presumably the king defeated the knights.*
d. *The envoy said that the king presumably defeated the knights.*

In particular, the question to be addressed here is whether placing a subject above a sentential adverbial leads readers to treat the subject as a topic. Consequently, it would be very odd to have a negative phrase like *no king* which cannot serve as topic, appear above a sentential adverbial, given the standard assumption that negatives are non-referential and therefore do not make good topics (Reinhart 1981, 1995; Ertshik-Shir 1997; Frey 2000).

In a self-paced reading study, participants read sentences like (5). We manipulated the referential status of the subject (*subject type - referential vs. non-referential*) and the relative order of subject and adverb (*adverb position - early vs. late*). The following hypotheses can be formulated:

Hypothesis 1

If English does not have a specific position for topics above the sentential adverbial as assumed by Bobaljik & Jonas (1996) and Svenonius (2002), no difference with regard to the referential status of the subject preceding the adverbial should be found for the processing of English (*no interaction of order and subject type; no reading time difference between (5b) and (5d)*).

Hypothesis 2

If adverb placement in English is comparable to adverb placement in German with respect to conveying information-structure constraints, then even in an English sentence, a non-referential subject preceding a sentential adverbial should be highly marked (*interaction of order and subject type; longer reading times for (5b) in comparison to all other conditions*).

Participants were asked to read sentences in a self-paced manner followed by a task which required the choice of the correct paraphrase of the sentence.

2.1. Method

2.1.1. Participants

52 undergraduate students of the University of Massachusetts who participated for course credit. All were native American English speakers.

2.1.2. Materials

The materials manipulated the type of subject (non-referential vs. referential) and the position of the adverb (early vs. late). Both factors were manipulated within items. 24 sentence quadruples were constructed (see examples in (5)). The sentences are provided in the Appendix.

12 different sentence adverbs were used, consisting of four evaluatives (*surprisingly, amazingly, unfortunately, fortunately*), four evidentials (*evidently, obviously, apparently, supposedly*) and four epistemics (*presumably, possibly, probably, certainly*). Each adverb appeared twice. Repetition of other lexical items was avoided as much as possible.

Four presentation lists were constructed by randomly combining the 24 experimental sentences with 88 filler sentences, counterbalanced across the four groups of sentences. Each participant saw only one version of each item.

The two paraphrases were reformulations of the sentences with negative and referential phrases.

(6) Paraphrases

- a. non-referential *The envoy assumed that the knights won.*
- b. referential *The envoy assumed that the knights lost.*

2.1.3. Procedure

The experiment was run on a PC using E-Prime software (Psychology Software Tools, Inc.). The sentences were presented in two regions in a self-paced mode with a moving window technique. Participants pressed the space bar of the keyboard to begin the trial, at which time a row of dashes appeared on the screen. A dash represented each character of the sentence. Then, participant pressed the space bar to present each region of the sentence (see illustration in (7)).

- (7) -----
 The envoy said that -----
 ----- no king presumably defeated the knights.

By pressing the space bar, the two paraphrases of the sentence appeared on the screen, preceded by a question mark to signal the new task. Participants chose one of the paraphrases by pressing one of two keys. They were told to read through the sentences at a natural pace and to read closely enough to choose the paraphrase.

2.1.4. Data analysis

We analyzed participants' reading times for the two regions, the accuracy for choosing the paraphrase and the response times. Reading times and responses that were more than 2.5 SD away from the mean were excluded from the analysis. This led to less than 3 % loss of data. The data of three participants were excluded from the analysis, because of more than 25 % loss of data.

2.2. Results

The results are presented in Table 1.

Table 1. Mean reading times (Region 1 and Region 2) in ms, percentage of correct paraphrases (% correct) and response times (Response) in ms by condition for Experiment 2

Condition	Region 1	Region 2	% correct	Response
non-ref.-early	1164	2277	91	4338
non-ref.-late	1168	2555	94	4391
ref.-early	1184	2208	89	4260
ref.-late	1110	2178	93	4240

The reading times of Region 1, which was identical for all four conditions, exhibited no significant differences (all $p > .10$).

The reading times for Region 2 revealed a main effect of subject type ($F_1(1,48) = 8.42, p < .01$; $F_2(1,23) = 7.57, p < .01$). Participants needed more time to read the sentences containing a non-referential subject. Addi-

tionally, there were two marginally significant effects: the main effect of adverb position, marginally significant in the subject analysis and fully significant in the item analysis ($F(1,48) = 2.94$, $p = .09$; $F(1,23) = 4.13$, $p < .05$), and the interaction of the two factors, significant in the subject analysis and marginally significant in the item analysis ($F(1,48) = 4.48$, $p < .05$; $F(1,23) = 3.26$; $p = .08$).

The conventional 2x2 analysis of variance provides some evidence that participants needed more time to read the sentences with a non-referential subject and a late adverb than each of the other three types of sentences. Since this pattern of results was predicted we performed more focused tests, comparing the non-referential subject/late adverb condition against each of the remaining three conditions. Each contrast was fully significant (see Table 2). However, none of the remaining three conditions differed significantly from any other ($F < 1.0$).

Table 2. ANOVA RT Region 2 – planned comparisons

Comparison	F1 (1,48)	p1	F2 (1,23)	p2
non-ref.-late with				
non-ref.-early	5.56	.02	5.40	.03
ref.-early	7.17	.01	10.24	.004
ref.-late	11.56	.001	8.92	.007

For the choice of the correct paraphrases, only a marginally significant main effect for adverb position was found ($F(1,48) = 3.33$, $p = .07$; $F(1,23) = 3.59$, $p = .07$). For unclear reasons, participants gave slightly more correct answers for sentences with a late adverb (93,5%) than for sentences with an early adverb (90%). The analysis of the question-answering times revealed no significant effects (all $F < 1.0$)

3. Discussion

The results of the self-paced reading study revealed significantly longer reading times for sentences with a non-referential subject preceding a sentential adverbial in comparison to all other conditions. These results can be interpreted as evidence for *Hypothesis 2*, which assumes a topic position for English comparable to that found in scrambling languages like German. *Hypothesis 2* predicted that a subject placed above a sentential adverbial is treated as a topic and thus a non-referential subject preceding the adverb

will be highly marked. This result is particularly interesting because German and English are so different with respect to the relevant structural properties: German permits various types of fronting operations (fronting to SpecCP, scrambling to various positions within the middlefield) to reflect information-structure whereas English permits very little movement of this type.

The results of our study can be interpreted as evidence against *Hypothesis 1* which assumes that English has only one landing position for subjects that is not sensitive to the information-structural status of DPs.¹ Our data suggest that English patterns with other Germanic languages with regard to information-structural constraints for the position of the subject.

One might worry that the long reading times for sentences with a negative subject preceding the adverb were due to the possibility of a scope ambiguity in these sentences, but not in the sentences with a referential subject. However, at least according to our intuitions, there is no scope ambiguity with the adverbs tested in the actual materials (*unfortunately, evidently, apparently, surprisingly, etc.*). Thus, we think this possibility is remote, given that at best one would be dealing with a potential ambiguity. Further, in the processing literature on scope, one does not find longer processing times due to actual scope ambiguity. For example, Anderson (2004, Experiment 6) tested scope ambiguous sentences like *A climbing expert scaled every cliff*. In a self-paced reading study, the ambiguous sentences were presented in either a context biased to surface scope or a context biased to inverse scope. Unambiguous control sentences were also tested (*The climbing expert scaled every cliff* for surface scope; *A different climber scaled every cliff* for inverse scope). As in all her other studies, the surface scope sentences were read faster than the inverse scope sentences but there was no effect of ambiguity.

4. Conclusions

Our study examined the behavior of subjects in English when a sentential adverbial followed the subject in an embedded clause. The results of the experiment showed that a non-referential subject gave rise to a penalty (longer reading times) when it preceded the adverb but a referential subject did not. This was expected if a subject preceding the sentential adverbial is treated as a topic, since non-referential subjects do not make good topics.

Based on evidence from intuitions, a similar effect seems to occur in German. But in German it is not so surprising that adverb placement would influence the information-structure of a sentence. Given the movement pos-

sibilities afforded by scrambling, often the only way to be sure where in the syntactic structure a subject sits is by looking at its position relative to an adverb or some other constituent. Further, the fact that a subject or other argument may appear in various syntactic positions allows the positions to be exploited for marking information-structure. But what the present results suggest is that adverbs may play a similar role in English.

The results encourage the view that in a non-scrambling language too adverb placement can constrain and signal information-structure.

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Note

1. Alternatively, a single syntactic subject position may be 'valued' by information-structure constraints in a context-dependent fashion, depending on its position relative to a sentential adverb. Regardless of whether one adopts a more complicated syntax with straightforward mapping to information-structure, or a simpler syntax and a more complicated statement of the information-structure constraints, it is clear that adverb position and the information-structure status of the subject interact.

Appendix

Materials (one version of all experimental items and paraphrases)

The envoy said that presumably no king defeated the knights.

The envoy assumed that the knights lost/won.

The electrician reported that presumably no appliance caused the blackout.

The electrician supposed that there was a/no defective appliance.

The officer noticed that surprisingly no suspect knew the victim.

The victim was known/not known by a suspect.

The exterminator saw that surprisingly no mouse ate the cheese.

The exterminator saw that the cheese was gone/still there.

The president declared that evidently no minister lied to the subordinates.

The president claimed that the subordinates were deceived/not deceived.

The doctor concluded that evidently no patient survived the disease.

The doctor concluded that the disease was nonlethal/lethal.

The police assumed that possibly no owner torched the warehouse.

The police assumed that the owner was/the owners were not involved in arson.

The magazine speculated that possibly no actress visited the hospital.

The magazine speculated that hospital was/was not visited by an actress.

The reporter said that unfortunately no quarterback attended the party.

The reporter said that the party was/was not attended by a quarterback.

The mother said that unfortunately no nurse called the doctor.

The mother said that a/no doctor was called.

The organizers announced that probably no band will play at the festival.

It is likely that the/no band will appear at the festival.

The forecast claimed that probably no storm will reach Amherst.

The forecast assumes that Amherst will/won't get nasty weather.

The journalist emphasized that obviously no soldier killed the demonstrators.

The demonstrators were/were not killed by the military.

The investigator heard that obviously no clerk broke the safe.

The investigator heard that the safe was/was not broken by the clerk.

The teacher said that certainly no pupil smoked a cigarette.

The teacher said that the pupil smoked/did not smoke.

The father stated that certainly no son washed the car.

The father stated that his son has been busy/his sons have not been busy.

The lawyer stated that apparently no priest embezzled the money.
The lawyer stated that the money was/was not embezzled by a priest.

The director heard that apparently no audience loved his film.
The film was a/no success.

The judge stated that supposedly no secretary stole the data.
The data were/were not stolen by a secretary.

The artist recognized that supposedly no gallery owner bought the picture.
The artist recognized that the picture was/was not sold.

The driver said that fortunately no child missed the bus.
Some child missed/Everybody caught the bus.

The mayor said that fortunately no people obeyed the request.
The request was/was not complied.

The professor noticed that amazingly no student passed the exam.
The professor noticed that somebody/nobody passed the exam.

The activist noticed that amazingly no whale survived the spill.
The spill left a/no whale alive.

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