

# Interpretation of leftward-moved constituents: processing topicalizations in German<sup>1</sup>

MARKUS BADER and LYN FRAZIER

## *Abstract*

*Five experiments were conducted on German topicalization sentences to explore their interpretation and the relation between the syntactic representation and the discourse representation of the sentence. It is proposed that a DP is rapidly instantiated as a discourse entity in the discourse representation whereas a NP is simply treated as a property. If the postulated discourse entity corresponding to the DP in SpecCP of a topicalized sentence must be retracted due to the occurrence of a later determiner (in split-topicalization) or due to the need to scope under a subsequent quantifier, the sentence should be difficult to process. These predictions were confirmed in two difficulty judgment experiments and in an experiment where participants selected the first interpretation assigned to a scopally ambiguous sentence involving an adverbial quantifier. However, in a separate experiment, where scope ambiguities involving determiner quantifiers were tested, the preference for the discourse instantiated DP to take wide scope disappeared.*

*Another difficulty judgment experiment revealed substantial difficulty for sentences containing “mixed chains” where a DP moves and then a NP moves out of the moved DP. This difficulty was not observed in corresponding sentences containing essentially the same lexical content in the same positions but without the movement responsible for creating the mixed chain.*

## **1. Introduction**

In many natural languages it is possible to move phrases leftward to sentence-initial position. In English, for example, leftward movement is obligatory for wh-phrases (cf. [1a]) and possible under highly restricted contextual conditions for non-wh object phrases.

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- (1) a. What<sub>i</sub> did you buy t<sub>i</sub>?  
 b. [This book]<sub>i</sub>, Peter will not understand t<sub>i</sub>.

How sentences with leftward-moved phrases are processed has already received a substantial amount of attention, but only for leftward moved wh-phrases (cf. Fodor 1989). In this article, we will investigate how the human sentence processor processes leftward-moved phrases that are not wh-phrases. In particular, we will ask how indefinite objects are interpreted when they are moved to sentence-initial position, or topicalized, as this kind of grammatical operation is also called. The language used in our experiments will be German. With respect to topicalization of objects, there are two main differences between English and German. First, in every German declarative main clause, a phrase has to be moved to the sentence-initial position immediately in front of the finite verb (this gives rise to the so-called verb-second property of German and other languages). While it is often the subject of a sentence that is topicalized, topicalizing the object, as in (2), is in no way exceptional and much more common than in English.

- (2) [DP EINIGE [NP FILME VON HITCHCOCK]]<sub>i</sub> habe ich T<sub>i</sub> gesehen.  
 some movies by H. have I seen  
 'I have seen some movies by Hitchcock.'

The second difference is that German not only allows one to topicalize a complete DP, but also to topicalize only part of a DP. This so-called "split" topicalization is shown in (3a), with the NP part of the DP topicalized but the determiner stranded in its base position (see Fanselow and Cavar [2001] for a recent syntactic analysis of split topicalization and examples from a variety of languages). If the moved NP is a singular NP, as in (3a), it may then be preceded by a "regenerated" determiner (*ein*) as in (3b) (cf. van Riemsdijk 1989).<sup>2</sup>

- (3) a. [NP FILME VON HITCHCOCK]<sub>i</sub> habe ich [DP EINIGE T<sub>i</sub>] gesehen.  
 movies by H. have I some seen  
 'I have seen some movies by Hitchcock.'  
 b. [NP EINEN FILM VON HITCHCOCK]<sub>i</sub> habe ich [DP KEINEN T<sub>i</sub>]  
 a movie by H. have I no  
 gesehen.  
 seen  
 'I have not seen a movie by Hitchcock.'

How are sentences with topicalized indefinite objects — either split or nonsplit — processed? In this article, our primary focus will be on the semantic interpretation of the topicalized phrase. In those cases where

an indefinite DP has been topicalized, interpretation should adhere to the discourse instantiation hypothesis proposed in Frazier and Clifton (2002). In terms of current theories of discourse processing (e.g. discourse representation theory [Kamp and Reyle 1993]), this means that an indefinite DP triggers the insertion of a discourse referent into the current representation of the discourse.

(4) THE DISCOURSE INSTANTIATION HYPOTHESIS

When a DP is encountered, the processor postulates a corresponding entity in the discourse representation unless one already exists.

The idea that DPs are rapidly instantiated in the discourse representation receives support in a variety of studies. Murphy (1984) presents experimental evidence that a sentence introducing a new discourse entity with an indefinite takes longer to process than a counterpart referring to an already existing entity with a definite. Warren and Gibson (2002) also present evidence suggesting longer processing times after a new discourse item than after an already given one at positions following the critical DP.

The idea that it is costly to retract an already made discourse assumption has also received support. Frazier and Clifton (2002) propose that discourse-linked (d-linked) interrogatives (Pesetsky 1987) are rapidly instantiated in the discourse representation. Given a singular d-linked phrase like *which boy* in (5), difficulty in processing should arise if the discourse assumption must be retracted, as in (5a).

- (5) a. Which boy did Tom say every girl married?  
b. Which boy did Tom say every girl saw?  
c. Who did Tom say every girl married?  
d. Who did Tom say every girl saw?

In (5a) and (5b), a singular discourse entity should rapidly be postulated. In (5a), once the embedded clause is processed, it will be pragmatically odd to keep this discourse assumption, because *marry* is strongly biased to a one-one pairing of girls and boys. Hence, in (5a) perceivers must retract the assumption of just a single discourse entity. By contrast, in (5b) the verb *saw* is not biased, and permits a many (girl)–one (boy) pairing. In (5c) and (5d) no difficulty should arise because *who* is not discourse-linked and no immediate discourse instantiation is predicted to occur. Frazier et al. (1996) present self-paced reading data supporting these predictions.

In the remainder of this article, we will present five experiments that have investigated how readers interpret indefinite NPs and DPs that have been moved to SpecCP. Experiments 1 and 2 will look at sentences with split DPs (cf. [3]), asking — among other questions — what

consequences it has for interpretation when a DP is distributed between two places in the sentence. The following three experiments will be concerned with the question of how the interpretation of an unsplit DP or NP in SpecCP (cf. [2]) interacts with a quantified element (which will either be a subject or an adverbial) in the later part of the sentence.

All five experiments reported in this article will use off-line methods (questionnaires collecting difficulty ratings or interpretive preferences) as their experimental task. Given that we are entering new terrain with the questions addressed below, we think that a reasonable way to begin developing a processing account is by mapping out intuitions, which we have done here. Of course, ultimately one also wants converging evidence from online techniques, like self-paced reading or measurements of eye movements. But drawing processing conclusions from questionnaire difficulty rating data is not unusual (as demonstrated by, e.g., Gibson 1998), and, furthermore, the results from more online methods typically reinforce the results of corresponding questionnaire data (e.g. Warren and Gibson 2002).

## 2. Experiment 1

How are split topicalizations processed? We propose that the answer to this question depends on the nature of the constituent in SpecCP. In Experiment 1, two types of indefinite constituents in SpecCP will be tested: indefinite singular DPs (cf. [6a]) and bare plural NPs (cf. [6b]).

- (6) a. [DP Einen Film von Hitchcock]<sub>i</sub> habe ich [DP keinen t<sub>i</sub>]  
       a movie by H. have I no  
       gesehen  
       seen  
       ‘I have not seen a movie by Hitchcock.’
- b. [NP Filme von Hitchcock]<sub>i</sub> habe ich [DP keine t<sub>i</sub>] gesehen.  
       movies by H. have I no seen  
       ‘I have not seen movies by Hitchcock.’

We tentatively assume that a noun may head a nominal projection, NP, which either may serve as a maximal projection, or it may contain an extra functional level of structure including a determiner and forming a DP.

With a singular noun preceded by the indefinite determiner *ein*, a discourse referent or discourse marker in the sense of discourse representation theory (Kamp and Reyle 1993) is incorrectly instantiated in the discourse representation. By contrast, a bare plural is not immediately instantiated in the discourse representation. We simply assume they are

initially analyzed as NPs and therefore treated as properties, for example, “book x.” In this sense their interpretation is incomplete. The ultimate interpretation will depend on whether the property (e.g. plural noun) is associated with a determiner, as in the split construction, or is interpreted as being under the scope of an overt, or perhaps implicit, adverb of quantification (e.g. *häufig* ‘often’) (cf. von Stechow 1994).

If the discourse instantiation hypothesis is correct, then in split topicalizations the perceiver should encounter difficulty at the determiner if a singular (*ein Buch* ‘a book’) occurred in initial position. In effect, the perceiver will have been semantically garden-pathed. By contrast, in the plural no semantic garden path should arise. Experiment 1 was designed to test the discourse instantiation hypothesis. To this end, we asked native German speakers to rate the difficulty of written German sentences on a 1 (*leicht* ‘easy’) to 5 (*schwer* ‘hard’) scale.

## 2.1. Method

*Material.* Sixteen split-topicalization sentences were constructed with four versions of each, as illustrated in (7) (all materials appear in Appendix 1). Two forms ([a] and [b]) contained a singular noun in SpecCP preceded by the determiner *ein*; two ([c] and [d]) contained a bare plural.

- (7) a. Singular, without adverbial:  
 Eine CD von Bob Dylan habe ich in diesem Geschäft keine  
 A CD by have I in this store no  
 gesehen.  
 seen  
 ‘I haven’t seen a CD by Bob Dylan in this store.’
- b. Singular, with adverbial:  
 Eine CD von Bob Dylan habe ich in diesem Geschäft schon  
 A CD by have I in this store already  
 dreimal keine gesehen.  
 three times no seen  
 ‘For three times now, I haven’t seen a CD by Bob Dylan in this store.’
- c. Plural, without adverbial:  
 CDs von Bob Dylan habe ich in diesem Geschäft keine  
 CDs by have I in this store no  
 gesehen.  
 seen  
 ‘I haven’t seen CDs by Bob Dylan in this store.’

d. Plural, with adverbial:

CDs von Bob Dylan habe ich in diesem Geschäft schon  
CDs by                    have I    in this    store    already  
dreimal    keine gesehen.  
three times no    seen  
'For three times now, I haven't seen CDs by Bob Dylan in this  
store.'

Two forms ([b] and [d]) contained an adverbial quantifier before the determiner of the split phrase and two ([a] and [c]) did not. The adverbial quantifier was *wieder* ('again') in half the materials and an adverb such as *dreimal* ('three times') in the others.<sup>3</sup> The determiner of the split phrase was *keine* ('no') in all the materials. All sentences were of the form shown in (8).

(8) Object-NP Auxiliary Subject-NP ... (Adverbial Quantifier) kein  
Main Verb

The discourse instantiation hypothesis predicts difficulty in processing the sentences with an initial singular phrase, (7a) and (7b), relative to sentences with an initial plural, (7c) and (7d), due in effect to a semantic garden path in (7a) and (7b). The adverbs in (7b) and (7d) were included to see if perhaps the presence of an adverb magnifies the predicted difficulty of the sentences with an initial singular. Very little is known at present about the domains involved in interpretive processing. If adverbial quantifiers serve to delimit interpretive domains, then perhaps the reanalysis of the initial singular in (7a) and (7b) would be harder in (7b) than in (7a) because in (7b), the reanalysis would go into a quantificational domain, that is, a phrase introduced outside the domain would need to be reanalyzed using material inside the domain.

Alternatively, the presence of a quantificational adverb may simply add complexity to all sentence types, but not interact with other interpretive decisions, such as the retraction of a discourse assumption in (7a) and (7b). In this case, the complexity of the adverb would surface as a main effect, but not interact with the number of the initial phrase.

The experimental items were counterbalanced so that each participant judged only one version of a given sentence but, across the experiment, judged an equal number of all sentence types. In addition to the items of Experiment 1, participants received 44 filler items. None of the filler items contained a split DP. Twelve of the filler items were the experimental items from Experiment 3. Sixteen filler items were from an unrelated experiment on focus structure. The remaining sixteen filler sentences were of a variety of structures. Eight of them were grammatical and easy

to understand; the other eight contained various syntactic or semantic anomalies (e.g. extraction out of embedded indirect question, negative polarity item without licensing negative element). Experimental and filler sentences were presented together in a pseudo-randomized order.

*Participants.* Thirty-two students of the University of Constance participated in Experiment 1. All were native speakers of German and naive concerning the purpose of the experiment.

*Procedure.* Participants received the questionnaires together with written instructions.<sup>4</sup> Under each sentence, the possible ratings (from 1 (*leicht* 'easy') to 5 (*schwer* 'hard') in increments of 1) were printed. Participants' task was to read each sentence and rate its difficulty by circling one of the possible numbers.

## 2.2. Results

The mean ratings for the sentences used in Experiment 1 are shown in Table 1.

In this and all following experiments, results were analyzed with both participants (*F1*) and items (*F2*) as random effects. Two-way ANOVAS (2 numbers  $\times$  2 presence of adverbial) revealed a significant main effect of number ( $F1(1, 31) = 47.48, p < .01$ ;  $F2(1, 15) = 30.36, p < .01$ ), with singular sentences rated higher than plural sentences. The main effect of presence of adverbial was also significant ( $F1(1, 31) = 82.85, p < .01$ ;  $F2(1, 15) = 20.04, p < .01$ ), reflecting the fact that sentences with adverbials were rated higher than sentences without adverbials. The interaction between number and presence of adverbial was not significant (both *F*-values  $< 1$ ).

## 2.3. Discussion

Experiment 1 has two major outcomes. First, split-topicalization sentences with a split singular object were rated as less acceptable than

Table 1. Mean ratings on a scale ranging from 1 (easy) to 5 (difficult) for the sentences of Experiment 1

	Singular	Plural
Without adverbial	2.9	2.1
With adverbial	3.6	3.0

split-topicalization sentences with a split plural object. Second, split-topicalization sentences were rated as less acceptable when containing an adverbial than when not. The first result provides supportive evidence for the discourse instantiation hypothesis. For singular objects, a complete DP consisting of a determiner and a NP is in the clause-initial topic position. This DP is subject to discourse instantiation by which a discourse referent is introduced for it. This discourse referent has to be retracted when the stranded quantifier *keine* is encountered, leading to low acceptability. For plural sentences, in contrast, only an NP is in topic position. Since an NP does not trigger discourse instantiation, but only the introduction of a property (N[x]) into the semantic representation, no discourse retraction becomes necessary when the stranded determiner is encountered, and the acceptability of these sentences is accordingly substantially higher than in the singular case.

There are many theories of the semantics of indefinites (Carlson 1977; Heim 1982; Kamp 1984; Chierchia 1998; Longobardi 2001). In some, for example Carlson's classic theory, the kind reading of bare plurals is basic. The kind reading is treated as referential: bare plurals name kinds. In this sort of theory, one would need to explain why an initial bare plural is not instantiated as a kind. The evidence from Experiment 1 thus might, in principle, be viewed as evidence against such a theory. However, we think such a conclusion would be premature. The examples tested in Experiment 1 might be biased against a kind reading. For example, the modifiers (*by Bob Dylan*) in the initial constituent might serve to bias against a kind reading and/or the kinds of predicates used in this study might serve as an implicit bias against a kind reading. To really sort out this issue, we would need to specifically design contexts that support the distinct readings of bare plurals and look at whether discourse instantiation effects were observed under these conditions.

All of our experimental sentences were sentences in which the object preceded the subject. Given the well-established subject–object preference for sentences which are locally or globally ambiguous between a subject–object and an object–subject structure (cf. Bader et al. 2000; Hemforth and Konieczny 2000; and many others), the question arises whether this preference might have interfered with the results of Experiment 1. In the sentences with a plural split DP, the topicalized phrase was always ambiguous between nominative and accusative case because this distinction is not morphologically encoded for plural NPs. For sentences with a singular split DP, twelve were locally ambiguous (feminine or neuter DP) and four were unambiguous (masculine DP). It might well be that the local ambiguity of the initial phrase caused a temporary processing problem given the general preference for assigning the subject role to an

ambiguous initial NP or DP. If this kind of processing problem were to be reflected in our results, it should be more severe for plural than for singular sentences, because plural sentences were always locally ambiguous whereas only one third of the singular sentences were so. Since sentences with plural split DP were indeed judged better than sentences with singular split DP, problems due to local ambiguity cannot be responsible for the results we found. Such problems might only have decreased the distance between sentences with plural split DPs and sentences with singular split DPs.

As a final point, we would like to address the grammatical status of the split singular sentences that were tested in the present experiment. As pointed out in Note 1, some speakers do not accept singular split sentences with a determiner as grammatical. Although these speakers are reported to be the minority (cf. Pafel 1995; Fanselow and Cavar 2001), it is nevertheless a possibility that the difference between singular and plural split found in Experiment 1 was caused by a subset of speakers who simply rejected sentences in the singular condition as outright ungrammatical.<sup>5</sup> To test for this possibility, we divided the 32 subjects of Experiment 1 into two groups of sixteen each in the following way. First, subjects were ordered with respect to their combined mean judgment on split singular sentences with and without adverbial. The first sixteen subjects according to this ordering will be referred to as Group 1, the second as Group 2. The mean rating collapsed over all four conditions was 2.3 for Group 1 and 3.5 for Group 2. This difference, however, stems not only from a difference concerning split singular sentences (Group 1: 2.5 versus Group 2: 4.0) because plural split sentences were also judged worse in Group 2 (Group 1: 2.1 versus Group 2: 2.9). An overview of the differences between sentences with and without adverbial in both groups is given in Table 2.

Although the differences are smaller for the first than for the second group, they are still there. Furthermore, statistical tests for the two groups considered separately reveal the very same pattern that was found in the overall analysis: both main factors are significant whereas the interaction between them is not (Group 1: factor adverb:  $F(1, 15) = 33.74$ ,

Table 2. *Differences between split plural and split singular sentences in Experiment 1 for Group 1, Group 2, and all participants together*

	Without adverbial	With adverbial
Group 1 (mean = 2.3)	0.34	0.41
Group 2 (mean = 3.5)	0.84	1.2
All (mean = 2.9)	0.60	0.80

$p < .001$ ;  $F2(1, 15) = 14.85$ ,  $p < .01$ ; factor number:  $F1(1, 15) = 14.09$ ,  $p < .01$ ;  $F2(1, 15) = 6.34$ ,  $p < .05$ ; interaction between adverb and number: both F-values  $< 1$ ; Group 2: factor adverb:  $F1(1, 15) = 48.51$ ,  $p < .001$ ;  $F2(1, 15) = 19.65$ ,  $p < .001$ ; factor number:  $F1(1, 15) = 55.02$ ,  $p < .001$ ;  $F2(1, 15) = 44.81$ ,  $p < .001$ ; interaction between adverb and number: adverb\*number:  $F1(1, 15) = 1.34$ ,  $p = .26$ ;  $F2(1, 15) = .61$ ,  $p = .45$ ). We therefore conclude that the results of Experiment 1 are not an artifact of including sentences in the experiment that were ungrammatical for some speakers.

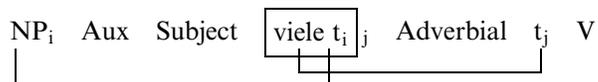
### 3. Experiment 2

In our second experiment, we will subject the syntactic assumption that split-topicalization involves a movement relation between the stranded quantifier and the topicalized phrase to an empirical test. We will do this by gathering acceptability judgments for sentences like (9).

- (9) ROMANE VON GRASS hat Oskar VIELE mehr als nur einmal  
 Novels by Grass has Oskar many more than only once  
 gelesen.  
 read  
 ‘Oskar read many novels by Grass more than once.’

Sentence (9) is like the plural split-topicalization sentences of Experiment 1 with one major exception: whereas the sentences of Experiment 1 contained either no adverbial or an adverbial in front of the stranded quantifier, sentence (9) contains an adverbial between the stranded quantifier and the clause-final verb. Given the common assumption that objects are sister to the verb, a sentence like (9) involves two movement steps: first, the complete DP *viele Romane von Grass* has to be moved in front of the adverbial; second, the NP part *Romane von Grass* has to be moved out of this DP to SpecCP. Schematically, this is shown in (10).

- (10) Split NP with adverbial: two movement steps



This creates what we will dub “a mixed chain”: a representation in which a constituent has been moved out of an already moved constituent. In order to test the prediction that sentences like (9) are of decreased acceptability due to the mixed chain, we will compare acceptability judgments to such sentences to acceptability judgments for sentences which contain

only one of the two movement steps depicted in (10). With respect to the first movement step, we will include sentences as in (11) in Experiment 2.

- (11) Was ROMANE VON GRASS betrifft, so hat Oskar VIELE mehr als  
 What novels by Grass concerns so has Oskar many more than  
 nur einmal gelesen.  
 only once read  
 ‘As far as novels by Grass are concerned, Oskar read many of  
 them more than once.’

In sentence (11) there is only one movement. In (11), the determiner is moved in front of the adverbial, but the NP *Romane von Grass* is base-generated in a sentence initial position as a hanging topic. Thus, *viele* and *Romane von Grass* never formed a single phrase and, therefore, no movement step of splitting up a DP is necessary. The relevant part of the syntactic structure of (11) is shown in (12) (where  $\Delta$  denotes an empty pronoun coreferent with the hanging topic).

- (12) Hanging topic with adverbial: one movement step  
 Was NP betrifft, Aux Subject viele  $\Delta$  Adverbial  $t_j$  V
- 

A second type of construction against which sentences like (9) will be compared is illustrated by the example in (13).

- (13) Split NP without adverbial:  
 ROMANE VON GRASS hat Oskar VIELE gelesen.  
 Novels by Grass has Oskar many read

In sentence (13), a DP has been split up by moving the NP-part of the DP to SpecCP. However, since the sentence does not contain an adverbial between the clause-final main verb and the stranded determiner, only one movement step is involved, as shown in (14). This movement step is identical to the second one needed for the derivation of sentence (9).

- (14) Split NP without adverbial  
 NP<sub>j</sub> Aux Subject viele  $t_j$  V
- 

We predict that sentences like (9) that contain a mixed chain should be rated as less acceptable than sentences like either (11) or (13), because the processor must create two chains in (9) which can neither be unified, due to their distinct syntactic categories, nor treated as independent chains, given that the head of the DP chain contains the tail (trace) of the NP chain.

3.1. Method

*Materials.* We constructed 24 sentences, with each sentence appearing in six conditions according to the two factors DP type (split vs. unsplit) and structure (without movement/with adverbial vs. with movement/without adverbial vs. with movement/with adverbial) (all materials appear in Appendix 2). A sentence in all its six conditions is shown in (15) and (16).

(15) Split DPs

a. Without movement, with adverbial:

Was ROMANE VON GRASS betrifft, so hat Oskar VIELE *mehr*  
What novels by Grass concerns so has Oskar many more  
*als nur einmal* gelesen.

than only once read

‘As far as novels by Grass are concerned, Oskar has read  
many of them more than once.’

b. With movement, with adverbial:

ROMANE VON GRASS hat Oskar VIELE  $t_i$  *mehr als nur einmal*  
Novels by Grass has Oskar many more than only once  
gelesen.

read

‘Oskar has read many novels by Grass more than once.’

c. With movement, without adverbial:

ROMANE VON GRASS hat Oskar VIELE gelesen.

Novels by Grass has Oskar many read

‘Oskar has read many novels by Grass.’

(16) Unsplit DPs

a. Without movement, with adverbial:

Oskar hat VIELE ROMANE VON GRASS *mehr als nur einmal*  
Oskar has many novels by Grass more than only once  
gelesen.

read

‘Oskar has read many novels by Grass more than once.’

b. With movement, with adverbial:

VIELE ROMANE VON GRASS hat Oskar *mehr als nur einmal*  
many novels by Grass has Oskar more than only once  
gelesen.

read

‘Oskar has read many novels by Grass more than once.’

c. With movement, without adverbial:

VIELE ROMANE VON GRASS hat Oskar gelesen.

many novels by Grass has Oskar read

‘Oskar has read many novels by Grass.’

The experimental items were counterbalanced so each participant judged only one version of a given sentence but, across the experiment, judged an equal number of all sentence types. In addition to the items of Experiment 1, participants received 48 filler items, none of which contained a split DP. Sixteen filler sentences were from an unrelated experiment on focus-structure. A further set of filler sentences were the same sixteen filler sentences (eight grammatical and easy, eight containing an anomaly) that were already part of Experiment 1. These two sets of filler-items had to be judged in the same way as the items of the current experiment. Sixteen additional filler sentences were the items from Experiment 5. For these sentences, one of two given readings had to be chosen (cf. Experiment 5 for details). Experimental and filler items were presented in a pseudo-randomized order.

*Participants and procedure.* Twenty-four students of the University of Constance rated the sentences of Experiment 2 using the same procedure as Experiment 1. All participants were native speakers of German and unaware of the purpose of the experiment.

### 3.2. Results

The mean ratings obtained for the sentences of Experiment 2 are shown Table 3.

Two-way ANOVAS (2 DP type  $\times$  2 structure) showed a significant main effect of DP type ( $F(1, 23) = 89.55, p < .01$ ;  $F(1, 23) = 61.83, p < .01$ ), a significant main effect of structure ( $F(2, 46) = 31.62, p < .01$ ;  $F(2, 46) = 25.57, p < .01$ ), as well as a significant interaction between DP type and structure ( $F(2, 46) = 16.63, p < .01$ ;  $F(2, 46) = 24.53, p < .01$ ). Planned contrasts revealed no significant effect of structure when the indefinite DP was unsplit (each  $p > .1$ ). When the DP was split, there was no significant difference between the no movement/with adverbial condition and the movement/without adverbial condition (each  $p > .1$ ), but the movement/with adverbial condition was

Table 3. Mean ratings on a scale ranging from 1 (easy) to 5 (difficult) for the sentences of Experiment 2

	No movement, with adverbial	Movement, with adverbial	Movement, without adverbial
Split	2.1	3.1	1.9
Unsplit	1.8	1.7	1.6

rated significantly higher than these two conditions ( $t_1 = 8.50$ ,  $p < 0.01$ ;  $t_2 = 10.06$ ,  $p < .01$ ). Furthermore, for each of the three types of structure, the split condition was rated significantly higher than the unsplit condition (each  $p < .05$ ).

### 3.3. *Discussion*

The major finding of Experiment 2 is that sentences in which a DP is first moved in front of an adverbial before its NP-part is moved further to SpecCP are judged significantly worse than sentences which contain only one of these two movement steps, that is, either movement of a DP in front of an adverbial or movement of an NP out of a DP to SpecCP. Of particular interest is the contrast between (15a) (= [11]) and (15b) (= [12]). In both sentences, *novels by Grass* occurs in a position to the left of  $C^0$ , before the adverbial *more than once*. Thus, in terms of lexical content, the sentences are quite parallel: the same lexical content occurs and it occurs in similar positions. Nevertheless, the sentence involving movement of *novels by Grass* to SpecCP (15b) is rated as being much more difficult than the sentence (15a) where no movement to this position is required. Sentence (15b) is also rated as much more difficult than its counterpart without DP split (16b), whereas (15a) is not rated as being more difficult than its counterpart without DP split (16a). This points strongly to the mixed chain property of (15b) being the source of its complexity. Why mixed chains are so difficult is an issue to which we return in the general discussion.

What we have argued so far is that an initial phrase with the shape of a DP (that is, introduced by an overt determiner as in the singular condition of Experiment 1) is analyzed as a DP and instantiated in the discourse representation. Consequently, a split-topicalization beginning with a DP is difficult to process because when the stranded determiner (e.g. *keine*) is encountered, the processor must both reanalyze the initial determiner as a regenerated/expletive element, not the true head of the DP, and it must retract the discourse assumption. Bare plurals, by contrast, are analyzed as properties when they are first encountered, and thus, no syntactic or discourse revision is required.

On this account, if the initial constituent could be biased by its lexical-semantic properties to a property reading, it should show intermediate difficulty. For example, in (17) *ein solches Buch* ('this kind of book' or 'such a book') may be biased to a property reading. It would then be expected to be intermediate in difficulty between bare plurals and the split-*ein* construction tested in Experiment 1: syntactic reanalysis of *solches* will

be necessary when the stranded determiner is encountered, but presumably no discourse instantiation will have occurred given the assumption that *solches* preferentially denotes a property. Intuitions support this prediction.

- (17) Ein solches Buch besitzt mein Opa keines.  
 A such book owns my grandpa no  
 'Such a book, my grandpa does not own.'

A summary of the account appears in (18).

(18)	Initial position	Initial processing	Revision
	a. Bare plural	Analyzed as a property	None
	b. Split- <i>solches</i>	Analyzed as DP, not instantiated	Syntactic reanalysis of determiner
	c. Split- <i>ein</i>	Analyzed as DP and discourse instantiated	Syntactic reanalysis of determiner plus retraction of discourse assumption
	d. Full DP	Discourse instantiated	Retraction of discourse assumption if the DP receives narrow scope

We turn now to (18d) and predictions about the scope of phrases in sentences with multiple quantificational elements.

#### 4. Scope of DPs

With the remaining experiments, we turn to sentences containing a non-split object moved to SpecCP. For the moment, we will simply assume that instantiating a phrase as an entity in the discourse representation permits the phrase to take wide scope without any alteration of the discourse assumption. By contrast, for the phrase to take narrow scope with respect to a later quantifier, a revision of the discourse assumption will be required. We are quite aware that this assumption requires further examination once a better understanding of discourse representations is available. Ultimately it will be necessary to distinguish between mere additions to the discourse representation and true revision of a discourse assumption. In the absence of an elaborated theory of this type, we make the simplifying assumption that all narrow scope readings of an already instantiated phrase require revision of the discourse assumption for that phrase in order to permit it to be under the scope of another quantifier.

With respect to the grammar of scope, we assume that a phrase may take scope over any phrase that it c-commands. Either the surface position of a quantified phrase or the base position of its trace may define its c-command domain (Aoun and Li 1993; Frey 1990). As for the preferred reading of scopally ambiguous sentences, we assume surface scope is generally preferred (Tunstall 1998; Lidz and Musolino 2002), although the properties of particular quantified phrases clearly also matter. Distributive universal quantifiers generally need to take scope over other phrases to satisfy their presuppositions. Tunstall (1998) shows, for example, that *each* emphasizes an interest in the differentiation of the entities or events that it quantifies over. By contrast, *every* emphasizes exhaustivity. Consequently, *Take each apple* is odd, because there is no indication of why individual apples are being distinguished (see Tunstall [1998] for evidence from both comprehension and production). *A boy took each apple* shares the oddness of *Take each apple* on the narrow scope reading of *each*, but becomes less odd with the wide-scope reading where for each apple, a different boy may be involved in the action. For English and other languages, the scoping properties of individual quantifiers could be superficially described as a hierarchy of quantifier strength, as proposed by Ioup (1975):  $each > every > all \dots > a$ . Of course, additional properties of a quantificational phrase may also matter. Phrases that are highly specified, for example, by modifiers (*a man with a long, red beard*) seem more biased to a wide-scope reading than phrases that are semantically unspecified or light (*a man*).

To our knowledge, most psycholinguistic investigations of preferred quantifier scope have investigated sentences without A'-movement. Since we assume that the initial phrase in a German sentence is A'-moved to initial position, we must ask whether different preferences exist for A'-moved quantifier phrases. It appears that the answer is "yes." Villalta (1999) showed that in both English and French *how many/combien* questions do not show a preference for surface scope. Instead, narrow scope for the *how many* phrase was preferred in sentences like *How many pieces of music did every student have to play?* This suggests the base position preference principle given in (19).

- (19) Base position preference principle:  
Interpret the scope of a phrase in the same position where it receives its thematic role.

Although further investigation of the principle is clearly called for, one may easily imagine that perceivers would prefer to interpret a phrase in just one position, for all aspects of interpretation (scope and thematic role interpretation). The hypothesized base position preference of course

will conflict with the preference for immediate interpretation given any leftward A'-movement: when a phrase is initially encountered in its moved position, immediate interpretation (discourse instantiation) and surface scope will favor wide scope for the moved phrase. By contrast, the base position preference principle will favor scope at the position where the thematic role is assigned. Hence with respect to quantifier scope ambiguities involving two determiner quantifiers, one of them A'-moved, we would expect the properties of particular quantifiers to be particularly important because the surface scope preference will be in conflict with the base position preference principle. In comparable ambiguities involving no A'-movement, surface scope tendencies should be stronger (unmitigated by a conflicting base position preference), and thus harder to overcome by the properties of particular quantifiers. With these assumptions about the general theory of processing scope, let's now return to German.

Imagine a German topicalization of a phrase like *einen Aufsatz* ('a paper') in a sentence containing a quantificational adverb like *frequently* or *several times*. The topicalized phrase should be instantiated in the discourse representation and if subsequent information fits with a wide-scope reading for the topicalized phrase, the wide-scope reading should be assigned. But if at the end of the sentence there is then sharp disambiguation to the narrow scope reading, difficulty should occur. However, if the sentence is fully ambiguous, and perceivers are asked to pick an interpretation for the ambiguous sentence, we expect that a milder wide-scope preference for the topicalized phrase should emerge especially in an off-line questionnaire study, because here perceivers are implicitly invited to evaluate both interpretations. Below we present studies designed to test these expectations.

We may compare the situation where a determiner quantifier interacts with an adverbial quantifier with a situation where perceivers are given scope-ambiguous sentences with two determiner quantifiers. In sentences with two determiner quantifiers, we expect that what will govern the final preference of the perceiver is the nature of the two quantified phrases: use of a distributive universal quantifier such as *each* in English or *jeder* in German may result in narrow scope readings for the topicalized phrase (*ein Aufsatz*), whereas quantifiers that are not distributive (*alle/all*) shouldn't show such a strong preference for the narrow scope reading of the topicalized phrase. In short, what we expect is that determiner quantifiers which are known to carry conditions that influence their relative scope may determine whether perceivers revise their initial discourse assumption about the topicalized phrase, but that adverbial quantifiers will be less likely to do so. (We think it is an interesting question why the conditions imposed by quantificational adverbs have not led to a hierarchy of

quantifier strength for adverbs comparable to that for determiner quantifiers, but we will not pursue the matter here.)

### 5. Experiment 3

To further test the discourse instantiation hypothesis, Experiment 3 investigated nonsplit topicalizations biased to a narrow scope reading of the initial constituent. When both quantificational elements — the adverbial and the object — are in nontopicalized position, as in (20), there is an intuitive preference for surface scope. In (20a), the adverbial precedes the object, and it preferentially takes scope over it. The reverse holds for (20b).

- (20) a. Wir haben dreimal einen gemeinsamen Vortrag gehalten.  
 we have three times a joint talk given  
 ‘Three times, we have given a joint talk.’  
 b. Wir haben einen gemeinsamen Vortrag dreimal gehalten.  
 we have a joint talk three times given  
 ‘We have given a joint talk three times.’

When the object is topicalized, as in (21), the sentence is generally held to be ambiguous. It can have either of the meanings illustrated in (20).<sup>6</sup>

- (21) Einen gemeinsamen Vortrag haben wir dreimal gehalten.  
 a joint talk have we three times given  
 (Meaning either as in [20a] or [20b]).

The discourse instantiation hypothesis predicts that the indefinite DP in a sentence like (21) should be instantiated in the discourse representation. As a result, the indefinite DP should take wide scope with respect to a following adverbial quantifier. To test this prediction, Experiment 3 will investigate sentences which are structurally like (21) but pragmatically biased toward the narrow-scope reading of the sentence-initial object DP. Three types of object DPs will be investigated, as shown in (22).

- (22) a. DP, singular:  
 EINEN AUFSATZ über seine Kinder hat Piaget mehrmals  
 a paper about his children has several times  
 in seinem Leben geschrieben.  
 in his life written  
 ‘Piaget wrote a paper about his children at several times  
 during his life.’

- b. DP, plural:  
EIN PAAR AUFSÄTZE über seine Kinder hat Piaget  
a pair papers about his children has  
mehrmals in seinem Leben geschrieben.  
several times in his life written  
'Piaget wrote a couple of papers about his children at several  
times during his life.'
- c. Bare NP (plural):  
AUFSÄTZE über seine Kinder hat Piaget mehrmals in  
papers about his children has several times in  
seinem Leben geschrieben.  
his life written  
'Piaget wrote papers about his children at several times during  
his life.'

The discourse instantiation hypothesis predicts that initial phrases containing an indefinite DP should be difficult, regardless of whether the DP is singular or plural (cf. [22a] and [22b]). Bare plurals will also be included (cf. [22c]). Assuming that bare plurals will not be interpreted as discourse referents, topicalized bare plurals should be rated as more acceptable than their counterparts with overt determiners. If these predictions are confirmed, it would show that the presence of a determiner, not singular number, is critical for the immediate instantiation of a discourse referent. Further, if the bare plurals are rated better than their counterparts with an overt determiner, this would confirm the intuition that bare plurals are preferentially interpreted as properties, not existentials, as in Experiment 1.

### 5.1. Method

*Materials.* Twelve sentences were constructed with three versions of each, as illustrated in (22) (all materials appear in Appendix 3). In all sentences, the complete object was topicalized (i.e. the object was never split). All sentences adhered to the schema shown in (23).

- (23) Quantificational Object Auxiliary Subject Quantificational Adverbial Main Verb

In each sentence triple, the sentence initial object-NP was either a singular indefinite DP beginning with a form of *ein* ('a') (cf. [22a]), a plural indefinite NP beginning with a plural indefinite article *einige* ('some') or *ein paar* ('a couple of') (cf. [22b]), or a plural bare NP immediately beginning

Table 4. *Mean ratings on a scale ranging from 1 (easy) to 5 (difficult) for the sentences of Experiment 3*

Singular, determiner	Plural, determiner	Plural, bare N
2.91	3.35	2.23

with the head noun (cf. [22c]). The lexical material of the initial object (head noun and modifying attributes) was the same in all three conditions. All sentences were pragmatically biased against a wide-scope reading of the phrase in SpecCP.

*Participants and procedure.* Experiment 3 was included in the same questionnaire as Experiment 1. With regard to participants, procedure, and filler items, the description given above for Experiment 1 therefore also holds for Experiment 3.

## 5.2. Results

The results for Experiment 3 are shown in Table 4.

A one-way ANOVA revealed a main effect of the factor sentence-initial phrase ( $F(1,62) = 28.15$ ,  $p < .01$ ;  $F(2,22) = 16.90$ ,  $p < .01$ ). Subsequent planned comparisons showed that plural DPs were rated significantly higher (worse) than singular DPs (3.35 vs. 2.91;  $t(62) = 2.89$ ,  $p < .01$ ;  $t(22) = 2.18$ ,  $p < .05$ ), which in turn were rated significantly higher than plural bare NPs (2.91 vs. 2.23;  $t(62) = 4.55$ ,  $p < .01$ ;  $t(22) = 3.57$ ,  $p < .01$ ).

## 5.3. Discussion

The pragmatic biases against a wide-scope interpretation of the sentence-initial phrase are very strong in the sentences of Experiment 3. Thus we assume perceivers ultimately compute the only plausible analysis of the sentences. In sentences with determiners in initial position, this requires changing the initial discourse assumption. For the bare plurals, in contrast, no retraction of the discourse assumption is required, and bare plurals therefore received a better rating than indefinite DPs. As for the higher acceptability of the singular DPs relative to the plural DPs, we think it is possible that *ein N[singular]* has lexical properties favoring a

VP-internal interpretation. This determiner is not inherently specific, topical or able to occur in a partitive (*\*a man of the men*). However, we will not develop this possibility because the results of Experiment 4 draw into question whether the difference observed in Experiment 3 between *ein* and *ein paar* is stable and fully trustworthy.

As in Experiment 1, the three conditions of Experiment 3 differed with respect to the local case ambiguity of the initial NP/DP. In the two plural conditions, the topicalized phrase was always morphologically ambiguous between a subject and an object analysis. In the singular condition, five of the twelve were case-unambiguous and seven were case-ambiguous. However, as one can see from Table 4, there is no simple relationship between ambiguity and judgments. The condition which was rated best, sentences with topicalized bare-plural NPs, was as ambiguous as the condition which was rated worst, sentences with a topicalized plural DP. We therefore conclude that the major result of Experiment 3 cannot be attributed to effects of processing problems caused by the local ambiguity of the initial object phrase.

## 6. Experiment 4

Experiment 4 will investigate sentences which are syntactically the same as the sentences used in Experiment 3: an indefinite NP/DP located in SpecCP, and an adverbial quantifier in the remainder of the sentence. The main difference between Experiment 4 and Experiment 3 will be the experimental task: in contrast to all preceding experiments, Experiment 4 will not use an acceptability judgment task but a task where participants have to indicate which of the two possible readings of a scope-ambiguous sentence came to mind first when reading the sentence.

- (24) a. EINE ZEICHNUNG von Kirchner habe ich schon häufig  
a drawing by K. have I already frequently  
gesehen.  
seen
- b. EINIGE ZEICHNUNGEN von Kirchner habe ich schon  
some drawings by K. have I already  
häufig gesehen.  
frequently seen
- c. EIN PAAR ZEICHNUNGEN von Kirchner habe ich schon  
a pair drawings by K. have I already  
häufig gesehen.  
frequently seen

- d. ZEICHNUNGEN von Kirchner habe ich schon häufig  
drawings by K. have I already frequently  
gesehen.  
seen

Given this change in methodology, there was one major change with respect to the sentence material: in contrast to Experiment 3, which used sentences semantically biased toward the narrow-scope reading of the initial object, the sentences of Experiment 4 were equally plausible under both the wide-scope and the narrow-scope reading of the initial indefinite object.

Obtaining preference judgments for sentences with two potential orderings among the quantifiers is also of interest from a purely linguistic point of view as far as the question of scope ambiguity is concerned. As pointed out above, sentences with a topicalized indefinite object-DP and a second quantificational element within the middle field are generally held to be scopally ambiguous (cf. Frey 1990; Pafel 1997). If this is true, we might expect to obtain preference judgments well below 100% for either of the two possible readings.

### 6.1. Method

*Materials.* Sixteen sentences were constructed for Experiment 4, with each sentence appearing in four different versions (all materials appear in Appendix 4). A sample stimulus was shown in (24). All sentences adhered to the same schema as the sentences of Experiment 3. This schema is repeated from above in (25).

- (25) Quantificational Object Auxiliary Subject Quantificational  
Adverbial Main Verb

The four versions of each sentence differed only with respect to the initial object DP which was one of four types: indefinite singular DP, indefinite plural DP with the indefinite determiner *einige*, indefinite DP plural with the indefinite determiner *ein paar*, and indefinite bare plural DP.

In contrast to Experiment 3, the sentences in Experiment 4 were semantically and pragmatically unbiased with regard to the scope relation holding between the initial object and the following adverbial quantifier: wide scope of the clause-initial object was as plausible as narrow scope.

Four sentence lists were created from the sentence material of Experiment 4. Each list contained one version of each sentence, and it contained an equal number of sentences in each condition. The experimental

sentences were presented together with 56 filler sentences. Twenty-four filler sentences were from an unrelated experiment on split DPs, sixteen from an unrelated experiment on focus structure, and sixteen were the same filler items (eight grammatical and easy, eight containing an anomaly) that were included in Experiment 1 and Experiment 2. The filler sentences had to be judged for naturalness in the same way as described for Experiment 1 and Experiment 2.

*Participants.* Twenty students of the University of Constance participated in Experiment 4. All were native speakers of German and unaware of the purpose of the experiment.

*Procedure.* Participants received the questionnaires together with a written instruction. Under each sentence, the two possible readings were provided in an abbreviated form. Participants' task was to read each sentence and to mark the reading which first came to mind.

## 6.2. Results

The results of Experiment 4 are shown in Table 5.

A one-way ANOVA revealed a main effect of the factor sentence-initial phrase ( $F(3, 57) = 11.67, p < .01$ ;  $F(3, 45) = 12.55, p < .01$ ). Subsequent planned comparisons showed that bare plural NPs received significantly less wide-scope judgments than plural *einige* DPs (16% vs. 46%;  $t(57) = 3.52, p < .01$ ;  $t(45) = 3.20, p < .01$ ). Within the class of DPs, the difference between singular DPs and plural *einige* DPs was almost significant in the subject analysis and significant in the item analysis (62% vs. 46%;  $t(69) = 1.85, p < .07$ ;  $t(45) = 2.52, p < .05$ ), but plural *ein paar* DPs did neither significantly differ from singular nor from plural *einige* DPs (each  $p > .1$ ).

## 6.3. Discussion

The major finding of Experiment 4 is that an object in SpecCP takes scope over a following adverbial much more often when the object is an

Table 5. Percentage wide-scope interpretation for the indefinite DP/NP

Singular	Plural, <i>ein paar</i>	Plural, <i>einige</i>	Plural, bare N
62%	57%	46%	16%

indefinite DP than when it is an indefinite NP (that is, a bare plural). Presumably this reflects the operation of the discourse instantiation of DPs, but not NPs, as in Experiment 1.

In addition, the results of Experiment 4 support the linguistic assumption that sentences of the sort considered here are scopally ambiguous. In the three conditions with a determiner, the percentages obtained in this experiment are clearly distinct from either 0% or 100%, which would be expected for sentences with only one interpretation. In the condition with bare plural NPs, the results show a very strong bias against the wide-scope interpretation of the bare plural, but even these sentences seem not to be unambiguous given that they still received 16% wide scope answers.<sup>7</sup>

### 7. Experiment 5

Our final experiment is identical to Experiment 4 with one major exception: instead of an adverbial quantifier, as in Experiment 4, the sentences of Experiment 5 will have a quantified subject following the indefinite NP/DP in SpecCP. Experiment 5 will thus investigate sentences as shown in (26).

- (26) a. Eine Zeichnung von Kirchner hat jeder Museumsbesucher  
a drawing by K. has every museum visitor  
sehen wollen.  
see want
- b. Zeichnungen von Kirchner hat jeder Museumsbesucher sehen  
drawings by K. has every museum visitor see  
wollen.  
want
- c. Einige Zeichnungen von Kirchner hat jeder Museumsbesucher  
some drawings by K. has every museum visitor  
sehen wollen.  
see want
- d. Ein paar Zeichnungen von Kirchner hat jeder  
a pair drawings by K. has every  
Museumsbesucher sehen wollen.  
museum visitor see want

As the prior sentences containing an indefinite object in SpecCP and an adverbial quantifier in the later part of the sentence, the sentences in (26) are globally ambiguous with respect to the scope of the two quantifiers contained in these sentences. If the initial indefinite DP is discourse-instantiated immediately, it will have scope over the following universally

quantified subject; if, on the other hand, the initial object is interpreted at its base-position according to the base position preference principle, it will receive narrow scope relative to the subject quantifier because the base position of the object is lower in the tree than the base position of the subject.

As already discussed above, prior research has revealed evidence that quantifiers inherently differ in their potential to take wide scope in a sentence. Ioup (1975), for example, proposed the following hierarchy among the universal quantifiers of English: each > every > all. Since we might expect similar effects for German, four different quantifiers will be used for the quantified subject in the sentences of Experiment 5. First, we will contrast the two basic quantifiers *jeder* (every/each) and *alle* (all). Given what is known from the prior literature, we should expect that the propensity to take wide scope should be greater for *jeder* than for *alle*. In addition, we will include sentences where the same two universal quantifiers are modified by *fast* (almost): *fast jeder* (almost every), and *fast alle* (almost all).

#### 7.1. Method

*Materials.* Sixteen sentences were constructed for Experiment 5 on the basis of the material used in the preceding experiment (all materials appear in Appendix 5). Each sentence appeared in the same four versions that were investigated in the preceding experiment. A sample sentence quartet was shown in (26). In contrast to the preceding experiment, the sentences of this experiment contained a quantificational subject but no quantificational adverbial. Four different quantifiers were used for the subject: *jeder* (every), *fast jeder* (almost every), *alle* (all), and *fast alle* (almost all). Each of these quantifiers appeared in four sentences.

(27) Quantificational Object    Auxiliary    Quantificational Subject  
      (Adverbial)    Main Verb

Four sentence lists were created for Experiment 5, with each sentence appearing in only one version on each list, and each list containing an equal number of sentences in each of the four conditions. Since Experiment 5 was part of the same questionnaire as Experiment 3, it contained the experimental sentences of Experiment 3 as fillers, as well as the 32 filler sentences that were described in the materials section of Experiment 3.

*Participants and procedure.* Twenty-four students of the University of Constance rated the sentences of Experiment 5 using the procedure as in

Table 6. *Percentage wide-scope interpretation for the indefinite DP/NP*

Singular	Plural, <i>ein paar</i>	Plural, <i>einige</i>	Plural, bare N
35%	38%	35%	17%

Experiment 4. All participants were native speakers of German and unaware of the purpose of the experiment.

## 7.2. Results

The results of Experiment 5 are shown in Table 6.

A one-way ANOVA revealed a main effect of the factor sentence-initial phrase ( $F(3, 69) = 3.57, p < .05$ ;  $F(3, 45) = 7.14, p < .01$ ). Subsequent planned comparisons showed that bare plural NPs received significantly less wide-scope judgments than singular DPs (17% vs. 35%;  $t(69) = 2.44, p < .05$ ;  $t(45) = 2.94, p < .01$ ) whereas singular DPs and the two types of plural DPs did not differ from each other (each  $p > .2$ ).

Table 7 presents scope preferences according to the four types of universal quantifiers used on the subject DP in Experiment 5. For ease of interpretation, we show both the percentages of wide-scope interpretation for the initial indefinite object (to make the results comparable to the preceding tables) as well as the inverse percentages of wide-scope interpretation for the universally quantified subject (to reveal more clearly the effect of the different quantifiers). Note that these two measures always sum to 100%. Table 7 shows that the particular quantifier on the subject DP had a strong effect on the interpretation of the sentences investigated in Experiment 5

Table 7. *Scope preferences in dependence on the particular type of universal quantifier on the subject*

	<i>alle</i> (all)	<i>fast alle</i> (almost all)	<i>jeder</i> (every)	<i>fast jeder</i> (almost every)
Percentage wide-scope interpretation for the indefinite DP/NP	54%	32%	26%	12%
Percentage wide-scope interpretation for the subject	46%	68%	74%	88%

### 7.3. Discussion

Experiment 5 has two major outcomes. First, the tendency to take wide scope was significantly higher for the three types of indefinite DPs than for the bare NPs. Among each other, indefinite DPs did not differ. Second, there was a strong effect of the type of universal quantifier used on the subject. As expected, the subject was interpreted as taking scope over the object in SpecCP much more often when the subject quantifier was *jeder* than when it was *alle*. This shows an effect of individual quantifiers in line with what has been observed for English. Also as expected, modifying the universal quantifiers by *fast* increased their propensity to take wide scope.

To our knowledge, the effect of *fast* on quantifier scope preferences has not been discussed in the literature. Clearly its effect is robust and cries out for an explanation. At the moment, we do not have a convincing proposal about its underlying source. We suspect that the “wide-scope” property of *fast* is tied to the difficulty of computing its scalar implicature when the DP containing it scopes under another quantifier. (?John didn’t see almost everyone at the party.) But pursuing this speculation goes far beyond the scope of the current article.<sup>8</sup>

With respect to the question of whether the sentences investigated in this experiment are indeed ambiguous, the same holds what was already said in connection with Experiment 4. Given the particular results obtained in Experiment 5, there is no reason to assume that any of the four sentence types allows for only a single interpretation.

## 8. General discussion

The discourse instantiation hypothesis predicted that an initial DP will trigger the postulation of a discourse entity in the discourse representation. This should result in difficulty in processing split-topicalization with a singular DP in topic position (cf. [6a]) because the discourse assumption must be retracted. Experiment 1 confirmed this prediction. The results suggest that incremental interpretation of a sentence is the norm, even when a phrase has clearly been moved to a position where it cannot receive a thematic role. The fact that discourse instantiation occurs under these conditions is striking. The postulation of a discourse entity corresponding to the initial DP should also operate as a bias toward a wide-scope interpretation of the initial constituent with respect to a subsequent quantifier. This prediction was confirmed in Experiments 3 and 4 with adverbial quantifiers but not in Experiment 5 with Det-quantifiers.

We see our work as a first step in trying to get a handle psycholinguistically on the relation of the syntax and the discourse representation. As such, our studies raise many questions about the relation between the developing syntactic representation and the developing discourse representation. Of particular prominence is the question of what constitutes a revision of the discourse representation versus a mere addition to it. Closely related is the question of the immediacy of interpretation.<sup>9</sup> For example, the discourse instantiation hypothesis favors the immediate interpretation of a DP in SpecCP whereas the base-position preference principle favors delaying the interpretation until the base position is encountered. Clear evidence for discourse instantiation was found for indefinite DPs in all experiments except the last one. However, what would happen if SpecCP does not contain an indefinite DP but a quantificational DP that cannot be discourse-instantiated (e.g. *die meisten N/most N*, *mindestens ein N/at least one N*)? Would the base-position preference principle become more important in this case? These are some of the questions which we will have to address in order to further our understanding of how syntax and discourse representation are related during online language comprehension.

The glaring contrast between the adverbial quantifiers (Experiments 3, 4) and determiner quantifiers (Experiment 5) deserves scrutiny. The determiner quantifiers behaved as we would expect from prior studies of quantifiers, for example, in English. *Jeder* ('each'/'every') received wide scope over the initial constituent most of the time, whereas *alle* ('all') received wide scope only half the time, as in the quantifier hierarchy of Ioup (1975). Fast *jeder* and fast *alle* received even more wide scope than their unmodified counterparts for unknown reasons. Following Tunstall (1998), we view the determiner quantifiers as imposing conditions of use which presumably are not readily satisfied when the universal received narrow scope. The attempt to satisfy the condition of the quantifier may in effect push the perceiver to compute the reading where the universal receives wide(r) scope.

But what about the adverbial quantifiers? Why don't they impose conditions like those of the determiner quantifiers? One possibility is that the appearance that adverbial quantifiers don't impose conditions is just an accident. Adverbial quantifiers haven't been investigated in the psycholinguistic literature. In our experimental materials, we tested mostly frequency adverbs and perhaps these are more scope neutral in the sense that in our sentences their "presuppositions" or associated pragmatic conditions might be met regardless of whether the adverb received narrow scope or wide scope.

Another possibility is that adverbs typically don't participate in chains. This might lead perceivers to expect that the adverbial quantifier sits in a

particular position precisely because that position marks its intended scope. In other words, if adverbs do not receive theta-roles or have other requirements that they must meet, scope may be the only factor determining their position.

Yet another possibility is that determiner quantifiers are special in belonging to a very small closed set of highly grammatical function words. This property may have as a side-effect a small stable grammatically given contrast set for the determiner quantifiers which allows them to “specialize” taking on conditions of use which distinguish each universal determiner quantifier from the other universal determiner quantifiers in the language, allowing *each* to be used for differentiation, *every* for exhaustivity, etc. Adverbs, by contrast, belong to a larger class of elements which are not uniformly function words. Consider *-ly* adverbs in English which may be freely derived from adjectives. Given this larger and less uniform class of items, perhaps the contrast set for any given adverb is less stable and more context dependent than for a determiner, thereby militating against the clear stable specialization of adverbial quantifiers that may exist for determiner quantifiers, and thus militating against the existence of special conditions of use for particular otherwise nearly synonymous adverbs.

Obviously the current investigation will not suffice to answer the question of whether, and if so why, adverbial quantifiers as a class differ from determiner quantifiers. But the present results do raise the question. Until it has been answered satisfactorily, we will have at best an incomplete account of the contrast between Experiment 5 and Experiments 3 and 4.

Another question raised by the current results is whether both a surface scope principle and a discourse instantiation principle are needed in an account of processing ambiguous quantifier sentences. Couldn't these two principles be reduced to a single principle of early interpretation?

In principle, replacing the surface scope and the discourse instantiation principle by an early interpretation principle might be possible. But there are reasons to be skeptical of such a move. First, in many languages (e.g. Malayalam and Kannada) linear order and c-command are not confounded. In such languages, it appears to be c-command relations, not linear order, which dictates the preferred scope for quantifiers (Lidz 1999; Lidz and Musolino 2002). This, of course, suggests that a surface scope principle is truly needed; the effects of a surface scope principle cannot in the general case simply be mimicked by an early interpretation principle.

Another reason to doubt that these principles can be replaced by early interpretation concerns (28). Intuition suggests that it is fairly easy to

grasp either a wide-scope or a narrow-scope interpretation of the universal in (28).

(28) Some child invited each of the teachers.

Now consider (29). Intuition suggests that in (29) one is committed to a clear stable wide-scope existential reading of the second sentence.

(29) Three children received lots of tickets to the talent show. Some child invited each of the teachers.

The intuition about (29) is exactly what one would expect if the subject of the second sentence in (29) is discourse-linked and consequently the perceiver assigns only a wide-scope existential reading in the second sentence.

Finally, the results of Experiment 2 suggest not only that A'-chains are involved in the processing of topicalizations, but also that "mixed" chains are very difficult. Given a DP chain and a NP chain as in (9), the two chains cannot be unified but they also are not independent: the trace of the NP is contained in the DP. Why is this configuration so difficult? Would a mixed chain also be difficult to process if, say, an NP moved out of a DP first, and then the DP moved (see Sekerina [1997] for a possible case in Russian)? At present we can only point to the "mixed" chain property and suggest that it is the source of the difficulty in (9). However, truly pinning down the explanation for the difficulty of mixed chains would require, we think, a large cross-language study of mixed chains going well beyond the scope of the present article.

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*University of Massachusetts, Amherst*

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### **Appendix 1. Material of Experiment 1**

The full experimental paradigm is only shown for sentence one. For all other sentences, only the first condition is shown. The remaining three conditions can be obtained from the one shown by (i) leaving out the adverbial in parentheses (conditions b and c), and (ii) replacing the initial singular indefinite DP by a bare plural (conditions c and d).

- 01 a. Eine Schallplatte von Bob Dylan hab ich in diesem Geschäft (schon dreimal) keine gesehen.  
'For three times, I have not seen a record by Bob Dylan in this store.'
- 01 b. Eine Schallplatte von Bob Dylan hab ich in diesem Geschäft keine gesehen.

- 01 c. Schallplatten von Bob Dylan habe ich in diesem Geschäft (schon dreimal) keine gesehen.  
01 d. Schallplatten von Bob Dylan habe ich in diesem Geschäft keine gesehen.  
02 Eine Postkarte von den Kindern hat Werner (schon mehrfach) keine bekommen.  
'Several times, Werner hasn't received a postcard from the kids.'  
03 Eine Wanderung haben wir wegen des Regens (an vier Tagen) keine unternehmen können.  
'On four days, we couldn't undertake a hike because of the rain.'  
04 Eine Zeitung aus Deutschland hab ich hier (häufig) keine kaufen können.  
'Frequently, I couldn't buy a newspaper from Germany here.'  
05 Eine Statue von Michelangelo hat Peter (wieder) keine gesehen.  
'Peter again did not see a statue by Michelangelo.'  
06 Eine Zeichnung von Kandinsky hat der Museumsdirektor (wieder) keine ersteigert.  
'The museum's director again did not buy a drawing by Kandinsky at the auction.'  
07 Ein Rezept von Biolek hat Maria schon (wieder) keines nachkochen können.  
'Maria again could not try a recipe by Biolek.'  
08 Einen Wal haben wir während unserer Ausfahrt (wieder) keinen gesehen.  
'During our cruise, we again did not see a whale.'  
09 Ein Buch von Chomsky habe ich in dieser Buchhandlung (schon zweimal) keines gesehen.  
'Already two times, I did not see a book by Chomsky in this book store.'  
10 Eine Geschichte über Clinton hab ich (jetzt schon auf drei Reisen) keine mehr gehört.  
'On three trips, I have now not heard a story about Clinton.'  
11 Einen Film von Fellini hat man (schon auf zwei Festivals) keinen gezeigt.  
'Already at two film festivals, they did not show a film by Fellini.'  
12 Ein Stück von Goethe haben wir (nur in zwei Spielzeiten) keines gesehen.  
'Only during two seasons, we did not see a play by Goethe.'  
13 Einen Anzug von Armani haben wir uns (wieder) keinen gekauft.  
'Again, we did not buy an Armani suit.'  
14 Ein Gebäude von Gehry hat Anna (wieder) keines besucht.  
'Anna again did not visit a building by Gehry.'  
15 Ein Programm der BBC habe ich (wieder) keines empfangen können.  
'Again, I couldn't receive a BBC program.'  
16 Einen Entwurf von Taymor hat der Chef (wieder) keinen zurückgewiesen.  
'Again, the boss did not reject a sketch by Taymor.'

## **Appendix 2. Material of Experiment 2**

The full experimental paradigm is only shown for sentence one. For all other sentences, only the first condition is shown. The remaining five conditions can be

obtained from the one shown by (i) leaving out the adverbial in parentheses (conditions c and f), (ii) replacing the phrase in SpecCP by the italicized NP (conditions b and c), and replacing the material in SpecCP by both the italicized NP and the quantifier in small caps (conditions e and f).

- 01 a. Was *Schallplatten von Bob Dylan* betrifft, so habe ich mir EINIGE mehrmals angehört.  
'I have heard some records by Bob Dylan several times.'
- 01 b. *Schallplatten von Bob Dylan* habe ich mir EINIGE mehrmals angehört.
- 01 c. *Schallplatten von Bob Dylan* habe ich mir EINIGE angehört.
- 01 d. Ich habe mir EINIGE *Schallplatten von Bob Dylan* mehrmals angehört.
- 01 e. EINIGE *Schallplatten von Bob Dylan* habe ich mir mehrmals angehört.
- 01 f. EINIGE *Schallplatten von Bob Dylan* habe ich mir angehört.
- 02 Was *Wale* betrifft, so haben wir während unserer *Ausfahrt* EINIGE (wiederholt) gesehen.  
'During our cruise, we have seen several whales repeatedly.'
- 03 Was *Wanderungen in den Dolomiten* betrifft, so haben wir EINIGE (jetzt schon mehr als viermal) unternommen.  
'We have undertaken several hikes in the Dolomiten more than four times.'
- 04 Was *Zeitungen aus Deutschland* betrifft, so habe ich hier EINIGE (fast nie) kaufen können.  
'I could almost never buy several newspapers from Germany.'
- 05 Was *italienische Weine* betrifft, so hat der Wirt EINIGE (schon des öfteren) auf der Karte gehabt.  
'The innkeeper had offered some Italian wines often.'
- 06 Was *Elefanten* betrifft, so hat Anton in diesem Zoo EINIGE (schon mehrfach) fotografiert.  
'In this zoo, Anton photographed some elephants several times.'
- 07 Was *Rezepte von Biolek* betrifft, so hat Maria VIELE (schon mehrfach) nachgekocht.  
'Maria has tried some recipes by Biolek several times.'
- 08 Was *Romane von Grass* betrifft, so hat Oskar VIELE (mehr als nur einmal) gelesen.  
'Oskar read many novels by Grass more than once.'
- 09 Was *gute Einführungsbücher* betrifft, so hat der Dozent VIELE (mehrfach) empfohlen.  
'The lecturer recommended many introductory books several times.'
- 10 Was *Hausaufgaben* betrifft, so hat der Lehrer VIELE (mehr als nur einmal) gestellt.  
'The teacher gave many homework assignments more than once.'
- 11 Was *Fischgerichte* betrifft, so hat der Wirt VIELE (dreimal die Woche) anbieten können.  
'The innkeeper could offer many fish dishes three times a week.'
- 12 Was *Opern von Wagner* betrifft, hat sich Klaus VIELE (mehrfach) angehört.  
'Klaus heard many operas by Wagner several times.'

- 13 Was *Bücher von Chomsky* betrifft, so hat Werner NUR WENIGE (zweimal) gelesen.  
'Werner read only few books by Chomsky twice.'
- 14 Was *Geschichten über Clinton* betrifft, so hat Herr Ullmann im Fernsehen NUR WENIGE (mehrfach) gehört.  
'Mr. Ullmann heard only few stories about Clinton several times on TV.'
- 15 Was *Filme von Fellini* betrifft, so hat man NUR WENIGE (gleichzeitig auf zwei Festivals) gezeigt.  
'One showed only few movies by Fellini concurrently at two festivals.'
- 16 Was *Stücke von Goethe* betrifft, so hat Klaus NUR WENIGE (in zwei aufeinanderfolgenden Spielzeiten) gesehen.  
'Klaus saw only few plays by Goethe in successive seasons.'
- 17 Was *Brillengestelle von Versace* betrifft, so hat der Optiker NUR WENIGE (mehrfach) im Angebot gehabt.  
'The optician offered only few glasses by Versace several times.'
- 18 Was *Besucher aus Amerika* betrifft, so konnte der Hotelchef NUR WENIGE (schon mehr als dreimal) begrüßen.  
'The manager of the hotel could welcome only few visitors from the U.S. more than three times.'
- 19 Was *Statuen von Michelangelo* betrifft, so hat Peter MEHRERE (schon zweimal) gesehen.  
'Peter has seen several statues by Michelangelo already twice.'
- 20 Was *Zeichnungen von Kandinsky* betrifft, so hat der Museumsdirektor MEHRERE (noch nie) ausgestellt.  
'The museum director has still not put several drawings by Kandinsky on exhibition.'
- 21 Was *CDs von John Lennon* betrifft, so hat Rainer MEHRERE (schon des öfteren) verschenkt.  
'Rainer gave several CDs by John Lennon often as a present.'
- 22 Was *Gebäude von Gehry* betrifft, so hat Anna MEHRERE (schon über vier Mal) besucht.  
'Anna has visited several buildings by Gehry more than four times.'
- 23 Was *Programme der BBC* betrifft, so hat Angelika MEHRERE (noch nie) empfangen können.  
'Angelika could never receive several BBC programs.'
- 24 Was *Entwürfe von Taymor* betrifft, hat der Chef MEHRERE (wiederholt) zurückgewiesen.  
'The boss rejected several sketches by Taymor repeatedly.'

### Appendix 3. Material of Experiment 3

The full experimental paradigm is only shown for sentence one. For all other sentences, only the first condition is shown. The remaining two conditions can be obtained from the one shown by replacing the initial indefinite singular DP by either

a bare plural or an indefinite plural DP with the determiner *ein paar* (sentences 1–6) or *einige* (sentences 7–12).

- 01 a. Einen Aufsatz über seine Kinder hat Piaget mehrmals in seinem Leben geschrieben.  
'Several times in his life, Piaget wrote a paper about his children.'
- 01 b. Aufsätze über seine Kinder hat Piaget mehrmals in seinem Leben geschrieben.  
'Several times in his life, Piaget wrote papers about his children.'
- 01 c. Ein paar Aufsätze über seine Kinder hat Piaget mehrmals in seinem Leben geschrieben.  
'Several times in his life, Piaget wrote a couple of papers about his children.'
- 02 Einen Stuhl mit Armlehnen hat Peter genau dreimal hergestellt.  
'Exactly three times, Peter produced a chair with arms.'
- 03 Ein Plätzchen mit Verzierung habe ich häufig gegessen.  
'I frequently ate a decorated cookie.'
- 04 Einen Brief aus New York hat Barbara häufig geschickt.  
'Barbara frequently sent a letter from New York.'
- 05 Eine Palme aus Hawaii haben wir häufig gepflanzt.  
'We frequently planted a palm from Hawaii.'
- 06 Einen Scheck über 300 Mark hat Peter häufig ausgestellt.  
'Peter frequently wrote out a 300 Mark check.'
- 07 Einen Vertrag mit Japan haben die Vereinigten Staaten häufig unterzeichnet.  
'The U.S. frequently signed a contract with Japan.'
- 08 Ein Foto von Maria habe ich des öfteren zerrissen.  
'I often destroyed a photograph of Maria.'
- 09 Eine Kerze aus Bienenwachs haben die Kinder dreimal gegessen.  
'Three times, the children crafted a candle made of beeswax.'
- 10 Eine Datei mit wichtigen Daten habe ich mehrfach gelöscht.  
'Several times I deleted a file with important data.'
- 11 Eine Postkarte von Maria habe ich dreimal erhalten.  
'Three times, I received a postcard from Maria.'
- 12 Ein Streichquartett hat der Komponist häufig komponiert.  
'The composer frequently composed a string quartet.'

#### Appendix 4. Material of Experiment 4

The full experimental paradigm is only shown for sentence one. For all other sentences, only the first condition is shown. The remaining three conditions can be obtained from the one shown by replacing the initial indefinite singular DP by either a bare plural, *einige*, or an indefinite plural DP with the determiner *ein paar*.

- 01 a. Eine Zeichnung von Kirchner habe ich schon häufig gesehen.  
'I have frequently seen a drawing by Kirchner.'
- 01 b. Zeichnungen von Kirchner habe ich schon häufig gesehen.  
'I have frequently seen drawings by Kirchner.'
- 01 c. Einige Zeichnungen von Kirchner habe ich schon häufig gesehen.  
'I have frequently seen some drawings by Kirchner.'
- 01 d. Ein paar Zeichnungen von Kirchner habe ich schon häufig gesehen.  
'I have frequently seen a couple of drawings by Kirchner.'
- 02 Eine Oper von Mozart hat sich Peter des öfteren angehört.  
'Peter frequently heard an opera by Mozart.'
- 03 Einen Freund hat Fritz mehrmals mit auf seinen Bauernhof genommen.  
'Several times, Fritz brought a friend to his farm.'
- 04 Ein Buch von Stephen King trägt Klaus immer in seinem Rucksack umher.  
'Klaus always carries a book by Stephen King in his backpack.'
- 05 Einen Fußballspieler des VfB haben wir in dieser Disco häufig angetroffen.  
'We frequently met a football player from the VfB in this disco.'
- 06 Einen Film von Hitchcock hat sich Sabine häufig angeschaut.  
'Sabine frequently saw a film by Hitchcock.'
- 07 Ein Gedicht von Goethe hat der Lehrer häufig rezitiert.  
'The teacher frequently recited a poem by Goethe.'
- 08 Ein Musical von Andrew Lloyd Webber hat sich Clemens jetzt schon viermal angehört.  
'Already four times, Clemens has heard a musical by Andrew Lloyd Webber.'
- 09 Eine CD von Elton John hört sich Angelika fast jeden Tag an.  
'Angelika listens to a CD by Elton John almost every day.'
- 10 Ein Theaterstück von Schiller hat der Kritiker fast jedes Jahr besprochen.  
'Almost every year, the critic has reviewed a play by Schiller.'
- 11 Einen Hund von Dieter hat die Jury jedes Jahr ausgezeichnet.  
'Every year, the jury awarded a dog of Dieter.'
- 12 Einen Lehrer seiner ehemaligen Schule hat Rudi fast jeden Tag in der Stadt gesehen.  
'Almost every day, Rudi saw a teacher from his former school in town.'
- 13 Ein Lied von Schubert hat der Musiklehrer in fast jeder Stunde vorgespielt.  
'During almost every lesson, the music teacher played a song by Schubert.'
- 14 Eine teure Gedenkmünze hat die Bank schon bei drei Gelegenheiten zum Kauf angeboten.  
'Already on three occasions, the bank offered an expensive commemorative coin.'
- 15 Ein Gemälde von Picasso hat der Kunstwissenschaftler schon in mindestens vier Aufsätzen analysiert.  
'In at least three articles, the art researcher has analyzed a painting by Picasso.'
- 16 Einen Witz über seinen Chef hat Erwin auf fast jeder Party erzählt.  
'At almost every party, Erwin told a joke about his boss.'

### Appendix 5. Material of Experiment 5

The full experimental paradigm is only shown for sentence one. For all other sentences, only the first condition is shown. The remaining three conditions can be obtained from the one shown by replacing the initial indefinite singular DP by either a bare plural, *einige*, or an indefinite plural DP with the determiner *ein paar*.

- 01 a. Eine Zeichnung von Kirchner hat jeder Museumsbesucher sehen wollen.  
'Every visitor of the museum wanted to see a picture by Kirchner.'
- 01 b. Zeichnungen von Kirchner hat jeder Museumsbesucher sehen wollen.  
'Every visitor of the museum wanted to see pictures by Kirchner.'
- 01 c. Einige Zeichnungen von Kirchner hat jeder Museumsbesucher sehen wollen.  
'Every visitor of the museum wanted to see some pictures by Kirchner.'
- 01 d. Ein paar Zeichnungen von Kirchner hat jeder Museumsbesucher sehen wollen.  
'Every visitor of the museum wanted to see a couple of pictures by Kirchner.'
- 02 Eine Oper von Mozart hat jeder Musikliebhaber schon live angehört.  
'Every music lover has heard a live performance of a Mozart opera.'
- 03 Einen Freund hat jeder meiner Brüder auf unseren Bauernhof mitbringen wollen.  
'Every brother of mine wanted to bring a friend to our farm.'
- 04 Ein Buch von Stephen King trägt jeder Horrorfan in seinem Rucksack umher.  
'Every fan of horror stories carries a book by Stephen King in his backpack.'
- 05 Einen Fußballspieler des VfB haben fast alle Besucher dieser Disco persönlich gekannt.  
'Almost all visitors of this disco knew a football player from the VfB personally.'
- 06 Einen Film von Hitchcock haben sich fast alle Kinofreunde im Original angeschaut.  
'Almost all movie lovers have seen a movie by Hitchcock in the original version.'
- 07 Ein Gedicht von Goethe können fast alle Lehrer rezitieren.  
'Almost all teachers can recite a poem by Goethe.'
- 08 Ein Musical von Andrew Lloyd Webber wollen fast alle Touristen anhören.  
'Almost all tourists want to hear a musical by Andrew Lloyd Webber.'
- 09 Eine CD von Elton John können alle Rockfans leiden.  
'All rock fans like a CD by Elton John.'
- 10 Ein Theaterstück von Schiller wollen alle Kritiker besprechen.  
'All critics want to review a play by Schiller.'
- 11 Einen Hund von Dieter haben alle Jurymitglieder auszeichnen wollen.  
'All members of the jury wanted to award a dog of Dieter.'
- 12 Einen Lehrer ihrer ehemaligen Schule hätten alle Schüler in dieser Kneipe vermutet.  
'All pupils suspected a teacher of their former school to be in this pub.'

- 13 Ein Lied von Schubert hat uns fast jeder Musiklehrer vorgespielt.  
'Almost every music teacher played us a song by Schubert.'
- 14 Eine teure Gedenkmünze hat fast jede Bank zum Kauf angeboten.  
'Almost every bank offered an expensive commemorative coin.'
- 15 Ein Gemälde von Picasso hat fast jeder Kunstwissenschaftler analysiert.  
'Almost every art researcher analyzed a picture by Picasso.'
- 16 Einen Witz über seinen Chef hat fast jeder Angestellter auf unserer Party erzählt.  
'Almost every employee told a joke about his boss at our party.'

### Notes

1. For helpful discussion and comments, we would like to thank Monika Doherty, the audience of the workshop on Language Specific Discourse Linking held at Humboldt University, Berlin, in October 2002, and two anonymous reviewers. The work of Lyn Frazier was supported by a NIH grant (grant number HD17246) to K. Rayner and L. Frazier. Correspondence address: Dr. Markus Bader, Fachbereich Sprachwissenschaft, Universität Konstanz, Fach D 191, Universitätsstr. 10, D-78457 Konstanz, Germany. E-mail: markus.bader@uni-konstanz.de.
2. In some dialects of German, the regenerated determiner is obligatory. In others, it is optional. For a few speakers, the regenerated determiner appears to be impossible, at least in the formal written language.
3. *Wieder* has both a quantificational and a nonquantificational (restitutive) reading (cf. von Stechow 1996). In all experimental sentences, *wieder* was used in its quantificational sense.
4. As pointed out by one reviewer, difficulty ratings allow for variability in the criteria individuals employ in making their ratings. Of course, what is of interest is the structure that emerges from the data despite the variability.
5. Evidence for this claim comes also from the audience of the Berlin workshop on Language Specific Discourse Linking at which the data of the current article were first presented. As a reaction to the claim that singular split sentences as investigated here are ungrammatical, the workshop's participants were asked to judge these sentences. Only two among ca. fifteen participants found them ungrammatical.
6. Summaries of the scopal properties of German sentences are found in Frey (1993) and Pafel (1997). We will discuss the empirical adequacy of the claim concerning sentences as in (21) in connection with the next experiment, because the method used there (preference judgments) is more suited for evaluating claims concerning ambiguity as such.
7. Even if these sentences were unambiguous, we would probably not get 0% wide-scope reading because of experimental noise. However, we consider it unlikely that a value of 16% is simply due to noise.
8. Frey (1990) has suggested that one semantic effect of *fast* is to remove possible group-readings. While this might work for *alle*, it is not clear whether it can be generalized for *jeder* (cf. Pafel 1997).
9. For a discussion of this point from a more general point of view, cf. Bierwisch (1983).

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