

Reconstruction, scope and the interpretation of indefinites

Markus Bader
University of Konstanz

&

Lyn Frazier
University of Massachusetts,
Amherst

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Adress for Correspondence:

Markus Bader

Universität Konstanz

Fachbereich Sprachwissenschaft

Fach D191

Universitätsstraße 10

78457 Konstanz

Phone: +49 7531-884753 - Fax: +49 7531-884759

Abstract

Do listeners (or readers) immediately interpret a moved indefinite phrase in its surface position by instantiating the phrase as a variable in the discourse representation? If so, what happens if a quantifier later appears between the moved phrase and the position of its trace? Four experiments on the preferred interpretation of German sentences are reported. In each, canonical subject before object sentences were compared to sentences in which the object had been scrambled before the subject in the Middlefield or fronted to SpecCP. The results show that readers typically assigned reconstructed scope to the moved object, especially for phrases in SpecCP, except when the phrase was a specific indefinite. Thus, the potentially specific ein Buch von Chomsky ('a book by Chomsky') received reconstructed scope less often than the nonspecific irgendein Buch von Chomsky ('some book or other by Chomsky, I don't care which') or the generalized quantifier mindestens ein Buch von Chomsky ('at least one book by Chomsky'); the potentially specific phrase also receive reconstructed scope less often than a universal quantifier. This general pattern of results is expected if, at the base position of a moved phrase, the processor wants to interpret the moved phrase with respect to all of its properties: scope as well as thematic role. But if the moved phrase has already been instantiated as a variable at the highest level of the discourse representation and the semantic properties of the phrase (e.g. its specificity) reinforce or confirm this analysis, the processor is reluctant to abandon the original analysis. By 'specific' what we have in mind is a singleton indefinite (Schwarzschild, 2002): a singleton indefinite involves a domain overtly or covertly restricted to a singleton. But how does the reader figure out whether a specific reading is intended? Experimental results suggest that the presence of a heavy restrictor typically makes it somewhat more likely that an indefinite phrase

is intended as specific (Experiment 4), but the presence of a partitive phrase in the indefinite makes the phrase non-specific.

1 Introduction

When confronted with a sentence of the form in (1) where a phrase XP has moved over a quantifier, do perceivers interpret XP with surface scope, scope over the quantifier Q, or with scope determined by the trace position of the moved phrase (reconstructed scope)?

(1) XP-j ...Qt-j....

Several types of phenomena indicate the need for reconstruction. Parts of idioms may be moved and still receive their idiomatic interpretation (“The careful track that she’s keeping of her expenses pleases me,” Schachter, 1973). Likewise anaphors may be bound with reference to the position marked by their traces (“Which picture of herself did Mary say every actress liked best?”, Barss, 1986). Scope may be computed with respect to the trace position (“I will phone the two patients that every doctor will examine tomorrow”, Bianchi, 1999). For our purposes, it is reasonable to assume the grammar must permit scope to be assigned to either the surface position of a phrase or to its base position (Aoun and Li, 1993, Barss, 2001, Fox, 1999, Frey, 1993, Heycock, 1991). However we note that in more complicated examples involving conditionals (Reinhart, 1997) or ellipsis (Sauerland, 2004) the assumption that the entire moved phrase may be interpreted in its base position is highly questionable.

Although the problems posed by reconstruction have long been recognized in linguistics, in the processing literature very little attention has been paid to reconstruction. Imagine that processing is incremental: the phrase XP may already have been interpreted and instantiated as a variable in the discourse representation before the quantifier or the trace position has been encountered (see Bader and Frazier (2005) for further discussion). Assume that interpretation of XP as a variable at the highest level in a discourse representation amounts to assignment of

surface scope because construction of the discourse representation proceeds from the top-down. Then it would be easy to imagine a processing system which would simply assign surface scope in (1) because it allows the processor to retain the original discourse representation built when XP was first encountered.

Below we will use the results of four experiments on the comprehension of ambiguous German sentences to argue that the human language processing system does not just build and automatically adopt the surface scope analysis of sentences like (1). Instead, at the trace position, the processing system also evaluates the reconstructed scope analysis and typically prefers reconstructed scope. However, depending on the semantic properties of XP, the processor may be more reluctant or less reluctant to give up its original analysis where the earlier phrase takes wider scope. We suggest that for indefinites, specificity is one property that matters: the processor will be less willing to give up its original discourse representation when XP is a specific indefinite than when it is nonspecific. By “specificity” what we have in mind is the singleton indefinite analysis of Schwarzschild (2002), where a specific indefinite involves an overt or implicit restriction narrowing the domain to a singleton. On this view a specific indefinite is referential. This notion may be close, though clearly not identical, to what has been called „discourse anchoring“ in the DRT semantic literature (cf. Bende-Farkas and Kamp, 2001). Both in order to be sure that we are investigating scope (not mistaking a narrow scope but specific reading for a wide-scope reading) and to explore the role of “specificity” in scope preferences, we compare the effect of *ein* (which is potentially specific) and *irgendein* (which is lexically marked as ‘nonspecific’) in Experiment 2. We also investigate the role of heavy versus light restrictors and partitive phrases. (See in particular the introduction to Experiment 4 below.)

Before turning to the experiments, we discuss existing evidence on the processing of quantified sentences in section 2.1, and then turn to the linguistic literature on indefinites and on German scope in sections 2.2 and 2.3.

2 Processing Scope-Ambiguities: Previous Accounts

2.1 Processing of quantified sentences

Ioup (1975) pioneered the processing of scopally ambiguous sentences. She argued that individual quantifiers have different inherent propensities for acquiring wide scope. Citing informal intuitions from thirteen languages, she noted that in all of them *each* would tend to take wide scope regardless of its particular grammatical role. *Every* was somewhat lower on the hierarchy and *all* was lowest of them all (see also Gil, 1982). In addition, Ioup proposed that topics tend to take wide scope and that grammatical functions differed, with subjects tending to take wider scope than objects, for example.

Kurtzman and MacDonald (1993) investigated sentences like (2) in a task where participants read the first sentence, pressed a button, then read a second sentence and judged whether the second sentence was a good continuation of the first sentence by pressing a “yes” or “no” button. Response times were not informative, but readers did accept the continuation more often when the continuation was consistent with NP1 taking wide scope, i.e., (2a) and (3a).

- (2) Every kid climbed a tree.
 - a. The trees were full of apples.
 - b. The tree was full of apples.
- (3) A kid climbed every tree.

- a. The kid was full of energy.
- b. The kids were full of energy.

Passive sentences were tested in a second experiment. With passives, the preference for surface scope was weaker than in the first experiment and the acceptability of continuations compatible with the inverse scope reading was higher than in the first experiment (Complex noun phrases were tested in subsequent experiments). Kurtzman and MacDonald concluded that no single principle was responsible for scope preferences. They argued that some principle favors wide scope for the leftward phrase in passives and some principle favors wide scope for the rightward phrase. „Candidates for the principle favoring wide scope for the leftward phrase in passives include the linear order, surface subject, c-command and topic principles; candidates for the other principle are the external argument and thematic hierarchy principles.” (Kurtzman & MacDonald, 1993, p. 271) Their central proposal was that the processor considers various scope interpretations in parallel and a variety of factors contribute to the ultimate preference for a particular scope.

As noted by Tunstall (1998), one problem interpreting the above results is the fact that (2b) is a perfectly good continuation of (2) even if the universal quantifier takes wide scope. The wide scope universal reading of (2) permits but does not require multiple instantiation of the referent of the object *a tree*. This observation points to the existence of the larger problem posed by indefinites, which do not really behave like other quantifiers, as will be discussed in section 2.2.

Tunstall (1998) reported a variety of comprehension and production experiments on quantifier scope, focusing on the difference between *each* and *every*. She argued for the Surface Scope principle in (4), which we essentially adopt here, though in the form of an Early Interpretation principle.

(4) Surface Scope principle (adapted from Tunstall, 1998)

If Q1 c-commands Q2 at surface structure, then perceivers prefer Q1 to take scope over Q2.

She assumed that *each* and *every* are both distributive but that *each* is used when the speaker is interested in the individuals in the set *each* quantifies over. Changing a situation slightly from one where the members of this set were uniform to one where some property distinguishes the individual members of the set from each other (e.g., employees all wear identical clothes versus having salient color differences in their uniforms) determined whether speakers described the situation using *each*, for differentiation, or *every*, for nondifferentiated situations. The Surface Scope principle (4) lies at the heart of Tunstall's account of processing quantifiers: on her view, perceivers assign surface scope but then alter that scope if the conditions associated with the individual quantifiers are not met.¹

To summarize, there is relatively widespread agreement that the preferred interpretation of quantified sentences depends on the intrinsic properties of the particular quantifiers. Positional constraints also have been proposed - most of them consistent with a basic preference for Qa to scope over Qb if Qa c-commands Qb at surface structure.^{2,3}

¹ For further evidence suggesting that the processor initially just computes the surface scope, at least when that does not conflict with the inherent properties of the particular individual quantifiers in the sentence, see Anderson (2004) and Arregui (in progress).

² There are many recent and very interesting studies of processing quantifiers which focus not on scope but on whether determiner quantifiers lead the sentence processor to draw semantic predictions (Arregui, 2003), on the complexity of processing quantifiers versus other kinds of determiner phrases (Warren and Gibson, 2002), and on the role of already available context sets for interpreting quantifiers (AlonsoOvalle, 2003, Mendendez-Benito, 2003, Warren, 2003).

Processing studies of quantifier scope ambiguity have largely focused on quantifiers in argument positions. One clear exception is the work of Villalta (2003). She investigated the processing of *how many* questions in contexts supporting both a wide scope universal and a narrow scope universal reading, in both English and French. A relevant example from English is given in (5).

(5) [How many pieces]_i did every student play t_i?

In both languages she observed a strong preference for the universal quantifier to take scope over the *how many* phrase, both in off-line judgments and in a self-paced reading study. Remarkably, in the French study, the preference for the reconstructed reading, where the universal takes wide scope, was just as strong when the entire *how many students* phrase moved as when only *how many* was fronted (the „split-combien” construction). Thus her study suggests a preference for reconstruction and, oddly, a preference which is no stronger when the restrictor remains in its original position than when it doesn't. Of course, it isn't known at present to what extent these results will generalize to other types of quantifiers: *how many* phrases may have relevant properties that distinguish them from other determiner quantifiers. Villalta attributed her results to a delay in processing triggered by context. The context she used supported both readings of the question. Thus they provided more than one antecedent for the set whose cardinality was at issue. She hypothesized that it was this ambiguity that was responsible for delayed interpretation

³ A few studies have examined the role of prosody in assigning quantifier scope. Baltazani (2001) investigated Greek and showed that focusing a quantifier, either *not* or *many/few/more than five*, corresponded to giving that quantifier wide-scope. Recent studies of Japanese sentence processing have suggested that prosody determines, at least in part, the reading assigned to scopally ambiguous questions in Japanese (Deguichi and Kitagawa, 2002, Hirotani, 2003, 2004).

of the interrogative phrase. But we take her results as preliminary evidence supporting the existence of a preference for base position interpretations, cast as the Base Position Preference Principle (see (19) below).

An approach which lies somewhere between processing accounts of scope (=grammar plus processing principles) and pure competence accounts (=grammar only) has been provided by Pafel (1993; 1997). Pafel presents a model of scope determination in German that quantifies the distinct preferences noted above in terms of scales for factors like „grammatical function” or „distributivity”. Each point on such a scale is assigned a numerical value. To compute the scope potential of a particular quantified phrase within a sentence, one computes the weighted sum of all its values on the different scales. If more than one quantifier is involved, the difference of their scope potentials is computed in order to determine which quantifier can take scope over the other. This is an interesting step toward bridging the gap between processing and competence accounts of scope. However, what remains unexplained in Pafel’s model is why particular scope factors receive particular numerical values, and why they are given different weights when they are combined. We will return to Pafel’s proposal after we have presented our experiments.

Two issues have emerged in the preceding discussion that will be central for the experimental work that we present below. One concerns the treatment of indefinites. The other concerns reconstruction. We take these up in turn.

2.2 The Semantic Properties of Indefinite NPs

Indefinite NPs and their peculiarities are an important topic within semantic theory. Traditionally, an indefinite NP in a sentence like (6a) is translated as the existential quantifier of predicate logic, and an NP with the determiner *every* like in (6b) as the universal quantifier of predicate logic (cf., for example, Chierchia and McConnell-Ginet, 1990; Larson and Segal, 1995).

- (6) a. A man met Mary.
b. Every man met Mary.

Under this analysis, indefinite NPs are semantically quantifiers, introducing tripartite structures consisting of a quantifier, a restrictor, and a nuclear scope, in contrast to other, non-quantificational NPs like proper names (and definite NPs under a referential analysis). Starting in the late 1970s, a second type of analysis of indefinite NPs was developed. A major impetus for this second analysis was the observation that there are important differences between indefinite NPs and quantifier phrases like *every man* or *no man*. In particular, indefinites behave like proper names or definite NPs with respect to cross-sentential anaphora, as illustrated in (7). A proper name can serve as antecedent for a pronoun across a sentence boundary (cf. (7a)) but a quantifier phrase cannot (cf. (7b)). As (7c) shows, indefinite NPs pattern with proper names, not with quantifier phrases.

- (7) a. Peter met Mary. He was wearing a funny hat.
b. *Every man met Mary. He was wearing a funny hat.
c. A man met Mary. He was wearing a funny hat.

Data like those in (7), among others, initiated the development of File Change Semantics (Heim, 1982) and Discourse Representation Theory (Kamp, 1984). According to these theories, indefinites are not quantifiers introducing tripartite structures. Instead, indefinite NPs are analyzed as variables (File Change Semantics) or discourse referents (Discourse Representation Theory). The interpretation of such variables or discourse referents (we will use the terms *variable* and *discourse referent* interchangeably in the following) depends on the position they occupy within a larger semantic representation.

(8) shows the Discourse Representation Structure (DRS), that is, the semantic representation that is constructed for a sentence like (6a) according to Discourse Representation Theory (DRT).^{4,5}

(8) Discourse Representation Structure (DRS) for „A man met Mary.“

x	y
man	(x)
Mary	(y)
x	met y

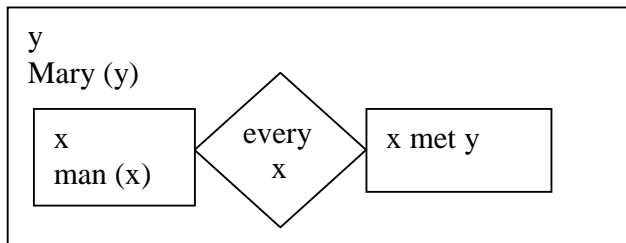
(8) contains several pieces of information. First, it contains the two discourse referents ,x‘ and ,y‘. Second, it contains three conditions pertaining to the discourse referents. The first one states that the predicate „man“ is true of ,x‘, the second one states that ,y‘ is the bearer of the name „Mary“, and the last one states that the relation of meeting holds between ,x‘ and ,y‘. The existential interpretation of the variable introduced by the indefinite will then result from the existential interpretation of the truth conditions of DRSs (see Kamp & Reyle, 1993).

⁴ Throughout we will present DRT in the form described in chapters 1-4 of Kamp and Reyle (1993). That is, we will abstract away from properties connected with tense and eventualities, as well as from the presuppositions that come with certain words and phrases (for a formal treatment of presuppositions within the framework of DRT, cf. , e.g., Kamp, 2001).

⁵ For psycholinguistic evidence supporting the DRT framework, see Dwivedi (1996) and Dwivedi, Phillips, Lague-Beauvais and Baum (submitted). They examined indefinites introduced in non-factual modal contexts but resumed in modal contexts and observe a P600 effect at the anomaly.

In contrast to the simple DRS in (8), a sentence like (6b) with a quantified phrase leads to a more complicated structure, as shown in (9).

(9) Discourse Representation Structure (DRS) for „Every man met Mary.“



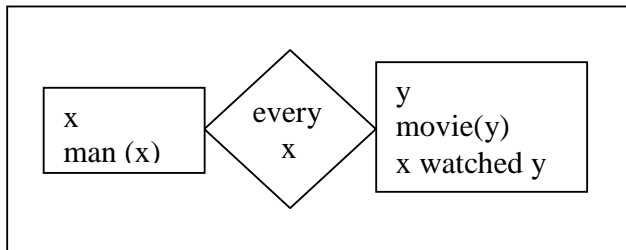
In (9), the quantifier phrase *every man* triggers the insertion of the tripartite structure characteristic of generalized quantifiers. The box to the left of the diamond in (9) represents the restrictor (the domain of quantification), the box to the right represents the nuclear scope, and the diamond itself contains the quantifier and the variable that is quantified over.

Indefinite NPs do not always act in the same way as proper names or definite NPs. This is true in particular when an indefinite is interpreted within the scope of a quantificational phrase, as in sentence (10).

(10) Every man watched a movie.

(10) is the kind of scopally ambiguous sentence discussed in the preceding section. One possible DRS for this sentence is shown in (11).

- (11) DRS for „Every man watched a movie“ with the indefinite interpreted within the scope of the universal quantifier

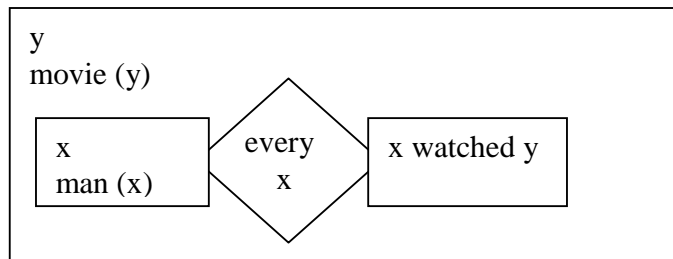


As before, the indefinite NP is translated as a discourse referent (y') together with a condition on it ($\text{movie}(y)$). What crucially differs from the DRS of sentence (6a) in which the discourse referent was not in the scope of a quantified phrase is the position at which the discourse referent of the indefinite NP is inserted into the DRS.

The way a variable or discourse referent corresponding to an indefinite NP is interpreted according to theories like File-Change Semantics or DRT depends on the context of the variable or discourse referent, as can be seen by comparing the DRS for sentence (6a) (*A man met Mary.*) with the DRS for sentence (10) (*Every man watched a movie.*). If the discourse referent of an indefinite NP is placed at the top-most level of the DRS, it will receive an interpretation basically like a proper-name or definite NP. In contrast, if it is placed into the nuclear scope of some quantifier, it will be interpreted as being referentially dependent on the quantifier.

The DRS shown in (11) represents the reading of sentence (10) according to which the universal quantifier has scope over the indefinite. The second reading of (10), according to which the indefinite has scope over the universal quantifier, results when the discourse referent introduced by the indefinite is not inserted into the nuclear scope of the quantifier, but at a higher position which is the top level of the DRS in our simple examples. This is shown in (12).

- (12) DRS for „Every man watched a movie“ with the indefinite interpreted outside the scope of the universal quantifier



How might the semantic representations introduced so far be constructed during on-line sentence comprehension? As a kind of null hypothesis, we will assume the EARLY INTERPRETATION PRINCIPLE in (13).

- (13) Early Interpretation principle

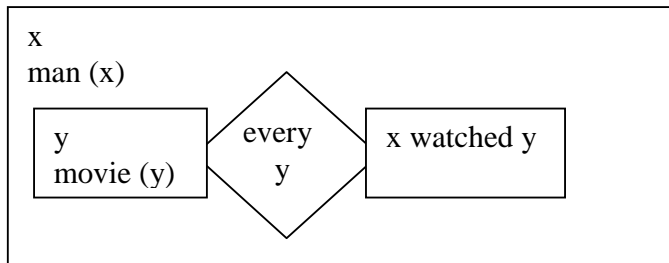
XPs are interpreted as soon as they are encountered.

The Early Interpretation principle is the counterpart of the widely held assumption that human syntactic parsing proceeds in an incremental way (cf. Mitchell, 1994). For the examples considered so far, the Early Interpretation principle only makes predictions about the time course of processing. But in other examples, this will amount to predicting a preference for one interpretation over another. Consider (14) where the variable corresponding to *a man* should immediately be postulated at the top-level of the discourse representation.

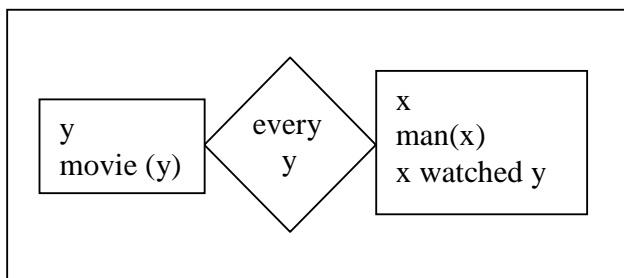
- (14) A man watched every movie.

This will result in a preference for the interpretation in (15), not (16).

- (15) DRS for „A man watched every movie“ with the indefinite interpreted outside the scope of the universal quantifier



- (16) DRS for „A man watched every movie“ with the indefinite interpreted within the scope of the universal quantifier

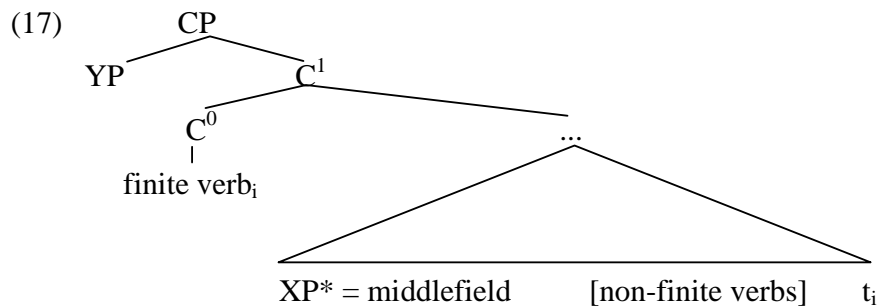


It is of course not impossible that the processor on occasion has reason to consider giving up a top-level variable (e.g., giving up its initial analysis in (15) in favor of the non-preferred (16)). We hypothesize that the processor will be less likely to do so if the indefinite is a tempting specific („a man with a red beard“) than if it is a nonspecific indefinite („some man or other, I don't know who“). This hypothesis will be tested in Experiment 2.

2.3 Reconstruction and Scope in German

Our experiments are in German because the language allows considerable movement, resulting in ambiguous sentences which allow a phrase to be interpreted in either its surface position or its

base position. Syntactically, German is both a verb-second and an SOV language. The structure of a German declarative main clause is therefore as shown in (17), where t_i is the trace of the finite verb which has to move to verb-second position in main-clauses.



In line with most research on German syntax, we will make the following assumptions concerning how phrases are positioned within the tree structure shown in (17). The base-position of subject and object is in the so-called middlefield which is the part of the sentence between the complementizer position C^0 (this position is filled by the finite verb in main clauses) and the clause-final non-finite verb(s) (if there are any). For the majority of verbs, the base position of the subject precedes the base position of the object. This will be true in all sentences that we will investigate experimentally. The sentence-initial position SpecCP (YP in (17)) is either occupied by some XP other than subject or object, or one of these phrases is moved to SpecCP (Fronting to SpecCP).⁶ Within the middlefield, the object can be moved in front of the subject. This particular kind of movement is called SCRAMBLING. Crucially it gives rise to narrow focus on the subject (cf. Haider & Rosengren, 2003, and the literature cited there for a grammatical discussion of scrambling; for psycholinguistic support, cf. Bader & Meng, 1999).

⁶ This kind of movement is sometimes called TOPICALIZATION. However, since a phrase moved to SpecCP is not necessarily a topic, we will use the functionally neutral term FRONTING TO SPEC CP.

The experiments to follow will investigate main clauses with a subject and a single object. For such sentences, there are four possible ways that subject and object can be positioned, depending on (i) whether the subject precedes the object or the object precedes the subject, and (ii) where subject and object are located: either they are both located below C^1 in the middlefield, XP^* in (17), or one of them is occupying the clause-initial SpecCP position, YP in (17). The resulting four versions of positioning a subject and an object are illustrated in (18).

(18) a. Subject > object, both in the middlefield

Anscheinend hat [_S jeder Student] [_O ein Buch] gelesen.

presumably has every student a book read

‘Presumably, every student read a book’.

b. Subject > object, subject in SpecCP/object in the middlefield

[_S Jeder Student] hat anscheinend [_O ein Buch] gelesen.

every student has presumably a book read

c. Object > subject, both in the middlefield

Anscheinend hat [_O ein Buch] [_S jeder Student] gelesen.

Presumably has a book every student read

d. Object > subject, object in SpecCP/subject in the middlefield

[_O Ein Buch] hat anscheinend [_S jeder Student] gelesen.

a book has presumably every student read

All sentences in (18) receive a base structure in which the subject precedes the object in the middlefield. This corresponds to the overt structure in (18a). Adopting a copy theory of movement where a trace is really a phonologically covert copy of the moved phrase, the overt

copy of the subject may appear in SpecCP with the covert copy in the base position, as in (18b). Or the overt copy of the object may appear before the subject in the middlefield (18c) or in SpecCP (18d) with a covert copy of the object in its base position before the verb.

Assuming the grammar allows any copy of a phrase to be semantically interpreted, whether or not it is the copy that is phonologically overt, sentences with a quantifier in both subject and object position would be ambiguous only if the object moved above the subject. In other cases, the quantifiers will be interpreted in the order in which they occur. However, in sentences with one quantifier and one indefinite, like in the “canonical subject-before-object“ sentences we test in Experiments 1 through 4, the sentence will be ambiguous when the indefinite occurs in object position, because the corresponding variable may be introduced at the highest level of the discourse or in the nuclear scope of the quantifier. But it will essentially not be ambiguous if the indefinite occurs in subject position.⁷

Following Bader and Frazier (2005), we propose the **BASE POSITION PREFERENCE PRINCIPLE** in (19), which specifies that base position scope, in addition to surface scope, will be considered for phrases moved out of their theta positions. The choice of analysis for moved phrases will then depend on the cost of an analysis, if reanalysis of the discourse representation is involved, and on how well an analysis satisfies the intrinsic properties of individual phrases.

(19) Base Position Preference Principle (see Bader and Frazier, 2005)

Interpret the scope of a phrase in the same position where it receives its thematic role.

⁷ Actually, in principle an operation like quantifier-raising (QR) is probably available in the grammar. But we assume that it is essentially used as a last resort operation by the processor (cf. Frey, 1993, and Pafel, 1993, 1997, for further discussion of scope in German).

2.4 Summary of Processing Principles

Rather than directly adopting the Surface Scope Principle in (4) above, we have adopted the Early Interpretation Principle in (13) which applies to quantificational and nonquantificational phrases alike. Given a right-branching syntactic structure, early interpretation of phrases as they are processed will automatically result in a preference for surface scope, as observed by various authors (e.g., Larson and Segal, 1995, p. 250ff.). The predictions of the Early Interpretation Principle are offset by the Base-Position Preference Principle (19) in cases where a phrase has been moved over an indefinite or quantifier phrase.

3 Experiment 1

Experiment 1 and the other experiments we report used written materials that did not contain any explicit information about intonation. Nevertheless, it is possible that intonation may be involved in silent reading (see Bader, 1998 and Fodor, 2002), so we begin with a brief discussion of our assumptions about how intonation may influence our experimental results. One possibility is that intonation is assigned by readers based on whatever linguistic analysis of a sentence is chosen on independent (non-intonational) grounds. In this case, intonational factors are not causal in the sense that the particular experimental set-up employed - interpreting written sentences - does not allow intonation to determine which analysis of a sentence is adopted.

Another possibility is that readers assign a “default” intonation as they process the constituents of a sentence. If so, then one would expect a minimal intonation to be assigned, e.g. with content words accented but not function words (Bader, 1998). One would not expect intonational morphemes to be postulated without evidence. This minimal intonation would presumably correspond to normal falling intonation, not to a more complicated intonation like

the rise-fall (I-topic) intonation (for German, cf. Jacobs, 1997). On this account, intonational factors might in principle play a causal role in determining which analysis of the sentence is assigned.

In sum, either intonation will be a reflex of the preferred analysis of a (written) sentence or it could play a causal role, favoring analyses consistent with the “default” intonation. But it is difficult to imagine (implicit) intonation favoring analyses which require a special intonation.

Materials and Procedure.

Experiment 1 will investigate sentences as in (20) and (21) in order to test the principles discussed above.

(20) Subject = Universal Quantifier, Object = Indefinite

Translation of (25a)-(25d)

‘Last year, every friend of mine bought a book by Grass’

a. Middlefield: Subj > Obj

Letztes Jahr hat [_S *jeder meiner Freunde*] [_O *ein Buch von Grass*] gekauft.

Last year has every my friends a book by Grass bought

b. Middlefield: Obj > Subj

Letztes Jahr hat [_O *ein Buch von Grass*] [_S *jeder meiner Freunde*] gekauft.

Last year has a book by Grass every my friends bought

‘Last year, every friend of mine bought a book by Grass’

c. SpecCP: Subj > Obj

[_S *Jeder meiner Freunde*] hat letztes Jahr [_O *ein Buch von Grass*] gekauft.

Every my friends has last year a book by Grass bought

d. SpecCP: Obj > Subj

[_O *Ein Buch von Grass*] hat letztes Jahr [_S *jeder meiner Freunde*] gekauft.

a book by Grass has last year every my friends bought

(21) Subject = Universal Quantifier, Object = Indefinite

Translation of (26a)-(26b)

‘Last year, a friend of mine bought every book by Grass’

a. Middlefield: Subj > Obj

Letztes Jahr hat [_S *einer meiner Freunde*] [_O *jedes Buch von Grass*] gekauft.

Last year has a my friends every book by Grass bought

b. Middlefield: Obj > Subj

Letztes Jahr hat [_O *jedes Buch von Grass*] [_S *einer meiner Freunde*] gekauft.

Last year has every book by Grass a my friends bought

c. SpecCP: Subj > Obj

[_S *Einer meiner Freunde*] hat letztes Jahr [_O *jedes Buch von Grass*] gekauft.

A my friends has last year every book by Grass bought

d. SpecCP: Obj > Subj

[_O *Jedes Buch von Grass*] hat letztes Jahr [_S *einer meiner Freunde*] gekauft.

Every book by Grass has last year a my friends bought

Thirty-two one-clause sentences were constructed. Each contained the indefinite *ein* and one of the universal quantifiers *fast jeder* (‘almost every’), *jeder* (‘every’), *fast alle* (‘almost all’), *alle* (‘all’). There were eight versions of each sentence, as illustrated in (20) and (21), according to

the three factors ORDER (subject before object versus object before subject), POSITION (both subject and object in the middlefield versus one of them in SpecCP), and QUANTIFIER (universal subject/existential object versus existential subject/universal object). Four sentences contained the universal in subject position and the indefinite in object position as in (20) and four contained the indefinite in subject position and the universal in object position as in (21). Half the sentences had both subject and object in the middlefield (a,b) and half had one phrase in SpecCP and the other one in the middlefield (c,d). The subject preceded the object in the a- and c-forms, and followed it in the other forms. All experimental items appear in Appendix A.

Four counterbalanced lists of written sentences were prepared and administered to 32 native German speaking students at the University of Konstanz. Participants were instructed to read each sentence and choose the paraphrase corresponding to their interpretation of the sentence. The paraphrases were constructed to disambiguate the scope of quantifiers. For example, for the sentences in (20) the choice would have been between *Jeder Freund dasselbe Buch* ‘Each friend the same book’ and *Nicht jeder Freund dasselbe Buch* ‘Not each friend the same book’. Filler sentences were not included in the experiment.

Predictions. We will start with predictions concerning canonical sentences with the subject before the object in the middlefield (sentences (20a) and (21a)). Scored in terms of percentage wide-scope subject responses, the Early Interpretation Principle predicts a very high percentage of wide-scope for the subject, essentially just surface scope. When the subject is a universal and the object is indefinite, the variable corresponding to the indefinite may be entered into the DRS at the top-level or into the nuclear scope of the universal quantifier (cf. example (10) with its associated DRSs (11) and (12)). But when the subject is indefinite and the object is universal,

only surface scope is expected. Consequently, more subject scope should emerge when the subject is indefinite than when the subject is universal in our sentences. In fact, this should hold for all of our sentences where the universal occurs before the indefinite. Whenever an indefinite follows a quantifier, we expect less surface scope because of the two possible places to insert a variable. This predicts a main effect of the factor that we call quantifier when scored in terms of percent wide-scope subject responses.

Turning to sentences where some phrase has been moved, we first discuss examples where the subject has been moved to SpecCP (sentences (20c) and (21c)). For such sentences, the same predictions apply as for sentences with the subject preceding the object in the middlefield. Early Interpretation and Base-Position Preference will favor wide-scope subject interpretations, with higher values when the subject is indefinite than when the subject is universal (because in the latter case the variable for the indefinite object may be inserted at the top DRS).

When the object has been moved over the subject (sentences (20b,d) and (21b,d)), Early Interpretation will again favor surface scope which for sentences with object-subject word order means low values for wide-scope subject responses. But now Base Position Preference will conflict with Early Interpretation, favoring wide-scope subject interpretations. When the object has been moved to SpecCP, in principle all aspects of interpretation may be assigned at the theta-position. As mentioned earlier, an object that has been scrambled over the subject results in a constrained focus structure where the subject must receive narrow focus which excludes the scrambled object. Assuming that focus is preferentially assigned preverbally (cf. Krifka, 1998), there will be a tension between having the narrow focused subject in the preverbal focus-position and interpreting the object in its preverbal theta-position. No comparable focus-constraint applies when an object has been fronted to SpecCP. As a consequence, the effects of base-position

preference may be weaker for objects scrambled in the middle-field than for objects fronted to SpecCP where all properties - scope, theta-role, and focus - may be assigned in a single position (cf. Krifka, 1998). This means more wide-scope subject responses for object before subject order in SpecCP than in the middlefield.

In addition we expect effects of particular quantifiers which will influence whether the baseline level of wide-scope subject responses is high or low. For distributive universals (*each*, in English, one interpretation of *jeder* in German), wide scope should be more strongly favored than for universals denoting a group (*alle* in German, *all* in English). By hypothesis, *fast* ('almost') eliminates the group reading and should therefore favor wide scope universal readings and show a larger effect for *alle* (typically a group-denoting expression) than for *jeder*.

Results. The results of Experiment 1 are reported in Table 1 in terms of percent wide-scope subject responses, along with percent surface scope where that differs from subject wide-scope. Analysis of variance taking either subjects or sentences as random effects (F1 and F2, respectively) were performed on the percentages wide-scope subject with respect to the main factors described in the materials sections and their interactions (Order: subject precedes/follows object; Position: middlefield versus SpecCP; and Quantifier: universal subject - existential object versus existential subject - universal object).

Table 1: Percentage „Subject has scope over object”

(in parentheses we give percent surface scope where that differs from subject wide scope)

Position:	Subj=Indefinite, Obj=Universal		Subj=Universal, Obj=Indefinite	
	Subj > Obj	Obj > Subj	Subj > Obj	Obj > Subj
Middlefield	88	64 (36)	69	39 (61)
SpecCP	86	73 (27)	74	54 (46)

The statistical analysis revealed that all simple main effects were significant. Sentences with subject-object order received 79% wide-scope subject responses in contrast to 57% received by sentences with object-subject order (factor order: $F(1,39)=58.87$, $p < .001$; $F(1,31) = 83.84$, $p < .001$). When the subject was a universal quantifier and the object an indefinite, 58% wide-scope subject responses were given, whereas 78% were given when the relationship between quantifiers and syntactic functions was reversed (factor quantifier: $F(1,39) = 26.50$, $p < .001$; $F(1,31) = 9.02$, $p < .01$). Finally, sentences with one of subject or object in SpecCP received 72% wide-scope subject responses whereas sentences with both subject and object in the middlefield received only 65% (factor position: $F(1,39) = 10.05$, $p < .01$; $F(1,31) = 10.30$, $p < .01$).

In addition to the significant main effects, the interaction between position and order ($F(1,39)=6.04$, $p < .05$; $F(1,31)=4.80$, $p < .05$) was also significant. This interaction is due to the fact that for subject-object sentences, it did not matter whether the subject was located in the middlefield or in SpecCP (78% vs. 80%; both t_1 and $t_2 < 1$) whereas for object-subject

sentences, the rate of wide-scope subject responses increased from 51% when the object was in the middlefield to 63% when the object was in SpecCP ($t_1 = 4.11, p < .01$; $t_2 = 3.46, p < .01$). All remaining interactions were not significant (all p 's $> .16$).

The results of Experiment 1 largely confirmed expectations. As predicted by the Early Interpretation principle, a significant effect of order was observed. In all cases, we predicted more wide-scope subject responses with an indefinite subject than with a universal subject. This prediction was supported by the main effect of quantifier.

The Base Position Preference Principle predicted less surface-scope (= more wide-scope subject responses) for object-subject orders than for subject-object orders, modulated by position (middle-field versus SpecCP). As predicted, the most wide-scope subject responses were observed when the subject preceded the object, the least when the object was scrambled, and an intermediate number when the object was in SpecCP (13-20% less wide-scope subject responses than when the subject was in SpecCP).

Table 2: Percentage ,Universal quantifier has scope over indefinite'

Subject quantifier	Subj=Indefinite, Obj=Universal	Subj=Universal, Obj=Indefinite
Alle	4	37
fast alle	24	63
jeder	27	61
fast jeder	34	74

The results for the four different quantifiers are presented in Table 2. As expected *alle* 'all' showed the least wide scope of all the universals and *fast jeder* 'almost every' showed the most

wide scope universal responses. *Fast* 'almost', as expected, increased the wide scope propensity of a quantifier. This was especially true when it modified *alle*, consistent with the assumption that *fast* eliminates the group reading, the preferred reading of *alle*.

It is interesting that there was not a surface scope preference in the middlefield when a universal object was scrambled over an indefinite subject. Looking at the individual quantifiers tested, this was particularly apparent when *alle* was the object (only 5% surface scope for *alle* in contrast to 30% - 62.5% for the remaining three quantifiers). *Alle* typically receives a group interpretation, which seems to favor narrow scope: there is no need for this quantifier to distribute over something when it is interpreted as a group (also see results of Experiment 2 below).

4 Experiment 2

In Experiment 1, the indefinite phrase always had the determiner *ein* ('a') and was usually but not always modified by a PP. We suspect that the processor's decision about whether to perform discourse instantiation, that is, insertion of the variable at the top-level, is determined at least in part, by the „specificity“ of the indefinite. A modified or highly elaborated indefinite may make a tempting specific, triggering substantial discourse instantiation. To test this assumption, Experiment 2 directly contrasts indefinites like those in Experiment 1 with indefinites introduced by the determiner *irgendein* instead of *ein*. A phrase like *irgendein Student* might be paraphrased as „some student or other, I don't know or care which“ (see Kratzer, to appear, for an analysis in terms of domain widening). *irgend* combines with a variety of indefinites (e.g., *irgendjemand* 'somebody or other, I don't know or care who'; *irgendwo* 'somewhere, I don't know or care who'), always contributing the same meaning. If specificity is related to the anchoring properties discussed by Bende-Farkas and Kamp (2001), than the „I don't know or care“-condition

b. Middlefield: Obj > Subj

Letztes Jahr hat sich [O (*irgend*)ein Buch] [S *jeder meiner Freunde*] gekauft.

Last year has himself a book every my friends bought

c. SpecCP: Subj > Obj

[S *Jeder meiner Freunde*] hat sich letztes Jahr [S (*irgend*)ein Buch] gekauft.

Every my friend has himself last year a book bought

d. SpecCP: Obj > Subj

[O (*irgend*)ein Buch] hat sich letztes Jahr [S *jeder meiner Freunde*] gekauft.

a book has himself last year every my friend bought

Eight counterbalanced questionnaires were prepared and administered to a new set of 24 native German speaking students at the University of Konstanz. The procedure was the same as in Experiment 1. Participants were asked to choose one of two paraphrases corresponding to the two possible scopes of the universal and existential phrases.

Predictions. The two factors order and position were already included in Experiment 1, and the predictions made there also hold for Experiment 2. That is, we expect more wide-scope subject responses for the subject-object order than for object-subject order, and an interaction between order and position because position should make a difference when the object precedes the subject but not when it follows it. The prediction that is new for this experiment concerns the indefinite determiner of the object. Here, we predict that sentences containing *irgendein*-objects should elicit more wide-scope subject responses than sentences containing *ein*-objects because only the latter should induce discourse instantiation which in turn will give the object scope over the subject, thereby reducing the amount of wide-scope responses.

Results. The results for Experiment 2 are shown in Table 3 in terms of percentages of the subject having scope over the object, as well as percentages of surface scope where that differs from subject wide scope.

Table 3: Percentage „Subject has scope over object”

(in parentheses we give percent surface scope where that differs from subject wide scope)

Position:	Object = ‘ein’		Object = ‘irgendein’	
	Subj > Obj	Obj > Subj	Subj > Obj	Obj > Subj
Middlefield	60	31 (69)	70	47 (53)
SpecCP	59	51 (49)	82	65 (35)

Statistical analysis on the percentages of wide-scope subject responses showed all main effects to be significant. Sentences with subject-object word-order received 69% wide-scope subject responses whereas sentences with object-subject order received only 48% (factor order: $F(1,23)=60.83$, $p < .001$; $F(1,31)=36.09$, $p < .001$). Sentences with one of subject or object in SpecCP received 64% wide-scope subject responses which is significantly more than the 52% that were received by sentences with both subject and object in the middlefield (factor position: $F(1,23)=12.99$, $p < .01$; $F(1,31)=13.15$, $p < .01$). Finally, sentences where the object quantifier was *irgendein* resulted in 65% wide-scope subject responses but sentences where the object

quantifier was *ein* in only 51% (factor quantifier $F(1,23)=11.20$, $p < .01$; $F(1,31)=16.96$, $p < .001$).

As in experiment 1, only one interaction reached significance, namely the interaction between position and order (although only marginally so in the item analysis; $F(1,23)=5.12$, $p < .05$; $F(1,31)=3.24$, $p = .08$). This was again due to the fact that for subject-object sentences, position of the subject had no significant effect (71% for subject in SpecCP vs. 65 for subject in the middlefield; $t_1 = 1.41$, $p > .1$; $t_2 = 1.51$, $p > .1$), whereas for object-subject sentences, sentences with the object in SpecCP received 58% wide-scope subject responses whereas sentences with the object in the middlefield received only 39% ($t_1 = 4.61$, $p < .01$; $t_2 = 4.06$, $p < .01$). All other interactions were not significant (all p -values $> .1$).

As before, the effects of position and order were significant. Crucially, the effect of object indefinite was significant, with less specific *irgendein*-objects receiving fewer wide-scope judgments than more specific *ein*-objects. This supports the idea that discourse instantiation applies more often to specific phrases than to non-specific ones. One unexpected effect was the non-significant finding of more wide-scope subject responses in SpecCP than in the middle-field for subject-before-object orders with *irgendein* as object (82% vs. 70%). We do not have an explanation for this result. However, the predicted interaction of position by order was significant, showing that position has a larger effect for object-subject-order than for subject-object order (a 6% difference for subject-object order in contrast to a 19% difference for object-subject order), as expected. Further, across experiments, the predicted position-by-order effect was stable whereas the effect of position for subject-object-sentences was variable.

Table 4
Percentage „Subject has scope over object”

Subject quantifier	Object = ein	Object = irgendein
Alle	39	58
fast alle	52	58
Jeder	54	70
fast jeder	56	77

Table 4 shows the results for distinct quantifiers. Although the effect is smaller, it is in the same direction as the one found in Experiment 1: *(fast) jeder* shows a stronger propensity for wide scope than *(fast) alle*.

5 Experiment 3

Based in part on its behavior with respect to cross-sentential anaphora, we assume that *mindestens ein* ('at least one') is a generalized quantifier. Intuitively, *mindestens ein* seems to be the generalized quantifier most similar to the indefinites tested in Experiments 1 and 2. Thus, testing quantified sentences containing an object with *mindestens ein* should provide some indication of what interpretations are preferred when discourse instantiation is not available. Our account predicts that more wide-scope subject interpretations should be assigned to sentences containing *mindestens ein* due to the lack of discourse instantiation.

Materials and Procedure. Again based on the materials of Experiment 1, thirty two sentences were constructed, with a universal quantifier (*(fast) jeder* or *(fast) alle*) in subject position. Each

sentence had eight forms defined by whether the object was *ein* or *mindestens ein*, by position (both quantifiers in the middlefield versus one of them in SpecCP) and by order (subject precedes versus follows the object), as illustrated in (23). All experimental items appear in the Appendix.

(23) Translation of (23a)-(23d) ‘Last year, every friend of mine bought (at least one/a) book’

a. Middlefield: Subj > Obj

Letztes Jahr hat sich [s *jeder meiner Freunde*] [o (*mindestens*) *ein Buch*] gekauft.

Last year has himself every my friends (at least one/a) book bought

b. Middlefield: Obj > Subj

Letztes Jahr hat sich [o (*mindestens*) *ein Buch*] [s *jeder meiner Freunde*] gekauft.

Last year has himself (at least one/a) book every my friends bought

c. SpecCP: Subj > Obj

[s *Jeder meiner Freunde*] hat sich letztes Jahr [s (*mindestens*) *ein Buch*] gekauft.

Every my friend has himself last year (at least one/a) book bought

d. SpecCP: Obj > Subj

[o (*Mindestens*) *ein Buch*] hat sich letztes Jahr [s *jeder meiner Freunde*] gekauft.

(at least one/a) book has himself last year every my friend bought

Eight counterbalanced questionnaires were prepared and administered to a new set of 32 native German speaking students at the University of Konstanz. The procedure was the same as in Experiment 1 and Experiment 2. Participants were asked to choose one of two paraphrases corresponding to the two possible orderings among the quantifiers.

Predictions. For the factors order and position the same predictions are made as in the two preceding experiments which contained the same factors. For the contrast between *ein*-objects and *mindestens ein*-objects, our assumption is that sentences with *ein*-objects, but not sentences with *mindestens-ein* objects, should trigger discourse instantiation. This predicts fewer wide-scope subject responses for sentences with *ein*-objects than for sentences with *mindestens-ein* objects.

Results. The results for Experiment 2 are shown in Table 5 in terms of percentages of the subject having scope over the object, as well as percentages of surface scope where that differs from subject wide scope.

Table 5: Percentage „Subject has scope over object”

(in parentheses we give percent surface scope where that differs from subject wide scope)

Position:	Object = ‘ein’		Object = ‘mindestens ein’	
	Subj > Obj	Obj > Subj	Subj > Obj	Obj > Subj
Middlefield	58	26 (74)	91	70 (30)
SpecCP	66	36 (64)	91	83 (17)

Statistical analysis of the percentages of wide-scope subject responses yielded the following results. First, as before, the main effects of order and position were significant. There were more wide-scope subject responses for sentences with subject-object order than for sentences with

object-subject order (factor order: 76% vs. 53%; $F(1,31)=62.78$, $p < .001$; $F(1,31)=45.40$, $p < .001$), and more wide-scope subject responses when one of subject or object was in SpecCP than when both were in the middlefield (Factor position: 69% vs. 61%; $F(1,31) = 14.81$, $p < .001$; $F(1,31) = 10.50$, $p < .01$). In addition, sentences with the generalized quantifier *mindestens ein* received 83% wide-scope subject responses which is almost twice the 46% received by sentences with the indefinite determiner *ein* (factor object quantifier: $F(1,31)=83.56$, $p < .001$; $F(1,31)=144.24$, $p < .001$).

In contrast to the two preceding experiments, of all possible interactions only the one between order and object quantifier was significant ($F(1,31)=6.83$, $p < .05$; $F(1,31)=11.50$, $p < .01$). The reason for this interaction is that the factor word-order had a much stronger effect for sentences with the indefinite determiner *ein* (62% for subject-object vs. 31% for object-subject sentences) than for sentences with the quantifier *mindestens ein* (91% for subject-object vs. 76% for object-subject sentences). The remaining interactions were not significant (all p 's $> .2$). Although the interaction between order and position, which was significant in the two preceding experiments, failed to be significant in this experiment, it was still there numerically, as witnessed by a 4% difference for sentences with subject-object word-order in contrast to an 11% difference for object-subject sentences.

The central prediction of Experiment 3 was for more wide-scope subject interpretations for sentences containing *mindestens ein* compared to sentences containing *ein* due to the lack of discourse instantiation. This was clearly confirmed. There was also a strong effect of order as expected due to Early Interpretation. The effect of position was only somewhat greater for object-before-subject than subject-before-object sentences. As mentioned in the discussion of Experiment 2, an effect of position for subject-before-object sentences was visible only

sometimes, and when it was visible, it was of only moderate strength, whereas such an effect was always observed for object-before-subject-sentences.

The absolute amount of reconstruction for sentences containing *mindestens ein* is consistent with our account but we would need a comparison with other generalized quantifier objects to be sure what determines the precise amount of reconstruction. *Mindestens ein* is clearly a quantifier without any condition requiring it to scope over another phrase. The contrast between *ein* and *mindestens ein* is dramatic, suggesting that the pragmatic contrast between them may have influenced participants' behavior. We see this in particular when we compare the amount of surface scope for object-subject sentences containing *ein* in Experiment 3 to Experiments 1 and 2.

Table 6

Percentage „Subject has scope over object”

Subject quantifier	Object = ein	Object = mindestens ein
Alle	44	80
fast alle	43	80
Jeder	46	86
fast jeder	52	88

Table 6 shows the results for distinct quantifiers. Although the effect is again quite small, it is in the same direction as the one found in Experiment 1: *(fast) jeder* shows a stronger propensity for wide scope than *(fast) alle*.

Consistent with our assumption that ‘specific’ phrases are more likely to take wide scope than non-specific phrases, *mindestens ein* tends not to take wide scope and it seems to be clearly non-specific: the cardinality of a set seems to be at issue, not the identity of the particular individuals in the set. Experiment 4 explores further the notion of specificity.

6 Experiments 4A and 4B

In Experiments 2 and 3 universal quantifiers were more likely to scope over the object if the object was non-specific (*irgendein*, *mindestens ein*) than if it was potentially specific (*ein*). In the examples that we tested, a modifier restricted the indefinite phrase. The presence of optional modification may imply that the speaker has in mind a particular individual. In the following experiments, we test this idea by comparing the same sentences with or without a heavy restrictor. In Experiment 4A, *irgendein* is tested; in Experiment 4B, *irgendein* is replaced by *ein*. With *ein* a heavy restrictor is likely to be taken as evidence that the speaker may know what particular individual is under discussion. With *irgendein*, the matter is less clear, because the choice of *irgendein* already suggests that speaker probably doesn’t know or doesn’t care about the identity of the particular individual. If *irgendein* is semantically non-specific, then the heavy restrictor presumably shouldn’t influence its interpretation.

Experiment 4 also tests the effect of partitive phrases on scope judgments. If specific indefinites are actually singleton indefinites (Schwarzschild, 2002), then adding a partitive phrase to an indefinite introduced by *ein* may actually decrease the number of wide-scope indefinite responses (increase the wide-subject responses in our materials) compared to the same sentences without the partitive. Much like heavy restrictors, partitives restrict the domain of discourse but, crucially, they cannot limit the domain to a singleton (**one of the painting by*

Picasso). Hence, adding a partitive phrase may give rise to what we call a ‘reverse’ effect: the partitive may place a restriction on the domain of discourse but because it cannot restrict it to a singleton, it may indicate that the *ein* phrase is non-specific and thereby favor narrow scope for the indefinite. Presumably with *irgendein*, however, the partitive will have no effect, assuming that *irgendein* is already non-specific.

Materials and Procedure. Again based on the materials of Experiment 1, thirty two sentences were constructed, with a universal quantifier ((*fast*) *jeder* or (*fast*) *alle*) in subject position. Since we wanted to investigate the effect of partitivity and restriction on sentences with either subject-object or object-subject order within a single experimental design, we dropped the factor position that was part of all three preceding experiments. All sentences of Experiment 4 therefore had either the subject or the object in SpecCP; sentences with both of them in the middlefield were not included in the experiment.

In addition to the factor order (subject precedes versus follows the object), Experiment 4 tested the two factors partitivity and restrictor. Both factors pertain to the object of the sentence. In non-partitive objects, the indefinite determiner (*irgendein* in Experiment4A, *ein* in Experiment 4B) is immediately followed by a singular common noun (e.g., *ein Buch* ‘a book’). In partitive objects, the indefinite determiner is immediately followed by a partitive PP (e.g., *eines von den Büchern* ‘one of the books’). The factor restrictor was manipulated by either having an additional PP within the object or not having such an additional PP. The complete design of Experiment 4 is illustrated in (23). All experimental items appear in Appendix B.

(24) Translation of (23a) and (23b) ‘Last year, all my friends bought a book (*by Thomas Mann*)’

Translation of (23c) and (23d) ‘Last year, all my friends bought one of the books (*by Thomas Mann*)’

a. Subj > Obj: Non-partitive

[_S Alle meine Freunde] haben sich letztes Jahr [_O ein Buch (*von Thomas Mann*)]
gekauft.

All my friends have themselves last year a book by Thomas Mann
bought

b. Subj > Obj: Partitive

[_S Alle meine Freunde] haben sich letztes Jahr [_O eines von den Büchern (*von Thomas Mann*)] gekauft.

All my friends have themselves last year one of the books by
Thomas Mann bought

c. Obj > Subj: Non-partitive

[_O Ein Buch (*von Thomas Mann*)] haben sich letztes Jahr [_S alle meine Freunde]
gekauft.

A book by Thomas Mann have themselves last year all my friends
bought

d. Obj > Subj: Partitive

[_O Eines von den Büchern (*von Thomas Mann*)] haben sich letztes Jahr [_S alle meine
Freunde] gekauft.

A book by Thomas Mann have themselves last year all my friends
bought

Experiment 4A and Experiment 4B differ only in that Experiment 4A used *irgendein* as the determiner of the object whereas *ein* was used in Experiment 4B. For both sub-experiments, eight counterbalanced questionnaires were prepared and administered to native German speaking students at the University of Konstanz. The number of participants was 46 for Experiment 4A and 44 for Experiment 4B. The procedure was the same as in the preceding experiments. Participants were asked to choose one of two paraphrases corresponding to the two possible orderings among the quantifiers.

5.1 Experiment 4A

Results. The results for Experiment 4A are shown in Table 7 in terms of percentages of the subject having scope over the object, as well as percentages of surface scope where that differs from subject wide scope.

Table 7: Percentage „Subject has scope over object”

(in parentheses we give percent surface scope where that differs from subject wide scope)

	Subj > Obj		Obj > Subj	
	Non-Partitive	Partitive	Non-Partitive	Partitive
Light Restrictor	82	79	54 (46)	54 (46)
Heavy Restrictor	72	81	49 (51)	47 (53)

Statistical analysis of the percentages of wide-scope subject responses revealed the expected main effect of order, with subject-object sentence receiving 78% wide-scope subject responses and object-subject sentences 51% (factor order: $F(1,45)=68.28$, $p < .001$; $F(1,31)=68.46$, $p < .001$). The factor restrictor was marginally significant; for sentences with a light restrictor, 67% wide-scope subject responses were given, in contrast to 62% for sentences with heavy restrictor (factor restrictor: $F(1,45)=3.16$, $p = .08$; $F(1,31)=3.93$, $p = .06$). The main effect of partitivity was not significant, and neither were any of the interactions.

5.2 Experiment 4B

Results. The results for Experiment 4B are shown in Table 8 in terms of percentages of the subject having scope over the object, as well as percentages of surface scope where that differs from subject wide scope.

Table 8: Percentage „Subject has scope over object”

(in parentheses we give percent surface scope where that differs from subject wide scope)

	Subj > Obj		Obj > Subj	
	Non-Partitive	Partitive	Non-Partitive	Partitive
Light Restrictor	74	86	43 (57)	50 (50)
Heavy Restrictor	60	75	48 (52)	45 (55)

Statistical analysis of the percentages of wide-scope subject responses yielded the following results. As in the preceding experiments, order had a strong effect: sentences with subject-object order received 74% wide-scope subject responses whereas sentences with object-subject order received only 47% (factor order: $F(1,43)=83.79$, $p < .001$; $F(1,31)=75.54$, $p < .001$). In addition, the main effects of partitivity and restrictor were also significant. Non-partitive sentences received 56% wide-scope subject responses in contrast to partitive sentences which received 64% (factor partitivity: $F(1,43)=8.77$, $p < .01$; $F(1,31)=7.56$, $p < .01$). Sentences with a light restrictor received 63% wide-scope subject responses, sentences with a heavy restrictor 57% (factor restrictor: $F(1,43)=8.28$, $p < .01$; $F(1,31)=6.96$, $p < .05$).

Importantly, both the effect of partitivity and of restrictor must be qualified by a significant interaction with order. The interaction of order by partitivity reflects the finding that partitivity had a clear-cut effect on sentences with subject-object order, but for unknown reasons not for sentences with object-subject order. Subject-object sentences with partitive quantifiers received 13% more wide-scope subject responses than subject-object sentences with non-partitive quantifiers whereas object-subject sentences did not differ significantly in this dimension (interaction order*partitivity: $F(1,43)=2.90$, $p = .095$; $F(1,31)=4.51$, $p < .05$), though a 7% numerical effect was observed.

The same pattern holds for the interaction of order by restrictor. Restrictor only had an effect on sentences with subject-object order but not on sentences with object-subject order. In particular, subject-object sentences with a simple restrictor received about 13% more wide-scope subject-responses than subject-object sentences with a heavy restrictor but object-subject sentences did not differ (interaction order*restrictor: $F(1,43)=6.80$, $p < .05$; $F(1,31)=6.15$, $p < .05$).

The remaining two-way interaction as well as the three-way interaction were not significant (all p 's > .1).

5.3 Discussion.

The results of the experiment show several fully significant effects: of order, with both *ein* and *irgendein*, and of partitivity with *ein*. There is also a robust significant effect of restrictor-type for *ein*, and a marginal effect for *irgendein*. Apart from that there are several numerical effects that are clearly not significant, and which therefore will not be interpreted.

For *ein* the results were precisely as expected: the order of phrases, the presence of a heavy restrictor, and the presence of a partitive phrase all mattered. As in all the earlier studies, we attribute the order effect to early interpretation and base position preference. The hypothesis motivating Experiment 4 was the idea that a heavy restrictor will make the reader more likely to interpret an indefinite as specific and therefore favor wide-scope of the indefinite (less subject wide-scope). This was observed. Similarly, it was hypothesized that a partitive would make an *ein* phrase less likely to be analyzed as a specific, and therefore the partitive should favor narrow scope for the indefinite (more wide-scope subject readings in our sentences). This prediction was also confirmed.

Turning to *irgendein*, the effect of order was significant, as expected, and the effect of partitivity was not, also as expected. The surprising finding is that there was a marginally significant effect of restrictor for *irgendein*. If the grammar of *irgendein* requires it to be non-specific, then it is not clear why the presence of a heavy restrictor should have favored it taking wide-scope over the subject. What we suspect is that, grammatically, *irgendein* is not required to be non-specific. It may normally be interpreted as being non-specific because, in most contexts, the “I don’t know or care which” condition is readily compatible with a non-specific

interpretation. However, in some contexts, it is clear that *irgendein* may receive a specific interpretation. This is perhaps most easily illustrated in examples with *irgendso*, as in (25), or examples with a pejorative adjective, such as *komisch* ('odd') below in (26).

(25) Maria hat irgendso einen Fußballspieler kennen gelernt.

M. has some-so a soccer-player known learned

'Maria has met some soccer player.'

(26) Maria hat irgendeinen komischen Typen kennen gelernt.

M. has a odd guy known learned

'Maria has met some odd guy.'

In (25) and (26) it is easy to get a specific reading. It also seems intuitively to be easy to get wide-scope, as predicted on the current hypothesis. Further, although an entity introduced with *irgendein* generally cannot be resumed with a pronoun, in examples like (26) it can. Thus, (27) is a completely normal continuation for (26).

(27) Gestern hat sie ihn uns vorgestellt.

Yesterday has she him us introduced.

'Yesterday, she introduced him to us.'

What these examples show is that *irgendein*, while generally interpreted as being non-specific, does not exclude a specific interpretation. This in turn allows us to make sense of the finding in Experiment 4A that with a heavy restrictor *irgendein* tended to receive more wide scope readings (fewer wide-scope subject readings) than when it had a simple restrictor. Presumably the presence of the restrictor helped the reader to at times interpret *irgendein* as being specific, thereby promoting more wide-scope readings of the indefinite. Not surprisingly, the effect of the

heavy restrictor was smaller with *irgendein* than with *ein*, since the latter is really completely open to a specific reading without a rich context.

6 Accounting for Scope Preferences

In all four experiments, a robust effect of order was observed, as predicted by Early Interpretation. Variable amounts of non-surface scope were observed and attributed to two sources: Discourse instantiation of indefinites and base position interpretation. Evidence for discourse instantiation being one source of non-surface scope derives from the effect of (subject-) quantifier in Experiment 1, where more wide-scope subject responses were observed when the subject was an indefinite and the object a universal than when the subject was a universal and the object was an indefinite. The stronger effect of order when the subject was indefinite than when the subject was universal might in principle be due to the ‘vagueness problem’, i.e., the possibility of singular instantiation of an indefinite object even when it is under the scope of the universal.⁸ However, further evidence for discourse instantiation was provided in Experiments 2 and 3 by comparing *ein* to indefinite NPs with nonspecific *irgendein* phrases (Experiment 2) and NPs with the generalized quantifier *mindestens ein* (Experiment 3). Overall, wide scope indefinite object responses were obtained in 50% of the *ein* examples in Experiment 2 and in only 34% of the *irgendein* examples. In Experiment 3, wide scope indefinite object responses were obtained in 54% of the *ein* examples and in only 17% of the *mindestens ein* examples. The effect of specificity receives a unified explanation on the present account: specificity influences the interpretation of an indefinite by influencing whether it is taken to be a variable at the highest

⁸ See the discussion of multiple versus singular instantiation of indefinites under the scope of a universal, the so-called “vagueness problem”, above in connection with the results of Kurtzman and MacDonald (1993).

level of the DRS and thus explains both the asymmetry in Experiment 1 and the differences between distinct kinds of indefinites in Experiments 2 and 3. It also points toward a unifying role of ‘specificity’ in understanding the effects of heavy restrictors, which favor wide scope for the indefinite, and partitive phrases, which favor narrow scope for the indefinite (for *ein*, with no effect for *irgendein*). If one instead points to the “vagueness” of the wide scope universal reading to explain why less surface scope was observed in Experiment 1 with universal subjects than with indefinite subjects, one must still assume that the specificity of the indefinite matters in order to account for the differences among Experiments 2 and 3 and one needs an explanation for the results of Experiments 4A and 4B.

Evidence for base-position interpretation derives from the finding of fewer surface-scope interpretations in sentences with moved objects than with objects in base-position. It also derives from the interaction of base-position and order due to more surface scope in the middle-field than in SpecCP which can automatically be attributed to stronger base-position interpretation for phrases moved to SpecCP where all properties of the phrase may be assigned at the theta position without any conflict with focus constraints.⁹

⁹ Pafel’s (1993; 1997) quantitative analysis of German quantifier scope fits quite well with our findings in terms of which reading of a sentence is predicted to be preferred. However, his system was laid out in terms of predicting which sentences of the language would be ambiguous and which unambiguous. This aspect of his proposal was not confirmed: lack of ambiguity arguably emerged in our results when the quantifiers appeared in their base positions and the higher quantifier was a distributive: in Experiment 1 with *jeder* in subject position it received 88% wide scope and when it was in SpecCP 86%. *Mindestens ein* was also essentially unambiguous in every position except when it was scrambled in front of the subject. Pafel’s system predicts lack of ambiguity also for objects moved to either SpecCP or the middlefield when the subject is *ein*. But to

7 Processing issues

What do the present results say about processing issues? Kurtzman and MacDonald (1993) claimed all scopes possibilities for a sentence are considered in parallel and evaluated using a variety of different principles. Is the present account any different from theirs? We think it is very different in important respects. We have argued for two principles, Early Interpretation and the Base Position Preference Principle, resulting from the processor's preference to interpret a phrase in just one position with respect to all of its properties. Notice that early interpretation and interpretation in just one place are both general properties of the language comprehension system, not principles applying only to scope interpretation.

Moreover, the system we have proposed does not imply parallel (simultaneous) processing of multiple scope representations as a general feature of the comprehension system. Instead, the processor might compute only surface scope. If two phrases sit in their thematic positions and the intrinsic properties of the phrases are satisfied by the surface scope interpretation, then only that interpretation is computed. The processor goes beyond the surface scope representation only when it has reason to do so. One reason for going beyond surface scope would be if the conditions of the individual phrases in the sentence are not satisfied by the surface scope interpretation, as argued by Tunstall (1998). Another reason, which applies only to moved quantifiers, is if the processor must interpret the phrase in another position in order to interpret its thematic role. We suggest that it is a by-product of thematic interpretation in the base position that induces the processor to consider an alternative scope assignment, which will presumably then be adopted if it doesn't require expensive revisions or giving up a plausible interpretation

assume that these cases are unambiguous we would need to ignore, depending on the experiment, between one third to one half of the data.

for a less plausible one. The results of the subject before object sentences in Experiment 3 in particular support this sort of account, as noted in the discussion below Table 4.

Villalta (2003) pioneered the psycholinguistic investigation of reconstruction in relation to preferred scope. In her study of processing *how many* phrases in English and *combien* phrases in French, the interrogative phrase was extracted over a universal quantifier but nevertheless was preferentially interpreted under the scope of the universal quantifier. Although her own explanation of the results invoked the anaphoric properties of the sentence and discourse, it is an interesting question whether her results can be subsumed under the Early Interpretation and Base Position Preference Principles adopted here. Both principles are predicted to apply to the questions she studied. What determines whether there is substantial surface scope, as predicted by Early Interpretation, or primarily only reconstruction, should depend on whether the *how many* phrase is a tempting specific. If we assume that the cardinality of a set does not make a particularly tempting discourse referent, except perhaps when it is the candidate numbers themselves which have been under discussion, then Villalta's results will follow. On a par with the reconstruction observed in Experiment 3, due to the discourse properties of the moved phrase (its lack of specificity), early interpretation should not offset the processor's desire to interpret the moved phrase (only) in its base position. This predicts the strong preference for the reconstructed interpretation that Villalta observed.

One important issue concerning Early Interpretation and Base Position Preference is the timing of the mental operations triggered by these principles. One possibility is reflected by the way we have described discourse instantiation so far, namely, that Early Interpretation always results in essentially immediate semantic and discourse interpretation, say, within a syllable of the offset of the phrase interpreted. If so, then in all reconstruction sentences, the interpretive

operations triggered by the Base Position Preference Principle will involve revising an already interpreted phrase, e.g., revising an already constructed DRS. Another possibility which should be considered, especially for a language like German where almost every sentence begins with a moved constituent, is that evidence that a phrase has been moved from another position immediately offsets the tendency for early interpretation. In this case, sentences which receive a reconstructed-scope interpretation may not involve a revision of an already assigned DRS. To address questions about the precise timing of operations, on-line studies are needed (and in fact are in progress).

8 General Discussion

Across the experiments reported here, a consistent pattern of results has emerged: perceivers favored reconstructed scope except when the object that preceded the subject was a potentially specific indefinite (*ein* but not *mindestens ein* or *irgendein*). The Base Position Preference Principle explains why there is a tendency for reconstruction: when a thematic role is interpreted at the base position, the perceiver is tempted to also assign focus and scope in this position. Descriptively there was the most reconstruction with *mindestens ein*, which cannot easily introduce a discourse participant, less with *irgendein* which may introduce a discourse participant but is typically nonspecific, and least with *ein* which is easily interpreted as specific especially when a modifier or heavy restrictor (Experiment 4) is present, as in most of the materials we tested. In short, the Base Position Preference Principle was supported generally with the exception of moved objects that are tempting specific indefinites.

Subject-before-object sentences received predominantly surface scope. In principle, one might account for this with either an early interpretation or a grammatical function principle. Assuming that the goal of psycholinguistics is a universal theory of language interpretation that

correctly predicts the preferred interpretation of sentences, the Early Interpretation principle is clearly to be preferred to a grammatical function principle, because it is a general principle needed for interpretation of all sorts, not just for the interpretation of indefinites and quantifiers.¹⁰

In many respects, the results of Experiments 1-4 confirmed expectations from prior accounts of processing quantified sentences. They go beyond these accounts in obtaining empirical data on the preferences for quantifier phrases that have been moved to a non-argument position. They also examined a larger range of quantifiers, including quantifiers modified by *fast*, the quantifier *mindestens ein*, and several types of indefinites. In addition, they at least begin to flesh out an account of ‘specificity’ by showing that heavy restrictors have one effect but partitives a different effect, as expected given the Singleton indefinite view of specifics.

The asymmetry between indefinite-first sentences and universal-first sentences observed in Experiment 1 supports the assumption that indefinites like *ein* are variables. When an indefinite has already been instantiated as a variable in the discourse representation, the processor is less

¹⁰ Tunstall (1998) examined prepositional objects in English and found that readers were slow to read the continuation sentence following (ib) relative to (ia), but (ic) and (id) didn’t differ. Though see also, Filik, Paterson and Liversedge (2004).

- (i) a. Kelly showed a photo to every critic last month. The photo was of a run down building.
- b. Kelly showed a photo to every critic last month. The photos were of a run down building.
- c. Kelly showed every photo to a critic last month. The critic was from a major gallery.
- d. Kelly showed every photo to a critic last month. The critics were from a major gallery.

These results are expected according to the Early Interpretation principle, which predicts a preference for a wide scope indefinite reading in (ia,b) and a wide-scope universal reading in (ic,d) (mitigated in the latter case by the possibility of instantiating the variable high in the tree and/or singular instantiation of the indefinite).

likely to reconstruct than when a universal occurred first. Thus more surface scope was observed in indefinite-first sentences than in universal-first sentences. This falls out very naturally given the assumptions of DRT, along with incremental interpretation. Although we cannot exclude the possibility that the results could be modeled in some other framework, the assumption of a structured discourse representation with variables at different levels seems to be exactly what is needed for an explicit characterization of our proposal. With respect to the issue of whether indefinites must be treated only as variables, we think the argument comes down to Occam's razor. One might legitimately wonder, if indefinites like *ein* were treated as generalized (existential) quantifiers, could the asymmetry between indefinite-first and universal-first sentences still be explained? We suspect so, providing that the existential was instantiated in the discourse representation. The explanation would remain the same, it is just that the extra structure implied by a generalized quantifier would play no role in explaining the asymmetry. In that sense, the assumption that *ein* is a generalized quantifier is simply unnecessary and not parsimonious. But see Koenig and Mauner (2000) for arguments that an existential quantifier treatment will not suffice for so-called „a-definites“ (terms which lie outside the opposition between definites and indefinites) such as „on“ ('someone') in French and implicit arguments generally. They argue a-definites provide strong evidence for the Discourse Representation Theory separation of two kinds of information: discourse markers (not introduced by a-definites) and a set of predicative conditions (which are introduced by a-definites). On the other hand, we are not aware of any psycholinguistic evidence whatsoever supporting the need for existential quantifiers in the treatment of either indefinites or a-definites.

Further work will be needed to determine how representative the current findings are concerning the interpretation of sentences with two quantifiers, in particular with respect to

reconstruction. So far, sentences like (28) have been tested and a very strong preference for reconstruction has been observed.

(28) [Mindestens ein Buch]_i hat jeder Student t_i gelesen.

at least one book has every student read

‘Every student read at least one book.’

According to informally gathered intuitions, the situation reverses completely when the two quantifiers are exchanged:

(29) Jedes Buch hat mindestens ein Student gelesen.

every book has at least one student read

‘Every book was read by at least one student.’

With the order subject before object, in contrast to (29), there seems to be a preference for surface scope. This reinforces the assumption that the properties of individual quantifiers must be taken into account. When the grammar permits two options, as in (28) and (29), the semantic and pragmatic properties of particular quantifiers clearly come into play. All of our results suggest that specificity is one important property of quantifier phrases. Examples (28) and (29) above as well as the differences in Experiments 1-3 among *ein*, *irgendein* and *mindestens ein* may be due to the role of specificity in determining where a moved phrase is interpreted. That is, a phrase may be interpreted high in the discourse representation whenever, or to the extent that, the speaker is behaving as if the domain of discourse has been restricted to a singleton.

We have shown that the existence and content of the restrictor is important in determining whether a phrase is taken to be specific. Indeed, recent psycholinguistic research by Warren (2003) and by Gordon, Hendrick and Johnson (2004) reinforce this point. Warren (2003) finds dramatically faster reading times for quantifiers with light restrictors (*everybody*, *everyone*, *no*

one) than for quantifiers with heavy restrictors (*every editor*). Gordon et al. (2004) also find processing difficulty when two content nouns must be stored in memory or retrieved from memory (e.g., *The salesman that the accountant contacted...*) compared to cases where one of the phrases is a quantifier with a light restrictor, e.g., *The salesman that everyone contacted...* Clearly further investigation is needed to pin down in a precise way the various dimensions of specificity. But we think the current results suffice to show that specificity is important in the processing of indefinites and in the preferred interpretation of reconstruction sentences.

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Appendix A: Experimental Materials for Experiments 1 - 3

Experiments 1 through 3 were based on the same set of 32 sentences. Below we first give the complete set of 8 versions for the first sentence of Experiment 1 and the first sentence of Experiment 2 and 3. For the remaining 31 sentences, we only show one version (corresponding to version a in the complete stimulus set) because the other versions can be derived from the given one according to the schema of the first sentences). Note that the two quantifiers „jeder” and „alle” were switched between the two experiments. If a sentence contained the quantifier „jeder” in Experiment 1, it contained the quantifier „alle” in Experiment 2 and 3, and vice versa. For sentences 2-32, the version of Experiment 1 is shown.

The complete first stimulus item from Experiment 1:

Translation of a-d:

[Every museum visitor] wanted to see [a drawing from Kirchner] today.

Translation of e-h:

[A museum visitor] wanted to see [every drawing from Kirchner] today.

01 a. Subject [Universal] > Object [Existential], First Quantifier in SpecCP

[Jeder Museumsbesucher] hat heute [eine Zeichnung von Kirchner] sehen wollen.

b. Object [Existential] > Subject [Universal], First Quantifier in SpecCP

[Eine Zeichnung von Kirchner] hat heute [jeder Museumsbesucher] sehen wollen.

c. Subject [Universal] > Object [Existential], Both Quantifiers in the middlefield

Heute hat [jeder Museumsbesucher] [eine Zeichnung von Kirchner] sehen wollen.

- d. Object [Existential] > Subject [Universal], Both Quantifiers in the middlefield
Heute hat [eine Zeichnung von Kirchner] [jeder Museumsbesucher] sehen wollen.
- e. Subject [Existential] > Object [Universal], First Quantifier in SpecCP
[Ein Museumsbesucher] hat heute [jede Zeichnung von Kirchner] sehen wollen.
- f. Object [Universal] > Subject [Existential], First Quantifier in SpecCP
[Jede Zeichnung von Kirchner] hat heute [ein Museumsbesucher] sehen wollen.
- g. Subject [Existential] > Object [Universal], Both Quantifiers in the middlefield
Heute hat [ein Museumsbesucher] [jede Zeichnung von Kirchner] sehen wollen.
- h. Object [Universal] > Subject [Existential], Both Quantifiers in the middlefield
Heute hat [jede Zeichnung von Kirchner] [ein Museumsbesucher] sehen wollen.

The complete first stimulus item from Experiment 2 and 3. The e-h versions contained the determiner *irgendein* ('a') in Experiment 2 and the determiner *mindestens ein* ('at least one') in Experiment 3

Translation of a-d:

[All museum visitors] wanted to see [a drawing from Kirchner] today.

Translation of e-h:

[All museum visitors] wanted to see [{at least one/a} drawing from Kirchner] today.

- 01 a. Subject > Object [ein], First Quantifier in SpecCP
Alle Museumsbesucher haben heute eine Zeichnung von Kirchner sehen wollen.
- b. Object [ein] > Subject, First Quantifier in SpecCP
Eine Zeichnung von Kirchner haben heute alle Museumsbesucher sehen wollen.

- c. Subject > Object [ein], Both Quantifiers in the middlefield

Heute haben alle Museumsbesucher eine Zeichnung von Kirchner sehen wollen.

- d. Object [ein] > Subject, Both Quantifiers in the middlefield

Heute haben eine Zeichnung von Kirchner alle Museumsbesucher sehen wollen.

- e. Subject > Object [mindestens ein/irgendein], First Quantifier in SpecCP

Alle Museumsbesucher haben heute {mindestens eine/irgendeine} Zeichnung von Kirchner sehen wollen.

- f. Object [mindestens ein/irgendein] > Subject, First Quantifier in SpecCP

{Mindestens eine/Irgendeine} Zeichnung von Kirchner haben heute alle Museumsbesucher sehen wollen.

- g. Subject > Object [mindestens ein/irgendein], Both Quantifiers in the middlefield

Heute haben alle Museumsbesucher {mindestens eine/irgendeine} Zeichnung von Kirchner sehen wollen.

- h. Object [mindestens ein/irgendein] > Subject, Both Quantifiers in the middlefield

Heute haben {mindestens eine/irgendeine} Zeichnung von Kirchner alle Museumsbesucher sehen wollen.

- 02 Jeder Freund von mir hat anscheinend eine Oper von Mozart im CD-Regal stehen.

Every friend of mine apparently has an opera from Mozart in his cd rack.

- 03 Jeder meiner Brüder hat letzte Woche einen Freund auf unseren Bauernhof mitbringen wollen.
Every one of my brothers wanted to bring along a friend to the farm last week
- 04 Jeder Student von mir trägt ein Buch von Umberto Eco in seinem Rucksack umher.
Every student of mine carries around a book from Umberto Eco in his backpack.
- 05 Jeder meiner Freunde hat sich letztes Jahr ein Buch von Thomas Mann gekauft.
Every one of my friends bought (themselves) a book from Thomas Mann last year.
- 06 Jeder Junge aus meiner Klasse hat vorige Woche einen Spieler von Bayern München in dieser Disco gesehen.
Every boy in my class saw a player from Bayern München in this disco last week.
- 07 Jeder Stammgast hat während der Aktionswoche ein Gericht von der Tageskarte spendiert bekommen.
Every regular guest received a dish from the daily menu for free during the special offers week.
- 08 Jeder Besucher des Diavortrages hat diesmal ein Foto des Vortragenden geschenkt bekommen.
Every visitor of the slide show received as a gift a picture of the presenter.
- 09 Fast Jeder Musiklehrer hat uns während unserer Schulzeit ein Lied von Schubert vorgespielt.
Almost Every music teacher played us a song from Schubert during our school days.
- 10 Fast jede Bank hat letztes Jahr eine teure Gedenkmünze zum Kauf angeboten.
Almost Every bank had on offer an expensive commemorative coin last year.

- 11 Fast jeder Kunsthistoriker hat in den letzten Jahren ein Gemälde von Picasso analysiert.
Almost every art scholar has analyzed a painting from Picasso in the last years.
- 12 Fast jeder Angestellter hat auf unserer Party eine Anekdote über unseren Chef erzählt.
Almost every employee told an anecdote about our boss at our party.
- 13 Fast jeder Mitarbeiter hat letzte Woche einen Kunden aus der Schweiz angerufen.
Almost every employee called a customer from Switzerland last week.
- 14 Fast jeder Seminarteilnehmer hat in den Semesterferien einen Aufsatz von Kant gelesen.
Almost every participant of the course read an essay from Kant during the semester break.
- 15 Fast jeder Arzt auf dieser Abteilung hat gestern einen Patienten befragt.
Almost every doctor in this department consulted a patient yesterday.
- 16 Fast jeder Insasse hat trotz der strengen Aufsicht eine Pflegerin belästigt.
Almost every inmate harassed a care-giver in spite of the strict surveillance.
- 17 Alle Kollegen von mir hören sich gelegentlich eine CD von Elton John an.
All of my colleagues occasionally listen to a CD from Elton John.
- 18 Alle Kritiker wollten dieses Jahr ein Theaterstück von Schiller besprechen.
All of the critics wanted to discuss a play from Schiller this year.
- 19 Alle Preisrichter haben am Wochenende einen Hund von Dieter gelobt.
All of the judges praised Dieter's dog on the weekend.
- 20 Alle Schüler haben in dieser Kneipe einen Lehrer vom Goethe-Gymnasium gesehen.
All of the students saw a teacher from the Goethe-Gymnasium in this bar.

- 21 Alle Kollegen von mir haben anscheinend ein Video mit Tom Hanks verschenkt.
All of my colleagues apparently gave me a video with Tom Hanks.
- 22 Alle Reisenden haben während der Überfahrt ein Restaurant aufgesucht.
All of the travellers frequented a restaurant during the layover.
- 23 Alle Busfahrer haben anscheinend ein Hotel in diesem Ort als empfehlenswert bezeichnet.
Apparently all of the bus drivers identified a hotel in this city as recommendable.
- 24 Alle Klassenkameraden von Max haben letzte Woche eine Sendung mit Günter Jauch gesehen.
All of Max's classmates saw a programme with Günter Jauch last week.
- 25 Fast alle Besucher dieser Disco kennen schon seit langem einen Fußballspieler des VfB persönlich.
Almost all the visitors of this disco have known a soccer player of the VfB personally for some time.
- 26 Fast alle Mitglieder unseres Filmclubs haben in letzter Zeit einen Film von Hitchcock im Original angeschaut.
Almost all the members of our film club watched a Hitchcock film in the original version recently.
- 27 Fast alle Lehrer können an dieser Schule ein Gedicht von Goethe rezitieren.
Almost all the teachers in this school can recite a poem from Goethe.
- 28 Fast alle meiner Freunde wollen dieses Jahr ein Musical von Andrew Lloyd Webber anhören.
Almost all of my friends want to listen to a musical from Andrew Lloyd Webber this year.

29 Fast alle Vereinsmitglieder haben anscheinend ein Foto vom Ausflug bestellt.

Apparently almost all the club members ordered a picture from the excursion.

30 Fast alle Tierpfleger haben letzte Woche einen Affen geärgert.

Almost all the animal caretakers aggravated a monkey last week.

31 Fast alle Kunden haben anscheinend eine Verkäuferin bewundert.

Apparently almost all of the customers admired a saleswoman.

32 Fast alle Kellner haben gestern Abend einen Gast beleidigt.

Almost all of the waiters insulted a guest yesterday evening.

Appendix B: Experimental Materials for Experiments 4A and 4B

Experiments 4A and 4B differed only in the determiner of the object NP: *irgendeine* in Experiment 4A and *eine* in Experiment 4B. Below we show the first sentence of Experiment 4B in all 8 versions. For the remaining 31 sentences, we only show one version from which the other versions can be derived according to the schema given for the first sentence.

- 1 a. Subject > Object, Non-Partitive, Simple Restrictor

Alle Museumsbesucher haben heute eine Zeichnung angeschaut.

all museumvisitors have today a drawing looked-at

- 1 b. Subject > Object, Non-Partitive, Complex Restrictor

Alle Museumsbesucher haben heute eine Zeichnung von Kirchner angeschaut.

all museumvisitors have today a drawing by K. looked-at

- 1 c. Subject > Object, Partitive, Simple Restrictor

Alle Museumsbesucher haben heute eine von den Zeichnungen angeschaut.

all museum-visitors have today one of the drawings looked-at

- 1 d. Subject > Object, Partitive, Complex Restrictor

Alle Museumsbesucher haben heute eine von den Zeichnungen von Kirchner
angeschaut.

all museum-visitors have today one of the drawings by Kirchner looked-at

- 1 e. Object > Subject, Non-Partitive, Simple Restrictor

Eine Zeichnung haben heute alle Museumsbesucher angeschaut.

a drawing have today all museum-visitors looked-at

1 f. Object > Subject, Non-Partitive, Complex Restrictor

Eine Zeichnung von Kirchner haben heute alle Museumsbesucher angeschaut.

a drawing by Kirchner have today all museum-visitors looked-at

1 g. Object > Subject, Partitive, Simple Restrictor

Eine von den Zeichnungen haben heute alle Museumsbesucher angeschaut.

One of the drawings have today all museum-visitors looked-at

1 h. Object > Subject, Partitive, Complex Restrictor

Eine von den Zeichnungen von Kirchner haben heute alle Museumsbesucher angeschaut.

one of the drawings by Kirchner have today all museum-visitors looked-at

2 Alle Freunde von mir haben anscheinend eine Oper (von Mozart) im CD-Regal stehen.

All friends of mine apparently have an opera (from Mozart) in their CD rack.

3 Alle meine Brüder haben letzte Woche einen Freund (von der Uni) in unser Ferienhaus mitbringen wollen.

All of my brothers wanted to bring a friend (from the university) to our holiday home.

4 Alle Studenten von mir tragen während des Semesters ein Buch (von Umberto Eco) in ihrem Rucksack umher.

During the semester all students of mine carry a book (by Umberto Eco) around in their backpacks.

- 5 Alle meine Freunde haben sich letztes Jahr ein Buch (von Thomas Mann) gekauft.
All of my friends bought a book (by Thomas Mann) last year for themselves.
- 6 Alle Jungen aus meiner Klasse haben vorige Woche einen Fußballspieler (von Bayern München) in dieser Disco gesehen.
All boys from my class saw a football player (from Bayern München) in the disco last week.
- 7 Alle Stammgäste haben während der Aktionswoche ein Menü (von der Tageskarte) spendiert bekommen.
All regular guests received a dish (from the daily menu) for free during the special offers week.
- 8 Alle Besucher des Diavortrages haben diesmal ein Foto (des Vortragenden) geschenkt bekommen.
All visitors of the slide show received a picture (of the presenter) this time.
- 9 Fast alle Musiklehrer haben uns während unserer Schulzeit ein Lied (von Schubert) vorgesungen.
Nearly all music teachers auditioned a song (by Schubert) during our school days to us.
- 10 Fast alle Professoren haben letztes Jahr einen Vortrag des Rektors besucht.
Nearly all professors attended a lecture (of the rector) last year
- 11 Fast alle Kunstwissenschaftler haben in den letzten Jahren ein Gemälde (von Picasso) analysiert.
Nearly all art historians have analysed a painting (by Picasso) in the last years.

- 12 Fast alle Angestellten haben auf unserer Party eine Anekdote (über unseren Chef) erzählt.
At our party nearly all employees told an anecdote (about our boss).
- 13 Fast alle Mitarbeiter haben letzte Woche einen Kunden (aus der Schweiz) angerufen.
Nearly all employees called a customer (from Switzerland) last week
- 14 Fast alle Seminarteilnehmer haben in den Semesterferien einen Aufsatz (von Kant) gelesen.
Nearly all course participants read an essay (from Kant) during the semester break.
- 15 Fast alle Assistenzärzte auf dieser Abteilung haben gestern einen Patienten (von Professor Maier) befragt.
Yesterday nearly all assistant doctors of this ward consulted a patient (of professor Maier).
- 16 Fast alle Insassen haben trotz der strengen Aufsicht eine Sendung (über Kampfsporttechniken) gesehen.
Despite the strict surveillance nearly all inmates watched a show (about martial arts).
- 17 Jeder Kollege von mir hört sich gelegentlich eine CD (von Elton John) an.
Every colleague of mine occasionally listens to a CD (by Elton John).
- 18 Jeder Kritiker wollte dieses Jahr ein Theaterstück (von Schiller) besprechen.
Every critic wanted to discuss a play (by Schiller) this year .
- 19 Jeder Preisrichter hat am Wochenende einen Hund (von Dieter) gelobt.
Every judge praised a dog (of Dieter) this weekend.
- 20 Jeder Schüler hat in dieser Kneipe einen Lehrer (vom Goethe-Gymnasium) gesehen.
Every student saw a teacher (of the Goethe- Gymnasium) in this bar.

- 21 Jeder Kollege von mir hat anscheinend ein Video (mit Tom Hanks) verschenkt.
Every colleague of mine gave away a video (with Tom Hanks).
- 22 Jeder Reisende hat während der Ausflugs ein Restaurant (aus dem Reiseführer) aufgesucht.
Every traveller frequented a restaurant (from the tourist guide) during the trip.
- 23 Jeder Busfahrer hat anscheinend ein Hotel (in diesem Ort) als empfehlenswert bezeichnet.
Every bus driver apparently identified a hotel (in this city) as recommendable.
- 24 Jeder Klassenkamerad von Max hat letzte Woche eine Reportage (über die bevorstehende Wahl) gesehen.
Last week every classmate of Max saw a report (about the forthcoming election).
- 25 Fast jeder Besucher dieser Disco kennt schon seit langem einen Fußballspieler des VfB persönlich.
Almost every visitor of this discotheque knows a football player (of the VfB) for some time personally.
- 26 Fast jedes Mitglied unseres Filmclubs hat in letzter Zeit einen Film (von Hitchcock) im Original angeschaut.
Almost every member of our filmclub watched a film (by Hitchcock) in the original version recently.
- 27 Fast jeder Lehrer kann an dieser Schule ein Gedicht (von Goethe) rezitieren.
Almost every teacher of this school is able to recite a poem (by Goethe).
- 28 Fast jeder meiner Freunde will dieses Jahr ein Musical (von Andrew Lloyd Webber) anhören.
Almost every friend of mine wants to listen to a musical (by Andrew Lloyd Webber).

- 29 Fast jedes Vereinsmitglied hat anscheinend ein Foto (vom Ausflug) bestellt.
Almost every club member apparently ordered a picture (from the excursion).
- 30 Fast jeder Tierpfleger hat letzte Woche einen Affen (aus dem Menschenaffenhaus) geärgert.
Almost every keeper bothered a monkey (from the ape house) last week.
- 31 Fast jeder Kunde hat anscheinend eine Verkäuferin (aus der Parfümabteilung) bewundert.
Almost every customer apparently admired a saleswoman (from the perfume department).
- 32 Fast jeder Kellner hat gestern Abend ein Mitglied (der japanischen Delegation) beleidigt.
Almost every waiter insulted a member (of the Japanese delegation) yesterday evening.

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