Robin Hörnig and Caroline Féry

Markers of discourse status in descriptions of altered spatial layouts

1 Introduction

Beginning with Linde and Labov (1975), there have been several studies on how people describe static spatial layouts, with apartment descriptions as a paradigmatic example. For the most part, these studies concentrated on the macrostructure of this kind of discourse addressing, for instance, strategies that people use in linearizing spatial configurations into speech (see also Levelt, 1982). In the present work, we examine the microstructure of German descriptions of changing layouts. We concentrate on these aspects that can be used to encode information structure, or, more specifically, discourse status (givenness) or newness (focus). As Arnold et al. (2013:403) put it, '[i]nformation structure helps explain why people say things in different ways. Speakers constantly make choices about how to phrase their utterances.' We assume that speakers in our study make choices in particular about the definiteness of the target expression, the constituent order of the linguistic localization of a target, and the tonal contour of the pitch accent carried by the target expression. We consider our work as a study on audience design[1] (Clark & Murphy, 1982), assuming that speakers tailor their utterances to their listeners by taking account of the common ground, that is, mutual knowledge of speaker and (imaginary) listeners about entities, the arrangement of the entities, and changes in the arrangement of the entities. The speaker's evidence about the common ground is her utterances up to the utterance of the target localization.

Linguistic localizations are usually uttered to inform the addressee about the place of a *located object, LO*, a place currently unknown to her or him. The task of conveying the unknown place to the addressee requires the speaker to relate that place to something known to the addressee. In describing a layout this can be done by linguistically relating the place of the LO to the place of another entity, a

1 We see commonalities between audience design and common ground management presented by Döring and Repp (this volume).

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reference object RO, both of which – the entity and its place – are supposed to be known to the addressee. We call such localizations, which are frequently uttered in descriptions of altered layouts, *relational localizations*. A relational localization typically includes a *locative expression LX* of which RO forms a proper part, as in 28:4 below. Localizations are especially well suited for the study of effects of the discourse status on the form of the produced utterances because three of four properties are generally fixed while the fourth property can be experimentally manipulated: the reference object RO and its place should be known to the addressee, the place of the located object LO is unknown to the addressee, yet the LO itself may be known or unknown to the addressee.

In our experimental setting, participants described a linear layout of three, or sometimes two, toy animals to an imaginary addressee. A sentence from our corpus, 28:4, serves as an example (labeling is explained in what follows).

28:4	[Links	[vom Pferd]$_{RO}$]$_{LX}$	steht	jetzt	[*ein Zebra*]$_{LO}$
	'[To-the-left	[of-the horse]$_{RO}$]$_{LX}$	stands	now	[*a zebra*]$_{LO}$'

The layout was repeatedly altered. In most instances, one of the animals was removed and a new one was added to the otherwise unchanged layout (*added target*). In other instances, one of three animals was removed and one of the two remaining animals was relocated (*relocated target*), see Figure 1 below for an overview of all layouts. These manipulations were intended to influence the discourse status of the LO and its place. This paper examines the linguistic reflexes of these influences. The experiment shows that speakers make reliable use of markers of discourse status, see below, yet not to the same extent.

1.1 Discourse status of the place of the target

In the following, a *target* is a toy animal that has been added to the layout, or one that has been relocated within the layout. Either way, once the instructor has placed the target, its place was new and unknown to the imaginary addressee. The task of the speaker was to inform the addressee about the place of the target. The speaker did so by means of a linguistic localization, called a *target localization*.

As the places of the other animals in the layout were unchanged and known to the addressee, the speaker could linguistically localize the target by spatially relating it to another animal in the layout, that is, by uttering a relational localization. If, for instance, a bear was added to the right of a horse, the speaker could naturally describe this change in the layout by uttering (1a).

(1) a. [A bear]$_{LO}$ is [*to the right of* [the horse]$_{RO}$]$_{LX}$.
b. [*The horse*]$_{LO}$ is [*to the left of* [a bear]$_{RO}$]$_{LX}$.

Although (1a) and (1b) follow from each other and hence convey the same information,[2] it would sound odd if the speaker uttered (1b) under these circumstances. Relational localizations like (1a) and (1b) assign distinct semantic roles to the internal argument of the spatial preposition, the reference object RO, and to the external argument, the located object LO (figuring here as grammatical subject). The RO expression forms a proper part of the locative expression LX, which comprises the whole prepositional phrase. The locative expression LX denotes a place in the layout. A key feature of a relational localization is its use to spatially relate an object, the place of which is unknown to the addressee, relative to another object, the place of which is known to the addressee. In this account, speakers are expected to produce relational localizations with the target as located object and another object already known to the addressee as reference object. Early comprehension studies demonstrated strong effects of the role assignment in relational placement instructions on the ability of participants to act out these instructions by adding new objects relative to given objects with English learning children (Huttenlocher & Strauss 1968) and English speaking adults (Clark 1972; Harris 1975; see also Hörnig, Oberauer, & Weidenfeld 2005, on German speaking adults). Listeners and readers are substantially faster and more often correct in adding a located object to a reference object than in adding a reference object to a located object.

Based on the linguistic analysis and the experimental evidence in support of it, we will restrict the analyses to relational target localizations in which the target constitutes the located object LO. This claim generalizes to non-relational localizations in which targets can only figure as LO. The place of the LO is thus new.

1.2 Discourse status of the target

While the place of the target is always new, the target itself can be new or given. Specifically, the target is new if it has been added to the layout, whereas it is given if it has been relocated within the layout. Important exceptions to this general

2 We presuppose the *deictic* or *viewpoint-dependent reading* of spatial prepositions and disregard their *intrinsic reading*. That (1a) and (1b) follow from each other does not hold with an intrinsic reading.

correlation arise whenever the speaker mentions the target before she linguistically localizes it.

(2) A horse has been added. [*The horse*]$_{LO}$ *is* [*to the left of* [the bear]$_{RO}$]$_{LX}$.

In instances like (2), the target has already been mentioned and is given when the localization is uttered. Since we are interested in how speakers linguistically encode the discourse status of the target, the target is classified as given whenever it is mentioned prior to its localization. In the following, three linguistic devices are considered that can be used to mark the discourse status of the target in German: the definiteness of the target expression, the constituent order of the localization, and the melodic contour of the pitch accent carried by the target expression.

1.2.1 Definiteness of the target expression

An obvious candidate for marking the discourse status of the target as new or given is the definiteness in the target expression. Definite DPs are referring expressions meant to enable the addressee to identify the referent the speaker has in mind. Accordingly, the speaker will not use a definite DP unless she has reasons to believe that the addressee is familiar with the intended referent. In our setting, this requires that the target is known to the addressee from previous descriptions of the altering layout or from mentioning the target in the current utterance prior to the target localization. If the addressee is unfamiliar with the target, the speaker should introduce the new target by means of an indefinite DP. With this distinction, we follow the *familiarity theory of definiteness* (cf. Heim 1983). An indefinite DP blocks a co-referential reading with an antecedent in connected discourse. It is impossible to interpret the second occurrence of the indefinite DP *ein Bär* 'a bear' in (3) as co-referential with the bear introduced by the first instance of the indefinite DP. Assuming such a co-referential reading, the brief discourse in (3) sounds odd.

(3) Ein Bär steht neben dem Pferd. Nun wurde [*ein Bär*]$_{LO}$ weggenommen
'A bear stands next to the horse. Now was [*a bear*]$_{LO}$ removed'

The earliest demonstration of the interrelation between discourse status and definiteness was documented by Osgood (1971). He asked his students in a graduate seminar to close and re-open their eyes on demand. With their eyes open, he shortly showed something to them, which they briefly described immediately afterwards with their eyes closed. The first three times he did the following: #1 he

placed an orange ring in the middle of the table in front of him, #2 he held a black ball in his hand, #3 he placed the black ball in the middle of the table. The critical comparison for our concerns addresses the definiteness of the expressions referring to the orange ring in #1, which is new to the students, and the black ball in #3, with which the students are familiar with from #2. Osgood (1971:497f) reports with respect to #1 that '[s]entences with definite articles [...] almost never occurred', whereas 'demonstration #3 did regularly yield sentences with the definite article [...].' In line with Osgood's observation we expect to find a reliable correlation of the discourse status of a target as new or given with the target expression being indefinite or definite, respectively.

1.2.2 Constituent order of the localization

Linguistic localizations have two obligatory parts, the LO expression, denoting the located object, and LX, the locative expression denoting the place of LO. The most general distinction that we draw is between the two possible orders of the LO expression and LX in the target localization: LO ≺ LX versus LX ≺ LO. The distinction applied to a relational localization is exemplified in (4) with the order LO ≺ LX in (4a) and the order LX ≺ LO in (4b).

(4) a. [Ein Bär]$_{LO}$ *ist* [*rechts von* [*dem Pferd*]$_{RO}$]$_{LX}$.
'[*A bear*]$_{LO}$ is [to-the-right of [the horse]$_{RO}$]$_{LX}$.'

b. [*Rechts von* [*dem Pferd*]$_{RO}$]$_{LX}$ *ist* [ein Bär]$_{LO}$.
'[To-the-right of [the horse]$_{RO}$]$_{LX}$ is [*a bear*]$_{LO}$.'

The constituent order in German, compared, for example, to English, is relatively flexible, see Féry, Skopeteas, & Hörnig (2010) for comparisons among several languages using comparable data to the ones presented in this chapter, and Weskott et al. (this volume). When the preverbal position of the verb-second main clause (the *prefield* of a V2 clause) harbors the grammatical subject, as in (4a), the constituent order is unmarked; with the prepositional phrase in the prefield, as in (4b), the constituent order is marked.[3] The German marked order, however, is less

3 We consider the constituent orders in (4a) and (4b) unmarked and marked, respectively, because, as regards comprehensibility, the latter order is contextually more restricted than the former (cf. Hörnig & Weskott 2010). Unmarked constituent orders are read faster in neutral contexts in which LO and RO are both new; a marked constituent order is especially difficult to read in an inappropriate context in which the RO is new and the LO is given. However, a marked constituent

strongly marked than the corresponding English locative inversion in (4b) and it is not infrequent in German. Ullmer-Ehrich (1982) observed that the locative expression frequently precedes the LO expression in naturally elicited apartment descriptions in German. A similar observation is reported by Ehrich & Koster (1983) for Dutch in a more controlled setting. O'Brien & Féry (2015) compared English and German speakers, both in their L1 and in their L2 for similar data to those examined in the present chapter. German speakers uttered much more localizations with a marked constituent order than English speakers, and these both in English and in German. From comprehension studies (e.g., Hörnig et al. 2005) we know that a German relational localization with a marked constituent order is especially easy to comprehend as long as the reference object is given by the previous context, whereas the located object is new. However, with a definite determiner and in response to the question *Wo ist der Bär?* 'Where is the bear?', (4a), *Der Bär ist rechts von dem Pferd*, should be preferred over (4b), *Rechts von dem Pferd ist der Bär*, as the marked order variant sounds infelicitous after the located object has been prominently referred to in the question (cf. Hartsuiker et al. 1999, for acceptability of marked and unmarked constructions dependent on definiteness in Dutch; see also Ehrich & Koster 1983:184f; see also Chafe's 1970:215, comments on his example (5a), *The box is under the table*. In the context of the question (6a), *Where is the box?*).

Based on these intuitions and on the reported evidence, it can be expected that the constituent order of target localizations covaries with the discourse status of the target: when the speaker utters a target localization with a marked order LX ≺ LO, she signals to the addressee that the target (LO) is new; a target localization with an unmarked order LO ≺ LX, on the other hand, indicates a given target. Our hypothesis is most straightforward for relational target localizations. As argued by Hörnig et al. (2005), the marked constituent order facilitates comprehension through the given-before-new ordering established by putting the given reference object before the new located object (cf. Clark & Haviland 1977). Accordingly, we hypothesize that the constituent order is unmarked, LO ≺ LX, unless the LO is new and follows LX with the given RO, thus LX ≺ LO.

We anticipated that speakers would sometimes produce non-relational target localizations like [*Rechts*]$_{LX}$ *ist* [ein Bär]$_{LO}$ '[On-the-right]$_{LX}$ is [*a bear*]$_{LO}$.' Since the

order is easiest to read if the context is appropriate, i.e., the LO is new and the RO is given. Reading an unmarked constituent order is much less sensitive to contextual properties. Hörnig & Weskott (2010) thus consider the particularly good comprehensibility of the marked order in an appropriate context an instance of a strong contextual licensing of a marked constituent order. Bader and Häussler (this volume) report on a similar observation for the *bekommen* passive in German. Weskott, Hörnig & Webelhuth (this volume) elaborate on markedness and contextual restrictions.

preverbal constituent 'on the right' does not contain a given element, we need a generalization of our hypothesis on the constituent order of target localizations to account for non-relational target localizations. Hörnig, Weskott, Kliegl, & Fanselow (2006) point out that, if a new LO is paired with a given RO, the preverbal PP of a relational localization refers to the place of the located object. This place is unknown to the addressee and thus new. However, the new place in question is easily accessible in the discourse model, be it by explicitly relating it to the given place of the given RO, as in a relational localization, or by implicitly relating it to some more abstract reference frame in the discourse model, as in a non-relational localization. The relevant reference frame for the interpretation of spatial adverbs in our setting is the array of toy animals in front of the speaker.

The binary given-new distinction can be replaced by a graded concept of givenness in terms of accessibility (e.g., Gundel, Hedberg, & Zacharski 1993; Prince 1981; Baumann & Riester 2013; Röhr & Baumann 2011). In the spirit of such approaches, a new place is readily accessible in the discourse model, whereas a new target must be introduced into the model before it becomes accessible. According to Dryer (1996), a referent is 'accessible' if it bears a pragmatic relation to a locally prior reference. In our case, the location of toy animals render locations to their right or left accessible, whereas a not yet introduced referent is not accessible. To summarize, the following ordering on a givenness hierarchy is assumed: *given LO* ≺ *new place of LO* ≺ *new LO*.

With this modification in mind the hypothesis on the constituent order of target localizations can be formulated without referring to the reference object: the constituent order is unmarked, LO ≺ LX, unless the LO is new.

1.2.3 Pitch accent type carried by the target expression

As a third possible linguistic marker of discourse status we examined the contour of the pitch accents realized on the LO expressions. The question underlying this part of our study is whether we can find a correlation between the direction of pitch accents as rising (L*H in a tone-sequence notation, see Pierrehumbert 1980, for English, and Féry 1993, for German) or falling (H*L) and the discourse status of the constituent it is realized on. In line with an extensive literature on the subject, we assume that every pitch accent is the head of a prosodic phrase, called Φ-phrase. The prosodic features of German are organized around the pitch accents, which are often rightmost in their Φ-phrases, and which, as a result, often fall together with tonal boundaries. A coherent succession of syntactically driven Φ-phrases in a sentence is organized in an intonation phrase, called ι-phrase. Selkirk (1980, 1984) and Nespor & Vogel (1986) assume that the prosodic

constituents are organized in a prosodic hierarchy, as illustrated in (5), and this view is still in use today. Each constituent preferably consists of constituents immediately below.

(5) Prosodic hierarchy

ι-phrase	intonation phrase	(corresponds roughly to a clause)
Φ-phrase	prosodic phrase	(corresponds roughly to a syntactic phrase)
ω-word	prosodic word	(corresponds roughly to a grammatical word)

Pitch accents are associated with prominent elements in the sentence, thus focused or new ones, although pre-nuclear given elements also carry pitch accents. Only post-nuclear given elements are systematically deaccented. Pitch accents vary in two dimensions: the direction of the excursion as a bitonal rise or fall, and the intensity of the excursion. The latter dimension is not addressed in the result section of this chapter, because of the large number of speakers and the fact that they were using different grammatical means to express the localizations of interest. Instead we restricted the analysis to the first dimension, thus the distribution of rising and falling pitch accents.

The literature on pitch accents has introduced a relationship between discourse status (or information structure) and the kind of accents. Büring (1997), Féry (1993), Jackendoff (1972), Jacobs (1997), and Steedman (2000) establish a very direct relation between a falling accent (sometimes also called accent A) and focus on the one hand, and a fall-rise or a rise (accent B) and given constituents on the other hand, see Baumann (2006) and Hadelich & Baumann (2006) for psycholinguistic and perception experiments on the relationship between givenness and accentuation in German. Focus is an information structural category that we treat as equivalent to the concept of 'new referent' (new target) used in this chapter. It is predicted that given constituents are realized with a rising accent if they are pre-nuclear, that is, if they appear before the focus of the sentence, which carries the nuclear accent. If the given constituents are located in the post-nuclear position of the sentence, that is, after the focus, they are unaccented. To sum up, a new referent is focused and realized with a nuclear falling tone, and a given entity is part of the background, and as such is realized without any accent if post-nuclear or with a rising one, if pre-nuclear. We do not exclude that a given constituent can be a topic (see the Discussion section), in which case, it is pre-nuclear and carries a rising accent. Since the constituent order of LO and LX may vary as a function of the discourse status of the LO, it is a special concern of this chapter to examine the variation in the pitch accents as a function of constituent order. Constituent order has an important effect on pitch accents: a non-final accent is preferably rising, and a ι-phrase final accent is falling. Because of this correlation, we expect that a

new target is preferably final and carries a falling accent, whereas a given referent is typically non-final and carries a rising pitch accent. This implies that the marked constituent order LX ≺ LO may be preferred for this reason as well. Additionally, it supports the preference discussed above that a new target is mentioned after the locative expression. See the summary of our hypotheses in Section 2.1.3 below.

2 Production experiment

2.1 Method

2.1.1 Material and procedure

Ten plastic toy animals were used as stimuli, all of them approximately of the same size (about 8 cm in length). Participants were tested individually in a quiet room, seated at a table beside the instructor. They were asked to briefly describe the spatial layouts of the animals such that an imaginary addressee who does not know the layouts is able to reproduce the layouts with their own set of toy animals. Care was taken to avoid giving participants any example of an utterance. The instructor started the session by putting two toys, a crocodile and a gorilla, side by side on the table. Then she added a third one, in this case a horse (*horse* = target). The first task of the participants consisted in giving a brief oral description of this first layout L1. In a second step, the instructor removed the crocodile and added a lion (*lion* = target), creating in this way a second layout L2, altered minimally as compared to L1. Again, participants described the current layout of three animals. This procedure was repeated until the participants had described nine different layouts, L1 to L9, each consisting of three animals, two of them being part of the preceding layout and the third one, the target, being added to the layout. In addition, participants described two layouts L5R and L9R in which one of three animals was removed and one of the two remaining animals, the target, was relocated. Figure 1 gives an overview of the sequence of layouts, which was identical for all participants. Targets are set in italics.

L1	L2	L3	L4	L5	L5R	L6	L7	L8	L9	L9R
A G *H*	G H *L*	G H *B*	*Z* H B	H B *D*	B *D*	B D *G*	B D *C*	*T* D C	*P* T D	*T* P

Figure 1: The 11 layouts L1–L5, L5R, L6–L9, and L9R; targets are set in italics (dark gray).
Legend: **A**lligator · **B**ear · **C**ow · **D**og · **G**orilla · **H**orse · **L**ion · **P**ig · **T**iger · **Z**ebra.

2.1.2 Participants and recordings

Thirty students of the University of Potsdam, 28 women and 2 men, all in their twenties and native speakers of German, took part in the experiment. The participants' utterances were recorded on a DAT recorder (Sony T100). First, the recordings were transcribed into written files, subdivided according to the layouts L1 to L9, L5R, and L9R. In a second step, the recordings were analyzed using the acoustic speech analysis software Praat© (Boersma & Weenink 1994–2006). The sound waves were partly manually divided into labeled sub-strings with the help of spectrograms, and carefully inspected for their pitch accents.

2.1.3 Hypotheses

Before turning to the results, we summarize our hypotheses on information structural correlates of target localizations dependent on whether the target was new or given. We consider an added target 'new' as long as it is not mentioned in the utterance prior to the target localization, otherwise we call it 'given.' A relocated target has always been mentioned in a previous utterance and is thus given. Remember that the target figures as located object in all valid target localizations.

(i) Definiteness
   a. if target is new, the LO expression is indefinite
   b. if target is given, the LO expression is definite

(ii) Constituent Order
   a. if target is new, the constituent order of the target localization is LX ≺ LO
   b. if target is given, the constituent order of the target localization is LO ≺ LX

(iii) Pitch Accent
   a. if target is new, it is a focus and the LO expression carries a falling pitch accent (H*L).
   b. if target is given, it is a topic or part of the background. Then the LO expression carries a rising pitch accent (L*H) in case it is pre-nuclear or it is unaccented in case it is post-nuclear.

We consider definiteness, constituent order, and pitch accent as linguistic devices that respond directly to the discourse status of the target. As speakers may signal the discourse status by making use of more than one of the devices, responses from the different devices can correlate. Correlations, however, may in principle

also result from interdependencies between the devices. It could be, for instance, that constituent order varies as a function of definiteness, in which case constituent order would signal definiteness rather than discourse status. Our statistical analysis reported below addresses this problem. The analysis answers the question whether our speakers' markings by definiteness, constituent order, and pitch accent all substantially contribute to a regression model predicting the discourse status of targets in a single blow. If constituent order in fact predicts definiteness, which in turn predicts discourse status, the joint predictive value of definiteness and constituent order should not exceed the predictive value of definiteness alone and the model would not identify constituent order as predictor for discourse status.

2.2 Data annotation and results

329 utterances were recorded altogether, 269 descriptions of the layouts L1 to L9 with an added target, and 60 descriptions of the layouts L5R and L9R with a relocated target. L6 of Participant 1 was inadvertently skipped by the instructor. For each utterance, the target localization, that is, the part of the utterance that conveyed the new place of the target, entered the analysis. The examples given below are labeled with regard to participant and layout, in this order. For example, utterance 2:9 is Participant 2, Layout L9 and 35:5R is Participant 35, Layout L5R. The LO expression, the locative expression (LX), and, if present, the RO expression of target localizations are enclosed in indexed brackets; target expressions are set in italics.

2.2.1 Categories of target localizations

We identified 279 valid target localizations in the 329 utterances (85%),[4] divided into three types: relational localizations (211), non-relational localizations (37), and mnemonic localizations (31).

Relational localizations overtly specify the place of the target with respect to at least one reference object. The vast majority of these localizations were realized by means of one of the spatial prepositions *neben* 'next to'/'beside,' *vor* 'in

4 38 utterances contained no target localization, e.g. 'The gorilla was replaced by *a zebra*' (36:4) or '... from left to right: the gorilla, the horse, and *a bear*.' (32:3); 12 utterances were discarded because the added target was mentioned before it figured as RO in the target localization, e.g., 'In front of me is *the zebra*, [to the right of [*the zebra*]$_{RO}$]$_{LX}$ [the horse]$_{LO}$ ...' (18:4).

front of,' *hinter* 'behind,' *rechts von* 'to the right of,' and *links von* 'to the left of,' cf 28:4. The indeterminate preposition *neben* was usually qualified by *rechts* 'right' or *links* 'left,' as in 33:9R. Some relational localizations were realized by a pronominal adverb like *dahinter* 'thereof-behind,' as shown in 4:9.

28:4 [Links [vom Pferd]$_{RO}$]$_{LX}$ steht jetzt [*ein Zebra*]$_{LO}$
'[To-the-left [of-the horse]$_{RO}$]$_{LX}$ stands now [*a zebra*]$_{LO}$'

33:9R und [*der Tiger*]$_{LO}$ wird [links neben [das Schwein]$_{RO}$]$_{LX}$ geschoben
'and [*the tiger*]$_{LO}$ Is [left next-to [the pig]$_{RO}$]$_{LX}$ pushed'

4:9 und [[da]$_{RO}$hinter]$_{LX}$ steht [*das Schwein*]$_{LO}$
'and [[there]$_{RO}$ behind]$_{LX}$ stands [*the pig*]$_{LO}$'

29:4 Jetzt ist [links außen]$_{LX}$ [*das Zebra*]$_{LO}$
'Now is [on the far left]$_{LX}$ [*the zebra*]$_{LO}$'

15:5 In der Reihe aus Pferd und Bär befindet sich [auf der rechten Seite]$_{LX}$
'In the row of horse and bear is situated [on the right side]$_{LX}$
[*ein Hund*]$_{LO}$
[a dog]$_{LOC}$'

17:4 Nun steht [da, wo der Gorilla stand]$_{LX}$ [*das Zebra*]$_{LO}$
'Now stands [there, where the gorilla stood]$_{LX}$ [*the zebra*]$_{LO}$'

48:4 [An der Stelle des Gorillas]$_{LX}$ steht nun [*ein Zebra*]$_{LO}$
'[At the place of-the gorilla]$_{LX}$ stands now [*a zebra*]$_{LO}$'

Non-relational localizations lack an overt reference object. These localizations often make use of a spatial adverb like *links* 'on the left' in 29:4. The spatial adverb implicitly refers to the row of animals as a reference frame, as becomes evident in the overt reference 15:5, where the row of horse and bear sets the reference frame.

Mnemonic localizations are specific instances of relational localizations in which the removed animal serves as a reference object to help the addressee identifying the place of the newly added target as the one from which the removed animal has been taken away (applies to L3, L4, L7, and L8). The examples 17:4 and 48:4 illustrate two possibilities how such a reference can be achieved.

To summarize, the analysis is based on 279 target localizations, classified as relational (76%), non-relational (13%), or mnemonic (11%).

2.2.2 Annotation of definiteness, constituent order, pitch accents, and discourse status

Definiteness of the target expression could be determined for almost all of the 279 target localizations by the determiner of the LO expression. The determiner was indefinite in 146 instances and definite in 126 instances. One of the 126 definite instances was a demonstrative determiner shown in 35:6. The demonstrative pronoun in 17:3 was classified as definite. Finally, the relative pronouns in six relative clauses exemplified in 2:1 below were also classified as definite.

35:6 Nun wurde *ein Gorilla* hinzugefügt und [*dieser Gorilla*]$_{LO}$
'Now was *a gorilla* added and [*this gorilla*]$_{LO}$
befindet sich nun [vor [dem Hund]$_{RO}$]$_{LX}$
is situated now [in-front-of [the dog]$_{RO}$]$_{LX}$.'

17:3 Nun wurde das Pferd durch *einen Bär* ersetzt, [*der*]$_{LO}$ steht jetzt
'now was the horse substituted for *a bear*, [*that-one*]$_{LO}$ stands now
[rechts]$_{LX}$.
[on-the-right]$_{LX}$.'

Above, marked constituent orders were distinguished from unmarked orders according to whether the grammatical subject (LO expression) precedes or follows the locative expression LX. Thus, we first briefly look at LO's grammatical function. LO figured as grammatical subject except for six target localizations, in which LO figured as direct object; in these cases, the subject was *wir* 'we' five times (e.g., 37:6) and an expletive subject of an existential construction once (42:5R).

37:6 [Vor [dem Hund]$_{RO}$]$_{LX}$ haben wir [*'n Gorilla*]$_{LO}$.
'[In-front-of [the dog]$_{RO}$]$_{LX}$ have we [*a gorilla*]$_{LO}$.'

42:5R Es gibt nur noch den Braunbären und [vor [ihm]$_{RO}$]$_{LX}$
'There is only the brown bear left and [in-front-of [him]$_{RO}$]$_{LX}$
[den Hund]$_{LO}$.
[*the dog*]$_{LO}$.'

Turning now to the constituent order of the 279 target localizations, it was 184 times LX ≺ LO (66%) and 95 times LO ≺ LX (33%). Among the 184 target localizations with the order LX ≺ LO, LX occupied the prefield (*Vorfeld*) of a verb second clause (German main clause) in 156 utterances. With the order LO ≺ LX the LO

expression occupied the prefield in 64 instances. In the remaining localizations, the prefield was most often, 48 times, occupied by the temporal adverb *jetzt* or *nun* 'now.' One target localization came in the form of a verb final subordinate clause and six others as relative clauses subordinated to the LO, as in 2:1. Although the grammar requires that the LO expression in 2:1, that is, the relative pronoun, comes first in the relative clause, we accepted these six utterances for analysis.

2:1 Neu hinzugekommen ist *das Pferd*, [*das*]$_{LO}$
'Newly added is *the horse*, [*which*]$_{LO}$
[rechts neben [dem Affen]$_{RO}$]$_{LX}$ steht.
[on-the-right next-to [the ape]$_{RO}$]$_{LX}$ stands.'

As for the pitch accents, they were strongly dependent on constituent order. The pitch accent on LO expressions of new targets was falling (H*L) in 66% of the cases. The falling contour was predictable when the target was mentioned last in the ι-phrase (74% of the cases). Since all sentences were declarative, the overall contour was usually falling, and the last falling accent was on the DP denoting the new target. The same is true when the only word following the LO expression of a new target was a participle. In those instances, the participle was unaccented, and the fall was realized entirely on the LO expression. One may wonder why an LO expression of a new target mentioned late in the sentence was realized 44 times with a rising accent (L*H). In most cases, the target was not mentioned last in the ι-phrase but subsequent accents were present, motivating a rising accent. For instance, a further localization was following the localization of the target in the same sentence. We call such a motivated rising accent at the end of a Φ-phrase a 'continuation rise.' The remaining cases came from so-called 'list intonations' at the end of an ι-phrase, where a fall is expected to signal finality. List intonations were realized when the participants adjusted their speech to the fact that the task was ongoing, in which case each layout was perceived as a subtask.

64 of the 81 given targets were realized with a rising tone. In 52 cases, this can be analyzed as resulting from constituent order, as the targets were not mentioned last in the ι-phrase. The remaining 12 occurrences were continuation rises or due to list intonation. Three of them were second mentions of added targets.

In sum, we find a high correlation between the shape of pitch accents and sentence position (i.e., constituent order), which is stronger than the association of newness with a falling accent predicted by Hypothesis (iii.a). For details of the pitch accent realizations and numerous illustrations, we refer the reader to Féry, Hörnig, & Pahaut (2011).

The discourse status of added targets is new as long as the target is mentioned in the target localization for the first time in the utterance. This was frequently the case, as 198 of the 225 added targets were not mentioned prior to the target localization. In the remaining 27 utterances, the target was mentioned prior to the target localization and hence was given at the time when it was localized. The six localizations in relative clauses, cf. 2:1, belong to these instances. Another example was shown in 17:3 above. Alternatively this sentence is an instance of a V2 relative clause. As the discourse status of the 54 relocated targets is classified as given, the analysis is based on localizations of 198 new and 81 given targets.

2.2.3 Results

Table 1 gives an overview of the interdependency of the values of our variables, separately for localizations of new targets (left panel, all of them added animals) and given targets (right panel, 54 relocated and 27 added animals). In each panel the target localizations are first subdivided by whether the target expression was indefinite or definite; they are further subdivided by whether the target expression follows (LX ≺ LO) or precedes the locative expression (LO ≺ LX); the final subdivision distinguishes between falling and rising pitch accents on the target expression. Proportions indicate relative frequencies with respect to the previous level of subdivision.

The data shown in Table 1 were submitted to logistic regression analyses using the *glmer* function of the lme4 package in R. All analyses include the intercept of the random factor *participant*. First, we computed the full model with all three predictors: definiteness, constituent order, and pitch accent. As can be verified in Table 2, all three fixed factors reliably predict the discourse status of the target.

For each of the three predictors, we compared the full model against a model without the predictor. The full model proved to be superior in all three instances. It provided a reliably better fit of the data than the models without definiteness, $\chi^2(1) = 61.1^{***}$, without constituent order, $\chi^2(1) = 9.5^{**}$, and without pitch accent, $\chi^2(1) = 4.5^{*}$. Hence, each of the three devices has a predictive value beyond the predictive value of the other two.

We exemplify the relative independence of the predictors by comparing definiteness versus constituent order as markers of discourse status. As can be gathered from Table 1, the definiteness of the target expression is a highly valid signal if the expression is indefinite (138 of 143 indefinites if target is new: 97%), but it is a poor signal if the expression is definite (76 of 136 definites if target

Table 1: Target localizations of new and given targets, classified according to Definiteness of target expression, Constituent Order, and contour of Pitch Accent on target expression. Percentages are specified in terms of the immediately preceding level.

DISCOURSE STATUS of Target																
New								**Given**								
198								81								
71%								29%								
DEFINITENESS of Target Expression								**DEFINITENESS of Target Expression**								
Indefinite				**Definite**				**Indefinite**				**Definite**				
138				60				5				76				
70%				30%				6%				94%				
CONSTITUENT ORDER of Localization								**CONSTITUENT ORDER of Localization**								
LX ≺ LO		**LO ≺ LX**		**LX ≺ LO**		**LO ≺ LX**		**LX ≺ LO**		**LO ≺ LX**		**LX ≺ LO**		**LO ≺ LX**		
116		22		44		16		5		–		19		57		
84%		16%		73%		27%						25%		75%		
PITCH ACCENT on Target Expression								**PITCH ACCENT on Target Expression**								
Fall	Rise	Fall	Rise	Fall	Rise	Fall	Rise	Fall	Rise	Fall	Rise	Fall	Rise	Fall	Rise*	
85	31	9	13	33	11	3	13	4	1	–	–	8	11	5	52	
73%	27%	41%	59%	75%	25%	19%	81%			–	–	42%	58%	9%	91%	

Note: The 52 rising accents in the rightmost column subsume two unaccented LO expressions

is given: 56%). Interestingly, since we have about the same number of new and given definite target expressions, we can look whether the constituent order of these target localizations is the same (if dependent on definiteness) or different (if dependent on discourse status). It turns out that the constituent order is not the same for new and given definite target expressions, as three quarters of the given instances have the constituent order LO ≺ LX, whereas three quarters of the new instances have the reverse order, LX ≺ LO.

Table 2: Outcome of the Logistic Regression Analysis with definiteness, constituent order, and pitch accent as predictors (fixed factors) for discourse status with participant as random factor (intercept). $^{***}p < .001$; $^{**}p < .01$; $^{*}p < .05$

Fixed factors	**Coefficient**	**Standard error**	**z**
Intercept	−4.717	0.681	-6.93^{***}
Definiteness	−3.760	0.678	-5.55^{***}
Constituent order	−1.493	0.501	-2.98^{***}
Pitch accent	−1.112	0.510	-2.19^{***}

2.3 An unexpected observation of apprehended relocation

We occasionally observed a phenomenon reminiscent of the Ternus display. Josef Ternus, a Gestalt psychologist, showed his participants a sequence of four point displays (Ternus 1926). Let's call the points *a*, *b*, *c*, and *d* from left to right. Each display showed *b* and *c*, while *a* and *d* showed up in alternation (cf. Figure 2, *a* visible at t_1, *d* visible at t_2). Ternus observed that this kind of stimulus can induce two different interpretations, *element motion* or *group motion*. With perceived element motion, participants distinguish four points: *b* and *c* are considered constant entities at fixed places ($b_1 = b_2$, $c_1 = c_2$), with *a* and *d* as additional entities, each one at a fixed place of its own. Hence, *a* and *d* are alternately added and new with respect to the previous display. With perceived group motion, participants distinguish three points that repeatedly move together from left (*a*, *b*, *c* are visible) to right (*b*, *c*, *d* are visible) and back ($a_1 = b_2$, $b_1 = c_2$, $c_1 = d_2$). *a*, *b*, and *c* are repeatedly relocated and always perceived as given from the preceding layout.

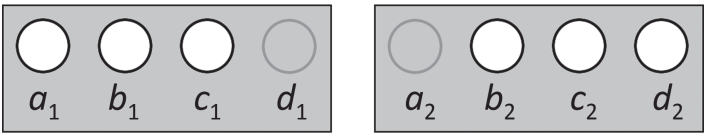

Figure 2: Ternus display with two alternative states.

Now, let A, B, C, and D be toy animals on a table instead of points on a display: A is a zebra, B a horse, C a bear, and D is a dog. If the zebra disappears and the dog shows up, we have the transition from L4 (*Z*HB) to L5 (HB*D*). The perceived identity of entities is not ambiguous because the toy animals can be easily distinguished. Apprehended group motion due to an added target is nevertheless possible. A speaker S, who produces non-relational localizations, will answer the question *Where is the horse?* differently for L4 and L5 although the horse was not actually moved: *The horse is in the middle* is an adequate answer for L4, but *The horse is on the left* is apt for L5. This is what we observe in 29:4 and 29:5. Participant 29 localizes the horse in the middle of L4 (29:4); in doing so, she uses the words *immer noch* 'still' to express that the horse was also placed in the middle of L3. In describing L5 shortly afterwards, she begins her utterance 29:5 by stating that the horse is now on the left, from which we recognize that she apprehends the horse as being moved from the middle to the left of the layout. Interestingly, Participant 29 begins her utterance 29:4 by localizing an added new

target and her utterance 29:5 by localizing a 'relocated' given non-target. These two localizations bear the opposite constituent order in agreement with Hypothesis (ii). The very same happens in 29:2 and 29:3, which mirror 29:4 and 29:5. The LO expression precedes the locative expression if LO is given (29:2 and 29:5), but it follows the locative expression if LO is new (29:3 and 29:5). In addition, the utterance-final target localizations in 29:2 and 29:5 have the opposite constituent order of the utterance initial localizations of a 'relocated' non-target, again in agreement with Hypothesis (ii). However, localizations of non-targets in 29:2 to 29:5 do not consistently signal the givenness of the LO by the unmarked constituent order LO ≺ LX. Even if we disregard the localizations of non-targets in 29:3 and 29:4 since the places of the non-targets are not new, the marked order of the bear's localization in 29:5 is not as predicted.

29:2 Jetzt ist der Affe links außen, das Pferd in der Mitte
'Now is the monkey leftmost, the horse in the middle,
und [rechts]$_{LX}$ [*der Löwe*]$_{LO}$.
and [on-the-right]$_{LX}$ [*the lion*]$_{LO}$.'

29:3 Nun ist [rechts außen]$_{LX}$ [*ein Bär*]$_{LO}$, in der Mitte das Pferd
'Now is [rightmost]$_{LX}$ [*a bear*]$_{LO}$, in the middle the horse,
und immer noch links außen der Affe.
and still leftmost the monkey.'

29:4 Jetzt ist [links außen]$_{LX}$ [*das Zebra*]$_{LO}$, in der Mitte immer noch das Pferd
'Now is [leftmost]$_{LX}$ [*the zebra*]$_{LO}$, in the middle still the horse,
und rechts außen immer noch der Bär.
and rightmost still the bear.'

29:5 Nun ist das Pferd links außen, in der Mitte der Bär
'Now is the horse leftmost, in the middle the bear,
und [rechts außen]$_{LX}$ [*ein Hund*]$_{LO}$.
and [rightmost]$_{LX}$ [a dog]$_{LO}$.'

The phenomenon is not peculiar to Participant 29. By inspecting the descriptions of the three layouts in which the target was placed at the opposite side of the removed animal, L2, L5, and L9, we found 13 further descriptions produced by eight participants that started with a non-relational localization expressing an apprehended relocation of a given non-target, all of them with an unmarked constituent order LO ≺ LX. The subsequent target localizations of 11 of these 13 descriptions had the opposite constituent order, LX ≺ LO, in agreement with

Hypothesis (ii). Although there is no strict correspondence between the constituent order of the localizations and the discourse status of LO, we consider these occasional observations as evidence in support of our Hypothesis (ii).

3 Discussion

This chapter reported on a production study in which German native speakers described a repeatedly changing layout of toy animals on a table. We were interested in how speakers mark the discourse status of a target, that is, an animal that appeared at a new place in the layout, either by being added to the layout or by being moved to a different place in the layout. In particular, the experiment tested how speakers make use of definiteness, constituent order, and the contour of pitch accents to mark the target as new or given. According to hypotheses (i) to (iii), a new target should be introduced by an indefinite DP, a marked constituent order LX ≺ LO, and a falling pitch accent; a given target should come along with a definite DP, an unmarked constituent order LO ≺ LX, and a rising pitch accent. Target localizations carrying all three markers of discourse status were indeed most frequent among localizations of new targets (85/198 = 43%) and given targets (49/81 = 60%). The statistical analysis confirmed that the three markers of discourse status reliably predict the discourse status of the target; the model fit significantly decreased if any one of the three predictors was excluded from the model, thus all three markers substantially contributed to the model's prediction.

The most reliable predictor in the model was the definiteness of the target expression. Target expressions were almost never indefinite when the target was given; hence, the indefinite determiner was a highly valid cue for the discourse status of the given target. This was expected if speakers were willing to provide a coherent discourse about the changing layout and the indefinite determiner blocked a co-referential interpretation. The definite determiner was a less valid cue as it was quite often used with a new target. However, the constituent order LX ≺ LO signaled the newness of the target in almost three-fourths of these instances. It can thus be concluded that linguistic markers of discourse status were used here in a compensatory fashion.[5]

Compared to the indefinite determiner, the marked constituent order LX ≺ LO is a less valid cue for the newness of the target, as it was more often

5 A model with a specified interaction of constituent order and definiteness did not converge, because there is no localization of a given target with a marked constituent order and an indefinite target expression. A separate model with the interaction coded as a main effect yielded a marginal effect, $z = 1.75$, $p = .08$, providing some support for compensatory usage.

used with a given target. On the assumption that LX ≺ LO is a marked order that must meet contextual constraints to be felicitously used, for example, LO is new, one would expect that localizations of given targets with a marked order are less frequent than localizations of new targets with an unmarked order. The counts in the small sample coincided with this prediction (24 vs. 38), but the moderate difference did not provide strong evidence for of a markedness difference, see 8:1 for a sample utterance from the present study with LX preceding a given target.

8:1 Drei Tiere nebeneinander, ein Krokodil, ein Gorilla und *ein Pferd*.
'Three animals side-by-side, a crocodile, a gorilla and *a horse*.
Der Gorilla steht in der Mitte,
The gorilla stands in the middle,
links davon steht das Krokodil und [rechts [da]$_{RO}$von]$_{LX}$ steht [*das Pferd*]$_{LO}$.
left thereof stands the crocodile and [right [thereof]$_{RO}$]$_{LX}$ stands [*the horse*]$_{LO}$.'

Speaker 8 starts her utterance with identifying a horizontal array, followed by an enumeration of the three animals that constitute the array. She continues with describing how the three animals are arranged. First, the gorilla is set as an anchor in the middle of the layout; here, LO precedes LX. The speaker proceeds by telling the addressee which place to the left and the right of the gorilla is harboring which animal; LO follows LX in both cases. We may assume with some certainty that the three animals do not differ much in discourse status. Even if givenness is in principle conceived of as graded, the gradation described in the literature does not apply to this case (see Prince 1981 and Baumann & Riester 2013 for gradation of givenness). It seems therefore impracticable to account for the different constituent orders in terms of discourse status.

Ullmer-Ehrich (1982) also reported numerous localizations with LX preceding a definite LO expression referring to pieces of furniture that had been mentioned before in an enumeration. Ehrich & Koster (1983:185), based on their own observations, considered dismissing the given/new explanation in favor of a topic/comment account based on Reinhardt's (1981) analysis of aboutness topics. Roughly, this means for 8:1 that the anchoring of the gorilla in the layout is a comment about the gorilla, which serves as the topic of the first localization: *Where is the gorilla?* The two subsequent localizations are then comments about the place to either side of the gorilla. These places each serve as a topic of a localization: *What is to the left/right of the gorilla*? We think that such an approach is on the right track, yet an elaboration is beyond the scope of this paper (see Büring 2003, 2016 for a view of topics as organizing the discourse). We emphasize, however, that constituent order showed a substantial relationship with the

target's discourse status in our study. Aboutness topichood remains a potentially superior substitute for discourse status in our scenario.

The contour of the pitch accents on target expressions is the third possibility to mark the discourse status of targets. The statistical analyses showed that pitch accents reliably marked the discourse status of targets, though to a lesser extent than definiteness and constituent order, and that pitch accents were informative beyond the other two markers. Hence the contour of the pitch accents turns out to be more than a mere correlate of the constituent order, in spite of what we thought previously (see Féry, Hörnig & Pahaut 2011 for such a view): LO expressions carried a falling pitch accent if late in the sentence, but a rising or no accent if early in the sentence. Whether an LO expression came early or late in a sentence depended on whether it preceded or followed LX and hence on constituent order. Indeed, three-fourths of our target localizations redundantly marked the discourse status of the target by constituent order as well as contour of pitch accent, LX ≺ LO together with a falling accent or LO ≺ LX together with a rising accent. In the remaining fourth of our target localizations, constituent order and pitch accent conflicted with each other. In 24 instances, 9% of the whole sample, the pitch accent marked the discourse status of the target in line with our hypotheses and the constituent order did not: there were 12 new targets with LO ≺ LX with a falling accent and 12 given targets with LX ≺ LO with a rising accent, as a signal that the utterance was not yet ended, thus the rising accent indicated a continuation contour. Out of the 12 new targets, 11 were marked as new by an indefinite determiner, a highly valid cue for the newness of the target, as we saw above. Without challenging the informativeness of the pitch accent cue, we nevertheless attest this cue a considerable portion of redundancy.

If we compare our data on pitch accents with Baumann & Riester's (2013) results, a great deal of similarities becomes apparent. Baumann & Riester also examined a corpus of spontaneous speech for the prosodic realization of referential expressions with different levels of information status, 218 referents in total. They were especially interested in the relation between different levels of givenness and newness and the kind of pitch accents realizing them. They hypothesized that a new referent should be realized with a falling pitch accent and a given referent with a rising accent, a lower falling accent or no accent at all. Their results did not confirm these hypotheses. In the spontaneous monologues they recorded and analyzed, that is, the data with pseudo-spontaneous speech most similar to our data, they found that all information statuses are similarly realized with a falling nuclear accent. Five categories out of six have "H*" (a falling accent) between 47 and 51% of the times. They interpret their finding with the fact that, like ours, their speakers realized short intonation phrases, and that each intonation phrase needs a final falling nuclear accent. This need supersedes the

relation between information status and accent shape. It must be noticed that the notation they use is difficult to interpret, especially in relation with the pitch track they show, and that the large number of categories they use renders the results difficult to assess. However, their main result is that word order is the main predictor of the kind of accent in spontaneous data, a result completely in line with ours.

To summarize, the production study demonstrated that speakers make use of definiteness, constituent order, and the contour of pitch accents to mark the discourse status of a target as new or given. The examples showed that the sample of target localizations was far from being a homogeneous set of uniform utterances. Although almost all combinations of the three markers occurred at least once in our sample, the discourse status was preferably simultaneously marked by all three devices. We found evidence for both redundant and compensatory marking of discourse status. Whether the marking actually signals newness and givenness or rather some related discourse status like topichood is left open in this chapter. What may be safely concluded is that the speakers behaved cooperatively in communicating more than just the new places of targets, a finding well in agreement with the idea of audience design.

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