

**The Information Status of
Nominal and Verbal
Expressions:
Intonational Evidence from
Production and Perception
in German**

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Abstract

The overall goal of this thesis is to shed light on the relation between information structure and prosody, in particular with respect to the dimension of given versus new information (*givenness* or *information status*).

According to the activation cost model proposed by Chafe (1994) and Lambrecht (1994) givenness is defined as the degree of activation of an idea or concept assumed by the speaker to be in the listener's consciousness at the time of utterance. The concept of activation is actually understood to be potentially continuous. The general aim of this thesis is to find further evidence for the basic assumption that (stepwise) changes in the degree of an entity's givenness are linguistically reflected in corresponding (stepwise) changes in its degree of prosodic prominence (pronounced activation cost).

Evidence for this correlation was obtained by means of production and perception data on read German. Variation in activation or givenness are assumed to be reflected in respective variations in the probability and appropriateness of particular prosodic realizations. This thesis presents two perception experiments on referential givenness and a production experiment plus a follow-up perception experiment on semantic relations between verbs and nouns. In contrast to other experimental approaches on the prosodic marking of givenness, the experimental results of this thesis additionally reveal insights into the coding of givenness by prosodic means alone and the informativeness of verbs.

The perception experiments on referential givenness aim to investigate to what extent a range of well-established types of German accents have an effect on the listener's perception of a referent's level of givenness, both in sentences in isolation and in context. The main findings are that these different accent types, different accent positions (nuclear, prenuclear) and the presence or absence of accent, significantly influence a referent's perceived degree of givenness. In particular, results reveal a stepwise decrease in the degree of perceived givenness from deaccentuation and prenuclear accents through low and early peak (falling) nuclear accents to high and rising nuclear accents. Accordingly, the absence of an accent and different accent positions differ in their appropriateness as a

prosodic marker of different degrees of givenness (i.e. from given through textually and inferentially accessible to new referents) in German.

The production and perception experiments on semantic relations between different parts of speech were used to investigate the encoding and decoding of the informativeness of verbs in German. Pairs of target verbs and nouns were either semantically unrelated (i.e. new) or related to each other in different ways. In a production study eliciting read speech, these differences in semantic relatedness were found to be expressed in the prosodic realization of the target words, with nuclear accents being more frequent on less related targets. This preference was reflected in appropriateness ratings in a follow-up perception study that investigated nuclear accent placement.

The experimental results of this thesis reveal, in particular, differences in the pronounced probability and perceived appropriateness of nuclear accent placement (and deaccentuation) as a function of an entity's information status.

These differences provide evidence for the relevance of different intermediate levels of cognitive activation between the active and inactive poles, indicating that the notion of information status involves gradient variations rather than categorical distinctions.

Furthermore, the informativeness of verbs has been found to affect the prosodic form of an utterance just like nouns/referents. Hence, results suggest that verbs serve not only as a source for a noun's level of givenness but can also be assigned an information status themselves. Verbal expressions are not per se referential, but the ideas they express may be activated to a greater or lesser extent at a lexical level, which indicates the need to distinguish between a referential and a lexical level of information status.

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Chapter 1

Introduction

In a communicative situation the ‘informative’ part of a message is usually expressed and interpreted in relation to information that is already ‘known’ by the interlocutors. Accordingly, the dimension of given versus new information is a central part in the investigation of information structure. This thesis is particularly concerned with the investigation of the relation between *givenness* (also called *information status*) and prosody.

In intonation languages like German, the marking of information status is an important linguistic function of prosody. Nevertheless, in the literature the various approaches to givenness differ with respect to the level this notion applies to. An adequate analysis of givenness clearly requires consideration of the positions of both speaker and listener. Our notion of information status/givenness is based on a (cognitive) activation cost approach as proposed by Chafe (1994) and Lambrecht (1994). They define givenness as the degree of activation of a concept or idea that the speaker assumes to be in the listener’s consciousness at the time of utterance. This means, a referent that is stored in the listener’s long-term memory is considered activated, or given, only if it is activated in the listener’s consciousness by the discourse context. Chafe and Lambrecht postulate three steps on a potentially continuous scale of cognitive activation that correspond to three different types of information status: In addition to given (active) and new (inactive) information they propose an intermediate level of cognitive activation that can be referred to as accessible (semi-active) information. This concept of givenness also implies ‘activation cost’ (e.g. expressed by prosodic means), relating to the effort a speaker has to make in order to transfer an idea from a previous (less active) state into an active state: the lower the activation of an item, the higher its activation costs.

With regard to the information structural component of language, a crucial distinction is often made between information about states and events on the one hand, and information

about referents or referring expressions on the other. A possible reason for this distinction might be the transitory nature of states and events in a person's active consciousness, since they are constantly replaced by other states and events. Referents, by contrast, remain active for a longer period and serve as anchor points for new information over a larger stretch of discourse (cf. Chafe, 1994).

Recent annotation schemes are able to capture fine-grained differences in an item's information status (e.g. different types of accessible information). They tend to concentrate on the information status of noun phrases (NPs), denoting referential or lexical relations between the same parts of speech, i.e. two referring expressions (usually argument categories like NPs/DPs, PPs and pronouns). Different parts of speech, e.g. verbs and nouns, can also be semantically interrelated. Accordingly, some systems also include verbs and verb phrases (VPs) as a possible source of a referent's accessibility. However, due to their non-referential character, verbs are usually not assigned an information status themselves.

In terms of prosody, several studies on West Germanic languages have shown that the commonly assumed dichotomy of new vs. given information and their marking as accented vs. unaccented is inappropriate for a general account of information status. In fact, recent studies indicate that differences in reference relations between NPs (reflecting differences in cognitive activation or givenness) are expressed by the choice of *nuclear* pitch accent placement and/or pitch accent type. More precisely, the studies provide evidence that accessible information cannot be treated as a uniform category and that different types of more or less activated information demand different accent types as linguistic markers: The less activated or given the referent, the higher the prosodic prominence produced. The role of verbs in the prosodic marking of information status has not been investigated so far.

The current evidence suggests that there is still need for further insight into the (de-)coding of givenness by prosodic means. Hence, the present thesis is concerned with the following research questions:

- (1) How can linguistically/prosodically relevant differences in an entity's cognitive activation be adequately measured?
- (2) To what extent are different intermediate levels of cognitive activation between the active and inactive poles linguistically relevant? (indicator of categorical distinctions vs. gradient variations of givenness)
- (3) How informative are verbs and how relevant is their (potential) information status for the prosodic form of an utterance?

- (4) Which role does prosody or do different prosodic features play in the production and perception of givenness?

This thesis set out to explore these research questions, by carrying out carefully controlled production and perception experiments on read German.

Two related perception experiments (see also Röhr & Baumann, 2010; Röhr, 2013; Baumann, Röhr & Grice, 2015) are used to examine whether different accent types and positions have an effect on the listener's perception of a referent's/noun's level of givenness (see part II). The first experiment investigates the perceived degree of a target referent's givenness solely by its prosodic marking. Seven different prosodic realizations are evaluated. The second experiment tests the appropriateness of the seven prosodic realizations with regard to the target referent's information status within a context. A distinction is made between given, textually accessible, inferentially accessible and new referents.

A production experiment and a follow-up perception experiment (see also Röhr, Baumann & Grice, 2015) are employed to examine the effect of different semantic relations between verbs and nouns within the same discourse on their prosodic realization (see part III). Two types of reference relations are investigated - (a) nouns that can be linked back to a preceding verb and (b) verbs that can be linked back to a preceding noun. For both reference types, five types of information status are distinguished by using different verb-noun pairs. We assume that the level of activation or givenness of a target verb/noun differs in relation to its semantic relation to a preceding element. In turn, we expect this difference to be reflected in the prosodic marking of the target element, in particular in terms of nuclear accent placement. By the same token, we assume that the listener is able to interpret an element's information status by means of its degree of prosodic prominence.

Insights may contribute to a more elaborate account of information status and the improvement of annotation schemes of information status and computational based annotation tools that involve automatic annotation processes. Furthermore, insights about the (de-)coding of givenness by prosodic means (alone) contribute to the comprehension of the general interplay between lexicogrammatical aspects and prosody in information structuring and thus help to define the role prosody plays in the extensive field of information structure. Furthermore, such findings will help to specify the relation between intonational form and function, whereby systems for manual and automatic prosodic transcription and also systems for speech synthesis and speech recognition can be improved.

Outline

This thesis is structured into four parts. Part I provides the theoretical background for the subsequent parts II and III which constitute the experimental parts of this thesis. Part IV contains a general summary of the experimental results and a final conclusion.

Part I (chapters 2 and 3) provides a theoretical background on the most relevant aspects on information status and intonation and their interrelation.

Chapter 2 is devoted to the notion of information status. The first section 2.1 aims to locate the notion of information status within the more general notion of information structure. This is done on the basis of a historical review of the different notions that are related to information structure in the literature. The following section 2.2 discusses and defines the basic contemporary concepts of information structure, including the concept of givenness. The last section 2.3 in chapter 2 provides a closer look into various aspects of the givenness dimension (information status). The presentation involves a discussion of the criteria used to identify units of givenness from different levels and perspectives (section 2.3.1), of the domains of application (section 2.3.2), of different taxonomies (section 2.3.3) and of general aspects of the linguistic form of information status (section 2.3.4).

Chapter 3 deals with the role of intonation in intonation languages, starting with an introduction of the basic features and functions of prosody in section 3.1. The following section 3.2 discusses the phonetic and phonological properties of intonation with regard to the two main functions of highlighting and phrasing. Section 3.3 introduces the most relevant phonological models of intonation and provides a description of the autosegmental-metrical annotation system (G)ToBI that is used for the intonation analysis in the experimental data of this thesis. Finally, in section 3.4 the findings of different studies that reveal empirical evidence for the relation of information status and prosody are discussed.

Part II (chapter 4) presents two perception experiments that are concerned with the referential level of givenness and its decoding by intonational means. The first experiment (section 4.4) tests the perceived givenness of target referents presented with different prosodic realizations in sentences in isolation. The second experiment (section 4.5) tests the perceived appropriateness of the same sentences in (relation to the referent's information status in) context.

Part III (chapters 5 and 6) presents a production and a follow-up perception experiment that in particular aim to explore the informativeness of verbs in German. The experiments investigate the intonational encoding and decoding of different semantic relations between verbs and nouns. After a general introduction the production experiment is presented in chapter 5 and the follow-up perception experiment in chapter 6. The findings of both

experiments are subsequently summarized and discussed.

Finally, part IV (chapter 7) comprises a summary of all experimental results as well as a general discussion and conclusion with regard to the research questions presented in chapter 1.

Part I

BACKGROUND

Chapter 2

Information Status

2.1 Historical Review

This section aims to provide the historical background for the contemporary understanding of the notion of information structure (see following section 2.2) and the role of givenness by presenting a selection of the most relevant approaches of the last two centuries.

First theories on word order and sentence structures that not only take syntactic but also other linguistic aspects into account already capture the most relevant features of information structure (e.g. Weil, 1844/1978; von der Gabelentz, 1869; Paul, 1880/1920; Ammann, 1928/1962, Prague School: Mathesius, Firbas, Daneš, etc.): Often based on psychological and/or communicative factors, they postulate in addition to the grammatical sentence organization a thematic organization of a sentence into (at least) two information-bearing parts.

Early Psychological Approaches

Weil (1844/1978: 29) introduces the above mentioned idea as follows:

There is then a point of departure, an initial notion which is equally present to him who speaks and to him who hears, which forms, as it were, the ground upon which the two intelligences meet; and another part of discourse which forms the statement (*l'nonciation*), properly so called. This division is found in almost all we say.

The basic assumption of Weil and also von der Gabelentz and Paul is that a sentence reflects the structure of the speaker's thoughts and ideas and is used to evoke those thoughts and ideas in the listener's mind.

However, in contrast to Weil's definition, von der Gabelentz's (1869) definition of the thematic two-part structure of a sentence is rather psychologically motivated, namely by the nature of the thought the speaker wants to convey. He assumes that it is composed of a 'psychological subject' and a 'psychological predicate'. With the former term he refers to the entity to which the speaker initially wants to draw the listener's attention to. With the latter term he refers to what the listener shall think about this entity (cf. 1869: 378). These psychological categories are solely determined by their position in the sentence (psychological subject in first, and psychological predicate in second position) and are clearly kept apart from the grammatical subject and predicate categories.

Paul (1880/1920) adopts the terminology introduced by von der Gabelentz but has a different explanation. The psychological predicate is interpreted as the most important and relevant part of a message. The psychological subject is interpreted as the part of a message that is already known by the interlocutors and serves as a starting point for new information. In addition, the two parts are defined not only by word order but also by intonation: Paul notes that the psychological predicate is the constituent that carries the strongest tone of the sentence (cf. 1880/1920: 283). Furthermore, he claims that the relation between the grammatical categories is based on the relation between the psychological ones, even though psychological and grammatical subject or predicate do not always coincide.

Communicative Functional Approaches/Prague School

Ammann (1928/1962) mostly supports von der Gabelentz's idea of the binary division of a sentence into subject and predicate. However, he does not argue from a psychological perspective but rather attributes the binary character of a sentence primarily to the communicative function of the sentence as a message. Using a different pair of terms - 'theme' and 'rheme' - he distinguishes between the general subject of a message ('*Gegenstand*', subject/theme) and the content of a message ('*Inhalt*', predicate/rheme) or the new/newsworthy information about the subject.

The Czech linguist and cofounder of the Prague School or Prague linguistic circle, Mathesius (1929/1983, 1939/1975), criticizes the early psychological approaches and, in order to explain sentence form, suggests proceeding from the speaker's standpoint and the com-

municative task of a sentence in a given situation.¹ This ‘functional sentence perspective (FSP)’ is the basis for his work on word order phenomena in Czech. Therein he clearly differentiates the thematic organization, or in his terms ‘topical articulation’, of a sentence from its grammatical organization or ‘formal articulation’ respectively. He also uses the terms theme and rheme in his representation of the thematic/topical sentence organization. However, unlike Ammann, his definition focuses on a distinction between ‘known’ (familiar) and ‘unknown’ (new) information that is reminiscent of the distinctions formulated by Weil (1844/1978) or Paul (1880/1920).

The intrinsic word-order factor in Czech is the aspect of functional sentence perspective. Every bipartite utterance is composed of two components, the first of which expresses something relatively new and contains what is asserted by the sentence. It is that part of the sentence which is sometimes called the psychological predicate and which, for the sake of a clearer distinction from the grammatical predicative with which it does not always coincide, I prefer to call the rheme of the utterance. The second part of the sentence contains the basis of the utterance or theme, the psychological subject according to earlier terminology, i.e. things relatively familiar or most readily available to the speaker as the starting point. (Mathesius, 1929/1983: 126-127)

Mathesius (1941) later prefers to distinguish between ‘basis’ (theme) and ‘nucleus/core’ (rheme) rather than known and unknown information and diverges from the idea of a mere sentence dichotomy (see also Sgall, Hajičová & Benešová, 1973 and Daneš, 1974). The basis defines the part that is spoken about in the sentence and the nucleus defines what is said about this part. The basis containing more than one element may be composed of a ‘most topical’ element (the center of the theme) and ‘accompanying elements’ leading to the nucleus. Mathesius furthermore adds the idea of elements that represent a transition (e.g. the predicate) between basis and nucleus.²

Firbas (1964, 1966) develops these ideas of FSP further. By additionally taking the viewpoint of the hearer (the receiver of information) into account he argues for the need of a more elaborate definition of the distinction between known and unknown/new information. As a consequence, he introduces a different and non-categorical criterion that is assumed to affect sentence structure - ‘the degree of communicative dynamism (=CD)’:

By the degree of CD carried by a sentence element we understand the extent

¹“What makes a sentence a sentence is the active attitude of the speaker to its content.” (Mathesius, 1929/1983: 124)

²A similar idea has already been mentioned by Paul (1880/1920: 284). He notes that besides the psychological predicate one particular element can stand out as psychological subject, while the remaining sentence elements serve as link between subject and predicate.

to which the sentence element contributes to the development of the communication, to which it ‘pushes the communication forward’, as it were. (Firbas, 1964: 270)

The general assumption is that, in accordance with the surface word order, the degree of CD gradually increases over the sentence elements, from the beginning towards the end of a sentence. Known elements are believed to have lower degrees of CD and therefore constitute elements of the theme, while unknown/new elements are believed to have higher degrees of CD and constitute elements of the rheme. Hence, in FSP the ‘basic distribution’ of CD is a theme-transition-rheme sequence. However, Firbas brings two further factors into play that have an effect on the ‘thematizing’ of sentence elements: semantic structure and context dependence. This means that the ‘final distribution’ of CD is determined by an interplay of linear word order, the semantic content and relation of the sentence elements and their (in)dependence of the relevant verbal/textual or situational context. In his ‘theory of utterance’ or ‘utterance organization’ Daneš (1964, 1970, 1974) picks up on Mathesius’s and Firbas’s ideas but criticizes their use of the notions ‘theme’ and ‘known (given) information’. Firbas’s degrees of CD show that both notions are closely related or even mutually dependent. This is also reflected in Mathesius’s (1929/1983, 1941) definition of the ‘starting point’ of an utterance, since the relating terms, basis/theme/familiar information, are used either to refer to the piece of information that is spoken about and/or to the known/given piece of information in a sentence. Daneš (1974) points out that such an undifferentiated definition is problematic, since there is evidence that the theme of an utterance (in the former sense) does not necessarily convey known information. Therefore, he proposes an utterance organization within FSP along two lines: He argues that “THEME (something that one is talking about, TOPIC) and RHEME (what one says about it, COMMENT)” (1970: 134; see also Daneš, 1964) may be defined from a sentence-internal point of view, while old/known/given and new elements (functioning as ‘starting point’ and ‘core’ of the utterance, respectively) may be defined by their relation to the context and/or situation.³

The early psychological and communicative theories discussed so far have been shown to define sentence constituents on a non-grammatical, information-bearing level either by sentence-internal (cf. von der Gabelentz, 1869 and Ammann, 1928/1962) or by contextual aspects (cf. Weil, 1844/1978 and Paul, 1880/1920) or by a combination of both (cf. Prague

³Even though these two aspects need to be evaluated along different lines, Daneš (e.g. 1970) proposes a theory of ‘thematic progression’, which organizes the theme within a sentence with regard to the plot of a whole text and the situation. This approach is based on the assumption that each theme is derived from the subject matter already presented in the given discourse or from the common knowledge stock of the discourse participants, i.e. the theme is commonly related to givenness.

School). In the following we will differentiate between the level of ‘**aboutness**’ and the level of ‘**informativeness**’ in order to refer to sentence-internal and contextual concepts, respectively. This difference in the nature of information-bearing sentence components as described by Daneš has also been pointed out by other linguists (e.g. Halliday, 1967b⁴) and turned out to be a fundamental distinction in theories on information structure.

A Systemic Functional Approach

The term ‘information structure’ was used for the first time by the American structuralist (systemic functional) Halliday (1967b). In the general sense it serves as a cover term for phenomena concerning “the distribution of information in the clause as a message” (1967b: 200) that are the object of one main syntactic area, namely the grammar of discourse (called ‘theme’).

Theme is concerned with the information structure of the clause; with the status of the elements not as participants in extralinguistic processes but as components of a message; with the relation of what is being said to what has gone before in the discourse, and its internal organization into an act of communication [...]. (Halliday, 1967b: 199)

Halliday describes six different, but related sets of options with particular structural functions or roles that determine the general information structure of a clause: While the options ‘information’ (informativeness level), ‘thematization’ (aboutness level) and ‘identification’ concern the clause as a whole, the options ‘predication’, ‘substitution’ and ‘reference’ concern the status of single clause elements.

However, in the narrower sense Halliday also uses the term information structure to refer to a particular distribution of the discourse which is determined only by the information options: That is the organization of a text into a (linear) sequence of meaningful ‘information units’ or message blocks. The components within an information unit are further organized into ‘information focus’ and ‘new’ and ‘given’ elements in relation to the preceding discourse. “Information focus reflects the speaker’s decision as to where the main burden of the message lies” (1967b: 204) and is to be interpreted as the informative (‘new’) part of a message. This notion is reminiscent of Paul’s (1880/1920) interpretation of the psychological predicate (and also Firbas’s degrees of CD) and brings yet another aspect into play, namely the level of an element’s communicative importance (‘emphasis’).

⁴“The difference can perhaps be best summarized by the observation that, while ‘given’ means ‘what you were talking about’ (or ‘what I was talking about before’), ‘theme’ means ‘what I am talking about’ (or ‘what I am talking about now’) [...]” (Halliday, 1967b: 212)

The domain of information focus is said to have the function ‘new’ and the optional remaining domain is said to have the function ‘given’ within an information unit. However, new (focal) information is not understood in the sense that it cannot have been previously mentioned, but in the sense that it is what the speaker chooses to present as new or interprets as non-derivable information.⁵ This means, that the focus of an utterance can present either information that is not derivable from the preceding discourse, or information that is familiar or has been previously mentioned. In the latter case the focus constituent usually provides a contrastive or alternative statement to a previous prediction. Thus, even though focus is closely related to ‘new information’, the definition of focus differs from a given-new distinction which is genuinely determined by the textual or situational environment. Therefore these two concepts, while both related to the level of informativeness, are defined along different lines and should be located on two different dimensions, which we will refer to as the ‘focus’ and ‘givenness’ dimensions.

Halliday’s information structure involves yet another innovation. He argues that in contrast to the other sets of options, information options do not operate on the syntactic constituent structure but on a suprasegmental level. That is, “one information unit is realized as one tone group” (1967b: 200). Its internal structure is reflected by at least one obligatory ‘tonic segment’, which expresses the point of information focus, and one optional ‘pretonic segment’. Herewith Halliday introduces a new concept of information(-bearing) structure that operates independently of the syntax-semantics interface.

A Generative Approach

In the realm of (transformational-)generative grammar and more semantically-based grammar Chomsky (1972) also discusses the alternative determination of ‘semantic representations’ (or ‘readings’) of a sentence in terms of phonetic representations (e.g. the intonational contour). He notes that not only the expressed proposition but also aspects of its form are relevant to the meaning or ‘realization’ of a sentence. Examining the relation of syntactic structure to semantic representation, he argues for the development of a system that is able to represent how the meaning of a sentence is related to various aspects of its form. Thereby his main concern is to define the role of ‘surface structures’ (mapped into phonetic representations) and post-lexical or ‘deep structures’ (basic syntactic structure after insertion of all lexical items into a phrase-marker; mapped into semantic representations). The basic assumption is that semantic structures are determined by deep structures. However, there are cases in which there seems to be a more direct relation to

⁵See Schwarzschild (1999) and von Heusinger (1999) for a discussion of different readings of new information in Halliday’s approach.

surface structure. This is demonstrated in particular for the representation of the ‘focus (F)’ and the ‘presupposition (P)’ of a sentence. Each sentence is supposed to contain a class of pairs of F P, whereby in a natural response the focus is said to be the only element that differs from the preceding utterance, while the presupposition (sentence minus focus element) has already been mentioned before.⁶ Chomsky points out that the focus can alternatively be determined by the surface structure: “The focus is a phrase containing the intonation center; the presupposition, an expression derived by replacing the focus by a variable.” (1972:100) This notion of focus and presupposition is closely related to Halliday’s (1967b) notion of information focus, whereas in Chomsky’s account the interpretation of focus depends primarily on semantic rather than on prosodic aspects (for a semantic theory of focus see Jackendoff (1972) and Höhle (1982)).

Cognitive Approaches

Colleagues of the newer Prague School (e.g. Sgall, Hajičová & Benešová, 1973) try to integrate the theories of FSP into a generative framework (‘functional generative description’)⁷. They propose a theory of ‘topic-focus articulation (TFA)’ (or ‘topic-comment articulation (TCA)’)⁸ that is based on Firbas’s (1964) approach and proceeds from the basic linguistic distinction between the ‘topic’ of a sentence and its ‘focus’. Similar to Chomsky they believe that all sentences have a focus domain that is determined by the relation of the response to the preceding utterance/question, i.e. it corresponds to the *wh*-expression in a presupposed question⁸ (see also Buring’s, 1997, 2007 notion of ‘question-answer-congruence’). Focus is assumed to signal what is presented as new or important information and identifies what is said about the topic. However, Sgall, Hajičová & Benešová argue that there is an important difference between formal (e.g. word order and prosody) and functional aspects (e.g. semantics and context). Furthermore, they criticize Firbas’s vague explanation of how to determine the degrees of CD over the sentence elements and give a refined definition of his semantic and contextual factors by introducing the concepts of ‘communicative importance’ and ‘contextual boundness’. While commu-

⁶“Choice of focus determines the relation of the utterance to responses, to utterances to which it is a possible response, and to other sentences in the discourse. The notions “focus”, “presupposition”, and “shared presupposition” [...] must be determinable from the semantic interpretation of sentences [...]” (Chomsky, 1972:100)

⁷Their grammar consists of a generative component which generates semantic representations or underlying structures for sentences.

⁸“In simple cases we can say immediately on the basis of a possible question [...] which part of the sentence is the topic and which is the comment: the elements that are necessarily present in the question belong to the topic; those that cannot be in the question belong to the comment; the elements that may, but need not necessarily be present in the question belong, according to some views, to the so-called transition.” (Sgall, Hajičová & Benešová, 1973:29)

nicative importance is a hierarchy derived from the semantic role of individual sentence participants, contextual boundness is defined in terms of a cognitive concept.

A contextually-bound element is interpreted as the point of information that is stored in the hearer's memory, which generally means that it is known to the hearer from the context or situation of the discourse. However, it is additionally noted that only some elements of the speaker's memory are 'foregrounded' by the discourse. Therefore a contextually-bound element is more precisely interpreted in the sense of what the speaker assumes to be present in or immediately available to the listener's consciousness in the discourse. The following statement demonstrates to what extent the speaker's assumptions about an element's contextual boundness are relevant for communication:

An old maxim says that TCA consists, first of all, in the distinction between 'what is spoken about' and 'what is said about it' in a sentence. [...] It is more exact to say that it belongs to a basic property of communication that one of its participants, the speaker, attempts to make the other(s), the hearer(s), modify in some respects some points of the information stored in the hearer's memory. (Sgall, Hajičová & Benešová, 1973: 10).

The cognitive aspect of information structure and its relevance for communication as formulated in the theory of TFA/TCA has been further developed by other linguists and turned out to be a central aspect in later notions of information structure (e.g. by Chafe, 1976; Prince, 1981; Vallduví, 1992; Lambrecht, 1994).

Along these lines Chafe (1976) describes how the content of what is being said is transmitted under the term (information) 'packaging'. He singles out six main packaging phenomena that denote the various syntactic and cognitive statuses a noun or a referent⁹ in a sentence may have: 'givenness' (givenness dimension resembling the concept of contextual boundness), 'contrastiveness' (particular aspect of focus dimension), 'definiteness', 'subject' (aboutness dimension), 'topic' and 'point of view'.

The cognitive aspect of this approach results from the basic idea that the speaker 'packs' information in such a way that it can be readily processed by the addressee at the moment of utterance. Hence, the addressee's processing abilities play an important role. Chafe assumes that in a communicative situation a person is only thinking, or is conscious of, a certain part of his or her long-term knowledge with regard to (the background of) the discourse context. These so-called "temporary states of the addressee's mind" (1976: 280) define the addressee's processing abilities and have to be taken into account by the speaker when he is talking to a person. This means, a noun's packaging statuses are identified with regard to what the speaker assumes to be in the listener's mind/consciousness at

⁹"[...] a referent is the idea a noun is used to express." (Chafe, 1976: 28)

the time of utterance. However, similar to Sgall, Hajičová & Benešová's (1973) approach this criterion seems to be primarily relevant to the definition of an element's status of givenness. Relating to this, Chafe notes that the terms 'given' and 'new' are misleading and argues that it would be more accurate to distinguish between 'already activated' and 'newly activated' information (see section 2.3.3 for further discussion). He furthermore directly connects the given-new distinction to Firbas's degrees of CD and thereby raises the question as to whether there are intermediate degrees of givenness/activation.¹⁰

This question is also addressed by Prince (1981). Following Chafe, she assumes that for information packaging in natural language "[...] the crucial factor appears to be the tailoring of an utterance by a sender to meet the particular assumed needs of the intended receiver" (1981:224). The structure and distribution of given-new information is the central aspect in her approach of information packaging. She relates notions like predictability/recoverability, saliency and shared knowledge to the given-new distinction. Assuming that these notions are not mutually independent, her aim is to develop a taxonomy that combines the different levels/types of givenness. As a consequence, she proposes a taxonomy of 'Assumed Familiarity' (applied to individual 'discourse entities' of a particular 'discourse model') that clearly diverges from a binary given-new distinction but suggests a rather ternary or even scalar taxonomy of the givenness dimension (see section 2.3.3). Prince's approach is based on the assumption that a linguistic theory of discourse should be able to account for the correlation between a taxonomy of morphological and syntactic form and a taxonomy of the values of assumed familiarity. With this she points out an essential parameter of cognition-based theories on information structure:

We are, therefore, NOT concerned with what one individual may know or hypothesize about another individual's belief-state EXCEPT insofar as that knowledge and those hypotheses affect the forms and understanding of LINGUISTIC productions. (Prince, 1981:233)

Within the scope of information packaging Vallduví (1992) also argues that a binary 'informational split' of a sentence is not enough. However, in contrast to Prince he is not concerned with the givenness dimension. He states that:

[...] referential status is a property of discourse entities and the phrases that encode them and information packaging is a relational property that constituents have by virtue of their standing in a particular relationship with the other element of the sentence. (1992:54)

¹⁰Due to the lack of linguistic evidence for the scalarity of the distinction this aspect is not further discussed in Chafe (1976) but continued in his later work, e.g. Chafe (1987, 1994).

Furthermore, he ascribes information packaging to have an autonomous status in the field of semantics and pragmatics and therefore subsumes corresponding notions under the term ‘informatics’. Vallduví proposes a ‘trinomial hierarchical articulation’ with the basic units ‘focus’, ‘link’ and ‘tail’, that represent the informational split of a sentence and incorporate different notions of the aboutness and focus dimension. Information packaging is defined in terms of “[...] A small set of instructions with which the hearer is instructed by the speaker to retrieve the information carried by the sentence and enter it into her/his knowledge-store.” (1992: 15)¹¹ Thus, the information packaging instructions play a central role in the informatics approach. They are represented by a sentence or rather by the arrangement of the basic units of the trinomial hierarchical articulation in a sentence. Vallduví’s idea of a tripartite informational split goes back to Dahl (1974), who distinguishes between a ‘topic-comment’ and a ‘focus-background’ structure, but argues for a parallel organization that may result in a tripartite structure, in particular in the case of longer sentences. Unlike Dahl, Vallduví suggests a hierarchical organization of the two structures with the basic/superordinate distinction attributed to the focus dimension (cf. Vallduví, 1992: 57-61): Focus is understood to be the only obligatory and informative part of a sentence (identified by context) and therefore represents the only contribution to the hearer’s knowledge-store. The focus (or information) part is complemented by the ‘ground’ which is already part of the hearer’s knowledge-store and therefore does not make any contributions to it. However, the ground serves to indicate the appropriate ‘anchoring’ or entry of information in the knowledge-store and is further divided into ‘link’ and ‘tail’. The link is a topic-like expression that opens the sentence and links up with the object of thought. While the link indicates where (or under which ‘address’) the information of a sentence is entered in the hearer’s knowledge-store, the tail (‘nonfocal nonlink part’) indicates how this information must be entered under the given address.

Vallduví’s approach to ‘digesting’ the sentence-internal relations of the focus and aboutness dimension into a single information structure yet again demonstrates the close or even mutual relatedness between both dimensions. Nevertheless, his approach also shows the need to (still) distinguish between different aspects or dimensions of information structure: While the focus-ground relation is primarily a context-dependent property (as in Halliday’s (1967b) approach), the link-tail relation is primarily a sentence-internal property.

Lambrecht’s (1994) work on ‘information structure’ also addresses the question of why there are so many kinds of sentence structures and how they are stored in the memory of speakers and hearers. By combining insights from different formal and functional approaches to information structure he aims to elaborate the basic concepts and terms that

¹¹The structure of the hearer’s knowledge-store is metaphorically compared with a file whose file cards are added and updated during a discourse (based on Reinhart, 1981 and Heim, 1983).

are needed to describe and define the interaction of sentences and their contexts. As a result, he explicitly distinguishes between the information structural concepts on the dimensions of givenness, aboutness and focus.

Lambrecht in particular picks up on Halliday's (1967b) and Chafe's (1976) approaches to the linguistic structuring of information and develops their ideas further. Like Halliday he understands information structure as a component of sentence grammar that is concerned with the relationship between the linguistic/sentence form and its pragmatic/communicative function in a discourse:

In the information-structure component of language, propositions as conceptual representations of states of affairs undergo pragmatic structuring according to the utterance contexts in which these states of affairs are to be communicated. Such PRAGMATICALLY STRUCTURED PROPOSITIONS are then expressed as formal objects with morphosyntactic and prosodic structure. (Lambrecht, 1994: xiii)

Lambrecht differentiates between discourse and conversational pragmatics. Following Grice (1975) the relation between sentence form and discourse context is determined by principles of grammar, while the relation between sentence form and conversational context is determined by principles of goal-oriented behaviour. Accordingly, Lambrecht argues that information structure is directly related to principles of discourse pragmatics only, since in conversational pragmatics the interpretation of a proposition is not necessarily related to the grammatical structure of the sentence expressing it.

Following Chafe (1976) and Prince (1981), Lambrecht furthermore postulates that psychological phenomena are relevant to information structure inasmuch as they have correlates in the grammatical form. He adopts the idea that the formal structure of a sentence reflects a speaker's assumptions about the hearer's state of knowledge and consciousness at the time of an utterance (cf. Lambrecht, 1994: xiii). This relationship is governed by four sets of categories of the information structure component: 'propositional information (pragmatic presupposition and pragmatic assertion)', 'identifiability and activation', 'topic' and 'focus'.

The categories of propositional information on the one hand and identifiability and activation on the other operate to the greatest extent at the givenness dimension (or informativeness dimension, for further discussion see section 2.3.1). Propositional information is structured into portions which the speaker and the hearer are assumed to already know (shared knowledge or representation) and portions of which only the speaker has a representation at the time of utterance and assumes the addressee does not yet know. The categories identifiability and activation define the speaker's assumptions about the statuses

of the mental representations of discourse referents in the addressee's mind at the time of an utterance (knowing something and/or thinking of something). A sentence topic or clause topic is the element the proposition expressed by the sentence is about (aboutness dimension), while the focus portion is the unpredictable or pragmatically non-recoverable element in an utterance and therefore makes it informative (focus dimension).

Contemporary Approaches

Modern views of information structure (e.g. von Heusinger, 1999; Krifka, 2007; Féry & Krifka, 2008; Zimmermann & Féry, 2010; Féry & Ishihara, 2016) commonly proceed from a three-dimensional account as mentioned above and enlarge and refine the theoretical concepts and assumptions by focusing either on one dimension or maintaining the distinction of information structure at three different dimensions.

Von Heusinger (1999: 212-213) understands information structure as a proper part of semantics conceived as a complex of different relations between discourse representation structures. In the frame of 'foreground-background' semantics he provides an approach that is mainly dealing with aspects related to the focus dimension of information structure. The main assumption is that a sentence makes (at least) two contributions to the context, namely by indicating the 'discourse anchoring' of the sentence (represented as 'background') and the propositional content (represented as 'foreground'). In constructing a discourse representation these two objects are linked in various ways with the representation of the established discourse.

In contrast, Krifka's (2007) approach aims to provide a general characterization of information structure and defines focus, givenness, topic and another notion, 'delimitation' ('contrastive topics' and 'frame setters'), as important subconcepts (see also Féry & Krifka, 2008; Zimmermann & Féry, 2010; Féry & Ishihara, 2016). Based on Chafe's (1976) notion of information packaging he argues that the transfer of information in communication is related to the temporary needs of the interlocutors. However, unlike Chafe he points out that information structure is not only concerned with how the content is transmitted but also with the content itself. Therefore he integrates information packaging into a communicative model of 'Common Ground (CG)' (originally going back to Karttunen, 1974; Stalnaker, 1974; Lewis, 1979) and distinguishes between 'CG content' (truth-conditional impact) and 'CG management' (pragmatic use of expressions). CG can be understood as background or shared knowledge among interlocutors in a conversation (see also section 2.3.1). The basic idea of the CG model is that each utterance of a discourse participant updates the CG so that it is continuously modified in communication. Krifka assumes that

information is packaged in correspondence with the CG at the point at which it is uttered. Thus, the new/relevant aspect of the CG model for information packaging is that it records the information that is mutually known or to be shared (presupposition as input CG) and accounts for its continuous update/modification (assertion/content as output CG) in communication. The information packaging component in the sense of Chafe is entailed in the notion of CG management, which accounts for how the CG content should/may develop with regard to the immediate and temporary needs and communicative goals of the interlocutors.

2.2 Basic Concepts of Information Structure

In the previous section we discussed various approaches to information structure that have been proposed within different communicative/functional, generative and psychological/cognitive linguistic frameworks. It has been shown that the information structure component of language covers phenomena that are concerned with the relation between the distribution of information units of a message over a sentence and linguistic form. This distribution primarily has to do with how the content of a message is transmitted, but also with the content itself. The theories on information structure often differ in the perspective from which they are derived. While early theories concentrate on a speaker-oriented perspective, subsequent theories started to pay more attention to the listener's perspective. Modern theories can be said to take a neutral position about the roles of speaker and listener by taking both perspectives into equal account. Even though information structure most commonly constitutes an independent level of description, there is still no agreement about where to locate it in the field of linguistics. Information structural phenomena have been argued to be related to grammar (morphosyntax and prosody) or semantics and (discourse and/or conversational) pragmatics.

However, the unifying aspect is that all theories are based on the idea that information, or the content conveyed by a sentence, is composed of old and new elements, in the sense that information arises by relating something new against something that can already be taken for granted (cf. Lambrecht, 1994: 51). This contrast involves the common assumption that an utterance/sentence is a statement about something and moreover implies a partition of information into a more informative and a less informative part. Dahl (1976: 38) formulated these relational aspects of information as follows:

[...] the speaker assumes that the addressee has a certain picture or model of the world and he wants to change this model in some way. We might then

identify THE OLD or THE GIVEN with the model that is taken as a point of departure for the speech act and THE NEW with the change or addition that is made in this model. OLD will be equivalent to PRESUPPOSED in one sense of the term. We can say that the addressee receives “new information” in the sense that he comes to know or believe more about the world than he did before.

Dahl’s definition demonstrates the vagueness of the terms given/old and new. Accordingly, it does not come as a surprise that different concepts evolved under these headings (see previous section 2.1). The different concepts show that there are at least two aspects (or perspectives) that are important for the definition of the contrast in informativity. On the one hand the contrast is evaluated with respect to the sentential environment and encodes a sentence-internal relational property (syntagmatic aspect). On the other hand it is evaluated with respect to the verbal/textual or situational discourse context and encodes a context-dependent relational property (paradigmatic aspect). Three basic levels/dimensions of information structure are frequently encoded in natural language with regard to the syntagmatic and paradigmatic aspects, that we will refer to as ‘aboutness’, ‘focus’ and ‘givenness’:

The concept of **aboutness** (often referred to as theme-rheme or topic-comment dimension) specifies what is being talked about in a sentence (theme/topic) and what is being said about this theme/topic (rheme/comment).

The concept of **focus** (often referred to as focus-background dimension) indicates the most important and informative part of a message (focus) in relation to information that has already been mentioned in the previous context (uninformative part, background).

The concept of **givenness** assigns a particular information status (e.g. given or new) to individual discourse entities and the phrases that encode them with respect to the discourse context and/or the hearer’s knowledge-store.

It is commonly assumed that aboutness more is a sentence-internal concept, while focus and givenness are context-dependent concepts (see e.g. Daneš, 1970 or von Heusinger, 1999: ‘aboutness’ vs. ‘discourse anchoring’). However, as Vallduví (1992) clearly pointed out, focus also involves a relational property on a sentential level and is therefore related to both aspects of information structure. The information structure of a sentence is usually expressed by the division of the sentence into (at least) two categories and parts. This is true for the aboutness and focus dimensions in particular, since they are both relational in nature with regard to the sentence or utterance level. The givenness dimension that is non-relational in this regard and solely applies to the discourse level has a different scope.

The information at the givenness dimension concerns the information status of individual discourse referents and is often thought of as having a gradient/scalar nature (see section 2.3.3). Hence, the information structure at the givenness dimension commonly exceeds a bipartite structure.

The following example adapted from Kadmon (2009) illustrates the different scopes of the three information structural dimensions as they will be used in the present thesis: (1a) aboutness, (1b) focus and (1c) givenness.

In (1a) *Anna* is the theme, because this is the entity to which the sentence refers, while the phrase *borrowed it from Max yesterday* is the rheme that contains information about this entity.

In (1b) the expressions *Anna* and *from Max yesterday* are in focus. *Anna* represents the most important part of the message since it is the answer to the context question. The information *from Max yesterday* is not an obligatory part of the answer to the context question but represents an informative part of the message since it is not derivable from the context. Moreover, *Max* represents contrastive information in relation to the previously mentioned *John*. Accordingly, the phrase *borrowed it* constitutes the background part of the sentence since it is the only (non-contrastive) information that has already been mentioned in the context question.

In (1c) the entities *Anna* and *yesterday* have the status of new information since this is the only information that is not recoverable by the listener from the context. The phrases *borrowed it* and *from Max* have the status of given information since the speaker has to assume that the event of borrowing (a book) and the denoted referent *Max* are recoverable by the listener due to explicit previous mention.

- (1) *Who borrowed the book that Max and John had purchased?*
- a. [*Anna*] [*borrowed it from Max yesterday.*]
 theme rheme
 - b. [*Anna*] [*borrowed it*] [*from Max yesterday.*]
 focus background focus
 - c. [*Anna*] [*borrowed it*] [*from Max*] [*yesterday.*]
 new given given new

The various approaches on information structure differ in how far they distinguish between or mix the concepts aboutness, focus and givenness, or whether they deal with only one or two concepts (for an overview see e.g. Allerton, 1978 and Foley, 1994). During the last century a confusing terminology has been used to capture the relational character of information structure. Sometimes, different theories even use the same terms but in different ways. An overview of the different terminologies used in the literature according

2.2. BASIC CONCEPTS OF INFORMATION STRUCTURE

to the the three basic dimensions is given in table 2.1 (aboutness dimension), table 2.2 (focus dimension) and table 2.3 (givenness dimension): terms denoting less informative parts are listed in the middle column and terms denoting more informative parts are listed in the right column. The list of references concentrates on terminologies that have been discussed so far (see previous section 2.1), and does not claim to be exhaustive for each of the three dimensions. Further relevant concepts are mentioned, which have not been discussed so far. They will partly be introduced in the following sections.

ABOUTNESS		
Weil (1844/1978)	ground (point of departure/initial notion)	statement
von der Gabelentz (1869)	psychological subject	psychological predicate
Ammann (1928/1962)	theme	rheme
Mathesius (1929/1983, 1939/1975)	theme (starting point)	rheme (assertion)
Mathesius (1941)	basis (most topical element & accompanying elements)	nucleus/core
Daneš (1964, 1970, 1974)	theme/topic	rheme/comment
Halliday (1967b)	theme	rheme
Dahl (1974, 1976)	given/old	new
Chafe (1976)	starting point	added information/ knowledge about
Vallduví (1992)	link	focus & tail
see also:		
Bloomfield (1935), Hockett (1958), Kuno (1972), Li & Thompson (1976), Dik (1978), Reinhart (1981), Davison (1984), Gundel (1985): ‘topic-comment’		

Table 2.1: Terminologies used in the literature that refer to the aboutness dimension of information structure.

The three information structural dimensions or rather the definitions of their primitives have been shown to be closely related to each other. However, theories also differ as to how far they account for the relatedness between the dimensions in their analysis of information structure. Some theories analyze the aboutness, focus and givenness structures on parallel independent levels. In this case the partitions are orthogonal to each other, which means that they might coincide, overlap or be stacked within one another. Other theories propose a hierarchical organization, in particular concerning the aboutness and focus structures. In this case either the focus structure is a substructure of the aboutness structure or the theme/topic is simply an (improper) part of the background (cf. Büring, 1997:54). However, the basic assumption is that focus commonly has to do with conveying new

information (not necessarily though), and that all sentences convey new information (cf. Lambrecht, 1994: 206). Thus, all sentences must have a focus, but not all sentences have a theme/topic which is claimed to be commonly related to given information.

FOCUS		
Weil (1844/1978)	ground (point of departure/initial notion)	statement
Paul (1880/1920)	psychological subject (known in discourse)	psychological predicate (most important & relevant part)
Mathesius (1929/1983, 1939/1975)	theme (familiar)	rheme (new)
Firbas (1964, 1966): degrees of communicative dynamism (CD) (semantic structure)	low degree of CD	high degree of CD
Daneš (1964, 1970, 1974)	old/known/given	new
Halliday (1967b)	given	information focus/new
Chomsky (1972), Jackendoff (1972)	presupposition	focus
Sgall, Hajičová & Benešová (1973)	topic	focus/comment
Chafe (1976)	starting point	added information/knowledge about
Dahl (1976)	given/old	new
Prince (1981)	open proposition	focus
Vallduví (1992)	ground	focus
Lambrecht (1994)	presupposition	assertion
von Heusinger (1999)	background/discourse anchoring	foreground/propositional content
Krifka (2007)	Common Ground	
see also:		
Kuno (1978): ‘old-new’, Jacobs (1982), Selkirk (1984), Rochemont (1986), Bolinger (1989): ‘focus’, Buring (1997), Buring (2007): ‘question-answer-congruence’, Steedman (2000): ‘theme-rheme’		

Table 2.2: Terminologies used in the literature that refer to the focus dimension of information structure.

Information structure has been argued to be only concerned with phenomena that do have correlates in grammatical form. The previous section 2.1 only touched on this topic, but it has been shown that the informational dichotomy is marked by word order and/or

2.2. BASIC CONCEPTS OF INFORMATION STRUCTURE

by intonation. However, languages differ in how far the information structural units are linguistically/grammatically encoded (see e.g. Zimmermann & Féry, 2010). Nevertheless, the three basic dimensions of information structure are taken to be universal. Furthermore, Vallduví (1992: 61) and von Heusinger (1999: 101) note that both theme/topic and focus/newness have some universal structural characteristics, namely that they often are sentence-initial and intonationally prominent, respectively. More generally this means that the more informative part is believed to follow the less informative part¹² and that the most informative part is correlated with the most prominent intonation feature (e.g. a pitch accent), while the rest of the sentence, the less informative part, is usually not marked by intonational prominence.

GIVENNESS		
Firbas (1964, 1966): degrees of communicative dynamism (CD) (context dependence)	low degree of CD	high degree of CD
Sgall, Hajičová & Benešová (1973): contextual boundness	bound	unbound
Chafe (1976, 1994)	given (already activated)	new (newly activated)
Prince (1981): assumed familiarity	evoked	brand-new
Lambrecht (1994)	presupposition	assertion
see also:		
Clark & Haviland (1977), Allerton (1978), Kuno (1972, 1978): ‘anaphoric-non-anaphoric’, Buring (2006): ‘given-new’		

Table 2.3: Terminologies used in the literature that refer to the givenness dimension of information structure.

Finally, following Zimmermann & Féry (2010: 1) information structure is nowadays understood as the cognitive domain that mediates between linguistic competence and other cognitive faculties, which serve the central purposes of information update, pragmatic reasoning, and general inference processes. Following these lines, in this thesis we adopt Lambrecht’s (1994: 5) definition of information structure:

INFORMATION STRUCTURE: That component of sentence grammar in which propositions as conceptual representations of states of affairs are paired with lexicogrammatical structures in accordance with the mental states of interlocutors who use and interpret these structures as units of information in given discourse contexts.

¹²However, Halliday (1967b: 211) notes that the focus can appear at any point in the information unit.

Since this thesis deals with the linguistic marking of information status, the following sections take a closer look into various aspects of the givenness dimension. We will primarily discuss the domains and the criteria to identify units of givenness from different levels and perspectives. Relating to this we aim to shed light on the gradient/scalar component of the givenness dimension. Furthermore, we will be concerned with the linguistic marking of givenness.

2.3 Givenness

2.3.1 Levels and Modes of Givenness

The notion of information status is usually concerned with the givenness dimension of information structure. Section 2.1 has shown that givenness has to do with the speaker's assumption about the 'cognitive accessibility' of particular discourse entities in the listener's head with regard to the current verbal/textual and situational discourse environment. This means that the information status of a discourse entity reflects the speaker's hypotheses about the listener's state of knowledge and consciousness as well as assumptions, beliefs and strategies at the time of utterance (e.g. Sgall, Hajičová & Benešová, 1973; Chafe, 1976; Prince, 1981; Lambrecht, 1994; Krifka, 2007). In this section we discuss the relevant parameters for an entity's cognitive accessibility. These are whether or not an entity already exists in the listener's knowledge-store, how it got there, what kind of entity it is and its degree of salience (cf. Gundel, 2003).

Identifiability and Activation

As the previous definition of information status shows, in the following we are concerned with phenomena that deal with the speaker's assessment of how the addressee is able to process what he is saying against the background of a particular context. Chafe (1976) notes that those phenomena depend on the interaction of two types of assumptions, namely the speaker's assumptions regarding long-term knowledge and the assumptions as to temporary states of the addressee's mind (short-term memory). Cognition-based approaches to givenness commonly account for this interaction by distinguishing between two levels of givenness that are often referred to as '**identifiability**' (knowledge, long-term memory) and '**activation**'/'**accessibility**' (consciousness, short-term memory). The former level applies to the general communicative situation and is concerned with the knowledge that

is assumed to be shared by speaker and listener. The latter level applies to the participants' current discourse model (discourse and sentence level) and is concerned with what the speaker assumes to be in the listener's consciousness at the time of utterance. Both levels are sometimes determined by inference (associations with other ideas), but as we will see later in this section the two levels apply to different kinds of inference processes (cf. Chafe, 1994, 1996).

Identifiability Chafe (1976:38-39) and Prince (1981:230) define givenness at the level of identifiability in terms of the speaker's assumption that the hearer knows, assumes or can identify/infer a particular entity the speaker has in mind by its linguistic expression. However, this does not mean that the listener is necessarily thinking about this particular entity. To be more precise, following Chafe (1976, 1987, 1994, 1996) givenness at this level has primarily to do with the speaker's assumption about the listener's ability to pick out the entity that the speaker has in mind from all the entities that might be categorized in the same way. The identifiability of a discourse entity is in turn based on the speaker's judgment that the knowledge about the entity in question is already shared with the listener, either directly (shared knowledge), or indirectly, by being inferable from some other more directly shared knowledge (see also Prince, 1992: 'Old/New: in the Hearer's Head' in relation to 'Inferable' and Lambrecht, 1994: 'identifiability').

Prince defines 'shared knowledge' (1981) or 'Hearer-old' and 'Hearer-new' information (1992) by reference to the following notions: Kuno's (1972) notion of 'permanent registry' (concerning the successful interpretation of an entity by 'anaphoricity' and 'genericness'), Clark & Haviland's (1977) notions of 'new' and 'given' information (information the listener does not yet know or already knows and accepts as true) as well as Clark & Marshall's (1981) notion of 'cultural copresence' (being part of the same community as a basis for successful communication). Lambrecht (1994: 74) refers to the set of representations which interlocutors in a given discourse may be assumed to share as 'discourse register'.

Activation We now turn from the identifiability level to the activation level of givenness. Following Chafe (1976:32) the activation of a discourse entity is fundamentally a matter of the speaker's judgment about whether the entity is in the listener's consciousness or not.

Prince (1981) distinguishes between two types of givenness that are related to the level of activation, namely 'saliency' and 'predictability/recoverability' (see also Prince, 1992: 'Old/New: in the Discourse-Model' in relation to 'Inferable'). Her definition of givenness in terms of saliency is based on Chafe's (1976) approach:

[...] The speaker assumes that the hearer has or could appropriately have some particular thing/entity/ ... in his/her CONSCIOUSNESS at the time of hearing the utterance. (Prince, 1981: 228)

Prince's definition of givenness in terms of predictability/recoverability refers to notions by Kuno (1978: 282-283) and Halliday & Hasan (1976: 326). Accordingly, a discourse entity represents predictable (= given/old) information, if it is recoverable from the situation or preceding context. Kadmon's (2009: 36) definition of 'recoverability' explains exactly what this means:

An expression B is RECOVERABLE in utterance U iff the following holds. Presented with the result of replacing B in U with a variable, it would be possible for the hearer to infer on the basis of prior context that in the actual utterance, the position of that variable should be occupied by B.

Chafe later proposes a concept of 'activation states' (1987) or 'accessibility' (1994, 1996) that involves both types of givenness, as described by Prince (1981). Therein he distinguishes between different degrees of activation with regard to the speaker's assumptions about the addressee's consciousness at the time of the utterance (see section 2.3.3). Lambrecht (1994: 93) adopts this concept under the notion of 'activation' but is additionally concerned with the addressee's willingness and ability to model the cognitive states or to interpret the speaker's communicative intentions according to how the speaker packages information.

Two levels of givenness that resemble the levels of identifiability and activation, are also discussed with regard to the notion of Common Ground (CG) (cf. Stalnaker, 2002). Common Ground refers to the common or mutual belief that participants in a conversation recognize to share with each other. This means each individual has a belief-set, and the intersection of the belief-sets among the participants in a conversation is usually interpreted as Common Ground (shared knowledge, background information). Thus, what a speaker presupposes (or interprets as given information) is what he considers to be common belief. However, the presuppositional nature of givenness is assumed to depend on beliefs about the subject matter of a conversation and beliefs about the conversation itself. Krifka (2007) (see also Rochemont, 2016) accounts for the two kinds of beliefs by distinguishing between a CG content and a CG management component (Rochemont refers to the latter as 'salience-based-givenness').

We have seen that the definitions of the two levels of givenness - identifiability and activation - suggest that knowing something (or being aware of the relevant set of shared presuppositions) and thinking of something involve different mental states/processes that

are related to knowledge and consciousness, respectively (cf. Lambrecht, 1994: 92). Both levels are correlated with each other, even though they are sometimes treated as independent properties of givenness (e.g. by Chafe, 1994: 95). The identifiability of a discourse entity is commonly assumed to be a prerequisite for its givenness at discourse level (consciousness), since cognitive activation requires the existence of a mental representation in the addressee's mind (knowledge). In turn, the interpretation of an entity's identifiability is independent of its information status or cognitive activation at discourse level (cf. Chafe, 1994: 107). However, following Chafe (1976) the level of consciousness or cognitive activation is crucial for the analysis of givenness, since it is directly related to dynamic and immediate changes in the discourse context.

This is also reflected in Prince's (1981: 231) explanation of the relatedness of activation (saliency and predictability) and identification (shared knowledge):

If a speaker assumes that the hearer can predict that some particular item or items will occur in some particular position within a sentence, then the speaker must assume that it is appropriate that the hearer have some particular thing in his/her consciousness. And, if the speaker assumes that the hearer has some particular thing in his/her consciousness, then the speaker must assume that the hearer has some assumption or can draw some inference.

Knowledge and Discourse

The discussion of the previous section leads us to the question of how givenness is established in spoken discourse (cf. Chafe, 1976; Prince, 1981; Chafe, 1994; Lambrecht, 1994; Baumann, 2006; see also Allerton, 1978 and Ariel, 1988 for an overview). As we have already seen, the identifiability or activation of a discourse entity (in the general sense of contextual salience) can be derived from shared knowledge among the interlocutors (**'knowledge-Givenness'**). Furthermore, in the literature it is commonly distinguished between givenness that is derived from the extralinguistic or linguistic context, often referred to as **'situation-Givenness'** and **'text-Givenness'**, respectively (see also Halliday & Hasan, 1976: 'exophoric reference' and 'endophoric reference'). Accordingly, Lambrecht (1994: 36) proposes a model of 'the universe of discourse' that is divided into a 'text-external world' and a 'text-internal world'. The different aspects that are relevant for an entity's givenness in the universe of discourse are covered by a concept of 'frame-linked referent identification'. Lambrecht (1994: 90) believes

[...] that the common cognitive property which unites all instances of identifiability and therefore justifies expression by a single grammatical category is

the existence of a cognitive SCHEMA or FRAME within which a referent can be identified.

He points out that an entity's identifiability is independent of whether it actually exists or will exist in the real world, but that it is established only by virtue of the frame of reference that is relevant in the ongoing discourse (e.g. the interlocutors' natural or social universe, a personal frame, the physical environment of the act of speech or the text-internal discourse world).¹³ This also means that the mere mention of an entity may be sufficient for it to be identifiable in a discourse. Knowledge of or familiarity with the entity is not absolutely necessary. Lambrecht's notion of a schema or frame is closely related to Fillmore's (1982: 111) notion of 'semantic frame':

By the term "frame" I have in mind any system of concepts related in such a way that to understand any of them you have to understand the whole structure in which it fits; when one of the things in such a structure is introduced into a text, or into a conversation, all of the others are automatically made available.

Lambrecht's (1994) rather global notion of frame-linked referent identification may raise the question as to how far knowledge-, situation- and text-Givenness differ from each other. Shared knowledge that becomes important for knowledge-Givenness usually involves unique 'public' or common knowledge, experience of the world (e.g. *the sun, the Pope, the post office*, etc.) as well as relatively 'private' knowledge that is shared among participants within a particular social context or community (e.g. a common meeting place: *the park* or friends/family members: *the dog, John*, etc.).

Recoverability by extralinguistic context (situation-Givenness) is intrinsically nonlinguistic (cf. Halliday & Hasan, 1976). This means that speaker and listener share the perception (visually, auditorily (except for speech), etc.) of an entity that is evident in the text-external/physical speech setting or environment (e.g. a picture on the wall; a blackboard or individual students in a classroom; a noise; an incident; etc.). Thus, in the case of situation-Givenness the representation of a discourse entity may be taken for granted just by virtue of being present in, or recoverable from the text-external world (cf. Lambrecht, 1994: 38). Those entities are commonly denoted by deictic expressions.

In contrast, entities that are recoverable by the linguistic context (text-Givenness) are established in the text-internal world by verbal/textual representations which the speaker

¹³Clark & Marshall (1981) in a similar fashion distinguish between 'community membership mutual knowledge', 'physical co-presence mutual knowledge' and 'linguistic co-presence mutual knowledge' (see also Ariel, 1988). They assume that mutual knowledge is the basis for an appropriate usage of referring expressions. Thus, their definitions of different kinds of mutual knowledge also directly account for the interaction of identifiability and activation.

must set up for the addressee. Thus, text-Givenness depends on whether and how an entity has been previously introduced (verbally/textually) in the discourse. This involves different ways and aspects of previous mention which will be discussed in more detail in the following section.

Modes of text-Givenness

Recoverability of a discourse entity by the verbal/textual linguistic context is commonly said to depend on three factors: explicitness, recency and frequency of previous mention (cf. Allerton, 1978: 143).

Explicitness is a main factor of text-Givenness that involves a distinction between explicit and implicit previous mention. This distinction is closely related to the distinction between coreferential and anaphoric relations between two or more expressions.

The relation of coreference means that two nouns or NPs refer to the same/ equal (= identical) entity (cf. Hirschman, Robinson, Burger & Vilain, 1997). Based on the assumption that each noun or NP ($= \alpha$) denotes a particular/unique entity in the context, van Deemter & Kibble (2001: 629) use the notion ‘Referent(α)’ as short for ‘the entity referred to by α ’ and define coreference as follows:

(2) **Definition of coreference:**

α_1 and α_2 *corefer* if and only if $\text{Referent}(\alpha_1) = \text{Referent}(\alpha_2)$

While givenness due to explicit previous mention usually involves coreference (cf. Leech, 1974: 169), givenness that is derived in a less direct way, namely by implicit previous mention, usually involves anaphoric relations. Van Deemter & Kibble (2001: 630) define the relation of anaphora and its relevance for the interpretation of text (context-sensitivity) as follows:

(3) **Definition of the relation of anaphora:**

An NP α_1 is said to take an NP α_2 as its anaphoric antecedent if and only if α_1 depends on α_2 for its interpretation.

Van Deemter & Kibble (2001: 630) explain that “anaphoric and coreferential relations can coincide, of course, but not all coreferential relations are anaphoric, nor are all anaphoric relations coreferential.” The relevance of coreference and anaphoric relations (anaphor = any kind of expression that refers back to an already established concept = antecedent) for the interpretation of textual givenness will be demonstrated in the following.

Explicit previous mention In the case of givenness due to explicit previous mention the coreferential expression in question is either a repetition of the identical expression or it is replaced by a substituted expression, e.g. by a proform (*John - he*), by a synonym (4), or by an expression with a different connotative meaning (5):

(4) *I turned to the ascent of the peak. The climb is perfectly easy.*

(Halliday & Hasan, 1976: 279)

(5) A: *Did you see Dr. Cremer to get your root canal?*

B: *Don't remind me. I'd like to strangle the butcher.*

(adapted from Buring, 2007)

However, explicit previous mention does not necessarily extend to a coreferential entity, but also to any other entity/referent that is categorized in the same way (cf. Chafe, 1976: 32), as e.g. in the case of generic expressions¹⁴ (6) or in cases like (7) and (8). Even though the two expressions in question are not coreferential, there is a strong correspondence between the two mentioned entities.

(6) a. *I bought a painting last week. I really like paintings.*

(Chafe, 1976: 32)

b. *I really like paintings. I bought a painting last week.*

c. *I really like paintings. I bought one last week.*

(7) *On my way home, a dog barked at me. It made me think of Anna's dog.*

(Baumann & Riester, 2012)

(8) A: *Why do you study Italian?*

B: *I'm married to an Italian.*

(adapted from Buring, 2007)

Examples like (6)-(8) demonstrate that givenness established by explicit previous mention does not necessarily involve coreference, but can also be derived on the basis of the lexical meaning or form of succeeding expressions. Following Allerton (1978) this means that there are different kinds of textual givenness. On the one hand givenness requires the

¹⁴Generic expressions generalize and refer to all members of a class or group, i.e. a generic expression does not refer to a specific entity but to the class of entities in general.

reconstruction of a particular individual referent that is denoted by the relevant expression, on the other hand givenness has a purely linguistic/textual status as it requires to reconstruct the lexical item by searching it in the preceding text. Allerton (1978:143-145) refers to such kinds of givenness as ‘definite-givenness’ and ‘proform-givenness’ (or lexical givenness), respectively. A similar distinction is made by Halliday & Hasan (1976) (‘reference’ and ‘substitution’ (or ‘ellipsis’); see also Leech, 1974) and Halliday & Matthiessen (2004) in the system of ‘cohesion and discourse’. While the notion of ‘reference’ describes links between elements from the situation (exophoric) or from the text (endophoric) at the phrase level, the notion of ‘lexical cohesion’ describes links between the choice of lexical items at the word level. Accordingly, Baumann & Riester (2012) propose distinguishing between a ‘referential’ and a ‘lexical’ level of givenness (see also section 2.3.3).

Implicit previous mention Apart from the distinction between referential and lexical givenness, it has already been mentioned that the recoverability of a discourse entity may be derived in a less direct way, namely by implicit previous mention. In these cases the entity in question is part of a ‘frame’/‘scenario’¹⁵ (9) or is lexically or collocationally (10) associated with a preceding expression (lexical cohesion). In such cases the presupposed expression cannot directly be proceeded to a proform.

- (9) a. *We looked at a new house yesterday. The kitchen was extra large.*
b. *I sold my bike yesterday. I wonder what I’ll do with the money.*

(Chafe, 1976: 40)

- (10) A: *Did you see that lightning just now?*
B: *No. I didn’t hear the thunder, either.*

(Allerton, 1978: 142)

Chafe (1976: 40) explains the relations demonstrated in (9) in terms of ‘entailment’ and points out that such entailments not only extend from one noun to another, but also from verbs to nouns. He later (1987: 29) uses the more general notion of ‘schema’ (borrowed from cognitive psychology) that includes entailment phenomena. As we have already seen, a schema is defined as a set or cluster of interrelated concepts and expectations and is closely related to Fillmore’s (1982: 111) notion of semantic frame (see above). The notion of schema/frame also involves lexical relations that play a role in lexical cohesion. Besides

¹⁵Garrod & Sanford (1982) similarly distinguish between ‘explicit focus’, which resembles explicit previous mention, and ‘implicit focus’ that contains information from situational scenarios that is not specifically mentioned but is directly relevant to something which is mentioned.

repetition and synonymy this concerns the following common lexical/semantic relations (cf. Allerton, 1978: 141):

- Converse relations: e.g. *to buy* \leftrightarrow *to sell*
- Hyponymy/Hypernymy:
 - (a) Hyponym (subordinate) \rightarrow Hypernym (superordinate): e.g. *dog* \rightarrow *animal*
 - (b) Hypernym (superordinate) \rightarrow Hyponym (subordinate): e.g. *dog* \rightarrow *poodle*
- Meronymy:
 - (a) Part \rightarrow Whole: e.g. *handbrake* \rightarrow *car*
 - (b) Whole \rightarrow Part: e.g. *car* \rightarrow *handbrake*

Allerton points out that it is important to take into account that converse relations (and also synonymy relations) are symmetrical relationships, while the relationships of hyponymy/hypernymy and meronymy concepts are asymmetrical. This asymmetry entails a difference in the interpretation of an entity's givenness.

Hyponymy and part-whole relations demonstrate that the hyponym or part (as an antecedent) frequently implies the superordinate or whole (as an anaphor) (cf. Lyons, 1968: 455). Van Deemter (1994: 21) calls this phenomenon 'concept-Givenness'.¹⁶ In (11a) the anaphor *string instruments* is classified as being concept-given since it subsumes/includes the antecedent expression *viola*.

Hypernymy and whole-part relations resemble Chafe's notion of entailment. In those cases the superordinate or whole (as an antecedent) is generally assumed to not automatically imply the hyponym or part (as an anaphor). Accordingly, in (11b) van Deemter (1999) would not treat the anaphor *viola* as being concept-given but new. Although *viola* is entailed in the antecedent expression *string instruments* it does not seem to be appropriate to interpret the subsectional anaphor *viola* as a presupposed concept in the succeeding sentence.

- (11) a. *Bach wrote many pieces for viola. He must have loved string instruments.*
(van Deemter, 1999: 7)
- b. *Bach wrote many pieces for string instruments. He must have loved the viola.*
(Baumann, 2006: 41)

¹⁶Van Deemter (1994, 1999) distinguishes between 'object-Givenness' and 'concept-Givenness'. The former applies to entities that are coreferent (or 'identity-anaphoric') to an antecedent, while the latter applies to entities that constitute a 'non-identity anaphor' of an extensionally-included word (as antecedent).

Allerton (1978:142) argues that in contrast to the interpretation of a superordinate or ‘whole’ word, the interpretation of a hyponym or ‘part’ word somehow involves adding extra information, which might explain the difference in information status. Chafe (1996) makes a similar observation of two different kinds of inference (= associations with other ideas) and relates them directly to the levels of identifiability and accessibility (= activation). He distinguishes between essential or immediate and non-essential associations. “One way to think of this essentiality is in terms of the referent in question being necessarily included in a mental image of what is being talked about” (1996: 43-44). Chafe argues that in (12a) the idea of playing basketball may immediately be located in a gym (similar to (11a)), while in (12b) the idea of buying a car may not immediately be associated with acquiring tags, since it involves a number of other (probably more essential) things (similar to (11b)).

- (12) a. The speaker was giving reasons why he had abandoned his earlier habit of playing basketball after work:

... *sometimes the gym's closed,*

(Chafe, 1996: 42)

- b. Within a discussion that involved various expenses that go along with buying a car:

... *and then you got to get the tags on it. Right?*

(Chafe, 1996: 41)

Chafe (1996: 43) explains that both types of associations are sufficient to treat the entities in question as identifiable, but only *the gym* (12a), similar to *string instruments* (11a), qualifies for being treated as accessible information (in the sense of being recoverable) due to its essential association with the preceding context. Accordingly, he suggests treating *the tags* (12b) as identifiable but rather new than accessible/recoverable information. As a consequence, Chafe (1996: 46) concludes that accessibility (= activation) requires a more direct and closer kind of inference in the sense of a more essential and immediate kind of association, than is necessary for identifiability.

The previous examples clearly demonstrate the role of frames in identifying antecedents and the independence of identifiability and activation at least in the sense that an identifiable entity may be given, accessible or new (cf. Chafe, 1994: 105).

We have already seen that text-Givenness does not necessarily mean coreference (in particular in the case of implicit reference), which leads us to the question of how listeners draw ‘inferences’ from what they hear. Clark (1975, 1977) and Clark & Haviland (1977) argue that cognitive ‘bridging’ is an obligatory part of the process of comprehension. Based

on a ‘given-new contract’ between speaker and listener, the speaker is supposed to construct his utterance in a way that enables the listener to compute a unique bridge from his previous knowledge to the intended antecedent of the present given information (cf. Clark, 1975:17). This means, when there is no direct or explicit antecedent the listener must bridge the gap to an (indirect) antecedent by building an inferential bridge from something he already knows (e.g. something that is part of the cognitive schema or frame of reference that is relevant in the ongoing discourse (following Lambrecht, 1994)). So far, we have only been dealing with forward-looking inferences. At this point it has to be noted that backward-looking inferences are also possible (e.g. in the case of cataphoric expressions). However, backward-looking inferences are not yet fully determined and will therefore not be further discussed in this thesis.

Recency of previous mention In the case of backward-looking inference, the recoverability of an entity depends on a yet another aspect, namely the distance between the anaphor and the previous mention of its explicit or implicit antecedent (cf. Allerton, 1978:142; Ariel, 1988). This means it has to be taken into account whether the previous mention is ‘immediate’ or ‘non-immediate’. While immediate mention means that the antecedent occurs in the immediately preceding utterance, non-immediate mention means that there are intervening sentences between the anaphor and its antecedent. In the case of non-immediate previous mention two factors are relevant for the interpretation of an entity’s givenness, namely the number of competitors for the role of the antecedent (see Arnold, 1998:22) and the length and number of the intervening sentences (see Clark & Sengul, 1979). Theories of textual coherence usually account for such phenomena. In their ‘Centering Theory’, Grosz, Joshi & Weinstein (1995) explore the factors that contribute to coherence among utterances within a discourse by analyzing sequences of continuation, retaining and shifting with regard to the role of the center of attention. An antecedent counts as immediate, as long as it is the center of attention. However, new (competing) entities in the intervening discourse might provide for a shift in the center of attention. In this case the competing entities distract the antecedent from the center of attention, which impedes the recoverability of the anaphor in question. This means that increased coherence will decrease the listener’s inference load. Yule (1981) describes this process in terms of a ‘current non-new’ entity (antecedent; most recently introduced entity) that becomes a ‘displaced non-new’ entity (anaphor), when another ‘new’ entity is introduced. Gundel (1996) argues that in the case of competing antecedents, the ‘correct’ choice for the recoverability of an entity normally depends on the plausibility of the bridging inference. Clark & Sengul (1979) investigated the effect of length and number of intervening sentences on the identification of an anaphor. Their main finding is that an anaphor is

identified much faster if it is mentioned in the previous sentence than if it is mentioned two or three sentences back.

Van Deemter (1994: 20) claims that the recency factor is stronger in concept-Givenness (instances of implicit previous mention) than in coreference relations ('object-Givenness'; instances of explicit previous mention). This has to do with 'memory limitations' that van Deemter postulates for concept-Givenness. Following Baumann & Riester (2012: 135) this difference may be related to the difference between the two levels of givenness (lexical vs. referential) which implies that lexical words are more transient than their denotated entities (referents). Accordingly, they conclude that lexical cohesion (or the lexical level of givenness) is crucial for concept-Givenness. In general, these interpretations suggest that recency of previous mention is more relevant to the lexical than to the referential level of text-Givenness.

Frequency of previous mention So far, it has been discussed to what extent text-Givenness on the referential and/or lexical level is affected by explicitness and recency of an entity's previous mention. However, Allerton (1978: 143) brings another factor into play, namely frequency of previous mention. This means that an item, despite possible ambiguity and lack of recent previous mention, may become thoroughly given due to frequent repeated mention throughout the discourse (see also 'hypertheme' (e.g. Daneš, 1974)).

Finally, it has to be noted that following Lambrecht (cf. 1994: 89) explicitness, recency and frequency of previous mention are only relevant to the activation status of an entity, since the identifiability status of an entity is assumed to be preserved throughout a discourse, and from one discourse to another.

2.3.2 Domains of Givenness in Discourse

In section 2.2 we introduced givenness as a context-dependent relational property of a discourse. While we discussed different aspects of context-dependence in the preceding section 2.3.1, in this section we will be concerned with the linguistic domains that qualify for the distribution of a given-new distinction.

Following Bach (1997) in the most general sense we can say that the meaning of a sentence depends on the meanings of its constituents and its syntactic structure. Lambrecht (1994: 37) makes three distinctions related to meaning, claiming they are important to the information structure component of language, which is defined to match form-meaning pairs with mental states of interlocutors: First, he distinguishes between the inherent lex-

ical meaning of words (pragmatic states of discourse referents) and the relational meaning that arises by relations between words (pragmatic relations between discourse referents and propositions). Second, he distinguishes the meaning of linguistic expressions (lexical level) from the things designated or denoted by these expressions (= referents; referential level). Third, those linguistically-expressed referents are distinguished from their abstract representations in the minds of the speech participants, which are the main concern of information structure analysis (according to Lambrecht, 1994).

Pragmatic and Semantic Information

The three distinctions just mentioned are obviously relevant for the interpretation of information and therefore have to be kept in mind when we have closer look at the domains of application of givenness or information status within a discourse context. We assume that a discourse can roughly be understood as a coherent written or spoken dialogue or monologue that is composed of a multitude of utterances. However, as we have already seen in the preceding section 2.3.1, a discourse is more than a sequence of propositions. The internal structure of a discourse is organized by explicit and implicit links between utterances and individual entities within them (cf. Kruijff-Korbayová & Steedman, 2003: 249-250). Prince (1981: 235) states that a discourse or text is the result of a “set of instructions from a speaker to a hearer on how to construct a particular discourse-model”. This implies a conception of communicative intentions as proposed by Grice (1975, 1989) (see also Clark & Haviland, 1977: ‘given-new contract’), which requires that the hearer presumes that the speaker’s intentions are identifiable with regard to a given context. Accordingly, Bach (1997) reasons that the context does not literally determine the content or what the speaker means. The relevant aspect for successful communication is that the hearer is able to determine what the speaker means by knowing what kind of information the speaker intended him to take into account. Thus, Bach defines ‘meaning’ in a broad pragmatic sense rather than in a narrow semantic sense (see Bach, 1997 for a discussion of the semantics-pragmatics distinction). He notes that pragmatic information pertains to actions, intentions and inferences of interlocutors and is relevant to making sense of speakers’ utterances, while semantic information pertains to linguistic facts/expressions (part of sentence grammar) whose meanings are relevant to use. This distinction between a pragmatic and a semantic component of communication reflects the difference between the speaker’s meaning that only arises by the act of uttering (intentional/implicated information) and the linguistic meaning that is encoded in what is uttered. Similarly, Lambrecht (1994: 43-44) distinguishes information conveyed by the utterance of a sentence from the meaning expressed by the sentence as a function of its linguistic

expression. He defines the text-internal discourse world as “the abstract world of linguistic REPRESENTATIONS created in the minds of the interlocutors in the process of communication” (1994: 37) and states that in conveying information, the speaker is required to manipulate or influence the listener’s mental representation of the world. This means that the information value of an utterance depends on the communicative situation and the mental states of the interlocutors, while the linguistic meaning of a sentence remains constant.

Propositional Information

The linguistic representations that are relevant at the time of speech are said to be formed by propositions. The sum of propositions can broadly be understood as (shared) knowledge in the sense of having a mental representation of the kind of things which may be denoted by a proposition (its ‘denotatum’), like states of affairs, situations, events, etc. Thus, “to inform a person of something is then to induce a change in that person’s knowledge state by adding one or more propositions” (Lambrecht, 1994: 44; see also Dahl’s, 1976: 38 definition of information). As we have already seen in section 2.1, information conveyed by a proposition or by making an assertion is normally a combination of old and new elements. This means a proposition contains some information that is presupposed or assumed to be taken for granted by the addressee and that serves as a point of departure for new information. Accordingly, Lambrecht (1994: 52) distinguishes between old and new propositional information in terms of ‘presupposition’ and ‘assertion’, respectively:

PRAGMATIC PRESUPPOSITION: The set of propositions lexicogrammatically evoked in a sentence which the speaker assumes the hearer already knows or is ready to take for granted at the time the sentence is uttered.

PRAGMATIC ASSERTION: The proposition expressed by a sentence which the hearer is expected to know or take for granted as a result of hearing the sentence uttered.

Thus, a proposition does not only reflect a state of affairs but also the speaker’s assumptions about the listener’s state of mind at the time of utterance, which is demonstrated in (13)¹⁷. Lambrecht (1994: 51) explains the speaker wants to communicate that he met his new neighbor (assertion) by assuming that the addressee already knows that someone moved in downstairs (presupposition).

¹⁷The presupposition is underlined.

- (13) *I finally met the woman who moved in downstairs.*
(Lambrecht, 1994: 51)

However, according to Allerton (1978: 151) the notion of givenness differs from the notion of presupposition, but they interact in various ways. He argues that givenness does not apply to propositions and defines presuppositions with regard to the capacity of propositions/sentences to be true or false, i.e. a presupposed proposition is assumed to be true. The answer to the *wh*-questions in (14) for instance reflects that the addressee accepts the speaker's presupposition as true and assumes that John was in Mary's bedroom for some length of time. Independently, the constituents within a proposition may be either new (14a) or given (14b).

- (14) a. A: *How long was John in Mary's bedroom?*
b. A: *How long was he there?*
B: *Two minutes.*
(Allerton, 1978: 151-152)

Allerton (1978: 152) describes this kind of presupposition as 'textual' (vs. lexical or inherent) since it "is part of the core structure of the sentence in which it occurs". Furthermore, his notion of textual presupposition is related to the notion of focus, since a textual presupposition represents the information that determines the contribution its sentence makes to the text (i.e. it determines the focus elements as in *wh*-question and answer constellations; for further discussion see Allerton, 1978: 152).

The difference between presupposition and givenness as formulated by Allerton is demonstrated in (15). The proposition referred to by *it* is not presupposed in the sense of being accepted as true by the listener, but it is given information in the sense of the speaker's assumption about the listener having a mental representation of it.

- (15) A: *John went by train to Manchester.*
B: *Are you sure? I don't believe it.*
(Allerton, 1978: 152)

The example shows that givenness and truth conditions ought to be determined independently of each other. Furthermore, it demonstrates that Lambrecht (1994) and Allerton (1978) define 'presupposition' along different lines. While Lambrecht's definition is concerned with how meaning is conveyed (pragmatic meaning of a proposition) Allerton's definition is concerned with the content of what is being said (semantic meaning of a

proposition). The truth condition is a necessary component of sentence meaning which traditionally does not take account of information structural differences of a sentence.¹⁸ Accordingly, the information status of an entity has to be interpreted independently of truth conditions. Hence, we can conclude that the information status of propositions solely concerns the assumed knowledge state of the addressee at the time of utterance. A proposition is informative or denotes new information if it is assumed to be not yet entailed in the listener's knowledge stock.

Referential Information

Givenness also concerns the assumed state of consciousness or awareness of the addressee at the time of utterance. Chafe (1987) argues that states of activation (see section 2.3.1) are not states that apply to larger chunks of information but rather to separate concepts that reside within those chunks.

Chafe (1994: 66-68) explains that speakers usually verbalize a focus of consciousness in the format of a clause, which may assert the idea of either an event (16a) or state (16b).

- (16) a. ... *and these gals were taking pictures.*
b. .. *She has something with her gallbladder,*
(Chafe, 1994: 66)

While an event usually involves something that happens during a perceptible interval of time (an action or a change of state), a state does not usually involve a change, but a situation or property that exists for a certain (greater or lesser) period of time. In a discourse the ideas of events and states are said to be highly transient and nonrepeated, which means that they generally occupy the focus of consciousness only for a brief time. This assumption is based on the observation that there is a constant progression, in that the event or state ideas are instantly replaced by other event and state ideas and that each event and state idea is usually activated only once within a particular discourse. However, events and states typically do not happen or exist without objects, persons/individuals or abstractions. Thus, ideas of events or states contain further ideas, namely the participants in these events or states that are often referred to as (discourse) 'referents'¹⁹. In a discourse

¹⁸However, there is evidence that the information structure at the aboutness and focus dimension may have a direct influence on the truth condition of sentences (see Hinterwimmer, 2011 for a discussion on the relation between information structure and truth conditional semantics).

¹⁹Prince (1981: 235) for instances uses the term 'discourse referent' in order to refer to discourse entities. A discourse referent is defined as a discourse-model object that may represent an individual, a class of individuals, an exemplar, a substance, a concept, etc.

these referents are generally more persistent and therefore said to remain active for longer periods than the events or states in which they participate. Needless to say that there are also more transient referents that are only activated in a single event or state. Conversely, an event or state that has been verbalized earlier can be reverbalized by using a different expression or it can be converted into a referent by being nominalized. This allows ideas of events or states to persist and appear as participants in a series of other events and states (see e.g. (15)).

In the case of propositional information we have already seen that givenness can apply to whole sentences that express the idea of an event or state that was in some sense given within a discourse. On the other hand, the distinction between given and new information can be applied independently to the referents that participate in events and states (cf. Chafe, 1994: 71). Chafe's 'local view of givenness and newness' is reflected in Lambrecht's (1994: 53) notion of 'consciousness presupposition', which is a type of givenness that is said to be primarily evoked by differences in the lexical coding of the denotata of individual sentence constituents (e.g. lexical vs. pronominal coding). Similarly Allerton (1978: 151) states that givenness is commonly assumed to apply "to sentence constituents including their component lexical items and to combinations of these; but it can also apply to whole sentences, when these are embedded".

Hence, propositional information can be divided into given and new constituents. More precisely the denotata of individual sentence constituents, which are present in the minds of speakers and listeners, can be regarded as having cognitive states which might be called given or new. In other words, given and new information has to be distinguished from given and new referents (cf. Lambrecht, 1994). While the propositional information '*hearer buys X*' in (17) is given by the question, its referent *a car* is new.

(17) A: *What did you buy?*

B: *I bought a car.*

It is important to point out again that the propositional and referential information is not dealing with the information status of words (at the lexical level) but with the information status of the constant idea of states of affairs and referents that exist in the minds of speakers and listeners, whether or not they have correlates in the real world (cf. Chafe, 1976: 28).

Following Lambrecht (1994: 74) the term 'referent' applies not only to entities but also to propositions (expressing state of affairs). A proposition acquires the status of a discourse referent once it is assumed by the speaker to be known to the addressee by being added to the set of pragmatic presuppositions in the discourse register. Accordingly, a distinction

should be made between **propositional referents** and **discourse referents**.

When we talk we typically express ideas of events and states or properties in verbs and adjectives or verb phrases (VP) and adjective phrases (AP), while we typically express ideas of objects, persons and abstractions in nouns or noun phrases (NP) (cf. Chafe, 1994: 80). Thus, discourse referents are typically factored out from the events and states by being syntactically verbalized in argument categories (such as NPs, pronouns, subordinate clauses, adverbial phrases, etc.) (cf. Chafe, 1994: 67). Following Lambrecht (1994: 74), discourse referents cannot normally be expressed in phrases which serve as predicates, since predicates do not denote discourse referents, but attributes of, or relations between, arguments. However, a finite VP can play an argument role in a sentence, when it is made into a referential expression by being nominalized, as demonstrated in the following example from Lambrecht (1994: 75):

- (18) *We went to the movies yesterday.*
a. *It was a mistake.*
b. *Our going to the movies yesterday was a mistake.*
c. *Going to the movies yesterday was a mistake.*

Due to nominalization the VP can have the status of a discourse referent (18a) or be a subject expression that counts as propositional referent, as in (18b) and (18c). Like discourse referents, propositional referents that are typically expressed via various kinds of subordinate clauses (including non-finite VPs), may serve as an argument of a predicate.

The notion of givenness is commonly assumed to apply only to (propositional or discourse) referents, which is based on the idea of ‘reference’ as e.g. defined in terms of coreference (2) and anaphora (3) (see section 2.3.1). Correspondingly, Gundel (see e.g. Gundel, 2003) distinguishes between ‘referential’ and ‘relational’ givenness. While referential givenness concerns the givenness dimension of information structure, relational givenness concerns the aboutness and focus dimension of information structure. Gundel (2003: 124) defines referential givenness as follows:

Referential givenness describes a relation between a linguistic expression and a corresponding non-linguistic (conceptual) entity in (a model of) the speaker/hearer’s mind, the discourse, or some real or possible world, depending on where the referents or corresponding meanings of these linguistic expressions are assumed to reside.

However, it has to be noted that there is still no common sense of the definition and use of the notions of ‘referent’ or ‘referential expressions’ or even ‘reference’. For a discussion

of various interpretations of the notions of reference and coreference see e.g. Bach (1987) and Kronfeld & Roberts (1998).

Moreover, Chafe (1976: 28) argues that givenness applies equally well to verbs, that generally do not count as referential information, which might be due to the assumption that the activation of events and states in discourse is usually more transient (see above). As a consequence, Chafe (1994: 80-81) distinguishes more generally information that involves ideas²⁰ and can function as a domain of givenness from non-idea information that remains outside the domain of givenness. Ideas can be subcategorized into referents on the one hand and events and states on the other, while non-idea information functions as the specification of relations between ideas (e.g. conjunctions, prepositions, inflectional or quantificational modifiers, etc.) or the inflectional or quantificational modification of an idea (e.g. modals, negators, evidentials, intensifiers, articles, numerals, etc). Thus, ideas are generally associated with content words and pronouns and non-idea information is generally associated with function words.

According to Chafe (1994) we will refer to ideas that are encoded in argument categories (such as nominal expressions) as discourse referents. Moreover, we will refer to ideas that are expressed by the predicate of a sentence (excluding nominal predicate complements) and the corresponding verbal and adjectival expressions as non-referential information. The distinction between referential and non-referential information has nothing to do with the potential of being given or new information (at the level of activation), but with its potential of being identifiable, which will be demonstrated in the following section. The different (linguistic) domains that are relevant for the distribution of information status, as proposed by Chafe (1994) and Lambrecht (1994), are summarized and illustrated in figure 2.1.

Considering Chafe's (1994: 66) example (16a) from the beginning of this section the four depicted domains of givenness can be distributed over the sentence as follows:

- (19) ... *and these gals were taking pictures.*
- a. [*and these gals were taking pictures*]
propositional information
 - b. [*and these*] [*gals were taking pictures*]
non-ideas ideas
 - c. [*and*] [*these gals*] [*were taking*] [*pictures*]
referential inf. non-referential inf. referential inf.
 - d. [*and these*] [*gals*] [*were taking*] [*pictures*]
discourse referent event discourse referent

²⁰In earlier studies Chafe (1976, 1987) used the term 'concept' for this notion.

The example shall clarify in how far states of activation apply rather to separate concepts within larger chunks of information. Considering sentence (19a) as a whole (predicate and all arguments) it represents propositional information that can be an assertion or presupposition. In order to be able to distinguish the idea of an event (e.g. *taking* in (19b)) from the idea of a referent (e.g. *pictures* in (19b)) the nominal predicate complements (e.g. *pictures*) have to be excluded from the predicate as in (19c) and (19d). This distinction is necessary since both ideas can potentially be activated separately as new ideas. Moreover, this shows that the distinction between referential and non-referential information takes place at word level and not at sentence/phrase level. If we include the nominal complement, as in *were taking pictures*, the whole VP displays propositional information that counts as referential since it can be made into a propositional referent. Hence, at word level (19d) only the verbal expression *were taking* represents non-referential information while the nominal expressions *gals* and *pictures* represent referential information.

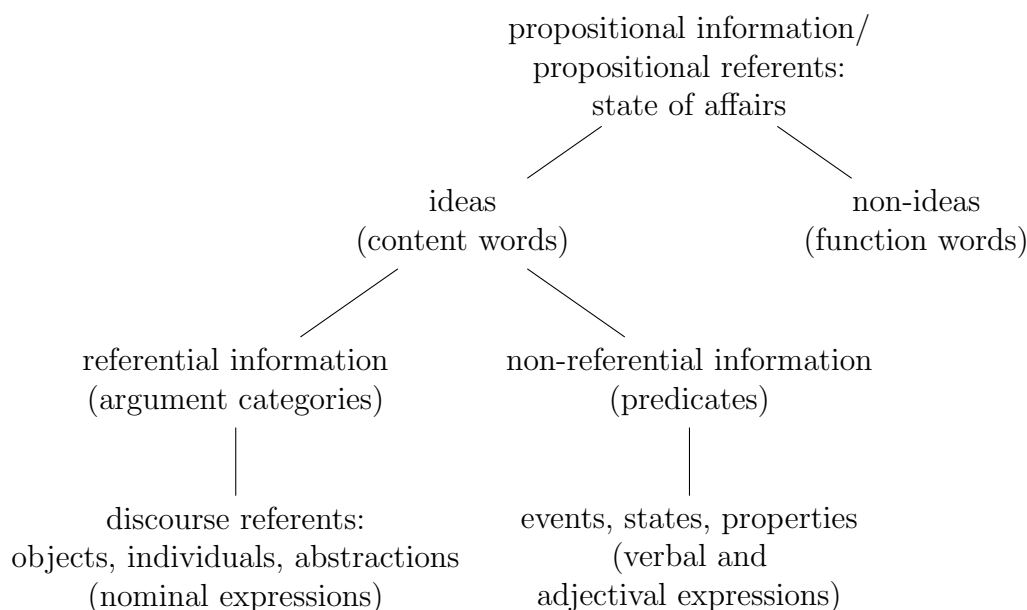


Figure 2.1: Domains of information.

Non-Referential Information

Non-referential information is commonly assumed to have no referent, which means that it is either not referential at all (e.g. non-ideas) or it does not refer to a *particular* instance or mental representation of an entity or set of entities (e.g. Chafe, 1994: 35).

In the preceding section we argued that the distinction between referential and non-referential information is not relevant to the level of activation but to the level of identifiability. Chafe (1994: 103) explains that *identifiability* depends on the existence of a shared

referent that refers to a particular instance of an entity. In the case of non-referential information, there is no such referent - thus, there is nothing to be shared. Lambrecht (1994: 111) has a similar explanation:

While it seems relatively straightforward to assume that an interlocutor may have the referent of a noun phrase [...] present in his consciousness or that he can mentally access such a referent, and [...] that an interlocutor can identify the referent of such a phrase once it has been introduced into the discourse it is not clear what gets "activated" in the hearer's mind when he hears a verb, and adjective, a preposition, or certain adverbs and what it is that can be assumed to be in his consciousness after he has heard it.

Accordingly, Chafe (1996: 43) notes that givenness at the level of identifiability is restricted to referents, or the ideas of objects, persons and abstractions, whereas givenness at the level of activation/accessibility can apply to ideas of events and states as well. Hence, the category of identifiability cannot be applied to non-referential information, but the idea of non-referential information can be 'lit up' in the hearer's mind, just as the idea of referential information can be activated in the interlocutors' minds during the speech act (cf. Lambrecht, 1994: 111; see also Chafe, 1976, 1987).

So far, we have seen that verbal and adjectival expressions denoting event and state ideas (in contrast to propositional information denoting state of affairs) are often said to be non-referential. However, there are also some non-referential NPs or pronouns. Following Chafe (1994: 103-104) and van Deemter & Kibble (2001: 631-633) this concerns the non-referential use of *it* (e.g. *It's raining.*), negatives (e.g. *no one, no solution*), universals (e.g. *everybody*), question words, quantifying NPs (e.g. *every*), event-modifying nouns (conventionalized collocation of verb and noun: e.g. *...he was telling jokes. - joke-telling*), nonspecific nouns (e.g. *I think I'll buy a newspaper.*) and predicative NPs (e.g. *She's a hypochondriac.*).

Furthermore, it has to be noted that the referential status of generic referents is somewhat ambiguous. Chafe (1994: 102-103) argues that sharing knowledge of generic referents (e.g. *An elephant/elephants will either stamp on you, ...*) is different, since they do not refer to the idea of a particular object or set of objects but to a typical instance of a category. Therefore the level of identifiability is irrelevant to generic referents, but they may appear to participate in the identifiable-nonidentifiable distinction.

We will now have a closer look at the information status of non-referential event and state ideas with regard to the level of activation/accessibility (cf. Chafe, 1994: 108-119).

A clause usually conveys some new information. Chafe argues that if a clause is composed

of a subject and a predicate that consists of a simple intransitive verb, predicate adjective, or predicate noun, the locus of new information is most likely the predicate. Thus, in those cases the most likely pattern will be a given or accessible subject and a new predicate. Chafe explains this pattern by a constraint against subjects that express referents that are heavy (**'light subject constraint'**), which implies that new information is not likely to reside in the subject of a clause.

Based on the observation that subject and predicate never both express new information, Chafe discusses what happens with predicates containing two or more content words, as e.g. in the following verb-object construction: *I broke the chisel*. He addresses the question whether it is possible that both the idea of an event (*breaking*) and the idea of a referent (*chisel*) participating in that event are activated separately as new ideas. Chafe notes that there seem to be only a few cases in which there are two or more separately activated ideas expressed within one sentence (intonation unit) as independent new ideas. Therefore he suggests that an intonation unit cannot express more than one new idea. Accordingly, Chafe formulates a second constraint that keeps an intonation unit from containing more than one new idea, wherever it might be located (**'the one new idea constraint'**). This constraint reflects the limited capacity of short-term memory and the claim that speaker and listener are not able to handle more than one new idea at a time. Similar ideas have been formulated by Givon (1975: amount of new information in 'message-transaction' is restricted to one new unit per proposition, 1984: 'one chunk (= asserted new information) per clause principle') or by Du Bois (1987) ('one new argument constraint').

In the following we will see how this constraint applies to different constructions that bring together two or more content words, providing the possibility that each content word might separately express new information.

In combinations of verb plus object, Chafe (1994: 110-111) observed three possibilities. First, if the verb is transitive and the verb and its object are independently activated ideas, only one of them will express new information. Usually such combinations contain a pronoun object expressing a given referent, while the verbs express a new or an accessible idea. Another less frequent option is that both verb and object express accessible information.

Second, there are many verb-object combinations containing a 'low-content' verb (e.g. *have, get, give, do, make, take, use*). These verbs are usually distinguishable by their weak prosody and extremely high frequency in (written) language. They are said to be subservient to the idea expressed by the object and therefore fail to carry the full load of newness (or 'activation cost', see following section).²¹ Chafe (1994: 111-113) lists the

²¹Similarly, Firbas (1966) notes that the weaker the verbal semantic content, the more effectively it performs the transitional function at the FSP level.

following verbs with regard to different functions:

Low-content verbs may ...

- convey possession of the referent expressed by the object noun:
e.g. *have (insurance)*
- convert referents into states:
e.g. *have (a backache)*
 - Such a verb also contributes a meaning of its own, but it is less informative than the meaning of verbs that contribute truly new information (e.g. *ignore his backache*).
- convert referents into events:
e.g. *get (backaches), give (me your chisel)*
- express the performance or realization of an event relating to the object:
e.g. *have (a talk), do (exercises), make (a career change), take (a long lunch)*
- express the use of whatever is conveyed by the noun:
e.g. *use (nose spray)*
- express some sort of arrangement of items in a complex configuration:
e.g. *use (get you and him together)*
- function as attribution of a direct or indirect quote to its source:
e.g. *say, go, be like*

There are other verbs that function in a similar manner, but are less frequent and contribute more content of their own.

Those verbs ...

- involve more specific changes of possession:
e.g. *borrow (dad's disk), pay (seven fifty)*
- express typical ways in which an object is used:
e.g. *drive (a car), drink (gallons of water)*
- present or introduce whatever is expressed by the object:
e.g. *suggest (Larry), call (Bob Jenkins)*
- specify how a referent was perceived:
e.g. *see (Gary), look (at Sue)*

Verbs of this sort are often subsumed under creation and/or activation verbs, appearance/existence verbs or as verbs of existence-presence, absence, beginning, continuing-remaining, production, occurrence, appearing, coming and lexical functions (see Chafe, 1994: 113 for references).

The third possibility for many verb-object combinations that Chafe mentions is their interpretation as a lexicalized phrase. Lexicalized phrases, like conventional collocations or idioms can be assumed to be already established in the speaker's repertoire (e.g. *wash dishes*). With regard to the one new idea hypothesis it is assumed that lexicalized phrases express ideas that are activated by the combination as a whole and do not activate verbs and objects independently.

The one new idea constraint is said to apply to combinations of verb plus prepositional phrase in similar ways as to combinations of verb plus object. However, since it is not unusual for a prepositional phrase to be separated from its verb, it is not unusual for both the verb and the prepositional phrase to express new information (e.g. *you lie flat, with your knees up*).

Furthermore, Chafe discusses attributive adjectives that are used either to assert that a referent has some property or to categorize a referent more adequately. However, he states that it is questionable whether there are combinations in which both the adjective and the noun express independently new information (e.g. *asthmatic bronchitis, new job*).

It has to be taken into account that Chafe's (1994) observations presented above focus on verbs with more predictable (and therefore less informative) meaning. He also mentions verbs that have a standalone meaning and therefore contribute truly new information, as e.g. in *ignore (his backache)*, but this is not further discussed. Moreover, he proposes a one new idea constraint which is based on two observations: Chafe argues that there is lack of evidence for sentences in which both subject and predicate express new information and that there are in general only few cases with more than two newly activated ideas within one sentence. This claim seems to be too strong since Chafe does not take 'all-new' sentences into account that might be uttered out of the blue. All-new sentences with semantically heavy verbs (high-content vs. low-content) are very likely to exceed Chafe's one new idea constraint which leaves room for further discussion.

The following clauses (composed of a subject and a predicate) clearly offer a potential for combining separate new ideas within a single clause but also demonstrate how the idea of non-referential information can be 'lit up' in the hearer's mind:

- (20) *What's happening on your TV show tonight?*
a. *Pavarotti is singing.*
b. *Fred Astaire is singing.*

- c. *A very famous publisher of vocal music is singing.*
- d. *Clinton is singing.*

(Kadmon, 2009: 43-44)

At first glance we would say that in all sentences the idea of *singing* as well as the idea expressed by the subject can be regarded as new information with regard to the preceding context (assuming that the *TV show* is by no means devoted to singing). This clearly violates Chafe's one new idea constraint as well as the light subject constraint. However, Kadmon (2009) notes that there are different degrees to which the idea of *singing* is recoverable in these examples. The recoverability does not depend on the preceding context but on the preceding subject of the sentence. While in (20a) *Pavarotti* is famous as a singer it is reasonable to expect that he is singing in a TV show rather than doing anything else. In this sense, the subject in (20a) represents new information and the predicate given information, which is in line with the one new idea constraint. Similarly, in (20b) *Fred Astaire* is at least as famous as a dancer as he is as a singer and is therefore not completely unlikely to sing. In this sense, the predicate might represent accessible, rather than new or given information. However, the subjects in (20c) and (20d) are least expected to sing or not even likely to sing at all, since the TV show is not devoted to singing and neither *a publisher of vocal music* nor *Clinton* are specifically known for their vocal skills. Thus, those cases would violate the one new idea constraint, since both the idea expressed by the predicate as well as the idea expressed by the subject have to be treated as separately activated new ideas.

The observations demonstrated by (20) do presumably also apply to more complex sentences, e.g. sentences containing more content words. However, the examples illustrate the complexity of the implementation of givenness and show, in particular, that if we want to reach a fuller understanding of verbs and their special relation to givenness at the activation level, further research on natural language is required.

2.3.3 Taxonomies

In the preceding sections we discussed different levels and modes of givenness (section 2.3.1) as well as their relevance for different domains of information (section 2.3.2). In the past decades a great number of taxonomies emerged that aim to capture different properties of the givenness dimension of information structure. Taxonomies of information status are commonly concerned with phenomena that are directly related to the dynamic and immediate changes in the discourse context. This means that the information status commonly reflects the lexicogrammatical links between entities in a discourse (lexical level

of givenness) and/or it reflects the cognitive status/activation of the denotata of individual discourse entities, which are present in the minds of speakers and listeners, with regard to the level of consciousness (referential level of givenness). Nevertheless, taxonomies of information status also implicitly signal the varying degrees to which a particular discourse entity may be tied to the background or shared knowledge of interlocutors in a specific discourse (identifiability). In the following we will discuss to what extent different taxonomies of information status account for the different aspects of givenness by presenting selected taxonomies that are relevant for the present thesis.

Givenness Based on Cognition

Chafe He originally proposed a binary given-new distinction that is related to the level of consciousness and is said to apply equally well to nouns (referential information) and verbs (non-referential information):

Given (or old) information is that knowledge which the speaker assumes to be in the consciousness of the addressee at the time of utterance. So-called new information is what the speaker assumes he is introducing into the addressee's consciousness by what he says. (Chafe, 1976: 30)

Chafe argues that consciousness has a very limited capacity and therefore he assumes that old ideas leave as new ideas come up. Thus, the speaker's treatment of an item as given is fundamentally a matter of his judgment about whether an entity has already left the listener's consciousness or not. However, Chafe admits that an entity might also be easily retrievable into consciousness by recoverability from the discourse context (as proposed by Halliday, 1967b), even though the addressee is no longer thinking about the entity in question. Chafe also discusses the establishment of givenness due to entailment or bridging inference (implicit previous mention). The comprehension of sentences containing entailment relations has been investigated by Haviland & Clark (1974). They found longer reaction times than for sentences containing entities that have been introduced by explicit previous mention. This means that the process of establishing an entity by inferences from another entity takes time. Chafe argues that the longer comprehension process has nothing to do with accepting or establishing the entity (as new information) into consciousness, as one might expect. Following Clark & Haviland (1977), Chafe supposes instead that the longer reaction times are due to the process of building an inferential bridge, i.e. the listener's task of finding an indirect antecedent, which has more to do with the process of identification.

Prince Her taxonomy of ‘Assumed Familiarity’ (1981) is based on Chafe’s (1976) approach. It also acts on the speaker’s assumption about the listener’s level of consciousness but also takes into account the level of knowledge. It applies only to discourse entities that are represented by NPs and denote discourse referents. Similar to Chafe (1976), Prince basically distinguishes between ‘new’ and ‘evoked’ (equal to given) information. A discourse entity is assumed to be new when a speaker first introduces it into the discourse, while an evoked entity is represented by an NP whose entity has already been established in the discourse-model. In contrast to Chafe (1976), Prince (1981) additionally differentiates an intermediate category of givenness, namely ‘inferrable’ information. A discourse entity is inferrable if the speaker assumes that the hearer can infer it (by logical or plausible reasoning) from an already evoked discourse entity or from another inferrable element. The anaphor *the driver* is for example assumed to be inferrable from the antecedent *a bus*, since it is common knowledge that buses have drivers. Furthermore, Prince argues that there are different types of new, inferrable and evoked discourse entities. The differences are briefly explained in table 2.4.²²

Prince (1981) assumes that the different types of assumed familiarity are relevant to linguistic form and found evidence for a preferred hierarchy or scale of familiarity that confirms this assumption. Based on this observation, she proposes a ‘Familiarity Scale’ (21) that ranks the categories of assumed familiarity according to their degree of givenness (from most familiar (left) to least familiar (right), indicated by >).

(21) **Familiarity Scale** (Prince, 1981:245):

Textually/Situationally Evoked > Unused > Inferrable > Containing Inferrable >
Brand-new Anchored > Brand-new

Note that the use of the scale must be relative to the speaker’s hypothesis about the hearer’s belief-set and cannot be construed as a statement about the relative probability of a particular type of NP occurring. (Prince, 1981:245)

According to this definition, unused entities are ranked on the more familiar side of the scale, since a corresponding entity already exists in the hearer’s model which only has to be copied into the discourse-model (shared knowledge). Hence the presence of an unused entity can be suddenly taken for granted, even though it is firstly introduced in the discourse (cf. Prince, 1981:235).

²²Prince reorganizes the taxonomy of assumed familiarity in Prince (1992) under the notion of ‘coding for information-status’. She retains the intermediate category of inferrables, but determines given and new information with regard to two different but related dimensions, namely from the point of view of the hearer (‘Hearer-old’/‘Hearer-new’) and from the point of view of the discourse model (‘Discourse-old’/‘Discourse-new’). In doing so she tries to fit some of the categories from the previous proposal into the new model.

New	
Brand-new: (Unanchored) vs. Anchored	Hearer has to create a new entity (e.g. <i>A person bought a Toyota.</i>) Hearer may anchor or link a brand-new NP to some other discourse entity that is properly contained within it (e.g. <i>a guy I worked with</i> is linked to the discourse entity representing the speaker by the containing NP <i>I</i>)
Unused	Hearer is assumed to have a corresponding entity in his/her own model (shared knowledge; e.g. <i>Noam Chomsky/Ellen bought a Toyota.</i>)
Inferrable	
(Noncontaining) Inferrable	Hearer can infer an entity from an already evoked discourse entity or from another inferrable (e.g. <i>I got on a bus yesterday and the driver was drunk.</i>)
Containing Inferrable	The inferrable NP itself contains the element from which the inference is drawn (e.g. <i>one of these eggs</i> is inferrable from the containing NP <i>these eggs</i>)
Evoked	
(Textually) Evoked	Hearer had evoked an entity earlier on textual grounds, i.e. the entity has already been introduced by the speaker as new or inferrable in the preceding text (e.g. <i>A colleague says he knows your sister.</i>)
Situationally Evoked	Hearer evokes an entity all by himself, for situational reasons, i.e. from salient participants/features from the extratextual context (e.g. <i>A friend of yours bought a Toyota.</i>)

Table 2.4: Overview of Prince's (1981:235-237) taxonomy of assumed familiarity. (Examples adapted from Prince (1981:233, 245-246)).

The taxonomy of assumed familiarity and the familiarity scale give the impression that we are dealing with a continuum or at least a ternary distinction of givenness. However, due to the lack of evidence Prince (1981:252) denies the possibility of assumed familiarity being a continuum, but also questions whether a binary or a ternary division is more appropriate. She argues that the status of inferrables is somewhat ambiguous. On the one hand they can be classified along with new entities, since they are not previously in the discourse model, on the other hand inferrables can be classified along with evoked entities, since they are made up of old parts. This discussion is reminiscent of Chafe's (1976) treatment of entailment relations (see above). He argues that an entailed entity can be classified as identifiable information, but he did not make a decision about whether it should/can be treated as new or given information.

Chafe and Lambrecht In a later study Chafe (1987) also introduces a third type of information, namely ‘accessible’ information, which is similar to Prince’s (1981) inferrables and in a sense intermediate between given and new information. Furthermore, Chafe defines the three types of givenness with regard to specific cognitive aspects (see also Chafe, 1994, 1996). According to Chafe (1987, 1994: 53) our minds contain large amounts of knowledge or information (long-term memory), but only a very small/limited amount of this information can be ‘active’ or focused on at any time (short-term memory). The active portion of our knowledge is said to be in our focal consciousness, which is ‘surrounded’ by the peripheral consciousness. This implies that the information stored in our long-term knowledge may lie dormant, but can be ‘activated’ or brought into focal or peripheral consciousness at any given time. The fact that our short-term memory/consciousness can only focus on a limited amount of information severely limits the capacity to activate information. Hence, the consciousness is in constant motion, shifting from one focus or activation state to the next. Chafe argues that there is evidence that a particular idea, at a particular time, may be in any of the three different cognitive activation states, namely the focal, peripheral, or unconscious state. These activation states are assumed to be crucial in understanding the distinction between different types of information status. Therefore, Chafe (1987) introduces the alternative (and more appropriate) labels ‘active’, ‘semi-active’ and ‘inactive’ in order to refer to given, accessible and new information, respectively. He defines the three cognitive activation states as follows:

An active concept is one that is currently lit up, a concept in a person’s focus of consciousness. A semi-active concept is one that is in a person’s peripheral consciousness, a concept of which a person has a background awareness, but which is not being directly focused on. An inactive concept is one that is currently in a person’s long-term memory, neither focally nor peripherally active.” (Chafe, 1987: 25)

This definition may raise the question as to how far an entity’s cognitive activation status is related to the distinction between given, accessible and new information. Chafe (1994: 71-75) explains that it is not important whether the speaker assumes that an idea is already known (given) or previously unknown (new) to the listener. On the basis of the three activation states it is more accurate to say that it is important for a speaker to assume an idea is already active (in a person’s focal consciousness) or inactive at a particular point in the conversation. It has already been mentioned that an idea does not remain in the active state very long. As a consequence, an active idea whose activation is not refreshed becomes deactivated. However, an idea that was in focal consciousness a few moments before, but has in the meantime receded from the fully active state, does not

become immediately fully inactive - it becomes a semi-active idea that resides in the peripheral consciousness (cf. Chafe, 1996: 40). Thus, if a speaker assumes that an idea is semi-active in the listener's consciousness at a particular point in the conversation, this idea can be said to be accessible. Following Chafe (1987, 1994, 1996) and Lambrecht (1994) the accessibility (semi-activeness) of a discourse entity can be ascribed to three factors: First, an idea becomes deactivated from an earlier active state in the discourse. Second, an idea is accessible by inference from or association with some other active or semi-active element in the discourse that belongs to the same cognitive schema or frame. Third, accessibility is due to salient presence in the text-external world. Accordingly, Lambrecht (1994: 100) differentiates between 'textually', 'inferentially' and 'situationally' accessible discourse entities, respectively. While textual and situational accessibility are said to correspond to the text-internal and text-external discourse world, he argues that inferential accessibility is neutral with respect to this distinction. However, according to Chafe (1996) the category of inferentially accessible discourse entities is restricted to a particular kind of inference, as we have already seen in section 2.3.1. He argues that accessibility requires a more essential or direct and immediate kind of association. Laxer and less essential associations are said to be involved only in the establishment of an entity's identifiability, which also means that in those cases the entity in question would be treated as being inactive in the listener's consciousness. Entailment relations seem to be such non-essential associations, since an entailed or subordinate anaphor is not assumed to be automatically implied by its superordinate antecedent, as the discussion in section 2.3.1 has already shown. However, the precise nature and limits of these different kinds of association are still unclear and require further investigation.

To sum up, Chafe (1987, 1994, 1996) and Lambrecht (1994) (similar to Prince, 1981) suggest a ternary distinction into given, accessible and new information in preference to a simple binary given-new distinction. Chafe (1994: 55-56) argues that at least three activation states are necessary to explain what we find in language, but he also allows for the possibility that there may well be more than three activation states. He assumes that the boundaries between activation states are in general less categorical than the given-accessible-new division suggests. Thus, Chafe understands cognitive activation to be a continuum, which implies that information status corresponds to three steps on a potentially continuous scale of cognitive activation. Lambrecht (1994: 100) supports Chafe's idea from a psychological point of view. He argues that there is no theoretical upper limit to the number of kinds of cognitive states which mental representations may have, but adds for consideration that it may be that their effect on language is rather categorical.

Lambrecht His notion of information status (1994) has already been shown to be based on Chafe’s (1974, 1976, 1987) and Prince’s (1981) approaches. A modified version of his summary of the various terms of identifiability and activation categories used in these systems is displayed in figure 2.2.

It has to be noted that the position of the label ‘unused’ in the depicted tree does not seem to reflect its position in Prince’s (1981) familiarity scale (21). This is due to the fact that Lambrecht’s model has two dimensions and distinguishes between the level of knowledge (identifiability) and the level of consciousness (activation). Prince’s one-dimensional interpretation of familiarity is related rather to the speaker’s hypothesis about the hearer’s belief-set (knowledge). Accordingly, an unused entity is familiar because it is shared knowledge. Lambrecht accounts for this familiarity by arguing that an unused item implies that it is already stored in the addressee’s mind (indicated by being identifiable), rather than calling it inactive (cf. Lambrecht, 1994: 107).

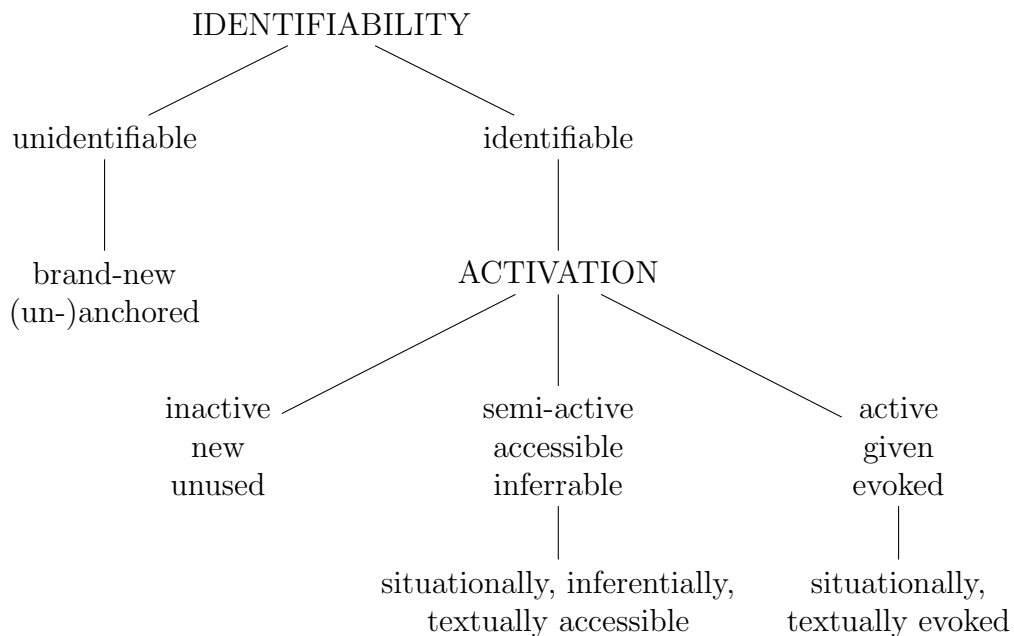


Figure 2.2: Summary of various terms of identifiability and activation categories used in the systems of Lambrecht (1994), Chafe (1974, 1976, 1987) and Prince (1981) (adapted from Lambrecht, 1994: 109).

Chafe’s Activation Cost Model The preceding discussion may lead to the impression that the notion of ‘activation states’ primarily concerns the activation of an idea for the listener. This is clearly not the case, though. Therefore, it has to be emphasized again that the notion of givenness in terms of cognitive activation primarily depends on the speaker’s beliefs about the activation states in the minds of other people. According to

Chafe (1994: 54) it is crucial for language to perform its communicative function so that speakers do not only account for the changing activation states of information in their own mind, but attempt to consider parallel changes in activation in the minds of their listeners. Chafe's (1994: 71-75) notion of '**activation costs**' explains the relevance of the speaker's anticipation and understanding of the activation process in the listener's mind for the interpretation of information status and the process of communication. Figure 2.3 demonstrates that at a certain time (t_1) a particular idea is assumed to be active, semi-active or inactive in the listener's consciousness. At a later time (t_2) this idea, whatever its earlier state may have been, is assumed to be active, since it has been activated by the speaker at the moment of utterance. In order to transfer an idea in the listener's mind from a previous state into an active state, the speaker has to invest some activation costs. Thus, based on the assumption about the activation state of an idea in the listener's mind, the speaker expresses an idea as given, accessible or new information: If an idea was already active, it is given information, if it was semi-active, it is accessible information and if it was inactive, it is new information. However, the activation costs differ with regard to the assumed level of information status. Given information is said to be least costly because it was already active. Accessible information is somewhat more costly, and new information is the most costly of all, since it involves presumably more mental effort to convert an inactive idea that might have been stored in long-term memory, or might never before have entered consciousness, into an active state. The correlation between the given-accessible-new distinction and activation costs also shows that newness more precisely means to be newly activated at the moment of utterance, and that accessibility means to be transferred by the speaker from a semi-active into an active state.

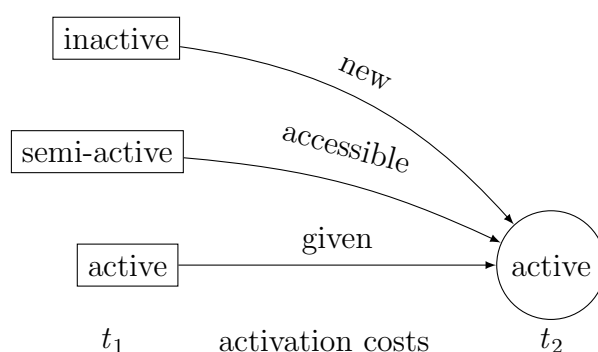


Figure 2.3: Activation states, activation costs and time (adapted from Chafe, 1994: 73).

Psycholinguistic experiments by Haviland & Clark (1974) and Clark & Haviland (1977) provide indirect evidence for Chafe's activation cost model. They measured the time it took subjects to comprehend sentences in a reading task with pairs of antecedents and anaphors in different contexts (end-of-sentence measures) and showed that accessible

entities, i.e. those entities whose comprehension requires an inferential bridge, take longer to process than given ones.²³

Givenness Based on Linguistic Form

Further taxonomies that account for three or more (cognitive) information statuses are, for instance, proposed by Allerton (1978), Ariel (1988) or Gundel, Hedberg & Zacharski (1993). In these approaches the notion of givenness is closely linked to linguistic form since it is assumed to be highly relevant for the distribution and interpretation of different forms of linguistic expression.

Allerton (1978:146-147) starts by generally distinguishing whether the speaker has the assumption that the addressee knows a particular referent or not. While ‘unknown’ (new) referents are supposed to be marked by an indefinite phrase, ‘known’ referents are supposed to be marked by a definite phrase. Allerton further distinguishes whether or not known referents are in the addressee’s medium-term memory, a fact related to the recency of their previous mention. ‘Offstage’ referents are not in the medium-term memory since they have not been mentioned or made obvious in the fairly recent past. Consequently, those referents are termed ‘semi-new’ information. ‘Onstage’ referents are in the medium-term memory due to recent previous mention. If the previous mention is non-immediate (reference in less immediate past) the referent is termed ‘semi-given’ information. If the previous mention is immediate (reference in absolutely immediate past) the referent is termed ‘given’ information. With regard to the formal expression of given constituents Allerton (1978: 149) in addition distinguishes between different kinds of givenness: ‘constituent-givenness’ (syntactically expressed) including ‘proform-givenness’ (pronominalization) and ‘definite-givenness’ (definiteness) as well as ‘news value-givenness’ (phonologically expressed by intonation nucleus placement).

The approaches by Ariel (1988) and Gundel, Hedberg & Zacharski (1993) similarly define givenness as a proper linguistic term that accounts for the distribution and interpretation of linguistic form (in particular of referring/referential expressions). They both propose a scale of givenness categories that is defined according to the way language (or English) codes it. The scales have similarities to Prince’s (1981) familiarity scale, however Ariel and Gundel, Hedberg & Zacharski argue that Prince’s categories are not linguistic categories. They claim it is not clear how the relationship between linguistic forms and discourse conditions should be defined under the types of assumed familiarity since Prince does not

²³More recently, the activation cost model has received further support from neurolinguistic experiments analysing event-related brain potentials (ERPs) during reading comprehension tasks on German (see Burkhardt, 2006, 2007; Burkhardt & Roehm, 2007).

attempt to characterize their linguistic forms.

Ariel (1988: 68) presents an approach of accessibility that is based on the assumption that “natural language primarily provide speakers with means to code the accessibility of the referent to the addressee”. Accessibility is said to be determined by three context types that are hierarchically ordered as to the degree to which a discourse referent is accessible to the addressee: general knowledge, physical surrounding and previous linguistic material. Ariel basically distinguishes between low, mid and high accessibility markers. Information that is uttered on the basis of general knowledge is not automatically accessible and is therefore treated as a low accessibility marker that is supposed to be stored in long-term memory. Information that is based on its physical surroundings is assumed to be mentally represented with a higher degree of accessibility (mid accessibility marker). Finally, recent linguistic material is the most accessible source of information that is supposed to reside in short-term memory (high accessibility marker). However, the three types of accessibility are only a simplification of a more complex system of various statuses of accessibility of mental representations. Accordingly, finer distinctions of degrees of accessibility are made within each category. The full scale of accessibility markers is then represented in an ‘Accessibility Hierarchy’ (see also section 2.3.4).

Gundel, Hedberg & Zacharski’s (1993) taxonomy resembles Prince’s (1981) taxonomy of assumed familiarity. They account for the cognitive state of a referent in the addressee’s mind as well as the means by which a referent acquires a particular status. Gundel, Hedberg & Zacharski propose that there are six related cognitive states (memory and attention states) that are relevant for explicating the use of referential expressions (see also Gundel, 2003). These cognitive states are organized in a ‘Givenness Hierachy’ (22) so that each status entails all lower statuses (statuses to the right/bottom, indicated by >), but not vice versa. “The statuses are thus ordered from most restrictive (in focus) to least restrictive (type identifiable), with respect to the set of possible referents they include” (1993: 276).

(22) **Givenness Hierarchy** (Gundel, Hedberg & Zacharski, 1993: 275):

in focus > activated > familiar > uniquely identifiable > referential > type identifiable

in focus:	referent is not only in short-term memory, but is also at the current center of attention
activated:	referent is represented in current short-term memory retrieved from long-term memory, or arising from the immediate linguistic or extralinguistic context
familiar:	addressee is able to uniquely identify the intended referent because he already has a representation of it

	in memory (in long-term memory, or in short-term memory if it has recently been mentioned or perceived)
uniquely identifiable:	addressee can identify the speaker's intended referent on the basis of the nominal alone
referential:	speaker intends to refer to a particular object or objects: addressee must retrieve an existing representation of it or construct a new one by the time of utterance
type identifiable:	addressee is able to access a representation of the type of object described by the expression

Givenness in Contemporary Annotation Schemes

In recent decades several schemes for the annotation of information status have been developed that are based on the previously presented taxonomies. Accordingly, the definition of information status categories is based on a combination of cognitive factors as well as factors that are related to the linguistic form.

A number of annotation tools have been developed that do not deal with information status categories in the classical sense, but rather account for the annotation of different semantic levels and functions of NPs or focus on the annotation of coreference or anaphora resolutions (for a discussion see e.g. Poesio, 2004). These annotation systems generally aim to provide a basis for the analysis of the realization and interpretation of discourse. Some annotation tools in particular are developed from a computational point of view with the aim of using linguistically annotated corpora as a resource for software development. However, as Eckert & Strube (2000: 51) point out, work on anaphora has concentrated primarily on the analysis of pronouns and definite NPs that involve NP antecedents, since this is considered to be the 'normal' type of anaphoric reference. In their corpus study they found that anaphoric reference also occurs with sentential and VP-antecedents (see also Webber, 1991 and Asher, 1993 for a discussion). Accordingly, Eckert & Strube distinguish between 'individual anaphora' and 'discourse-deictic' reference, respectively. Discourse-deictic reference usually involves cases in which a pronoun or a deictic expression (e.g. *it*, *this*, etc.) refers to a previously expressed event, concept, state, fact or proposition as demonstrated by the following examples given in Eckert & Strube (2000: 56-57):

- (23) a. **Event:** *John kicked Sam on Monday and it hurt.*
- b. **State:** *John didn't know the answer to the problem. This lasted until the teacher did the solution on the board.*

More recent taxonomies of information status profit from such semantic and discourse annotation systems (e.g. Nissim et al. 2004; Götze et al., 2007; Baumann & Riester, 2012). Proceeding from a ternary taxonomy as proposed by Prince (1981, 1992), Chafe (1987, 1994) and Lambrecht (1994) they are able to capture fine-grained differences in an entity’s information status (e.g. different types of accessible information).

The annotation schemes proposed by Nissim et al. (2004) and Götze et al. (2007) are very similar and use a basic three-way distinction that allows for finer-grained categories as subtypes of the main classes. An overview of their terminologies used is given in table 2.5. For a comparison with Prince’s (1981, 1992) taxonomies see Riester (2008).

Nissim et al. (2004)	Götze et al. (2007)
new: = entity has not yet been introduced in the discourse and cannot be inferred from previously mentioned entities	
mediated: general, bound, part, situation, event, set, poss, func_value, aggregation = entity has not been directly introduced in the discourse, but is inferable from previously mentioned entities, or generally known to the hearer	accessible (acc-): general, inferable, situative, aggregation
old: identity, event, general, generic, ident_generic, relative = entity has been previously mentioned (within the last/current sentence or before the last sentence)	given (giv-): active, inactive

Table 2.5: Overview of terminologies used in annotation schemes for information status proposed by Nissim et al. (2004) and Götze et al. (2007).

Götze et al. argue that their annotation system is designed for the annotation of discourse referents that are referred to by referential expressions. With the term ‘discourse referent’ they mean all entities that can be picked up by anaphoric expressions, i.e. individuals, places, times, propositions and even events and situations. However, they tend to concentrate on the annotation of information status of NPs. Verbs or VPs are usually not considered as markables, i.e they are usually not assigned an information status themselves. Nevertheless, Nissim et al.’s system, which is developed for the annotation of information status of all NP types, at least accounts to some extent more elaborately for verbs and VPs as a possible source of a referent’s accessibility. Thus, the subtype ‘old/event’ applies whenever the antecedent is a VP rather than an NP, as demonstrated in (23). Moreover, the subtype ‘mediated/event’ is applied whenever an entity is related to

a previously mentioned VP. In (24) the NP *the bus* could be linked back to the previously mentioned VP *travelling around Yucatan*.

(24) *We were travelling around Youcatan, and the bus was really full.*

(Nissim et al. 2004: 1024)

Baumann & Riester (2012, 2013) further develop the annotation systems proposed by Nissim et al. (2004) and Götze et al. (2007), but diverge from a classical three-way division of givenness in order to avoid underspecification (see table 2.6).

Referential level (indicated by r-)	
r-new	indefinite non-unique discourse-new entity
r-unused	globally unique discourse-new (non-anaphoric) entity which is generally known (-known) or identifiable from its own linguistic description (-unknown)
r-bridging	non-coreferring anaphor dependent on previously introduced scenario
r-given	coreferring anaphor that is immediately present (or -displaced) in previous discourse context or contained in the text-external context (-sit)
Lexical level (indicated by l-)	
l-new	markable is not related to another expression within the last five intonation phrases or clauses
l-accessible	markable has an identical word stem (-stem) or is a hyponym (-sub) or meronym (-part) of a previous expression
l-given	markable is a repetition (-same), synonym (-syn), hypernym (-super) or holonym (-whole) of a previous expression

Table 2.6: Simplified overview of annotation tags of the *RefLex* annotation scheme proposed by Baumann & Riester (2012, 2013).

Baumann & Riester criticize that none of the annotation schemes that emerged in recent decades have proven detailed enough to capture and distinguish the sorts of informational distinctions which are necessary to explain even the most elementary linguistic (in particular intonational) patterns. They argue that, for an adequate analysis of an entity's information status in spoken language, two levels of givenness have to be investigated: a referential and a lexical level. Accordingly, they developed a new, two-layered type of annotation system for information status of referring (and non-referring) expressions (called *RefLex*), which also distinguishes intermediate classes of givenness/novelty. Referential information status is assigned at the level of DP and PP, whereas lexical information status applies at the word level or modified NP level. Table 2.6 presents an overview of the

scheme, divided into a referential and a lexical level. The overview is a simplification (cf. Baumann & Riester, 2013) of a more comprehensive account. Consult Baumann & Riester (2012) for the entire scheme and Riester & Baumann (2017) for detailed annotation guidelines.

The previous discussion has shown that the dimension of givenness is far more than just a simple given vs. new dichotomy. However, there is still much debate about the number and modes of so-called accessible information that are located between the poles of givenness and newness. Furthermore it has been demonstrated that verbs in the notion of givenness are clearly underrepresented.

2.3.4 Linguistic Form

The different approaches to information structure and information status generally differ in the way they examine the relationship between information status and linguistic form. On the one hand linguistic form is described in terms of information status and on the other hand information status is described in terms of linguistic form (cf. Lambrecht, 1994: 107). We subscribe to the former perspective. Accordingly, information status has so far been discussed mostly independent of its relation to linguistic form in order to avoid a circular argumentation. This section is devoted to the linguistic expression of information status. The interplay with other dimensions of information structure will be discussed in chapter 3, section 3.4.

Following Lambrecht (1994: 6), information structure is commonly known to be manifested in the form of syntactic constituents and their position and ordering in the sentence, in the form of complex grammatical constructions, in certain choices between related lexical items, in special grammatical markers as well as in prosodic aspects. While some approaches provide rather global correlates between information status and grammatical and phonological form (cf. Chafe, 1994 and Lambrecht, 1994) other approaches provide very complex accounts of the morphosyntactic marking of givenness or accessibility.

In many languages, an important grammatical correlate of identifiability is the formal representation of definiteness. This means that the distinction between identifiability and unidentifiability is commonly expressed by a formal distinction between definite and indefinite noun phrases (see above, e.g. Allerton, 1978 and Baumann & Riester, 2012, 2013). However, this is not a one-to-one correlation, not even in West Germanic languages. In particular the correlation between unidentifiability and formal indefiniteness is strong, but not absolute.

The investigation of the influence of information structure on grammatical or lexical form has a long tradition, e.g. Prince (1981), Ariel (1990), Prince (1992), Gundel, Hedberg & Zacharski (1993), Birner & Ward (1998), Wasow (2002). We have already mentioned that some of these approaches organize differences in lexical form hierarchically according to their level or degree of familiarity/accessibility (e.g. Assumed Familiarity Scale (21), Accessibility Hierarchy or Givenness Hierarchy (see below)).

The way in which Gundel, Hedberg & Zacharski (1993) relate the notion of givenness to the form of referring expressions (in English) is shown in (25). The assumed cognitive status (see (22) for further explanations) is given in parentheses next to the formal expression. Gundel, Hedberg & Zacharski propose that by the use of a particular form (i.e. some determiners and pronouns) the speaker signals his assumption about the associated cognitive status and therefore constrains possible interpretation. This means that the speaker signals whether he assumes that the addressee has the intended referent in mind or not (see also Gundel, 2003).

(25) **Givenness Hierarchy** (Gundel, Hedberg & Zacharski, 1993:275):

it (in focus) > *this/that/this* N (activated) > *that* N (familiar) > *the* N (uniquely identifiable) > indefinite *this* N (referential) > *a* N (type identifiable)

Ariel's (1990) 'Accessibility Theory' is even more complex and aims to account for the selection and interpretation of definite referring expressions. The theory is based on the assumption that speakers refer to discourse entities at all activation levels and therefore claims that each referring expression is specific to a particular degree of mental accessibility (ranging from very low through various intermediate to high degrees). Accordingly, the accessibility markers (= referring expressions) can be graded on a scale of accessibility marking, starting with low-accessibility markers and ending with high-accessibility markers (indicated by <), as has been proposed in Ariel (1990):

(26) **Accessibility Marking Scale/Hierarchy:**

full name + modifier < full name < long definite description < short definite description < last name < first name < distal demonstrative + modifier < proximate demonstrative + modifier < distal demonstrative + NP < proximate demonstrative + NP < distal demonstrative (-NP) < proximate demonstrative (-NP) < stressed pronouns + gesture < stressed pronoun < unstressed pronoun < cliticized pronoun < verbal person agreement marker < zero

Ariel's accessibility hierarchy is claimed to be universal, even though not all languages have exactly the same set of referring expressions. Furthermore, all referring expressions

are predicted to indicate the same relative, though not absolute, degrees of accessibility (cf. Ariel, 2006).

From this complex account we turn to global correlates between information status and grammatical and phonological form. An identifiable entity is necessarily in one of the three activation states (active, semi-active, inactive). The givenness and accessibility hierarchies presented above demonstrate that cognitive activation states have a variety of formal correlates. Besides a definite vs. indefinite marking, their most important formal correlates are pronominal vs. lexical coding and presence and absence of accent (cf. Lambrecht, 1994: 107).

Following Chafe (1994: 75-76), given information is typically realized in a more attenuated way, i.e. in the form of a ‘weakly accented’ pronoun, while new information is usually expressed with an accented full noun or NP. With regard to accessible information he notes that it tends to be expressed in more or less the same way as new information. Similarly, Lambrecht (1994: 105-108) argues that given information may be coded as an unaccented or accented, pronominal or lexical, definite or indefinite expression, but that pronominal coding and absence of pitch prominence are sufficient for an entity to be interpreted as given. New information (identifiable or unidentifiable) is assumed to be necessarily relatively prominent, i.e. it is prosodically marked by an accent and is typically coded as an (in-)definite lexical noun phrase. In contrast to Chafe (1994), Lambrecht states that accessible information has no direct phonological or morphological correlates and may be coded either like given or new information. However, Lambrecht (1994: 108) comes to the conclusion that givenness is the only state which can be unambiguously expressed by grammatical means (at least in English):

In sum, the only one-to-one correlation between a formal category and a cognitive state is the one between lack of prosodic prominence and/or pronominal coding and activeness.

However, with regard to lack of prosodic prominence, it has to be distinguished between ‘deaccented’ and ‘unaccented’ entities. *Deaccentuation* indicates the absence of a pitch accent on a word that is expected to be accented in an analogous unmarked ‘all-new’ utterance (cf. Ladd, 1980). This does not account for words that are generally expected to be unaccented, e.g. pronouns. Hence, Rochemont (2016: 43) suggests that it is rather the possibility for deaccenting a discourse entity that is conditioned by its information status (or rather givenness). He explains this phenomenon by reference to the following example (Rochemont, 2016: 41; adapted from Haviland & Clark, 1974 and discussed in Chafe, 1976: 41):

- (27) *John and Mary went to the beach.*
- a. *They brought some picnic supplies, but they didn't drink the beer because it was warm.*
 - b. *They bought some beer, but they didn't drink the beer because it was warm.*

Rochemont argues that the (definite) use of the noun *beer* in (27a) is licensed by its identifiability and accessibility due to bridging inference from the previously introduced picnic supplies, while the (definite) use of the second instance of the noun *beer* in (27b) is licensed by its explicit previous mention. However, the mention of *beer* in (27a) is said to be intonationally prominent (pitch accented), while the second mention of *beer* in (27b) is said to be deaccented. Despite the definiteness and familiarity/accessibility of a uniquely identified referent as in (27a), deaccentuation does not seem to be possible. Hence, Rochemont concludes that the deaccenting of an expression requires full activation by a (situationally) salient antecedent.

Allerton (1978: 146-148) formulated yet another principle effect of givenness on phonological form that deals not with the presence or absence of accent but with the placement of the last pitch accent in a sentence (nucleus accent placement). He distinguishes between a non-nuclear and a nuclear intonation status and explains that given elements are weakened to non-nuclear intonation status. This means that the nuclear/last accent in a sentence usually falls on new, semi-new and semi-given elements but not on given ones.

In the following chapter we will see that the relation between information status and prosody is far more complex and that, furthermore, different types of more or less activated information demand different accent types as linguistic markers: The less given or active an item is, the higher the speaker's activation costs, which in turn leads to the production of a higher prosodic prominence.

Chapter 3

Intonation

3.1 Basic Features and Functions of Prosody

In spoken language, the linguistic units or elements (e.g. syllables, words, sentences) that constitute utterances are made up of different patterns of successive speech sounds. Those sound patterns are generally assumed to be simultaneously composed of a ‘segmental’ (textual) component and a ‘suprasegmental’ component of speech production. The segmental component accounts for the phonetic properties that form the individual speech sounds or segments (vowels and consonants) while the suprasegmental component accounts for vocal properties that are associated with larger units of speech sounds, i.e. sequences of segments (e.g. Lehiste, 1976). The different phenomena that are related to the suprasegmental component of speech are commonly subsumed under the notion of ‘prosody’ (e.g. Crystal, 1969: 3):

By prosodic systems I am referring to sets of mutually defining phonological features which have an essentially variable relationship to the segmental/verbal items of an utterance as opposed to those features (e.g. the vowels, consonants, syllabic structure, or lexical meaning) which have a direct and identifying relationship [...]. (Crystal, 1970: 78)

The prosodic system of a language usually concerns phenomena such as the division of speech into chunks (phrasing, including pauses), pitch movements/directions and range (= ‘speech melody’, ‘tune’ or ‘intonation’), highlighting (stress) at word level (lexical stress) and utterance level (postlexical stress, accentuation), the marking of prominence relations (rhythm) and variations in speech rate (tempo) (see e.g. Crystal, 1969, 1970; ‘t Hart, Collier & Cohen, 1990; von Heusinger, 1999; Grice & Baumann, 2007; Ladd, 2008).

All of these prosodic phenomena are phonetically implemented in terms of (a combination of) pitch, timing (the relative length of units of speech sounds), loudness, vowel quality, voice quality and silence (e.g. Crystal, 1970: 78).

A central feature of the prosodic component of a language is denoted by the term ‘intonation’. Intonation has been phonetically defined in at least two different ways in the literature. The term has previously been mentioned as being equivalent to the manifestation of melody in speech. In this very narrow and restricted sense it refers exclusively to the modulation of pitch over larger units of speech sounds, e.g. over the domain of the utterance (cf. Nolan, 2006; ‘t Hart, Collier & Cohen, 1990: 10). Jones (1922: 135) already defined intonation very similarly as:

[...] the variations which take place in the pitch of the voice in connected speech, i.e. the variations in the pitch of the musical note produced by vibration of the vocal cords.

While intonation in a narrow sense is treated as an isolated system of pitch contours and levels, intonation in a broader sense is treated as a complex of different phonetic features that in particular concerns the patterning of pitch in relation to timing and loudness (cf. Crystal, 1969: 78 and Nolan, 2006).

Moreover, Nolan (2006) explains that the interaction between intonation (in the broad sense) and stress (highlighting function) is particularly close in many languages (see also Jones, 1950 and Kingdon, 1958). Ladd (2008)’s definition of intonation also includes a functional component that refers to the assumption that intonation only applies to sentences, phrases or utterances as a whole. Accordingly, Ladd (2008: 4) proposes the following (phonological) definition of intonation with regard to its postlexical function:

Intonation [...] refers to the use of *suprasegmental* phonetic features to convey ‘postlexical’ or sentence-level pragmatic meanings in a linguistically structured way.

Grice & Baumann (2007) also suggest that intonation (at least in intonation languages; see below) performs two main communicative tasks, namely phrasing and highlighting. Thus, some linguists cover not only pitch movements and range under the notion of intonation, but also other prosodic phenomena (see above). As a consequence, in a broader account (which will be adopted for the present thesis) the term ‘intonation’ is often used as an equivalent to the more general notion of ‘prosody’.

Prosodic phenomena of an utterance are commonly known to provide additional communicatively relevant meaning that complements the literal meaning contained in the lexical

and syntactic make-up of an utterance (cf. 't Hart, Collier & Cohen, 1990). The resulting phonological structure of an utterance may reflect various features of the utterance or the speaker (see e.g. Heusinger, 1999; Grice, 2006; Nolan, 2006; Grice & Baumann, 2007 for an overview). Accordingly, it is generally distinguished between linguistic and paralinguistic functions (or linguistic and extralinguistic meaning, respectively) of prosody.

Linguistic functions involve for instance the marking/expression of speech acts (e.g. request vs. command), sentence modality (e.g. statement vs. question), units of meaning/phrasing (i.e. disambiguation between different syntactic structures), discourse regulations (i.e. regulation of turn-taking in conversation), information structure (in particular focus and givenness, see section 3.4) and implicature (e.g. irony, sarcasm, emphasis).

Paralinguistic functions may involve the intended or unintended expression of the emotional or emphatic state of a speaker (e.g. excitement, depression, tiredness) or the speaker's attitude (e.g. friendliness, enthusiasm, hostility).

In addition to the expression of linguistic and extralinguistic meaning, prosody encodes a variety of a speaker's social aspects (e.g. age, gender, profession, dialect, etc.). Furthermore, intonation is said to imply an iconic use of pitch variation (i.e. metaphorical associations of up and down) that helps to convey (extra-)linguistic meaning.¹

Both linguistic and paralinguistic functions interact with intonational features. It is a widespread assumption that linguistic aspects are primarily expressed in categorical distinctions and relations (e.g. high vs. low pitch at boundaries of intonation units), while paralinguistic aspects are primarily expressed by continuously variable (pitch) parameters (e.g. steepness of pitch movement, or tempo and loudness) that signal continuously variable states of the speaker (e.g. Heusinger, 1999 and Ladd, 2008). However, it has to be pointed out that this is by no means an absolute relationship, but rather a general tendency (cf. Grice & Baumann, 2007).

Nevertheless, non-categorical or gradient paralinguistic features are often said to share more commonalities across languages. Gussenhoven (2002a), building on earlier work by Ohala (e.g. 1983, 1984), explains the nature of the 'universal' paralinguistic meanings in terms of three biological codes that are based on physical and physiological properties of the process of speech production: the 'Frequency Code', the 'Effort Code', and the 'Production Code'. Each code determines affective and/or informational meanings. It is argued that "speech communities will vary in the extent to which they employ those meanings [...]" (Gussenhoven, 2002a: 47), but that speech communities will not change their natural form-function relations. However, it is also noted that grammaticalized meanings may result in form-meaning relations contradicting the universal biological codes. This

¹A typical example for the iconic use of pitch is that "higher pitch is typically associated with higher positions of the eyebrows, shoulders and often hands and arms [...]" (Bolinger, 1998: 45; see also Bolinger, 1985).

means that each code may have different linguistic manifestations in different languages. Since there is clear evidence that different languages interpret intonational features in different ways (cf. Grice & Baumann, 2007), we can conclude that (more or less universal) linguistic and paralinguistic functions of prosody require language-specific interpretation.

So far, the function of pitch/intonation has been discussed as a marker of (extra-)linguistic meaning (i.e. meaning that is not yet expressed by the lexical and syntactic structure of an utterance). However, many languages use pitch (and also other phonetic features) also for lexical and morphological marking (cf. von Heusinger, 1999; Nolan, 2006; Grice & Baumann, 2007; Ladd, 2008).

Languages that exhibit lexical and/or grammatical tones are called ‘(lexical) tone languages’ (e.g. Standard Chinese, Thai, Hausa (Nigeria), Mixtec (Mexico), etc.). In these languages a limited set of distinctive pitch patterns (contour tones) or heights (level tones) is employed to assign different lexical meanings or grammatical functions to syllables or words (that may be segmentally identical).

A number of other languages - so-called ‘pitch/lexical accent languages’ (e.g. Swedish and Japanese) - make more limited use of such categorical tonal contrasts. While tone languages have categorical lexical tones on almost all syllables, in pitch accent languages the tonal contrasts that constitute lexical distinctions are restricted to specific syllables or words (e.g. word accents in Swedish). However, the dividing lines between these two language categories are fuzzy (cf. Gussenhoven, 2004: 47).

Languages that do not feature tonal contrasts determined in the lexicon are called ‘intonation languages’ (or ‘stress accent languages’). In intonation languages (e.g. English and German) pitch is solely a postlexical feature that is only relevant at utterance level. This means that, unlike lexical tone, changes in pitch (= tonal movements) are superimposed on the words at utterance level and alter not the lexical meaning or identity of individual syllables or words, but rather the (extra-)linguistic meaning of sentences and phrases as a whole. Admittedly, intonation languages also exhibit lexical minimal pairs that can only be distinguished by prosodic parameters, namely the place of (word/lexical) stress, as e.g. in English the contrast of the noun *pérmít* and the verb *permít*. However, as we will see in the following section 3.2, this contrast is not (necessarily) implemented by pitch (see Ladd, 2008 for discussion).

The previous discussion revealed that, phonologically, the notions of ‘tone’, ‘accent’ and ‘stress’ that involve a lexical use of pitch have to be distinguished from the notion of intonation. However, all tone and pitch accent languages also employ intonation in addition to their lexical and/or grammatical tones. Since tonal and intonational features phonetically interact in many ways, the complexity of the intonation systems varies considerably. In general it is said that the more extensive a language’s use of lexical/grammatical tones,

the less elaborately developed is its intonation system. Accordingly, English and German are generally agreed to have relatively complex intonation (cf. Nolan, 2006; Grice & Baumann, 2007).

To conclude, it has been shown that “a theory of intonation should comprise a phonetic and a linguistic component” (’t Hart, Collier & Cohen, 1990:2). Accordingly, the following section 3.2 explains the phonetic and phonological properties of intonation with regard to the interaction of physiological, acoustic and perceptual parameters of the suprasegmental component of speech. Second, section 3.3 presents a phonological (autosegmental-metrical) model of phonetic parameters that accounts for the interpretation and representation of intonation in communicative interaction. Third, section 3.4 provides a link between the phonetic and linguistic components of language by demonstrating how the intonational marking results from the focus structure of an utterance as well as from the speaker’s assumptions about an entity’s information status or state of activation in the listener’s consciousness.

3.2 Phonetic and Phonological Properties of Intonation

In the previous section 3.1 it has been mentioned that phrasing and highlighting are supposed to be the main tasks of intonation in order to express a variety of prosodic functions. This section clarifies how these tasks are phonetically implemented in intonation languages. As a basis for the following discussion, the physiological/articulatory, acoustic and perceptual correlates of the most relevant suprasegmental phonetic features are given in table 3.1 (adapted from Baumann, 2006:12; building on Uhmman, 1991:109).

The interaction of the different phonetic parameters will be briefly demonstrated by reference to speech melody: During speech production (articulation) the egressive pulmonic air stream may induce quasi-periodic vibration of the vocal folds (phonation²) which generates a complex, quasi-periodic sound wave. Acoustically the repetition frequency of this sound wave is manifested in the fundamental frequency or F0. The fundamental frequency is measured in ‘Hertz’ (Hz) (replacing the former term ‘cycles per second’ (cps)) and correlates with the frequency of the oscillation pattern (opening and closing) of the glottis. Finally, pitch is the perceptual correlate of the fundamental frequency of a sound wave that has been generated by vocal fold vibration. Accordingly, pitch variations are due to changes in the rate at which the vocal folds vibrate. The higher the frequency of vocal fold

²The phonation process is based on myoelastic and aerodynamic forces (e.g. van den Berg, 1958) and is generally determined by the amount of subglottal air pressure, tension of the laryngeal muscles as well as by elasticity, length and mass of the vocal folds.

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vibrations and, in turn, the higher the fundamental frequency of a sound, the higher its perceived pitch.³ The fundamental frequency is known to be affected by the segmental composition of sound patterns, i.e. the alternation of voiced and voiceless speech sound often leads to minor perturbations in the fundamental frequency (see Kingston, 1991 and Gussenhoven, 2004). Such perturbations are commonly referred to as ‘microprosody’ or ‘microintonation’ but do not usually influence the listeners’ interpretation of the speech melody (see Silverman, 1987).

ARTICULATION	ACOUSTICS	PERCEPTION
quasi-periodic vibrations of vocal folds	fundamental frequency (F0) measure: Hertz (Hz)	pitch perceived scale: high – low
duration and phasing of articulation process	(segment) duration measure: millisecond (ms)	length (quantity) perceived scale: long – short
articulatory effort, subglottal air pressure	intensity measure: decibel (db)	loudness perceived scale: loud – soft
vocal tract configuration, articulatory precision	spectral quality measure: formant values in Hz	vowel quality perceived scale: full – reduced

Table 3.1: Articulatory, acoustic and perceptual correlates of suprasegmental features of speech (adapted from Baumann, 2006: 12).

Phrasing

Speech is not naturally produced in a continuous, uninterrupted flow, but in chunks. This is obviously due to the biological/physiological necessity of breathing, but also fulfills various communicative functions in discourse that are concerned with the division of speech into meaningful units of information (see section 3.1). The division of speech into chunks is known to be delimited by various intonational means. Hence, “a well-formed utterance contains minimally one intonationally defined phrase” (Grice, 2006: 778). Those phrases

³Frequency of vibration averages in male speaking voices between 100 to 150 Hz, in female speaking voices between 190 to 250 Hz and in children’s speaking voices between 350 to 500 Hz. This is the range of fundamental frequencies of different speakers: male, 90 to 220 Hz; female, 180 to 450 Hz; children, 300 to 700 Hz (Neppert, 1998: 125). The differences are due to the size of the larynges. While female larynges are much smaller in the front to back dimension than those of males, children have in general smaller larynges than adults (cf. Gussenhoven, 2004.)

are denoted differently in the literature (see Cruttenden, 1986, 1997 for an overview), e.g. as ‘breath group’, ‘sense group’, ‘tone group’, ‘tone unit’ (British linguists, see section 3.2), ‘phonological phrase’, ‘intonation group’ (Cruttenden, 1986), ‘intonational phrase’ (Pierrehumbert & Beckman, 1988), ‘intonation phrase’ or ‘intonation unit’ (e.g. Chafe, 1994).

It is often distinguished between larger and smaller phrases (e.g. Williams, 1996b, 1996a: a ‘major tone unit’ contains a number of ‘(minor) tone units’) which reflects a difference in the (perceived) strength (strong vs. weak) of the respective phrase boundaries. Phrase boundaries often coincide with syntactic breaks, but not necessarily. More precisely, phrases or phrase breaks are commonly assumed to occur at phonologically relevant positions within an utterance, which implies that there are multiple levels or domains of phrasing. The relevant levels of phrasing are defined in terms of a hierarchically organized prosodic structure (that differs from language to language). According to Grice most researchers agree on the following levels of prosodic phrasing (‘prosodic hierarchy’; depicted in figure 3.1):

An Utterance (U) contains one or more Intonational Phrases (IP); an IP contains one or more Smaller Phrases (XP); an XP contains one or more Words (W), a W contains one or more Feet (F), which in turn contains one or more Syllables (s). (Grice, 2006: 778)

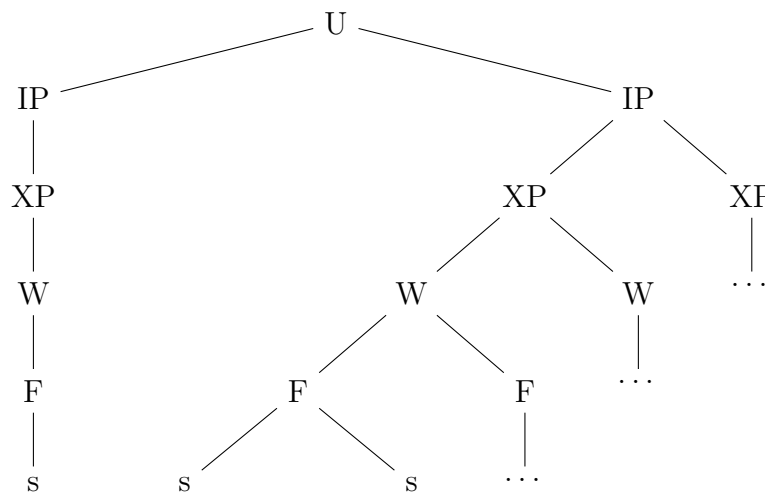


Figure 3.1: The Prosodic Hierarchy (adapted from Grice, 2006: 779; see also Keating, Cho, Fougeron & Hsu, 2003).

Functionally relevant phrases are delimited by changes in F₀, changes in duration, changes in intensity, alternations of vocalization with silence and changes in voice quality (cf. Chafe, 1994: 58). Furthermore such phrases are said to contain at least one prominent element (see section 3.3). Filled and silent pauses are the most obvious indicators of

phrase boundaries. The longer the pause, the stronger the perceived boundary. However, the perception of a phrase break is also often induced by tonal marking (even when a pause is missing), i.e. by an abrupt change or jump (either up or down) in pitch. Accordingly, some prosodic constituents are defined in terms of tones at one or both of their edges. Furthermore, prosodic phrasing also affects the pronunciation of sounds at the beginning and ends of domains (cf. Grice, 2006; Grice & Baumann, 2007). There is evidence that the segment at the beginning of a larger phrase (domain) is pronounced with greater strength than at the beginning of a smaller phrase. This phenomenon of ‘domain initial strengthening’ (e.g. Keating, Cho, Fougeron & Hsu, 2003) is assumed to involve greater resistance to assimilation at larger phrase boundaries. Another phenomenon that applies to the ends of domains is commonly known as ‘final lengthening’. The segment at the end of a phrase has been found to be produced longer but less loudly and clearly than in (post)lexically stressed syllables, due to a slowing down of the articulators. The larger the phrase, the greater the degree of final lengthening (e.g. Wightman, Shattuck-Hufnagel, Ostendorf & Price, 1992).

Highlighting

The highlighting effect of intonation is closely related to marking of ‘stress’ and ‘prominence’ relations, i.e. it essentially contributes to an element’s impression of ‘standing out’ in relation to neighbouring elements within a phrase. However, in the past century, the notion of stress (and also prominence) has not been used uniformly by linguists. Along with this, there has been controversial discussion about the phonetic correlates of stress and intonation, respectively (see Uhmann, 1991 and Ladd, 1996, 2008 for discussion).

There are two divergent problems: On the one hand, in early phonological approaches (e.g. Bloomfield, 1935; Pike, 1945; Trager & Smith, 1951; Chomsky & Halle, 1968) pitch variation (or intonation) is often treated separately from stress (in the sense of postlexical stress/prominence). On the other hand, stress is often treated as a scalar phonetic property of individual syllables, and pitch is one of the components of that scalar phonetic property (cf. Ladd, 2008: 50). In the latter case for instance, it has been a long-standing and widespread assumption that stress is a complex of F₀, duration, and intensity, with F₀ being the most effective cue to the perception of stress, followed by duration and intensity. This assumption is based on experimental results by Fry (1955, 1958), who tested the perceptual discrimination of minimal stress pairs in English (e.g. *cóntract* (noun) vs. *contráct* (verb)) by different phonetic cues (similar results were found by Nakatani & Aston, 1978 and in German by Isačenko & Schädlich, 1966 and Goldbeck & Sendlmeier,

1988)⁴. However, the interpretation of Fry's results has to be treated with caution. He tested the minimal stress pairs in isolation and did not consider the effect and interpretation of F0 with regard to sentence level (cf. Pierrehumbert, 1980: 103). Furthermore, as Ladd (2008) points out, the different words (stress patterns) will certainly be distinguishable in context even if there is no distinction in F0 on the word in question. This implies the need for a more elaborate account of stress.

Linguistic Levels of Highlighting An approach that accounts for stress at different linguistic levels is proposed by Weinreich (1954) and Lehiste (1970). They distinguish between 'abstract' word stress and 'concrete' sentence stress.⁵

It appears probable that word-level stress is in a very real sense an abstract quality: a potential for being stressed. Word-level stress is *the capacity of a syllable within a word to receive sentence-stress when the word is realized as part of the sentence* [...] The fact that not all syllables that are perceived as stressed are associated with peaks of subglottal pressure supports the idea that what is realized phonetically is sentence-level stress rather than word-level stress. In other words, our knowledge of the structure of the language informs us which syllables have the potential of being stressed; we 'hear' the underlying phonological form. (Lehiste, 1970: 150)

This means, stress at word (lexical) level is an abstract phonological property that is determined in the lexicon. The 'stressed' syllable of a word (in citation form) merely provides a potential place where an actual prominence at sentence (postlexical) level may occur (cf. Ladd, 2008: 51).

Moreover, Halliday (1967a) and Vanderslice & Ladefoged (1972) (see also Ladefoged, 1982) distinguish two types of postlexical prominences, which Ladd (2008) refers to as '(utterance-level) stress' and '(intonational) accent' (Halliday: 'salience' and 'tonicity'; Ladefoged: 'stress' and 'tonic accent'). Both types of postlexical prominences are assumed to have a phonetic basis and are, in contrast to lexical stress, not an abstraction but represent a concrete highlighting/prominence at sentence level. Ladd (2008: 53) summarizes Halliday's and Vanderslice & Ladefoged's ideas as follows:

[...] syllables can have either a full vowel or a reduced vowel; if they have a full vowel they can be abstractly stressed or unstressed in the lexicon; if they

⁴The hierarchical importance of duration and intensity varies in different experiments, while F0 usually remains the most important cue to the production and perception of stress (see Lehiste, 1970).

⁵Similarly Abercrombie (1991) distinguishes between 'accent' (word-level abstraction) and 'stress' (actual phonetic manifestation in an utterance).

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are stressed in the lexicon, they may or may not be actually prominent in an utterance; if they are actually prominent in an utterance, they may or may not be pitch-accented. Actual prominence in an utterance is signalled by a complex of phonetic cues that reflect greater force of articulation and possibly rhythmic regularity. Pitch accent is an additional feature that is part of the intonation system.

To sum up, the notion of ‘stress’ applies to word and utterance levels and correspondingly involves a distinction between abstract and concrete prominences. Furthermore, concrete prominences at utterance level may be phonetic implementations of word stress or sentence accent. Following Grice & Baumann (2007) in this thesis we terminologically distinguish between:

lexical stress/word stress:	word level, abstract prominence, potential position for concrete prominence
postlexical stress:	utterance level, concrete prominence
accent:	utterance level, concrete prominence

The difference between stresses and accents at utterance level involves differences in their phonetic implementation (as the contribution of pitch) and is assumed to entail differences in the strength or degree of (postlexical) prominence.

Bolinger (1958) claims in a theory of ‘pitch accent’ that actual prominence (at sentence level) is exclusively a matter of pitch movement on designated stressed syllables, which is reflected in the following definition:

A pitch accent may be defined as a local feature of a pitch contour - usually but not invariably a pitch change, and often involving a local maximum or minimum - which signals that the syllable with which it is associated is prominent in the utterance. (Ladd, 2008: 48)

However, even though pitch variation seems to be the primary correlate of perceived prominence there is evidence that *accentuation* is not exclusively cued by pitch variations (which would be in line with Fry’s findings, amongst others). Kohler (1977) for German and Beckman (1986) for (American) English and also Batliner et al. (2001) for both languages show experimentally that the phonetic correlate of accent is a complex of F0 variation, increased intensity and increased duration (as well as (unreduced) vowel quality). As a consequence, Beckman calls these languages ‘stress accent languages’ (e.g. intonation languages or Swedish) and claims that they employ phonetic features other

than pitch to a greater extent than ‘non-stress accent languages’ (e.g. tone languages or Japanese).

With regard to postlexical (word) stress there is evidence that it is phonetically different (and independent) from accent. It has been shown that lexically stressed syllables are (postlexically) reliable even in cases where the stressed syllables have no pitch accent. The identifying parameter for lexical stress has been found to be quantifying duration (e.g. Campbell, 1993) and/or spectral tilt (distribution of energy in the spectrum) (e.g. Huss, 1978; Sluijter & van Heuven, 1996; Beaver, Clark, Flemming, Jaeger & Wolters, 2007). This means, primarily stressed syllables are longer and produced with greater lip-aperture or jaw height than secondarily stressed syllables (cf. Harrington, Beckman, Fletcher & Palethorpe, 1998).

Halliday’s (1967a) and Vanderslice & Ladefoged’s (1972) accounts (see above) also revealed that postlexical prominence, as the concrete phonetic realization of word stress, is signaled without involving pitch. However, Kohler (1991b, 2005, 2006) introduced further concepts of prominences at utterance level that are more or less related to pitch. He distinguishes between three types of sentence accents, namely ‘pitch accents’, ‘duration accents’ (1991b, 2006) and (strong) accents or ‘force accents’ (2005). While force accents are not related to pitch features and are said to be primarily based on increased intensity and increased duration (‘phonatory and articulatory force’), pitch accents and duration accents are related to pitch features. However, in contrast to pitch accents, the phonetic realization of duration accents (that are not ‘heightened by extra force’) is said to be largely independent of pitch. Kohler (2006) assumes that sentence accents (coded by pitch features) comprise four distinct levels (unaccented, default accented, partially deaccented, reinforced) and defines pitch accents and duration accents as follows:

The phonetic manifestations of the default and reinforced *sentence accent* levels are primarily signalled by F0 peak contours of varying height and may therefore be called *pitch accents*. The partially deaccented level has its acoustic exponents primarily in the duration domain although it may be accompanied by an F0 peak inflection of a magnitude that is well below the F0 peak declination, and, of course, also by higher energy. This accent may be called *duration accent*. (Kohler, 2006: 749)

Thus, postlexical prominences like the duration accent cannot be interpreted as the mere expression of word stress, but at the same time clearly deviate from the concept of fully-fledged pitch accents. This implies that there are different types of postlexical stresses and accents that differ in their strength or degree of prominence (see below).

Levels of Perceived Prominence The previous discussion revealed a need to differentiate between abstract prominences at word level (lexical stress) and at least two types of concrete prominences at utterance level (postlexical stress and accent). According to autosegmental-metrical theory (see section 3.3) these distinctions can be explained in terms of a ‘stress pattern’ and an ‘intonation pattern’ of an utterance. The stress pattern involves different degrees of perceived prominence and “reflects a set of abstract *prominence relations* between the elements of the utterance” (cf. Ladd, 2008:54). However, “in addition to the stress pattern, there is an intonation pattern for the utterance” (cf. Ladd, 2008:54). This intonation pattern is assumed to evolve from the composition of pitch accents that occur in conjunction with prominent/stressed syllables.

This means, in intonation languages like English and German, prominence at utterance level is realized on designated syllables (i.e. syllables carrying the primary lexical stress). While prominence of (postlexical) stress is provided by increased loudness, length and unreduced vowel quality, prominence of accents is due to pitch variation that is superimposed on (post)lexically stressed syllables. Thus, we will use the term ‘pitch accent’ as an equivalent to our notion of ‘accent’ (see above). We generally assume that perceived pitch (or pitch variation) is the primary correlate for the perception of prominence and that the strength of utterance-level prominence is also affected by the (structural) position of the respective syllable within the phrase.

In intonational phonology a special status is often attributed to the last (fully-fledged) pitch accent within a phrase, referred to as ‘nucleus’ or ‘nuclear syllable’⁶ (see section 3.3). The nucleus is said to occupy the position of the most prominent syllable in an utterance and is consequently defined as the strongest primary (pitch) accent in a phrase.⁷ Accordingly, some postlexical prominences are considered as ‘secondary (pitch) accents’ and are attributed a secondary status with regard to their role as prominence marker in comparison to fully-fledged pitch accents (cf. Baumann, 2006). A secondary status has often been attributed to prenuclear pitch accents since they are optional in many cases and are claimed to not contribute much to meaning. Similar concepts that resemble the idea of secondary (pitch) accents are represented by Kohler’s (2006) duration accent (only allowed in prenuclear and/or postnuclear position), Grice, Ladd & Arvaniti’s (2000) ‘phrase accents’ (only allowed in postnuclear position) and Büring’s (2007) ‘ornamental accents’ (only allowed in prenuclear position). Hence, this structural difference in prominence also affects the possible positions where different types of postlexical stresses and accents may

⁶A *nuclear* pitch accent is defined as the last pitch accent in an intonation unit. It constitutes the only obligatory element in the phrase and is considered to be the *structurally* (phonologically) most important element determining the interpretation of the phrase’s information structure.

⁷Even though the nucleus is structurally defined as the most prominent syllable in an utterance it is not necessarily perceived or pronounced (phonetically) as the most prominent accent in a phrase.

occur within a phrase.

As a consequence, we distinguish between at least four different levels of (postlexical) prominence that can be applied to particular syllables (of words) within utterances, listed in table 3.2 for an overview (adapted from Grice & Baumann, 2007).

1) No stress/accent	
2) (Postlexical) Stress:	A stressed syllable is louder, longer and more strongly articulated, with less vowel reduction than an unstressed syllable. (It may occur in prenuclear or postnuclear positions.)
3) Pitch accent:	An accented syllable (i.e. a syllable bearing a pitch accent) has additional tonal movement on or in the direct vicinity of a stressed syllable.
4) Nuclear pitch accent:	The nuclear syllable is the last pitch accent ('nucleus') in an intonation phrase, usually perceived as the most prominent one in the phrase.

Table 3.2: Prominences at utterance level (adapted from Grice & Baumann, 2007).

There is some empirical evidence on prominence perception that confirms this theoretical view of prominence relations that involve categorical parameters of pitch like presence or absence of pitch accent as well as accent position. Experimental results by Ayers (1996) on English and by Jagdfeld & Baumann (2011) and Baumann (2014) on German suggest the following (hierarchical) organization of accent placement according to perceived prominence, assuming an increase in prominence (indicated by $<$) from left to right:

(28) **Prominence scale of accent placement/position:**

no accent $<$ (postnuclear accent) $<$ prenuclear accent $<$ nuclear accent

Pitch accents are based on gradient modulations of pitch, involving e.g. variations in the way a pitch movement is realized. Accordingly, different categories of pitch accent types are defined by differences in the form of a tonal movement in the vicinity of a (post)lexically stressed syllable (see section 3.3). This implies the basic direction of the tonal movement (rise vs. fall), the scaling and height of pitch (pitch excursion and pitch range, vertical axis) and the alignment or synchronization of a pitch peak or valley with a stressed syllable (horizontal axis) (cf. Baumann & Röhr, 2015). The relation of such tonal cues to perceived prominence is complex, but there is evidence that there are gradual differences in perceived prominence between different accent types.

In fact, it has been shown that the local shape of an accent or contour, in particular the

excursion and slope of a rise or fall and its alignment with an accented syllable, has an important impact on the syllable's perceived prominence (see Kohler, 1991a; Niebuhr, 2009 for German and Knight, 2008 for English). Based on previous findings for West-Germanic languages Baumann & Röhr (2015) directly tested the perceptual prominence of seven attested nuclear pitch accent types (plus deaccentuation⁸) in German. Results reveal that they gradually differ with respect to their perceived prominence along three tonal dimensions:

Direction of pitch movement: rises are more prominent than falls
(see also Baumann, 2014)

Degree of pitch excursion: steep rises and falls are more prominent than shallow rises and falls
(see also 't Hart, Collier & Cohen, 1990)

Relative pitch height: high accents are more prominent than downstepped and low accents

– see also Rietveld & Gussenhoven (1985), Gussenhoven & Rietveld (1988) on Dutch and Ladd & Morton (1997) on (Scottish and British) English

– Gussenhoven (2004): A later peak may create the same prominence-lending effect as a higher peak, thus serving as a perceptual substitute.

Of course, each accent type is a combination of different levels of these dimensions (plus duration), which do not always have to be ranked in the same way. However, the various experimental results suggest the following (hierarchical) organization of different (nuclear) accent types according to perceived prominence, assuming an increase in prominence (indicated by <) from left to right. The accent types are categorized according to 'GToBI' (Grice & Baumann, 2002; Grice, Baumann & Benzmüller, 2005), see table 3.3 in section 3.3:

(29) **Prominence scale of accent types** (cf. Baumann & Röhr, 2015):

no accent < low accent (L*) < falling accent (H+L* < H+!H*) < high accent (!H* < H*) < rising accent (L*+H < L+H*)

⁸'Deaccentuation' indicates the absence of a pitch accent on a word that is expected to be accented in an analogous unmarked 'all-new' utterance (cf. Ladd, 1980).

3.3 An Autosegmental-Metrical Model of (German) Intonation

In phonological models of intonation, modulations of an utterance's speech melody are generally represented in two different ways. They are either treated as

- (i) pitch configurations (as e.g. in (the style of) the British School: Kingdon, 1958; Halliday, 1967a; Crystal, 1969; O'Connor & Arnold, 1973; see also Cohen & 't Hart, 1967 for Dutch (IPO) and Kohler, 1991a for German (KIM)), or as
- (ii) a sequence of interpolated tonal targets (as e.g. in autosegmental-metrical frameworks: Pierrehumbert, 1980; Beckman & Pierrehumbert, 1986 and Ladd, 1996, 2008; see also Gussenhoven, 2004 and Jun, 2005, 2014 for surveys).

In British School studies, pitch configurations are defined in terms of dynamic local pitch movements ('tones'), such as rise, fall, low-rise, high-fall or global pitch contours ('tunes'), such as rise-fall, fall-rise. The identified individual tones and holistic tunes are associated with particular meanings. Besides the identification of tones and tunes, further central ideas of British School approaches are the distribution of speech into 'tone groups' or 'tone units' (tonality) and the location of the syllable carrying the most relevant tonal information, the 'nuclear tone' (tonicity) (cf. Halliday, 1967a). The 'nuclear syllable' or 'nucleus' (Halliday's 'tonic') is said to be the utterance's strongest or most prominent syllable and continues to the end of the phrase, i.e. it is the last prominent syllable in a phrase. O'Connor & Arnold (1973) divided the intonation of a phrase (or information unit) in up to four parts: The nucleus is the only obligatory part of a tone group. It is optionally preceded by a 'prehead' (initial syllables up to the first pitch accent) and/or a 'head' (first pitch accented syllable up to the nucleus), and it is optionally followed by a 'tail' (unaccented postnuclear syllables). Particular combinations of the different parts entailed in a tone groups have been identified to convey different meanings.

In contrast to the pitch configurations defined by the British School approaches, the basic units of intonation in autosegmental-metrical approaches are 'building blocks' derived from specific points or targets in the F₀ contour ('tones'), such as high tones (H = peak in F₀ contour) and low tones (L = valley in F₀ contour) that may be combined into composite tones, e.g. a rise (LH) or a fall (HL). Tones are functionally organized into pitch accents and boundary tones, the former being associated with 'Tone Bearing Units (TBU)'. The intonation contour between these tonal building blocks (pitch accents and boundary tones) is argued to be filled in by interpolation.

The idea of this model goes back to Pierrehumbert (1980) and is based on principles

3.3. AN AUTOSEGMENTAL-METRICAL MODEL OF (GERMAN) INTONATION

of ‘non-linear’ phonology, namely ‘Autosegmental’ and ‘Metrical Phonology’. The aim of this model is to provide a phonological representation of intonation separated from the details of phonetic implementation. In contrast to earlier models Pierrehumbert’s analysis of intonation is not based on perceived pitch (as e.g. in the British School) but on the actual F0 contour. Ladd (1996) continues Pierrehumbert’s ideas and coins the term ‘Autosegmental-Metrical (AM)’ model (see also Beckman, 1996 and Shattuck-Hufnagel & Turk, 1996 for an introduction). Ladd (1996:42) characterizes the main features of the AM theory as follows:

[...] the AM theory adopts the phonological goal of being able to characterise contours adequately in terms of a string of categorically distinct elements, and the phonetic goal of providing a mapping from phonological elements to continuous acoustic parameters.

Ladd, 2008 mentions two central innovations of the AM theory: The most important innovation is the distinction between tonal events, i.e. the localization of linguistically important pitch features (localized events or tones), and gradual transitions, i.e. globally rising and falling segments between the end and beginning of local events. The other innovation is that “it ascribes no necessary role in pitch description to the syllable” (2008: 47). The metrical aspect of the AM theory is based on Metrical Phonology (see e.g. Liberman, 1975; Liberman & Prince, 1977), which is concerned with the description of prominence relations between elements of different hierarchical organized domains (see prosodic hierarchy in section 3.2) and rhythmic structures of utterances (in terms of ‘metrical trees’ and ‘metrical grids’). In the AM theory the metrical structure is reflected by the division of utterances into phrases and the assignment of a stress pattern (abstract prominence relations between elements) to the utterance.

The autosegmental aspect of the AM theory is based on Autosegmental Phonology (see Goldsmith, 1976). The basic idea is the autonomous organization of suprasegmental (tune) features from segmental (text) features on different independent tiers. This means, different phonological features are treated as independent elements or ‘autosegments’ and are arranged in a linear fashion on parallel running tiers. However, the tune has to be anchored to the text at strategic points (‘tune-text association’). A connection between autosegments of different tiers is enabled by association lines at anchor points, i.e. textual elements often serve as anchor points for associations to elements of other tiers. The AM theory accounts for the autosegmental aspect in that it has separate tiers for segments (vowels and consonants) and tones (H, L) and associates tones (tune) with the metrical structure (text; e.g. stressed and boundary syllables) of an utterance. This means that the intonation pattern (string of pitch accents and boundary tones) of an utterance is

lined up on the basis of its stress pattern. Accordingly, pitch accents must occur with prominent stressed syllables (TBUs).

While the idea of separate tonal and segmental tiers is also implicit in the British School model, the advantage of the AM model is the precise location of tonal information in relation to the text. Furthermore, in contrast to the British School, in most AM models there is no theoretical distinction between prenuclear and nuclear accents that assigns a special status to the nucleus. In AM models the last fully-fledged pitch accent in a phrase is simply associated with the ‘Designated Terminal Element (DTE)’, which tends to be interpreted as the pragmatically most important accent in the phrase.

An example for the description of intonation according to the AM model is given in figure 3.2 by means of a stylized intonation contour and Gussenhoven’s (2002b:271) analysis: “In the schematic implementation the targets are given as bullets, which are connected by line segments that represent the F0 interpolations between them. The boundary tone is attached to the bracket, as per convention (cf. Hayes & Lahiri, 1991).” The starred tone of a monotonal (e.g. H*) or bitonal (e.g. L*+H) pitch accent indicates its association with the accented syllable.

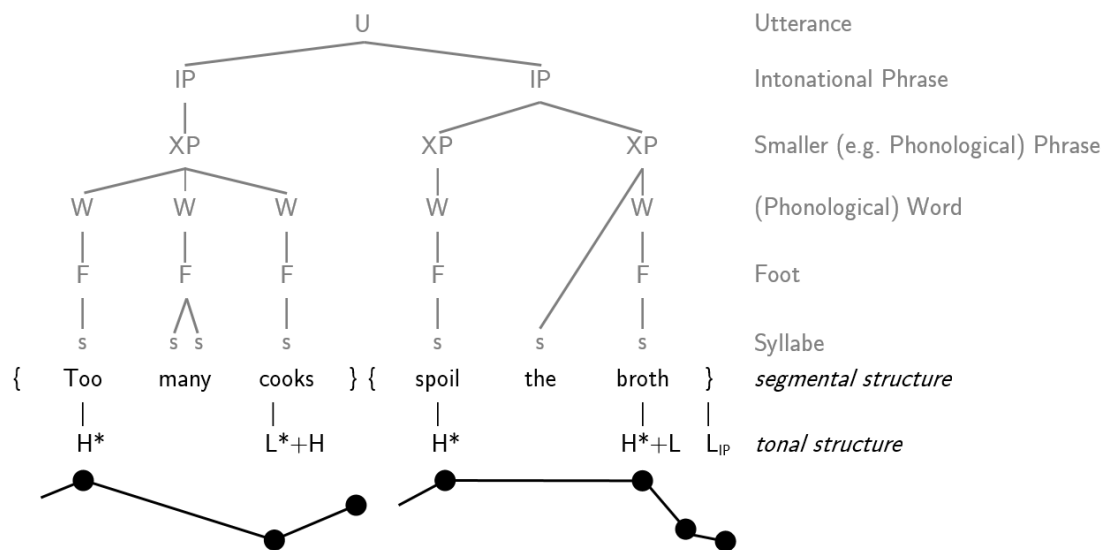


Figure 3.2: Stylized intonation contour for the sentence *Too many cooks spoil the broth* and an analysis according to the AM model adapted from Gussenhoven (2002b: 271).

(German) Tones and Break Indices - (G)ToBI

Within the presented framework of AM theory Beckman & Hirschberg (1994) (see also Beckman & Ayers Elam, 1997) developed a system for the transcription and analysis of

(Mainstream American) English intonation. The so-called ToBI (‘Tones and Break Indices’) system has become a widely accepted standard and serves as a basis for developing transcription systems for many other intonation languages.

The tonal aspect of this system relates to the central feature of intonation in AM phonology, namely the identification of local events in the intonation contour, that are anchored to or associated with prominent syllables or edges of phrases. Accordingly, the tonal inventory of the ToBI system comprises a set of pitch accents and a set of boundary/edge tones. Pitch accents are tonal events that serve a highlighting function and are synchronized with (post)lexically stressed syllables, while boundary tones are tonal events that serve a delimiting function and are synchronized to left (facultative) or right (obligatory) edges of phrases. There are two different types of boundary tones: One set of boundary tones applies to ‘Intonation Phrases (IP)’ that constitute major intonation units. Another set of boundary tones applies to ‘intermediate phrases (ip)’ that constitute minor intonation units and are entailed in IPs. The tonal inventory of the ToBI system is based on the work of Pierrehumbert (1980) and Beckman & Pierrehumbert (1986). Pierrehumbert’s system originally comprises a third type of tone, the ‘phrase accent’ or ‘phrase tone’, which determines the pitch value between the last pitch accent and the boundary tone. However, in Beckman & Pierrehumbert, it was defined as the boundary tone of an intermediate phrase.

It has already been mentioned that tones (monotonal) or a combination of tones (bitonal) are denoted in terms of high (H) or low (L) targets in the F0 contour. The two tonal targets of bitonal pitch accents are joined with a ‘+’ sign. Furthermore, in pitch accents the tone which has the main association with the lexically stressed syllable of the accented word is marked with a star ‘*’ following the tone (according to the ‘Accentuation Principle’ proposed by Goldsmith, 1976), e.g. H* or H+L*. Boundary tones of intonation phrases are symbolized with a percent ‘%’ sign following the tone, e.g. L%. The phrase tone of intermediate phrases, which is always monotonal, is marked with a minus ‘-’ sign after the tone.

As its name implies, the ToBI system not only entails tonal categories, but also ‘break indices’ (Beckman & Ayers Elam, 1997:9): “The break index tier marks the prosodic grouping of the words in an utterance by labelling the end of each word for the subjective strength of its association with the next word, on a scale from 0 (for the strongest perceived conjoining) to 4 (for the most disjoint).”

Hence, the ToBI annotation is implemented on at least three tiers, an orthographic tier, a tone tier and a break index tier, which can be thought of as corresponding to autosegmental tiers. The abstract phonological notation of intonation on different tiers enables and facilitates the comparison of intonation contours of different utterances, which may

be functionally equivalent, even though the phonetic realization might be slightly different. Due to the physiological effect of ‘declination’, which leads to a decrease of overall frequency in the course of an utterance, the transition or interpolation between adjacent tones will not always be as direct as the notation suggests. While these differences are claimed to have no phonological relevance, there are phonologically relevant differences that concern syntagmatic relations between the height of F0 peaks. However, the notations of H and L do not reflect absolute F0 values, but are roughly categorized in relation to a speaker’s pitch range.⁹ Therefore phonologically relevant differences in scaling of intonation contours are captured by the concepts of ‘downstep’ and ‘upstep’ that apply to high tones of pitch accents and boundary tones (within the same phrase).¹⁰ In the case of downstep, a high tone is considerably lowered in relation to an immediately preceding high tone. In the case of upstep, the high tone is considerably higher than an immediately preceding high tone.

ToBI systems for other languages have since been developed (see e.g. Jun, 2005, 2014). However, their tonal inventory is adjusted to the intonation structure of the language concerned, i.e. it entails tonal events that have been found to be phonologically distinctive in the respective language.

Between 1995 and 1996 a ToBI system for Standard German, ‘GToBI’, was developed (Grice, Reyelt, Benz Müller, Mayer & Batliner, 1996; Reyelt, Grice, Benz Müller, Mayer & Batliner, 1996), and it is this which is used for the intonational description and analysis of the experimental data presented in the following sections of this thesis.¹¹ The original GToBI system is based on speech data mainly from Northern German speakers and has been slightly modified in the last few years (for an overview see Grice & Baumann, 2002 and Grice, Baumann & Benz Müller, 2005 as well as the guidelines and training materials provided on the GToBI webpage (Grice, Baumann, Ritter & Röhr, 2016)).

A (G)ToBI transcription is based on the speech signal and on the F0 record. The symbolic labels that reflect an utterance’s prosodic structure are arranged on at least three different descriptive levels. An orthographic transcription of the speech signal is arranged on a text tier. Monotonal and bitonal pitch accents and boundary tones that mirror the perceived pitch contour are arranged on tone tiers. Pitch accents (see table 3.3) are placed within the limits of the accented word, generally at the local F0 minima and maxima that is associated with the lexically stressed syllable (indicated by a starred ‘*’ tone, e.g. L+H*).

⁹High tones are roughly situated in the top three quarters of a speaker’s pitch range, whereas low tones occur in the bottom quarter (cf. Grice & Baumann, 2002: 278).

¹⁰In Pierrehumbert’s (1980) original model upstep only applies to boundary tones. However, there are AM models that allow for upstep on pitch accents as well.

¹¹Other approaches of German intonation within the AM framework models include those of Wunderlich (1988), Uhmann (1991), Féry (1993) and Grabe (1998).

3.3. AN AUTOSEGMENTAL-METRICAL MODEL OF (GERMAN) INTONATION

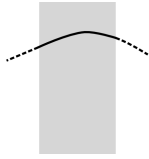
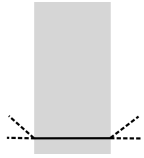
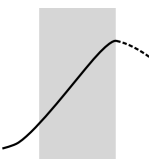
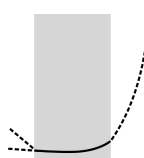
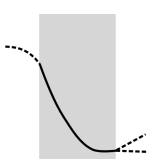
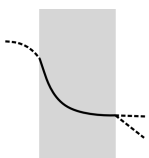
PITCH ACCENTS		
H*		canonical pitch peak (high in the speaker's range) preceded by a shallow rise; accented syllable is perceived as relatively high, 'default' accent
L*		local pitch minimum (low in the speaker's range) preceded by a shallow fall, there is no substantial tonal movement before or after the accented syllable; due to the low pitch register on the accented syllable, intensity and duration are key components for its perception
L+H*		low tonal target immediately before or at the beginning of the accented syllable followed by a sharp rise in (or jump up to) the accented syllable, the peak is often late in the accented syllable (late peak accent); accented syllable is perceived as high
L*+H		low tonal target immediately before or within the accented syllable followed by a sharp rise starting late in the accented (or in the post-accented) syllable and reaching its peak on the following syllable (or even later) (late peak accent); accented syllable is perceived as low
H+L*		(relatively) high tonal target before or at the beginning of the accented syllable followed by a local pitch fall onto the accented syllable that has an F0 valley very near the bottom of the speaker's range (early peak accent)
H+!H*		(relatively) high tonal target before or at the beginning of the accented syllable followed by a local pitch fall onto the accented syllable that is not low, but around the middle of the speaker's pitch range (early peak accent)

Table 3.3: GToBI pitch accents: Labels, stylized intonation contours (accented syllables shaded in gray) (from Grice, Baumann, Ritter & Röhr, 2016) and explanations (according to Grice, Baumann & Benz Müller, 2005).

Boundary tones are assigned to the end of phrase-final syllables, (minor) intermediate phrases marked by ‘-’ (see table 3.4) and (major) intonation phrases marked by ‘%’ (see table 3.5) after the respective tone. The boundary tones determine the F0 contour from the last tone of the last pitch accent to the end of the phrase, whereby the tonal target for the intermediate phrase boundary tone is often reached at a postnuclear stressed syllable

(if there is one).¹² Furthermore, boundary tones of intonation phrases are combined with boundary tones of intermediate phrases, since they, by definition, coincide at the right edge of intonation phrases. The concept of downstep is indicated by an exclamation mark before the downstepped tone, e.g. !H*, while the concept of upstep is indicated by a ‘^’ symbol before the high tone, e.g. ^H*. Furthermore the GToBI system involves a junctural ‘break index’ tier that allows the indication of different levels of perceived strength of phrase boundaries: 4 = IP, 3 = ip, 2r = rhythmic break with tonal continuity and 2t = tonal break with rhythmic continuity. The basic tonal inventory for GToBI is demonstrated in table 3.3 (pitch accents), table 3.4 (ip phrase/boundary tones) and table 3.5 (IP boundary tones) according to Grice & Baumann (2002), Grice, Baumann & Benz Müller (2005) and the GToBI webpage (Grice, Baumann, Ritter & Röhr, 2016).

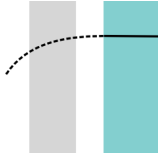
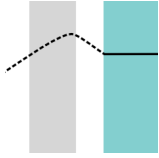
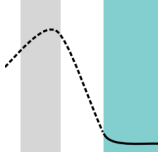
PHRASE/BOUNDARY TONES of intermediate phrases (ip)		
H-		terminal F0 value corresponds either to a previous accentual H tone (which may result in a high plateau at the end of the phrase) or rises from a previous accentual L tone to the middle of the speaker’s pitch range (staying flat)
!H-		H- tone is downstepped in relation to a previous H tone, terminal F0 value around the middle of the speaker’s range (plateau is not possible); common in calling contours
L-		terminal F0 minimum low in the speaker’s range

Table 3.4: GToBI phrase/boundary tones of intermediate phrases: Labels, stylized intonation contours (accented syllables shaded in gray, phase-final syllables marked in turquoise) (from Grice, Baumann, Ritter & Röhr, 2016) and explanations (according to Grice, Baumann & Benz Müller, 2005).

Finally, it has to be noted and kept in mind that, in intonational phonology, the properties of pitch must always be defined in relation to the speaker and the occasion, since the intonational features of speech are less generalizable (than its segmental features) and can noticeably differ between speakers and occasions (cf. Ladd, 2008: 4).

¹²GToBI provides an optional transcription of potential postnuclear prominences in terms of ‘phrase accents’, labelled as L(*) or H(*). According to Grice, Ladd & Arvaniti (2000) phrase accents have a hybrid nature in that they function as boundary/phrase tones (delimiting function) but are at the same time secondarily associated with postnuclear stressed syllables (highlighting function).

3.4. INFORMATION STRUCTURE AND INTONATION

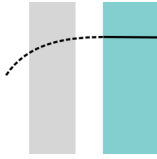
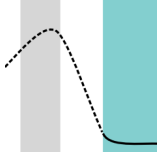
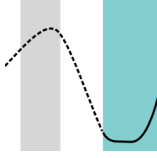
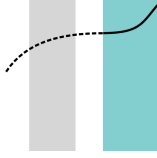
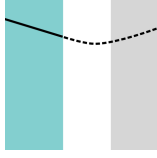
BOUNDARY TONES of Intonation Phrases (IP)		
H-%		high plateau until the end of the phrase; similar to tonal contour of H-, but stronger boundary (i.e. higher break index)
L-%		terminal low level stretch, may be followed by a drop to extra low; L-% is generally lower than L-
L-H%		terminal falling-rising contour if preceded by an H tone, otherwise low tonal target followed by a rise generally to the midpoint of the speaker's pitch range on the last syllable
H-^H%		high plateau (like H-%) with a sharp rise in the last syllable of the phrase, often to a point very high in the speaker's pitch range
%H		exceptional high beginning of an IP (mid or low onsets are not explicitly marked, they are regarded as 'default' case)

Table 3.5: GToBI boundary tones of Intonation Phrases: Labels, stylized intonation contours (accented syllables shaded in gray, phrase-final syllables marked in turquoise) (from Grice, Baumann, Ritter & Röhr, 2016) and explanations (according to Grice, Baumann & Benz Müller, 2005).

3.4 Information Structure and Intonation

Intonational patterns express informational structuring, and a great part of the information structure is linguistically conveyed by intonation. (von Heusinger, 1999: 1)

It is commonly known that an important linguistic function of intonation is the marking of different levels of information structure (in combination with word order permutations and other morphosyntactic phenomena, such as clefting, passivization, etc.). This implies that the same channel or linguistic level of description is used for different independent levels of information. This is in particular the case for the marking of the focus-background

structure of an utterance and for the marking of the discourse entities' information status. Hence, before we have a closer look at the intonational marking of information status, we first have to discuss the interplay between focus and givenness with regard to their intonational marking.

In fact, focus is claimed to be ranked higher than givenness. Lambrecht (1994: 323-324) points out that the actual choice of accenting or not accenting an entity is determined primarily by the focus-background structure of an utterance and only secondarily by an entity's degree of givenness. Thus, focus prosody seems to 'override' activation prosody.

- (30) A: *What do you want to drink, tea or coffee?*
 B: *I want [TEA]_F.*
 (Krifka, 2007: 30)

In (30) the constituent *tea* in the response sentence is in (contrastive) focus, but given due to explicit previous mention. This shows that new information and focus do not necessarily coincide and should not be confused. This also means that the correlation of focus with newness and highlighting should not be confused with its semantic-pragmatic definition (cf. Krifka, 2007).

Focus Prosody

In chapter 2, section 2.2 focus has roughly been introduced as being the most important and informative part of a message in relation to information that has already been mentioned in the previous context. However, there is a vast amount of different views on and definitions of focus. Focus is defined in terms of

- (i) its kind (e.g. presentational focus, question focus or contrastive focus; see e.g. Gussenhoven, 2007),
- (ii) syntactic and pragmatic aspects (e.g. Büring, 2007: Question-Answer-Congruence (QAC) and F-marked items (given vs. new) in a larger focus domain), or
- (iii) semantic uses (e.g. Rooth, 1985, 1992: *Alternative Semantics*; Krifka, 2007: 18: "Focus indicates the presence of alternatives that are relevant for the interpretation of linguistic expression.").

Furthermore, different types of focus are commonly distinguished with regard to the size of their domain. According to Ladd (1996: 161) a narrow focus includes only a single word,

whereas a broad focus expands over a sequence of constituents or whole sentences. However, as von Heusinger (1999: 31) points out, the distinction between narrow and broad focus should not have theoretical implications, but should be treated in purely descriptive terms.

Rooth's (1985, 1992) approach of Alternative Semantics represents the most common understanding of focus. The focused element is assumed to involve an abstract contrast between alternative interpretations that are available in the discourse context. In many languages this contrast is marked by means of pitch accents, while the background information is often marked by lack of accent. Accordingly, a 'Focus-to-Accent' approach has been commonly accepted for West Germanic languages since the early 1980s (first proposed by Bolinger, 1958). In the case of a narrow focus domain, this means that the single focused element needs to be marked by an accent. In the case of a broad focus domain (or in complex narrow focus constituents) a phenomenon called 'focus projection' (e.g. Selkirk, 1984, 1995; Rochemont, 1986 for English and von Stechow & Uhmman, 1986; Uhmman, 1991 for German) comes into play that implies that one accent (sometimes called 'focus exponent', e.g. by Uhmman, 1991) stands in for a larger focus domain. However, the question as to which elements qualify for carrying the main accent in a broad focus domain has been the subject of discussion. While Halliday (1967b) and Chomsky & Halle (1968) (Nuclear Stress Rule) propose that the last full lexical item in a sentence receives the main accent (= nucleus), other approaches are more flexible, e.g. Ladd (1980, 1983), Gussenhoven (1983, 1985) (Sentence Accent Assignment Rule), Selkirk (1984, 1995) (Basic Focus Rule and Phrasal Focus Rule; reanalyzed by Büring, 2006 in terms of vertical and horizontal focus projection rules) and Uhmman (1991), Truckenbrodt (2005) (focus projection rules for German). With regard to the principle effect of unmarked nucleus placement on the last full lexical item, Allerton (1978: 148) exemplifies that in 'Subject + Intransitive Verb' structures the verb takes the nucleus, while in 'Subject + Transitive Verb + Object(s)' structures it will be the (last) object. In general the 'standard view' or default pattern for English and German is that within the same focus domain arguments (nominal complements of the verb) are more likely to receive a pitch accent than predicates (or any other constituents such as adverbials or determiners). However, it has to be pointed out that such default accent rules only apply to all-new sentences, since accentuation in broad focus domains may be affected by the givenness level of the sentence constituents. Thus, the previous discussion clarified the role of the focus domain for intonational marking, in particular for (nuclear) accent placement.¹³ Furthermore, we can conclude that activation prosody can be overridden by narrow focussing, but that fo-

¹³Moreover, studies on German have shown that words in contrastive and narrow focus involve greater prosodic prominence in relation to words in non-contrastive and broad focus, respectively. The differences in prominence marking result from discrete F₀ modifications of accent categories as well as from continuous

cus prosody and activation prosody may interact within broad focus domains. The latter aspect brings us to the discussion of the intonational marking of givenness.

Activation Prosody

In chapter 2, section 2.3.4 it has already been mentioned that it is commonly assumed that new referents are marked by accents whereas given referents are not accented (or more precisely are deaccented). However, the prosody of accessible referents seems to be a matter of some debate. Chafe (1994), e.g., postulates that accessible information is marked, like new information, by accented noun phrases, while Lambrecht (1994) suggests that accessible referents are either accented or deaccented.

Empirical support for Chafe's assumed correlation between newness/accessibility and accentuation on the one hand and givenness and deaccentuation on the other is provided by Brown (1983) in a production study on Edinburgh Scottish English (87% of brand-new and 79% of inferrable items were accented, while 96-100% of evoked items were deaccented). Furthermore, the dichotomy of new vs. given information and their marking as accented vs. unaccented has been confirmed for West-Germanic languages by a cross-linguistic production study on the intonational marking of textually given material by Cruttenden (2006).

However, several studies on English and German have shown that differences in a referent's level of givenness cannot adequately be described by a simple accented vs. unaccented dichotomy. Instead, they provide evidence that accent strength (reflected by the position of an accent within a phrase) and the accent type (tonal configuration) on a referent is important for encoding its givenness. First, given referents are often accented in prenuclear and/or prefocal position (e.g. Terken & Hirschberg, 1994) which has often been found to be due to rhythmical reasons, i.e. in order to keep up the principle of rhythmic alternation (see e.g. Gussenhoven, 1991; Baumann, Becker, Grice & Mücke, 2007; Féry & Kügler, 2008). Furthermore, several studies on English (e.g. Brazil, 1975; Gussenhoven, 1984, 2002a; Pierrehumbert & Hirschberg, 1990; Chen, Den Os & De Ruiter, 2007) and German (e.g. Kohler, 1991a; Baumann, 2006; Baumann & Grice, 2006; Schumacher & Baumann, 2010; Baumann & Riester, 2013; Röhr & Baumann, 2010) provide evidence that variations in the tonal configuration also mark important differences concerning an item's information status.

F0 modifications within the same category (e.g. Ritter & Grice, 2015; Grice, Ritter, Niemann & Roettger, 2017).

Variations in the Tonal Configuration In particular, Pierrehumbert & Hirschberg's (1990) study on American English roughly suggests a ternary distinction between low accents for given, downstepped accents for accessible and high accents for new referents. The results of their data analysis can be summarized as follows (according to Baumann, 2006), arranged with respect to a decrease in a referent's givenness (indicated by <) from left to right:

(31) **Pierrehumbert & Hirschberg (1990):**

Intonational marking of givenness in American English

given (no accent, L*) < modification of given (L*+H) < accessible (H+!H*, !H*)
< addition of a new value (L+H*) < new (H*)

The most obvious conclusion of Pierrehumbert & Hirschberg's results would be: the higher the pitch on an accented syllable (i.e. on the starred element in autosegmental-metrical terms), the less given the respective referent.

For German, Kohler (1991a) used perception experiments to investigate the question of peak alignment differences in single-accent sentences and the influence of these differences on the sentences' linguistic and paralinguistic meanings. He found that the change from an early to a medial peak accent (or: from a falling to a high accent) caused a perceptual change from given/accessible to new information, i.e. a linguistically relevant change. Furthermore, he found that the change from a medial to a late peak (or: from a high to a rising accent) adds greater involvement or surprise, i.e. basically a paralinguistic value. In other words, the categorical change in perception indicates an interrelation between medial/late peaks and some kind of new information on the one hand and between early peaks and 'established' (interpreted here as accessible) information on the other.

Hence, Pierrehumbert & Hirschberg's and Kohler's studies reveal a relation between higher pitch accents and later accentual pitch peaks to the expression of 'newness'. These variances in relative pitch height and peak alignment (or the direction of pitch movement) have been shown to lead to an increase in perceived prominence (see (29) in section 3.2). This means there is a link between prominence judgments of accents to aspects of intonational meaning which is compatible with Gussenhoven's (2002a, 2004) Effort Code: the higher the pitch on a lexically stressed syllable (due to increased effort in speech production) - and, in turn, the higher its prominence¹⁴ - the newer (or more newsworthy) the discourse referent.

¹⁴A later peak may create the same prominence-lending effect as a higher peak, thus serving as a perceptual substitute.

Different Types of Accessible Information Moreover, there is evidence that accessible information cannot be treated as a uniform category, in that different accent types are used to discriminate between different types of more or less activated (accessible) information. In a perception experiment on German, Baumann (2006) and Baumann & Grice (2006) found a significant preference for falling accents (H+L*) over high/rising accents (H*) and deaccentuation in whole-part-relations and scenario conditions whereas deaccentuation was preferred over H+L* and H* accents in relations such as converseness, part-whole, synonymy and hypernym-hyponym (in either order). The results support the assumption that the association of entailed anaphora (e.g. *viola*) to their (subsuming) antecedent (e.g. *string instrument*) is less close or direct than the association of subsuming anaphora (e.g. *string instrument*) to their (entailed) antecedent (e.g. *viola*) (see discussion in chapter 2 section 2.3.1). The former relation (e.g. whole-part) prefers prominence marking by falling accents whereas the latter relation (e.g. part-whole) does not necessarily require prominence marking at all (indicating a higher degree of givenness). This relation between prominence marking and accessibility has been (indirectly) confirmed in a neurolinguistic study using ERPs by Schumacher & Baumann (2010). Referential processing indicates that falling accents (H+L*) are the most appropriate marker for inferentially accessible referents (i.e. entailment relations like *shoe – sole*) in comparison to high accents (H*) and deaccentuation.

Röhr & Baumann (2010) and Baumann & Riester (2013) developed a more fine-grained relation between degrees of givenness or information status categories and accent type in German. Results reveal that a decrease in the referent’s level of givenness is reflected by an increase in its prosodic prominence (expressed by differences in the strength and type of accent used) providing evidence for the relevance of different intermediate types of information status between the poles given and new. In general, the two studies detected a stepwise decrease in the degree of an entity’s givenness from deaccentuation (and prenuclear accents) through low and early peak nuclear accents to high and rising nuclear accents.

Röhr & Baumann (2010) (see also Röhr, 2013; Baumann, Röhr & Grice, 2015) are concerned with the prosodic marking of information status that is assigned to a referent, according to its salience in a text-internal discourse due to explicit or implicit previous mention. In the case of explicit (co-)reference, they distinguish between immediately evoked items (textually *given* information), and items whose previous mention is non-immediate or *displaced* (textually accessible information). Implicit reference involves cognitive *bridging* between an antecedent and an anaphor and is subsumed under the term ‘inferentially accessible’ information. In fact, this production experiment on read German revealed that a range of accent types (including deaccentuation) reflects different levels of

activation: The number of pitch accents as well as their prominence-lending cues (higher and later accentual peaks) increases stepwise from *given* through textually accessible (*displaced*) and inferentially accessible (*bridging*) to discourse-new (*unused*) referents. More precisely, Röhr & Baumann found that the newer, or less activated, a referent is, the more likely it is to be marked by a nuclear pitch accent. Conversely, the higher the degree of a referent's activation, the higher is the preference for deaccentuation. Prenuclear accents are only used if the referent is already accessible or given in the discourse. As for the types of accent used, new information is found to be primarily marked by high and relatively late peaks, while in accessible and given information the relative proportion of lower and early peak accents increases. As a main result of the study, the stepwise change in the relation between accentuation and deaccentuation among the four types of information status investigated suggests a difference in cognitive activation between the two types of accessible information: As expected, Röhr & Baumann found more prominence-lending cues on inferentially than on textually accessible items, which seems to confirm that a bridging inference between an anaphora and its antecedent involves more activation cost than the explicit repetition of a referent. Furthermore, the observed differences in the prosodic marking of accessible information (i.e. textually and inferentially accessible referents) indirectly supports the basic assumption that the system of cognitive activation of information is a continuum.

Baumann & Riester (2013) investigated the impact of the information status categories on the prosodic realization at both a referential and a lexical levels (as proposed in their RefLex scheme; see table 2.6 in chapter 2, section 2.3.3). For read speech they generally confirmed the relationship between information status and prosody showing a stepwise increase in prosodic prominence from given to new items, predominantly ordered according to the information status at the lexical level. However, the results have been found to be less clear in spontaneous speech.

The data by Röhr & Baumann (2010) and Baumann & Riester (2013) in general suggest that accent placement/position or accent strength is a more decisive prosodic marker of information status than accent type. The results are in line with the attested differences in perceived prominence (or accent strength) that are involved in accent placement/position (see (28) in section 3.2): Results reveal a general tendency of a stepwise increase in prosodic prominence (i.e. an increase in the use of nuclear accents and a decrease in the amount of deaccentuation) from given to new expressions (at both a referential and a lexical level). Furthermore, the preferred use of prenuclear accents for accessible or given information (as shown in Röhr & Baumann (2010)) is in line with several studies on English and German that propose different kinds of secondary prominence as markers of accessible information, e.g. Allerton (1978): 'secondary rise', Chafe (1994) and Büring

(2007): ‘secondary accent’, Halliday (1967b): ‘secondary information focus’, or Grice, Ladd & Arvaniti (2000): ‘phrase accent’.

It has to be pointed out that the results by Röhr & Baumann (2010) and Baumann & Riestler (2013) only indirectly reflect differences in prosodic prominence in relation to different levels of activation. The studies actually obtain differences in the relative distribution of accentuation. This means, differences in prosodic prominence are indicated by differences in the likelihood for accent placement (presence vs. absence of accent) and position (prenuclear accent vs. nuclear accent) and for particular accent types on the respective types of information status (cf. Calhoun, 2010).

To sum up, the results of the presented perception and production studies are indicative of the following relation: The stronger the accent (position) and the higher the pitch on a lexically stressed syllable and the later the pitch peak, the higher the perceived prominence and the ‘newer’ the discourse referent.¹⁵ Furthermore, accessible information cannot be treated as just one uniform intermediate category between the poles *given* and *new* and, different types of more or less activated information demand different accent types as linguistic markers, with the degree of prominence being the determining factor.

The Role of Verbal Expressions With regard to the previous discussion on the intonational marking of information status, a further important aspect must be pointed out: All presented studies investigated the intonational marking of reference relations between nominal expressions. The role of verbs in the prosodic marking of information status has hardly been investigated thus far. This might be due to the general assumption that nouns generally carry more semantic weight than verbs (see chapter 2, section 2.3.2). Furthermore, the contribution of verbs to the distribution of accents has primarily been discussed with regard to the focus-background structure of a sentence (see Prague School or e.g. Birner, 1994; Lambrecht, 1994) and/or in terms of topicalization (e.g. Kratzer & Selkirk, 2007; Féry, 2011). However, it has already been shown that there are cases where the accent pattern of a sentence may be influenced by the givenness (in terms of recoverability or expectability) of verbs that carry semantic weight, as e.g. in subject plus verb constructions like (20) (see chapter 2, section 2.3.2). Allerton (1978: 148) explains that in those cases the nucleus (most naturally) falls on the subject (and not on the last full lexical item = the verb) if the verb is highly predictable in terms of the subject. This has recently been confirmed in an acceptability study on German by Verhoeven & Kügler (2015). They investigated the accentual pattern of simple intransitive sentences

¹⁵However, with regard to the notion of prominence it has to be noted that there is an inverse relation between discourse prominence (givenness) and prosodic prominence, i.e. the more accessible a concept in the listeners mind, the lower its prosodic prominence.

and its interaction with the predictability of the verb. If the verb is to be expected due to the subject (e.g. *A ballerina danced.*) a prosodic realization with nuclear stress on the subject and a deaccented verb is appropriate. If the verb is not expected (e.g. *A teacher danced.*), the most appropriate prosodic realization involves nuclear accent on the verb. Such findings give rise to the assumption that (semantically heavy) verbs need to be more elaborately incorporated into the notion of information status.

The previous discussion of experimental evidence for the prosodic (de-)coding of givenness is the basis for the experiments presented in following two parts of this thesis.

Part II presents two perception experiments that aim to verify the results of the production experiment conducted by Röhr & Baumann (2010) (see above) from the listeners' perspective. The experiments investigate the effect of signal-based and context-based judgments of prosody with regard to the interpretation of an entity's information status. While a signal-based interpretation is solely based on the prosodic realization of an expression without context, a context-based interpretation of prosody involves expectations raised by the pragmatic context.

Part III is devoted to the investigation of the informativeness of verbs. In carefully controlled production and perception experiments we explore the effect of verbs on the interpretation of a noun's level of givenness and moreover address the question in how far verbs can be assigned an information status themselves.

Part II

Information Status of NOMINAL EXPRESSIONS: Signal-Based & Context-Based PERCEPTION

Chapter 4

Perception of Referential Givenness

4.1 Introduction

This chapter is concerned with investigations of a referent's level of givenness/information status and its decoding by prosodic means in read German. Two perception experiments will be presented that aim to find further evidence for the basic assumption that (stepwise or gradient) changes in a referent's level of givenness between the given and new poles are reflected in corresponding changes in its prosodic marking.

Several studies on English and German (presented in chapter 3, section 3.4) have shown that a simple dichotomy of accentuation vs. deaccentuation is inappropriate for an account of information status in general and in particular for an account of accessible information. The perception experiments presented in this chapter provide a more detailed account of the notion of givenness and the relation between a discourse referent's information status (referential level) and its prosodic decoding in German. This account is based on a previous production experiment on carefully controlled read data in German conducted by Röhr & Baumann (2010) (see also Röhr, 2013; Baumann, Röhr & Grice, 2015; cf. chapter 3, section 3.4). Based on the activation cost model proposed by Chafe (1994) and Lambrecht (1994) (see chapter 2, sections 2.3.3) the concept of givenness is actually understood to be potentially continuous. Since the experimental setup does not guarantee absolute continuity of *degrees* of givenness, different *levels* of semantic-cognitive activation are distinguished.

Röhr & Baumann (2010) investigated four classes of definite discourse referents that dif-

fer in their level of givenness, due to their salience in a text-internal discourse: Some of the investigated referents are discourse-new (*unused*). Another set of referents are *given* since they corefer to an antecedent in the immediately preceding discourse. In addition, two types of accessible information are distinguished: One class of referents is textually accessible due to previous mention that is non-immediate or (*given-*)*displaced* (cf. Yule, 1981). The other class of referents is inferentially accessible from a previously introduced scenario involving cognitive *bridging*.¹

The working hypothesis of the production study is based on the assumption that given, accessible and new information differ in the degree of cognitive activation in the listener's consciousness, which leads to differences in the activation effort by the speaker, which is in turn expressed by differences in the pronounced prosodic prominence. For the two types of accessible information Röhr & Baumann assume that inferentially accessible information (due to the bridging inference) probably requires more activation cost than the explicit repetition of a referent, however displaced. Different reading comprehension tasks already provide evidence that these two types of accessible information involve a semi-active level of activation (see chapter 2, sections 2.3.1 and 2.3.3).²

The results of the production study confirmed that the assumed decrease in the referent's level of givenness (from *given* through *displaced* and *bridging* to *unused* referents) is reflected by an increase in its prosodic prominence (expressed by differences in (a) accent placement, (b) accent position and (c) the type of (nuclear) accent used). This provides evidence for the relevance of different intermediate types of information status between the poles given and new. More precisely, results reveal that the less given or activated a discourse referent is,

- (a) the more likely it is to be marked by a pitch accent.
- (b) the more likely it is to be marked by the *nuclear* pitch accent.
- (c) the more likely it is to be marked by a (nuclear) accent with a (relative) high pitch and a late accentual peak.

Thus, in general the results of read German show, the 'newer' (or less activated) the referent, the higher the produced prominence.

¹*Unused* and *bridging* referents are denoted by lexically new expression, while *displaced* and *given* referents are denoted by lexically given expressions.

²Haviland & Clark (1974) and Clark & Haviland (1977) showed in psycholinguistic experiments that accessible referents that require inferential bridging take longer to process than given ones. Furthermore, Clark & Sengul (1979) found referents that have not been previously mentioned within two or three preceding sentences to be significantly less activated than referents whose previous mention is immediate. Recent neurolinguistic experiments using event-related brain potentials (ERPs) provide further support for an activation cost model (Burkhardt, 2006, 2007; Burkhardt & Roehm, 2007).

With regard to perception, it is generally assumed that the listener in turn is able to interpret the referent's information status by means of its degree of prosodic prominence. In order to verify this assumption, the following sections examine whether differences in accent placement/position and (nuclear) accent type have an effect on the listener's perception of a referent's level of givenness. Therefore two follow-up perception experiments were conducted on a selection of target sentences of Röhr & Baumann's (2010) production study (see also Röhr & Baumann, 2011; Röhr, 2013; Baumann, Röhr & Grice, 2015). In a first experiment the perceived degree of a target referent's givenness has been investigated solely by its prosodic marking. In a second experiment the appropriateness of the prosodic marking on a referent has been tested in terms of its information status within a context. While the first experiment aims to determine to what extent intonational features (only driven by the acoustic signal) may trigger a shift in the perception of different levels of givenness, the second experiment aims to find out in how far the information conveyed by the acoustic signal (according to the results of the first experiment) is influenced or even overwritten by the expectations evoked by the context.

Previous to the presentation of the two experiments, the following section 4.2 initially provides an introduction to the production study's reading material and the stimuli (target sentences) that are tested in both perception experiments. The reading material is particularly relevant to the second (context-based) perception experiment since it comprises the contexts for the test stimuli. The perception of the selection of target sentences of the production study were tested both in sentences in isolation (signal-based perception; see section 4.4) and in context (context-based perception; see section 4.5) by means of web-based rating tasks (see section 4.3). A summary of the main results and final conclusions are given in the last section 4.6.

4.2 Test Material

Reading Material (Target Sentences and Contexts)

The reading material is composed of ten different target words denoting discourse referents. Each of them is embedded in four target sentences in three different contexts in order to elicit four different types of information status of the target words (at a referential level): *unused*, *bridging*, *displaced*, *given*. The target words are bi- and tri-syllabic nouns in feminine gender (*Ballade* 'ballad', *Banane* 'banana', *Dame* 'lady', *Lawine* 'avalanche', *Rosine* 'raisin') and proper names ((*Dr.*) *Bahber/Bieber*, *Janina*, *Nina*, *Romana*), always with stress on the penultimate syllable and a comparable segmental structure: (CV).^hC/i/.CV

or (CV).’C/a:/.CV

The structure of the target sentences and their NP are simple and kept constant in all contexts³: That is, each target sentence starts with a pronominal subject followed by the finite part of a separable verb and the target word and ends with the verbal particle (i.e. the prefix of the separable verb). The target word is always encoded as a definite direct object which is supposed to indicate its ‘identifiability’, i.e. the target word refers to a particular instance of an entity (cf. Lambrecht, 1994; see chapter 2, sections 2.3.1 and 2.3.4). A sample reading material for the target word *Banane* is given in table 4.1.⁴

In target sentence (a) of the first context, the target word is mentioned for the first time and is not derivable from the previous context sentence. The target referent refers to items that are generally known and that are identifiable from their own linguistic description. Hence, the target referent is identifiable, but at this point still inactive in the minds of speaker and listener and can therefore be classified as (discourse-)new or *unused* (cf. Prince, 1981; see chapter 2, section 2.3.3). After two or three intervening context sentences with a change in topic, the target word is repeated in target sentence (b). Due to the displacement of the target word (antecedent) in sentence (a) from the centre of attention, the target word (anaphor) in sentence (b) is no longer fully activated (e.g. ‘Centering Theory’: Grosz, Joshi & Weinstein, 1995; see chapter 2, section 2.3.1) but textually accessible. The target word is referred to as *displaced*.

The second context sets up a scenario, from which the target word in target sentence (c) is inferentially accessible. That is, the target word has not been explicitly mentioned before but is derivable from the preceding contextual frame via a *bridging* process (e.g. the banana is inferable from a zoo-monkey-food context). Accordingly, the target word’s information status is classified as *bridging*.

In sentence (d) of the third context, the target word is a repetition of an antecedent in the immediately preceding context sentence. In contrast to sentence (b), this target word is already fully activated and thus classified as *given*.

As far as possible, we controlled the focus structure of the target sentences in order to keep its influence on the prosodic marking of the target words to a minimum. In target sentences (a), (b) and (c), the target words are part of a broad focus domain. Only in sentence (d), the target word is part of the background due to its immediate previous mention.

³Target sentences that contain accessible and given target words are always identical for the same referent (see table 4.1).

⁴The reading/test material for all target words is given in appendix A.1.

CONTEXT 1: (a) new/unused (b) textually accessible/displaced
<p>(a) <i>Ich</i> [<i>nehme die <u>Banane mit.</u></i>]_{Focus}</p> <p>(b) <i>Er</i> [<i>steckt sich die <u>Banane ein.</u></i>]_{Focus}</p> <p>„Was hätten Sie gerne?“. (a) „<i>Ich nehme die <u>Banane mit</u></i>“, antwortet Thomas dem Obsthändler. Normalerweise ernährt er sich sehr ungesund und isst zwischendurch ständig Süßigkeiten. Außerdem treibt er fast nie Sport und wenn doch, dann am liebsten Minigolf. (b) <i>Er steckt sich die <u>Banane ein.</u></i> Lecker sieht die Banane aus. Vielleicht wird er demnächst öfter welche kaufen.</p> <p>“What would you like?” (a) “I’ll take the <u>banana</u> (along)”, says Thomas to the fruit merchant. He usually eats very unhealthily and he is always eating sweets between meals. He hardly ever plays sport, and if he does he prefers mini golf. (b) He pockets the <u>banana</u>. The banana looks delicious. Maybe he’ll buy them more often in future.</p>
CONTEXT 2: (c) inferentially accessible/bridging
<p>(c) <i>Er</i> [<i>steckt sich die <u>Banane ein.</u></i>]_{Focus}</p> <p>Thomas darf heute im Zoo seinen Lieblingsaffen füttern. Voller Vorfreude wird er sich gleich auf den Weg zu ihm machen. (c) <i>Er steckt sich die <u>Banane ein.</u></i> Vorhin war er dafür extra noch auf dem Markt beim Obsthändler.</p> <p>Today Thomas is allowed to feed his favourite monkey in the zoo. With great anticipation he’s about to set off (for the zoo). (c) He pockets the <u>banana</u>. He’s just been to the green grocer’s at the market especially to get one.</p>
CONTEXT 3: (d) given
<p>(d) <i>Er</i> [<i>steckt sich</i>]_{Focus} <i>die <u>Banane</u></i> [<i>ein.</i>]_{Focus}</p> <p>Thomas hat gerade auf dem Markt eine Banane gekauft. (d) <i>Er steckt sich die <u>Banane ein.</u></i> In Zukunft möchte er sich viel gesünder ernähren.</p> <p>Thomas has just bought a banana at the market. (d) He pockets the <u>banana</u>. In the future he wants to eat much more healthily.</p>

Table 4.1: Sample reading material for the target word *Banane* with English translation. The target sentences are printed in bold face and the target words are underlined.

In the production study ten native speakers of Standard German were recorded (seven female, three male), aged between 22 and 31 years (mean age = 25, SD = 2.7). All of them originated from the area around Cologne and Düsseldorf (North Rhine-Westphalia) (see appendix A.2, table A.11 for speaker information). Before the acoustic recordings, each subject was asked to read through the material quietly in order to guarantee full comprehension. After that, their task was to read out the reading material (three times

in randomised order) in a contextually appropriate manner to a potential hearer as for example in a role-play. A total of 120 target sentences (ten target words * four types of information status * three repetitions) per speaker entered into the analysis.

The target sentences were annotated according to GToBI (cf. Grice & Baumann, 2002; Grice, Baumann & Benzmüller, 2005; see chapter 3, section 3.3).

Perception Stimuli

For the perception tasks, seven original target sentences (and their original contexts) were selected from the production study for each information status (*unused*, *bridging*, *displaced*, *given*) according to their prosodic realizations. The selected target sentences differed in the accent placement/position and the type of accent realized **on the target words**.

The production study revealed that target sentences, with the argument in non-final position, were either produced with the nuclear accent on the target word (32a) or on the sentence-final verbal particle (32b) and (32c). In the former case (32a), we tested five nuclear pitch accents (H^* , $!H^*$, $H+!H^*$, L^* , $H+L^*$)⁵ on the target words. In the latter case the target word is either deaccented (32b) or receives a (low) prenuclear accent (32c). In those two cases, test sentences were chosen that displayed an $H+L^*$ nuclear accent on the sentence-final verbal particle.

In order to keep the variation in the prosodic realisation of the 28 test sentences (seven prosodic realizations * four types of information status) to a minimum, they all showed a prenuclear rising accent on the finite part of the separable verb with a peak in medial (H^*) or late position ($L+H^*$) and a sentence-final low boundary tone ($L-\%$).

To sum up, we tested the perception of target sentences with five nuclear pitch accents H^* , $!H^*$, $H+!H^*$, L^* , $H+L^*$; one low prenuclear pitch accent (PN) and no accent (deaccentuation, \emptyset) on the target word; see table 4.2.

- (32) a. *Er STECKT sich die Ba**NA**ne ein.*
b. *Er STECKT sich die Banane **EIN**.*
c. *Er STECKT sich die Ba**NA**ne **EIN**.*

‘He pockets the banana.’

⁵ $L+H^*$ and L^*+H accents were not tested, since the production data did not provide instances of these accent types for each type of information status.

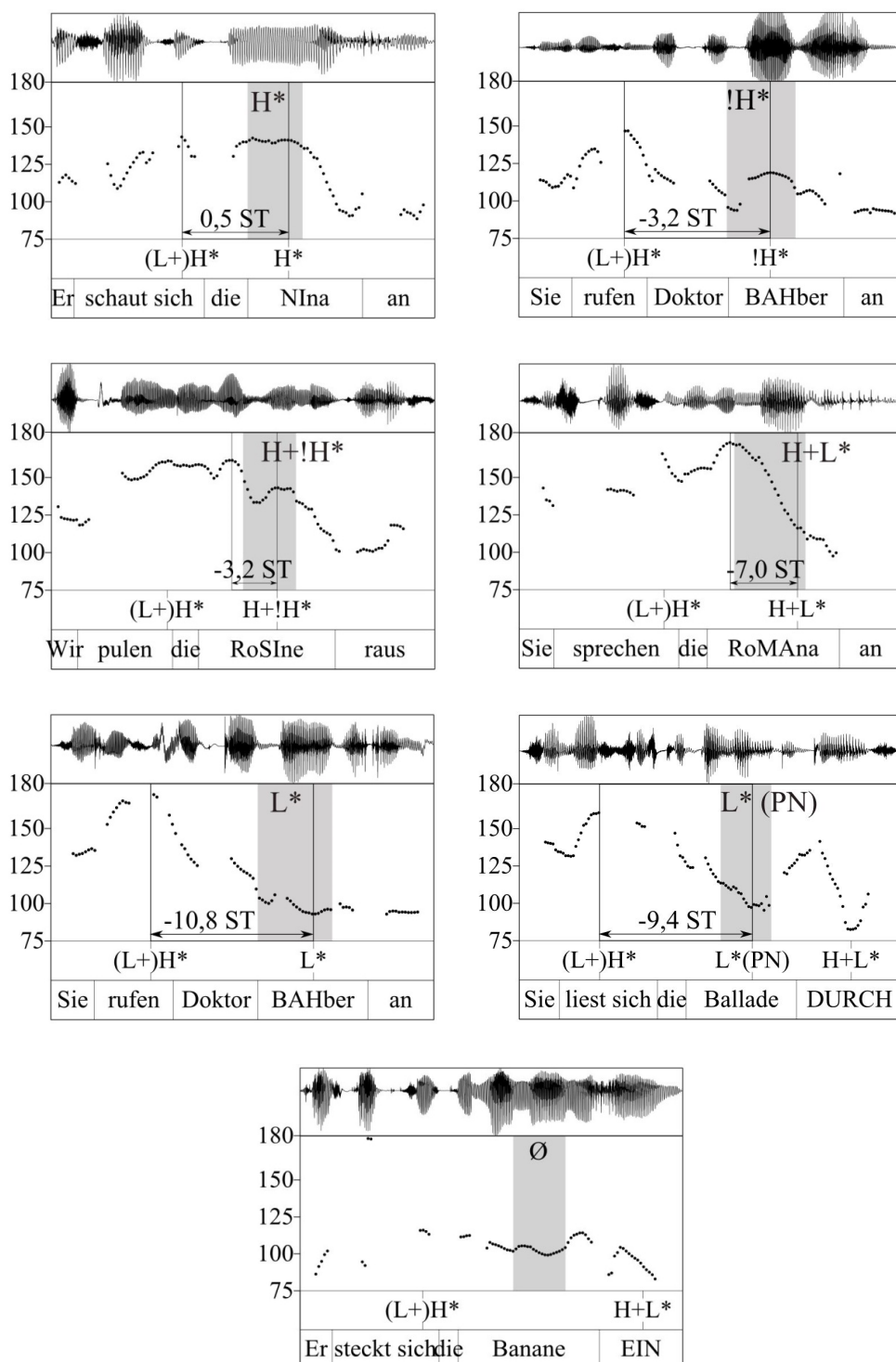


Table 4.2: Examples of seven prosodic realizations on target sentences: oscillogram (top panel), F0 contour (with semitone difference between starred tone of target word’s accent and a previous F0 peak in [ST]) (middle panel), GToBI annotation and text (bottom panel). The stressed syllable of the target word is shaded in gray. ‘PN’ stands for prenuclear pitch accent and ‘Ø’ for no accent/deaccentuation.

The perceptual equivalence of the respective prosodic realizations of the selected target sentences (i.e. seven target sentences for each information status, see above) has been approved in an informal perception experiment. Furthermore, we controlled the acoustic equivalence of the respective accents on the target words in terms of a comparison of semitone [ST] differences between the starred tone of the accent in question and the most recent preceding F0 peak (leading tone of the accent or F0 peak of accent on finite verb; see [ST] values in table 4.2). No adjustments of the original utterances were made, except for an equalization of the sound level of the test material.

A balanced distribution of all target words and speakers of the production study was not possible for the selection of target sentences. However, each target word and each speaker occurs at least once in the selection of test material for the perception studies (see appendix A.2, table A.13). Nevertheless, we did not select more than one combination of target word and speaker for the experiment.

4.3 Method

The selected target sentences of the production study were tested in isolation and in context by means of two separate web-based rating tasks implemented with the ‘SoSci Survey’ software of an online questionnaire named ‘onlineFragebogen (oFb)’ (Leiner, 2014).

Subjects gave their judgements by placing a roll bar on a continuous horizontal line between two end-points and without apparent scaling (visual analogue scale (VAS)). The roll bar could be moved from the middle of the line to the left pole or to the right pole. The responses on the VAS are encoded as interval data ranging from 1 (left pole) to 100 (right pole). However, VAS does not guarantee that the differences between the points of measurement are equally distant and that they are interpreted similarly by different subjects. In order to eliminate subject effects relating to the use of VAS we therefore used a repeated measures ANOVA (rmANOVA) for statistical analysis⁶ by means of SPSS (IBM corp., 2013). Hence, for each analysis data were submitted to an rmANOVA with subject as a random factor and prosodic realization (\emptyset , PN, five nuclear accent types), accent placement/position (no accent (\emptyset), prenuclear accent (PN), nuclear accent) and nuclear accent type (without \emptyset & PN) as independent variables. We report p-values, an effect was deemed to be significant at $\alpha \leq 0.05$.

In both experiments, each test stimulus had to be evaluated three times in randomized order. The evaluation was carried out for each test sentence/context on a separate page.

⁶Since visual inspection of residuals reveal deviations from homoscedasticity or normality we did not perform a linear mixed effects analysis.

The participants controlled when to start a stimulus but it could not be played again. In general both experiments are composed of four parts: (1) introduction and description of the task, (2) anonymous questionnaire (personal data), (3) practice section (seven stimuli), (4) main section (involving seven additional stimuli at the beginning and seven additional stimuli at the end of the main section, that did not enter the analysis). The experiments were provided via different open URLs.

4.4 Signal-Based Perception

4.4.1 Hypotheses

The basic assumption is that a referent's prosodic marking has an effect on its perceived degree of givenness. Target sentences are tested in isolation, i.e. no context is provided. Accordingly, we hypothesize the following:

- (I) An increase in a referent's prosodic prominence - by (a) the presence of an accent, (b) a nuclear accent status and (c) a (nuclear) accent type with a higher pitch and a later pitch peak - triggers a decrease in the referent's perceived degree of givenness.

4.4.2 Task

In this experiment the perception of the target sentences was tested in isolation, i.e. no context was provided. A test sentence was automatically played twice, separated by a pause of one second, without being presented orthographically (in order to avoid visual priming effects). The participants' task was to evaluate 'whether the target word in a test sentence sounded as if it was (rather) known or unknown'. The left pole of the rating scale (VAS) was labelled *bekannt* 'known' and the right pole was labelled *neu* 'new' (see figure 4.1). Accordingly, higher ratings on this *givenness* scale reflect a lower degree of givenness.

In the main part of the experiment in total 83 stimuli had to be evaluated: seven target sentences/prosodic realizations * four types of information status * three repetitions. Subjects on average needed 10-15 minutes to finish the experiment.

1. Das genannte Substantiv in der Äußerung klingt so, als wäre es ...



Figure 4.1: Sample of experimental design and rating task/scale used in the signal-based perception experiment (implemented with the ‘SoSci Survey’ software (Leiner, 2014)).

4.4.3 Subjects

The evaluations of 142 native German speakers (61 % female and 34 % male)⁷ that took part in the experiment entered the analysis. Subjects were aged between 19 and 75 years (mean age = 30.6, SD = 13.7), grew up in 14 different German federal states and were no experts in speech analysis.

4.4.4 Results

An rmANOVA revealed effects of prosodic realization (\emptyset , PN, five nuclear accent types) [$F(6,83) = 22.930$, $p < 0.001$], accent placement/position (no accent (\emptyset), prenuclear accent (PN), nuclear accent) [$F(2,83) = 24.406$, $p < 0.001$] and nuclear accent type (without \emptyset & PN) [$F(4,83) = 13.458$, $p < 0.001$]. This means, as an overall result, the responses on the *givenness* scale prove to be significantly influenced by the accent *placement/position* as well as the nuclear accent *type* on a target word.

Results reveal that deaccentuation and low prenuclear accents (homogeneous subgroup \emptyset & PN: mean = 24.4 %, SD = 24.6) lead to significantly lower values on the rating scale than nuclear accents (all accent types pooled: mean = 40.9 %, SD = 29.7). Moreover, the evaluations of the five different nuclear accent types are distributed in two significantly different groups (homogeneous subgroups: rising and falling accent types), as presented in figure 4.2 (see also table 4.3).

Results show that a target word realized with no accent or a low prenuclear accent is most likely to be perceived as known, or given, whereas target words that show a local F0 rise to a high or downstepped accentual peak (H^* , $!H^*$) are perceived as least given (mean = 45.8 %, SD = 31.5). Low accents (L^*) and early peak accents ($H+L^*$, $H+!H^*$) with a predominant falling part onto the accented syllable take an intermediate but significantly distinct position with regard to their perceived degree of givenness (mean = 37.3 %, SD = 28.0).

⁷5 % of the subjects did not specify their gender.

Test stimuli originate from different context types, but their originally produced (intended) information status did not affect the givenness ratings (see table 4.3).

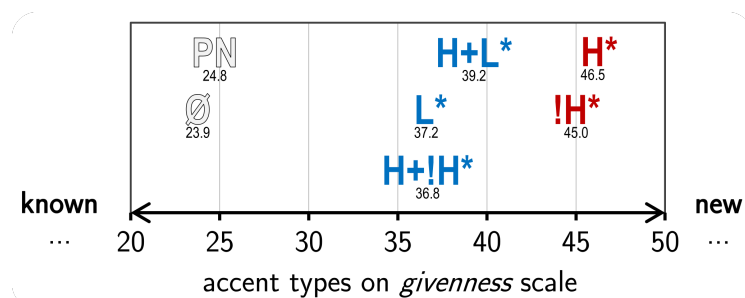


Figure 4.2: Distribution of no accents (\emptyset), prenuclear accents (PN) and nuclear accent types (rising accents indicated in red, falling accents indicated in blue) on the *givenness* scale according to their mean response values for all subjects pooled.

signal-based responses on <i>GIVENNESS</i> scale (mean and (SD)) for prosodic realizations								
original context/ information status	total \emptyset	total PN	L*	nuclear accent types (N)				total N
				H+L*	H+!H*	!H*	H*	
<i>unused</i>	24.8 (30.6)	30.4 (34.5)	42.4 (35.5)	41.2 (35.4)	35.1 (34.6)	44.7 (37.4)	44.6 (38.7)	41.6 (36.5)
<i>bridging</i>	28.6 (32.4)	20.2 (28.3)	34.3 (33.1)	33.4 (34.2)	30.2 (33.5)	49.4 (37.3)	40.2 (36.1)	37.5 (35.5)
<i>displaced</i>	18.4 (25.5)	20.6 (27.8)	41.7 (35.0)	43.4 (36.4)	32.1 (32.3)	40.5 (35.2)	46.5 (38.0)	40.8 (35.7)
<i>given</i>	23.9 (28.7)	28.0 (32.1)	30.2 (32.2)	39.0 (36.7)	49.6 (37.1)	45.5 (36.7)	54.9 (39.3)	43.8 (37.4)
mean	23.9 (29.6)	24.8 (31.0)	37.2 (34.3)	39.2 (35.8)	36.8 (35.2)	45.0 (36.7)	46.5 (38.3)	40.9 (36.3)

Table 4.3: Mean response values on the *givenness* scale (and standard deviation in parentheses) for all test sentences with no accent (\emptyset), a prenuclear accent (PN) and different nuclear accent types (N) on the target referent. All subjects are pooled. Results are ordered according to the target referent's (originally intended) contextual information status.

4.4.5 Discussion

The results of the signal-based perception experiment generally confirm hypothesis (I): A referent is perceived as less given (high values on the *givenness* scale) the more prosodically prominent it is. Conversely, this means, the higher the produced prominence, the more likely is the perception of 'newness'.

4.4. SIGNAL-BASED PERCEPTION

Target referents with no accents and prenuclear accents are rated similarly with regard to their perceived degree of givenness. This might be due to the fact that in both cases the nuclear accent falls on the sentence-final verbal particle. This implies that nuclear accent placement (nuclear vs. prenuclear accent) is a decisive cue for the perception of givenness/newness.

Furthermore, there is a significant difference between different accent types. However, this difference has been found to be not necessarily reflected by the relative pitch height but by the presence or absence of an early peak. This in particular applies to referents with downstepped accents (!H*), which were perceived significantly ‘more given’ if they were preceded by an early peak (H+!H*). The grouping of accent types with a predominant falling part (L*, H+L* und H+!H*) has also been shown in a production experiment, that found the tonal movement before the accented syllable (‘onglide’) to play an important role in the distinction of contrastive vs. non-contrastive information (cf. Grice, Mücke & Ritter, 2012; Ritter, Riester & Grice, 2012; Grice, Ritter, Niemann & Roettger, 2017; see also Ritter & Grice, 2015).⁸ Furthermore, this finding is in line with the result of a recent perception study that reveals a difference in perceived prominence between rising and falling accent types, i.e. rises are more prominent than falls (cf. Baumann & Röhr, 2015; see chapter 3, section 3.2).

However, strikingly, the perceptual differences of the current perception experiment solely reside in the first half of the evaluation scale which belongs to the side of the ‘known’ pole. This may be due to the definiteness of the target words. In German, as in many other languages, the formal representation of definiteness is an important grammatical correlate of identifiability. A referent is identifiable if the speaker assumes that the referent is generally known or that the listener can identify or infer the particular referent (which the speaker has in mind) by its linguistic expression. This means, identifiability involves shared knowledge between speaker and listener. All target referents in the current perception study are marked as being identifiable by definiteness. This already signals some kind of ‘familiarity’, which might affect listener’s judgements or even inhibit that the referent can be perceived as being new.⁹

Finally, the results reveal that the origin of the test stimuli (i.e. the context type involving different types of (produced) information status) did not play any role for the givenness ratings and that listeners decoded an items degree of givenness exclusively by prosodic means.

⁸As a consequence, in the latest version of GToBI, presented in Grice & Baumann (2016), the two early peak accents (H+L* and H+!H*) are collapsed into one category that is annotated as H+!H*.

⁹Another possible explanation for the mean evaluations to reside in the ‘known’ half of the *givenness* scale may be attributed to the experimental design: Some target word appear several times during the experiment. Even though same target words a produced by different speakers, the mere repetition of a referent might have impaired the perception of newness.

4.5 Context-Based Perception

4.5.1 Hypotheses

The basic assumption is that a referent's information status can be marked but also be interpreted by means of prosody. This means, a listener should be able to interpret the level of prominence of a word as indicative of its information status. Target sentences are tested within contexts from a production study (see e.g. Röhr & Baumann, 2010) that confirmed a decrease in the referent's level of activation/givenness from *given* through *displaced* and *bridging* to *unused* discourse referents. Accordingly, we hypothesize that the appropriateness of a prosodic marking varies depending on the referent's degree of activation induced by the discourse context as follows:

- (II) An increase in a referent's prosodic prominence - by (a) the presence of an accent, (b) a nuclear accent status and (c) a (nuclear) accent type with a higher pitch and a later pitch peak - is perceived as contextually more appropriate for referents with a decreasing level of givenness.

4.5.2 Task

In this experiment, the target sentences were rated in relation to their corresponding contexts. The entire context (including the test sentence (underlined within context)) was presented orthographically and automatically played once.¹⁰ The participants' task was to evaluate 'how well the melody of the test sentence fits into the context'. The left pole of the rating scale (VAS) was labelled *gar nicht* 'not at all', meaning not appropriate, and the right pole was labelled *sehr gut* 'very well', meaning appropriate (see figure 4.3). Accordingly, higher ratings on this *appropriateness* scale reflect a higher degree of appropriateness.

Due to the increased complexity the experiment was divided into four parallel sub-experiments. In a sub-experiment we only tested test sentences originating from the same single context type (*given*, *displaced*, *bridging*, *unused*). This means that all target words that had to be evaluated within a sub-experiment have the same information status. Thus, in the main part of each sub-experiment in total 21 stimuli had to be evaluated: seven

¹⁰The acoustic stimuli ended with the test/target sentences. Furthermore, for the *unused* condition, a short version of the original context was used, so that each target sentences was only followed by one context sentence.

4.5. CONTEXT-BASED PERCEPTION

Thomas hat gerade auf dem Markt eine Banane gekauft. Er steckt sich die Banane ein. In Zukunft möchte er sich viel gesünder ernähren.

Wie gut passt die Melodie der unterstrichenen Äußerung in den Kontext?



Figure 4.3: Sample of experimental design and rating task/scale used in the context-based perception experiment with a *bridging* context for the target word *Banane* (implemented with the ‘SoSci Survey’ software (Leiner, 2014)).

target sentences/prosodic realizations * one type of information status * three repetitions. Subjects on average needed 30-40 minutes to finish a sub-experiment.

4.5.3 Subjects

In total the evaluations of 83 native German speakers (57 % female and 33 % male)¹¹ that took part in the experiment entered the analysis. Subjects were aged between 19 and 75 years (mean age = 26.8, SD = 10.8), grew up in 14 different German federal states and are no experts in speech analysis.¹²

Since the four sub-experiments were randomly provided by the same open URL the subjects are distributed differently over the four sub-experiment:

<i>unused:</i>	39 subjects / 67 % female, 28 % male / age: 19-75 years / mean age = 27.3, SD = 12.3
<i>bridging:</i>	34 subjects / 50 % female, 29 % male / age: 19-59 years / mean age = 26.5, SD = 9.6
<i>displaced:</i>	33 subjects / 55 % female, 33 % male / age: 19-65 years / mean age = 26.5, SD = 11.2
<i>given:</i>	36 subjects / 56 % female, 42 % male / age: 19-62 years / mean age = 26.7, SD = 10.1

4.5.4 Results

A first descriptive analysis of the data indicates, as an overall result, that the appropriateness of an item’s prosodic marking differs in terms of accent *placement/position* with

¹¹10 % of the subjects did not specify their gender.

¹²The group of subjects for the signal-based perception experiment partly overlaps with the group of subjects for the context-based perception experiment.

respect to its role as prosodic marker of different types of information status as presented in figure 4.4 (see also table 4.5).

Given and accessible referents (*given*, *displaced* and *bridging*) show clear differences in their appropriateness ratings: The prosodic marking by nuclear accents is increasingly more appropriate, the less given a target word is. This in particular applies to the nuclear accent types H^* , $!H^*$ and $H+!H^*$ (see figure 4.5). Conversely, the appropriateness of pre-nuclear accents and deaccentuation increases the more given a target word is. However, new (*unused*) information is rated differently. In the following the results are presented in more detail from *given* through *displaced* and *bridging* to *unused* target words.

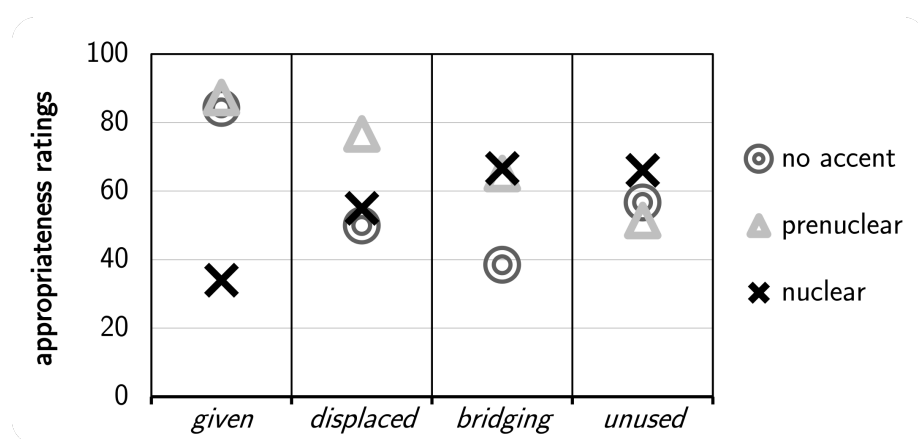


Figure 4.4: Distribution of no accents (\emptyset), pre-nuclear accents (PN) and nuclear accents (all accent types pooled) on the *appropriateness* scale according to their mean response values in the four sub-experiments for all subjects pooled.

An rmANOVA revealed effects of accent placement/position (no accent (\emptyset), pre-nuclear accent (PN), nuclear accent) for *given* [$F(2,36) = 107.118$, $p < 0.001$], *displaced* [$F(2,33) = 12.126$, $p < 0.001$] and *bridging* [$F(2,34) = 11.039$, $p < 0.01$] target referents.

The ratings for accent placement/position were most explicit for *given* target words: Target sentences with the nuclear accent on the sentence-final verbal particle are rated as most appropriate. This means, that deaccentuation (84.3%, $SD = 20.9$) and low pre-nuclear accents (87.3%, $SD = 19.0$) (homogeneous subgroup) turned out to be best qualified to mark *given* target words, while nuclear accents (all accent types pooled: 34.0%, $SD = 32.9$) are least qualified as their prosodic marker.

Low pre-nuclear accents also seem to be an appropriate prosodic marker for accessible information (*displaced*: 76.7%, $SD = 22.5$ and *bridging*: 65.1%, $SD = 28.4$). In the *displaced* condition target words with no accents (49.9%, $SD = 31.9$) and nuclear accents (54.9%, $SD = 29.6$) (homogeneous subgroup) take a neutral position with regard to their appropriateness as prosodic marker. However, for *bridging* target referents, nuclear (66.6%,

4.5. CONTEXT-BASED PERCEPTION

SD = 28.5) as well as prenuclear accents (65.1 %, SD = 28.4) (homogeneous subgroup) seem to be both rather appropriate for the listener, while deaccentuation is rather perceived as inappropriate (38.4 %, SD = 33.0).

In contrast to given and accessible information, ratings attributed to the accent placement/position for new (*unused*) target words are not significantly different: nuclear (66.1 %, SD = 27.9), prenuclear (51.4 %, SD = 32.4) and no accents (56.6 %, SD = 28.9) take an intermediate position on the *appropriateness* scale.

In terms of different accent *types*, an rmANOVA revealed an effect for *given* target referent only (see figure 4.5 and table 4.5): prosodic realization (\emptyset , PN, five nuclear accent types) [F(6,36) = 28.886, $p < 0.001$] and nuclear accent type (without \emptyset & PN) [F(4,36) = 17.933, $p < 0.001$]. Moreover, *given* target referents show a significantly different distribution of nuclear accent types on the *appropriateness* scale that is in line with hypothesis (II)(c). Nuclear accents with higher (and later) F0 peaks are increasingly perceived as less appropriate (indicated by $<$) prosodic markers for *given* discourse referents (homogeneous subgroups: H* & !H* < H+!H* < H+L* & L*).

The ratings of different nuclear accent types did not reveal significant effects for accessible and new referents.

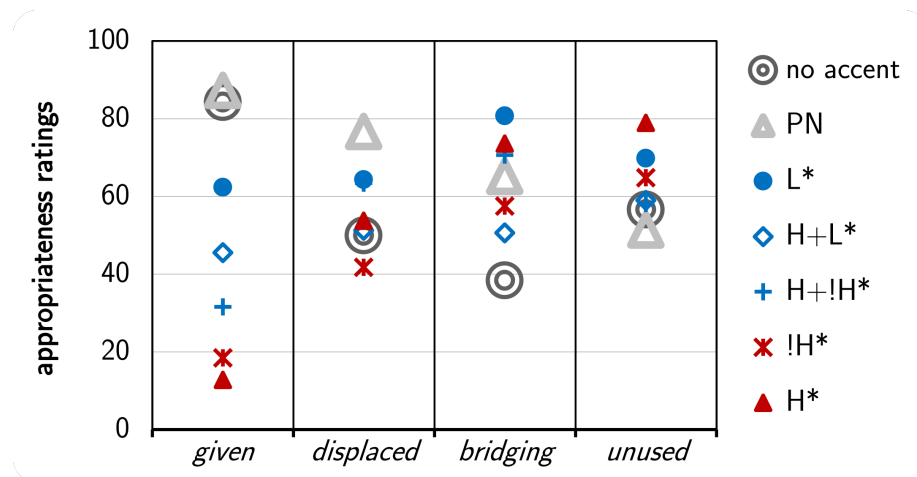


Figure 4.5: Distribution of no accents, prenuclear accents (PN) and nuclear accents types (rising accents indicated in red, falling accents indicated in blue) on the *appropriateness* scale according to their mean response values in the four sub-experiments for all subjects pooled.

context-based responses on <i>APPROPRIATENESS</i> scale (mean and (SD)) for prosodic realizations								
original context/ information status	total ∅	total PN	L*	nuclear accent types (N)				total N
				H+L*	H+!H*	!H*	H*	
<i>unused</i>	56.6 (28.9)	51.4 (32.4)	69.9 (25.5)	59.0 (29.9)	58.2 (29.5)	64.8 (27.7)	78.9 (20.8)	66.1 (27.9)
<i>bridging</i>	38.4 (33.0)	65.1 (28.4)	80.8 (20.5)	50.6 (29.1)	70.7 (25.7)	57.5 (31.8)	73.6 (23.1)	66.6 (28.5)
<i>displaced</i>	49.9 (31.9)	76.7 (22.5)	64.4 (27.2)	51.3 (30.3)	63.4 (24.1)	41.8 (27.8)	53.7 (32.3)	54.9 (29.6)
<i>given</i>	84.3 (20.9)	87.3 (19.0)	62.3 (30.5)	45.6 (32.0)	31.6 (29.6)	18.5 (23.2)	12.8 (21.1)	34.0 (32.9)

Table 4.4: Mean response values on the *appropriateness* scale (and standard deviation in parentheses) for all test sentences with no accent (\emptyset), a prenuclear accent (PN) and different nuclear accent types (N) on the target referent. All subjects are pooled. Results are ordered according to the target referent’s contextual information status in the sub-experiments).

4.5.5 Discussion

Despite a smaller number of participants for each of the four sub-experiments and a natural variability in the prosody of the read contexts, hypotheses (II) was confirmed in terms of (a) accent *placement* and (b) accent *position*, even for the two types of accessible information: The less given a referent is, i.e. from *given* through *displaced* and *bridging* to *unused* referents, the more appropriate is the prosodic marking by nuclear accents. Conversely, the higher the level of a referent’s givenness, the more appropriate is the prosodic marking by low prenuclear accents and deaccentuation.

As an exception, we did not find significantly different ratings attributed to the placement/position of accent for discourse new (*unused*) target words: nuclear, prenuclear and no accents take an intermediate position on the *appropriateness* scale. This is probably due to the preceding context question eliciting a broad focus in the target sentence. The target sentence is exclusively composed of discourse-new items and this leaves room for a wide variety of possible prosodic realizations of the target sentence. Furthermore, in the perception experiment with the *unused* condition, the whole context after the target sentence was not presented. This might have led to a different interpretation of the informativeness of the target sentence/word than in the production experiment.

As to the appropriateness of different nuclear accent *types* we only found significant differences that reflect the assumed correlation between contextual givenness and prosodic prominence for *given* target words, i.e. hypothesis (II)(c) was partly confirmed. In contrast to the the other target words, they are part of the background domain of the target

sentences, which might highly restrict the variety of possible prosodic realizations and requires a low prominence marker.

The results of the signal-based perception experiment (see section 4.4) have already shown that different prosodic realizations involve the perception of different levels of givenness. The context-based perception experiment confirms this relation by the following correlation between the appropriateness of different prosodic realizations of a referent and its level of givenness induced by the context: the less given a referent in context, the more perceptually appropriate is an increase in the pronounced prominence produced.

4.6 Summary and Conclusion

This chapter presented two (follow-up) perception experiments on read German that investigated

- (i) whether different nuclear accent types, prenuclear accents and deaccentuation on a referent lead to differences in its perceived level of givenness (only driven by the acoustic signal) and
- (ii) whether their appropriateness (as prosodic marker) differs with respect to the referent's contextual givenness (i.e. we tested givenness (*given*), textual accessibility (*displaced*), inferential accessibility (*bridging*) and discourse-newness (*unused*)).

Both perception experiments provide corresponding results and confirm the findings of a previous production study. This means that there is a clear relation between (i) the perceived degree of givenness of a referent and its prosodic marking and (ii) the preferences or appropriateness ratings for prosodic markers with regard to a referent's contextual givenness.

More precisely, results reveal that deaccentuation and (low) prenuclear accents are mostly interpreted as encoding given items, and turned out to be best qualified to mark given referents. This is probably due to the fact that in these cases the (structurally stronger) nuclear accent falls on the following verbal particle, leading to a weaker (secondary) prominence of the target word's accent in relation to the nuclear accent (see chapter 3, section 3.4 for evidence). Accordingly, referents with nuclear accents are perceived as least given. They are also (more frequently used in production and) perceived as more appropriate the newer a referent is.

Moreover, we found that the four types of investigated information status involve stepwise changes in the appropriateness of differences in accent placement/position: The 'newer'

the referent (from *given* through *displaced* and *bridging* to *unused*), the more appropriate is an increase in the pronounced prosodic prominence. As expected, inferentially accessible items (*bridging*) involve a higher degree of prosodic prominence than textually accessible items (*displaced*). This seems to confirm that a bridging inference between an anaphora and its antecedent involves more activation cost than the explicit repetition of a displaced referent. Hence, the results provide further evidence for the relevance of *different* intermediate levels of (cognitive) activation/givenness between the poles active/given and inactive/new.

Results also confirm that given information does not necessarily need to be deaccented (e.g. Baumann, Becker, Grice & Mücke, 2007; Féry & Kügler, 2008).¹³ The relation between a referent's contextual information status and its decoding by prosodic means has been found to be primarily reflected by differences in the prosodic *status* of accentuation (or accent placement/position, i.e. no accent, prenuclear accent, nuclear accent) on the referent (cf. Baumann & Riester, 2013). Thus, an appropriate account of the de-coding of a referent's givenness requires a more fine-grained differentiation of prosodic prominence by means of differences in the *status* of accent.

In terms of the form and function of different accent types, the signal-based perception study suggests that the determining factor for the decoding of a referent's information status is the tonal movement onto the accented syllable (see also Ritter & Grice, 2015; Grice, Ritter, Niemann & Roettger, 2017): Falling accents with an F0 minimum (L*) and/or an early peak (H+L*, H+!H*) lead to the perception of a higher degree of givenness than rising accents with a high (H*) or downstepped accentual peak (!H*). This reflects that in German rising tonal movements on the accented syllable are perceived as more prominent than falling tonal movements (cf. Baumann & Röhr, 2015).

To sum up, it has been shown that a referent's prosodic marking *can* serve as an important cue for the interpretation of its information status or level of givenness (both only driven by the acoustic signal or in context). More precisely, the experimental results reveal further evidence for the commonly assumed (inverse) correlation between givenness (*discourse* prominence) and *prosodic* prominence, i.e. and increase in givenness (*discourse* prominence) correlates with a decrease in prosodic prominence. Moreover, in line with Chafe's (1994) activation cost model, the perception studies also provide further evidence for the relevance of different intermediate levels of cognitive activation between the active and inactive poles. These findings are even more remarkable since the test material was spoken by a number of different speakers, and evaluated by a heterogeneous group of listeners.

¹³A (low) prenuclear accent turned out to be somewhat appropriate for all types of information status.

Part III

Semantic Relations between NOMINAL and VERBAL EXPRESSIONS: Production and Perception

Introduction

In part II two types of accessible referents were investigated whose degree of activation differed with regard to recency (textual displacement) and explicitness (inferential bridging from a scenario) of previous mention. The experimental results provide linguistic evidence for the relevance of different intermediate levels of cognitive activation between the poles active (given) and inactive (new). This part deals with an increased granularity of accessibility evoked by different types of implicit previous mention. A general aim is to explore which factors (levels and modes) of an entity's givenness or activation are linguistically relevant, i.e. in how far is givenness linguistically encoded, in particular in terms of prosodic marking. The studies presented in this part do not concentrate on the information status of nominal/referential expression, but moreover aim to investigate the informativeness of verbs (or predicates without nominal predicate complements). Since verbs or verbal expressions, in contrast to nominal expressions, do not refer to a *particular* instance or mental representation of an entity (see chapter 2, section 2.3.2) they are said to have a non-referential character. Hence, this chapter is not concerned with referential but with lexical givenness.

Implicit previous mention commonly involves different semantic relations between an anaphor¹⁴ and its antecedent. It has already been discussed that particular semantic relations are commonly assumed to differ in their closeness of association (e.g. subordinate (entailed) vs. superordinate anaphora); see chapter 2, section 2.3.1). In line with this, perception experiments on German (see Baumann, 2006; Baumann & Grice, 2006; Schumacher & Baumann, 2010; presented in chapter 3, section 3.4) reveal evidence that scenario and whole-part relations involve a higher level of prosodic prominence than relations such as converseness, part-whole, synonymy and hypernymy/hyponymy. These basic semantic relations usually involve links between the same parts of speech, namely two referring expressions (i.e. noun phrases (NPs)). Different parts of speech, e.g. verbs and nouns, can also be semantically interrelated (e.g. Chafe; see chapter 2, section 2.3.1).

¹⁴In this part the term 'anaphor' is not used in the traditional sense. Here it serves to denote *any* kind of expression that refers back to an already established concept.

Accordingly, verbs and verb phrases (VPs) are integrated in some annotation systems of information structure as possible source of a referent's accessibility (e.g. Nissim, Dingare, Carletta & Steedman, 2004; see chapter 2, section 2.3.3). However, verbs are usually not assigned an information status themselves, since there is a crucial distinction between information about states and events on the one hand, and information about referents or referring expressions on the other. A possible reason for this distinction might be the transitory nature of states and events in a person's active consciousness, i.e. they are constantly replaced by other states and events. Referents, by contrast, remain active for a longer period and serve as anchor points for new information over a larger stretch of discourse (cf. Chafe, 1994; see chapter 2, section 2.3.2).

Due to the lack of empirical evidence, this part investigates the encoding and decoding of the informativeness of verbs from two perspectives: (a) On the one hand we aim to explore in how far verbs have an effect on the givenness of nouns. (b) On the other hand we aim to explore in how far verbs can be assigned an information status themselves. We account for both perspectives by examining the effect of different semantic relations between verbs and nouns within the same discourse on their prosodic realisation. More precisely, in a carefully controlled production experiment (see chapter 5) and a follow-up perception experiment (see chapter 6) on read German two types or directions of reference relations are investigated (see also Röhr, Baumann & Grice, 2015):

(a) nouns that can be linked back to a preceding verb: **verb** ← **NOUN**

(b) verbs that can be linked back to a preceding noun: **noun** ← **VERB**

For both types of reference five types of information status are distinguished by using different verb-noun pairs. These pairs of target verbs and nouns were either semantically unrelated (i.e. new) or related to each other in different ways. Relations across parts of speech are not interrelated by *basic* semantic relations. In the case of many verbs and nouns the most important relation is the one between the event and the involved participants. According to Chafe's (cognitive) activation cost model we assume that the level of activation or givenness of a target verb/noun differs with respect to its semantic relation to a preceding element. In turn, we expect this difference to be reflected in the prosodic marking of the target element, in particular in terms of nuclear accent placement. By the same token, we assume that the listener is able to interpret an element's information status by means of its degree of prosodic prominence.

Chapter 5

Production of Relations between Nouns and Verbs

5.1 Reading Material

In a carefully controlled reading experiment the investigated verb-noun pairs (see table 5.1) were embedded in constructed mini dialogues (see tables 5.2 and 5.3), presenting them in consecutive sentences in both orders.

VERBS	NOUNS		
	created entity:		instrument
intentionally create something	result-stem	result	
<i>backen</i> 'to bake'	<i>Gebäck</i> 'pastries'	<i>Kuchen</i> 'cakes'	<i>Rezepte</i> 'recipes'
<i>fotografieren</i> 'to photograph'	<i>Fotografien</i> 'photographs'	<i>Bilder</i> 'pictures'	<i>Kameras</i> 'cameras'
<i>malen</i> 'to paint'	<i>Gemälde</i> 'paintings'	<i>Kunstwerke</i> 'artworks'	<i>Farben</i> 'paints'

Table 5.1: Target verbs and nouns (with English translation).

Three (semantically heavy) transitive active verbs denoting an event of intentionally creating an element serve as targets (cf. table 5.1). For each of these we chose three nouns that differ in their semantic relation to the verb (semantic relations based on Fillmore, 1976). The corresponding nouns either denote an *instrument* for creating a related element or the nouns denote the created element itself, namely the result. The noun denoting the result is either morphologically unrelated to the verb (labelled *result*) or displays the same word stem (labelled *result-stem*).

The structure of the mini dialogues is simple and kept constant for all semantic conditions. A sample mini dialogue for (a) **verb** ← **NOUN** relations is given in table 5.2 and for (b) **noun** ← **VERB** relations in table 5.3.¹ The mini dialogues consist of three sentences, with the target sentence last. The first sentence of a dialogue provides a thematic frame and contains the element to which the target element can be linked back to. The second sentence is a simple question eliciting a broad focus structure over the following target sentence.

Target sentences are embedded clauses consisting of the pronominal subject *sie* (S), a verb (in the present tense in the third person plural) (V), the adverb *gerne* (Adv) and an (in-)definite noun as direct object (O). The noun is always used in its plural form. Hence, definite nouns come with a definite article, while indefinite nouns come without an article. Verbs and nouns within the same target sentence are semantically unrelated in order to avoid collocations. The embedded target sentences are always combined with the preceding main sentence *Ich habe gehört ...* ('I've heard ...'). Two syntactic constructions are employed in order to test the target elements in medial and final sentence position (object-final: S-V-Adv-O (33a) and verb-final: S-Adv-O-V (33b)). In the verb-final sentences, target sentences have to begin with the conjunction *dass*.

- (33) *Ich habe gehört,*
a. *sie verkaufen gerne die Bilder.*
subject verb adverb object
b. *dass sie gerne die Bilder verkaufen.*
complement subject adverb object verb

'I've heard they like to sell the pictures.'

While the information status of the target element varies in the target sentences with respect to the preceding text, the information status of the other sentence elements is kept constant. The subject is always (lexically an referentially) given and the adverb is (at least lexically) new. In target sentences with the NOUN as the target element (verb ← NOUN), the verb can also be classified as being (lexically) new. In target sentences with the VERB as the target element (noun ← VERB), the noun is already activated (lexically and referentially) due to previous mention, i.e. it denotes a subsuming anaphor. The noun needs to be activated in these cases in order to be able to investigate the prosodic variation as a function of the verbs' givenness. If the noun was *not* activated at all it would presumably always attract the nuclear accent (disregarding variations in activation

¹The complete reading material is given in appendix B.1 for verb ← NOUN relations and in appendix B.2 for noun ← VERB relations.

of the verb) since discourse-new arguments are structurally stronger than their predicates in German (e.g. Büring, 2012; see also chapter 3, section 3.4). However, on the other hand the givenness of the noun might impair the deaccentuation of the verb in case of its givenness. As a consequence, we included a third sentence element, the adverb *gerne*, that provides a potential place for the nuclear accent without being a strong attractor for accentuation itself.²

(a) verb ← NOUN

<i>fotografieren</i> ('to photograph') – result	
A:	<i>Zu Beginn der jährlichen Wohltätigkeitsveranstaltung <u>fotografieren</u> die Studenten häufig die Gäste.</i>
B:	<i>Und dann?</i>
A:	<i>Ich habe gehört, sie verkaufen gerne die <u>Bilder</u>.</i>
A':	<i>Ich habe gehört, dass sie gerne die <u>Bilder</u> verkaufen.</i>
A:	At the beginning of the annual charity event the students frequently <u>photograph</u> the guests.
B:	And then?
A:	I've heard they like to sell the <u>pictures</u>.

Table 5.2: (a) verb ← NOUN: Sample mini dialogue with English translation for the *result* condition of the *fotografieren* contexts. The target sentences are printed in bold face and the target words are underlined.

(b) noun ← VERB

<i>fotografieren</i> ('to photograph') – result	
A:	<i>Neben dem Studium verkaufen die Studenten öfters <u>Bilder</u> von Miniaturbauwerken.</i>
B:	<i>Warum?</i>
A:	<i>Ich habe gehört, sie <u>fotografieren</u> gerne die <u>Bauwerke</u>.</i>
A':	<i>Ich habe gehört, dass sie gerne die <u>Bauwerke</u> <u>fotografieren</u>.</i>
A:	Besides studying the students frequently sell <u>pictures</u> of miniature buildings.
B:	Why?
A:	I've heard they like to <u>photograph</u> the <u>buildings</u>.

Table 5.3: (b) noun ← VERB: Sample mini dialogue with English translation for the *result* condition of the *fotografieren* contexts. The target sentences are printed in bold face and the target words are underlined.

²This is not a general assumption. At least we tried to construct the dialogues in a way that the interpretation of the adverb *gerne* is rather neutral.

NEW	(a) $\emptyset \leftarrow$ NOUN	(b) $\emptyset \leftarrow$ VERB
new (indefinite object)	\emptyset \leftarrow Fotografien	\emptyset \leftarrow fotografieren (<i>Bauwerke</i>)
new (definite object)	\emptyset \leftarrow die Fotografien	\emptyset \leftarrow fotografieren (<i>die Bauwerke</i>)
ACCESS./GIVEN	(a) verb \leftarrow NOUN	(b) noun \leftarrow VERB
instrument	<i>fotografieren</i> \leftarrow die Kameras	<i>Kameras</i> \leftarrow fotografieren (<i>die Bauwerke</i>)
result	<i>fotografieren</i> \leftarrow die Bilder	<i>Bilder</i> \leftarrow fotografieren (<i>die Bauwerke</i>)
result-stem	<i>fotografieren</i> \leftarrow die Fotografien	<i>Fotografien</i> \leftarrow fotografieren (<i>die Bauwerke</i>)

Table 5.4: Overview of the different semantic test conditions for the *fotografieren* contexts.

With regard to the information status of the target elements we distinguish between three different types of accessible/given information corresponding to the different semantic relations between the verb-noun pairs: *result-stem*, *result* and *instrument*. While the *result-stem* relation involves explicit previous mention (resembling fully activated information), the *result* and *instrument* relations do not involve explicit previous mention, but differ in their type of interrelation (see below). Furthermore, we investigate new information, i.e. verbs and ('result') nouns³ that are not derivable from the previous text, distinguishing between target sentences with definite and indefinite nouns. Indefinite nouns are often said to be not inherently different from generic nouns which do not refer to a specific or particular instance of an entity but rather to a general or typical instance of a class. Therefore, indefinite nouns may be interpreted as being less specific (or less 'familiar') than

³In target sentences with the NOUN as the target element (verb \leftarrow NOUN), we used the same nouns as in the *result-stem* condition.

definite nouns. An overview of the different texts or semantic conditions investigated is presented in table 5.4. The conditions are ordered according to the assumed degree of activation of the respective target anaphor. That is, from bottom to top we expect the noun/verb to be less given or activated.

5.2 Hypotheses

The general assumption is that the investigated types of semantic relations involve different degrees of activation of the target elements (in anaphor position). Due to explicit previous mention the target elements in *result-stem* relations are expected to be fully activated. For the two types of semantic relations that do not involve explicit previous mention (*result* and *instrument*), we assume that the bridging inference or the association of *instrument* information with the event expressed by the verbal counterpart is less essential and close than the association of *result* information. Accordingly, an *instrument* relation probably requires more activation cost than a *result* relation. Furthermore, regarding the two types of new information, it has to be taken into account that *indefinite* nouns are likely to require more activation cost than *definite* nouns due to their less specific generic-like character.

Hence, the working hypothesis is based on the assumption that from *result-stem* to *result* through *instrument* to *new (definite object)* and *new (indefinite object)* the target element (noun/verb) is less given or activated. Proceeding from this assumption, we hypothesize that the decrease at the level of activation involves an increase in activation costs for the target elements. Differences in activation cost are expected to be expressed by differences in a target element's prosodic prominence indicated by different distributions and/or probabilities of prosodic categories. The categories we are looking at are (a) accent placement (accent vs. no accent) (b) accent position (nuclear vs. prenuclear accent) and (c) accent type for nuclear and prenuclear pitch accents.

More precisely, for the present production study we hypothesize the following:

- (III) The less given or activated a target element (noun/verb) is,
 - (a) the more likely it is to be marked by a pitch accent.
 - (b) the more likely it is to be marked by the *nuclear* pitch accent.
 - (c) the more likely is the use of accent types that involve a higher level of perceived prominence (cf. Baumann & Röhr, 2015).

5.3 Method

5.3.1 Recordings

The experiment took place at the IfL Phonetik of the University of Cologne and was composed of two parts: a practice section (ten mini dialogues) and the main section of the experiment (divided into four parts).

The mini dialogues were presented to the subjects successively and in randomized order on a computer screen in a sound attenuated room. Each subject was asked to read through a dialogue quietly in order to guarantee full comprehension. After that, their task was to read out the dialogue in a contextually appropriate manner to a potential hearer as for example in a role-play. In the practice section subjects were familiarized with this task. For the acoustic recordings a headset condenser microphone was used for each subject. Each mini dialogue was read out twice by each subject, adding up to 120 target sentences per speaker that entered the analysis: two types of reference relations (verb ← NOUN, noun ← VERB) * five types of information status (*result-stem*, *result*, *instrument*, *new (definite object)*, *new (indefinite object)*) * three target items (*backen*, *fotografieren*, *malen*) * two sentence structures (object-final, verb-final) * two repetitions.

5.3.2 Subjects

We recorded 14 native speakers of Standard German (ten female and four male) aged between 18 and 39 years (mean age = 25.8, SD = 5.1). All of them originated from North Rhine-Westphalia or Lower Saxony. Nine subjects were second semester bachelor students at the linguistics department of the University of Cologne with basic expertise in general speech analysis. (See appendix B.3, table B.7 for speaker information.)

5.3.3 Analysis

The target sentences were annotated according to GToBI (cf. Grice & Baumann, 2002; Grice, Baumann & Benz Müller, 2005; see chapter 3, section 3.3). That is, we analyzed the accent placement/position and the realized accent types on the **noun**, **verb** and **adverb** of the target sentences.

The acoustic data was segmented and annotated in Praat (Boersma, 2001). At a segmental level we annotated every spoken word. Furthermore, we annotated the prosodic realization of all sentences at two different levels. On a level of accent status we marked for every

word whether it was realized with no accent ($\emptyset = 0$), a prenuclear accent (PN = 2), a nuclear accent (= 3) or with a postnuclear stress/prominence (= 1, e.g. a phrase accent). On a tonal level we marked the positions of realized pitch accents and boundary tones and categorized their tonal configuration according to GToBI (see figure 5.1).

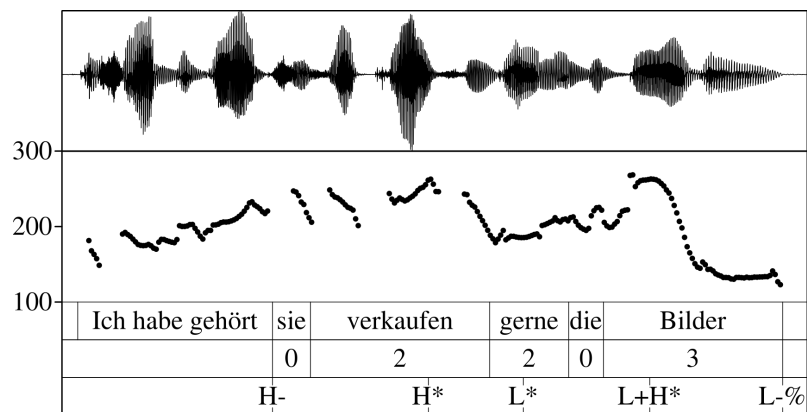


Figure 5.1: Praat annotation sample of the sentence ‘I’ve heard they like to sell the pictures.’ from speaker F03 with oscillogram (top panel), F0 contour (middle panel) and three annotation tiers (bottom panel).

The complete data set was independently annotated twice (by three experienced annotators.⁴ A consensus of the two annotations has been used for the analysis. The analysis of Cohen’s Kappa (unweighted Kappa for categorical data without a logical order) for two raters revealed a good reliability of agreement between two different annotators: accent status $\kappa = 0.885$; GToBI accent type $\kappa = 0.603$.

We applied a linear mixed effects analysis on a contingency table displaying the distribution/number of nuclear accents (dependent measure) on the noun, verb and adverb of the target sentences in relation to the investigated factors by using R (R Development Core Team, 2012) and lme4 (Bates, Maechler & Bolker, 2012). We included subjects as random intercepts. Part of speech, information status (semantic relations), sentence type and context type/target item were included as fixed effects, as well as the interactions between part of speech and information status. We report p-values based on likelihood ratio tests. An effect was deemed to be significant at $\alpha \leq 0.05$.

In the following the analysis of the data for the two types of reference relations is presented separately, starting with the results of the prosodic analysis as a function of the noun’s level of givenness.

⁴Two annotators did not annotate the complete data set, but half of the data each.

5.4 Results

5.4.1 Verb-NOUN Relations

Likelihood ratio test reveal a significant effect of the interaction between part of speech and information status on the distribution of nuclear accents: $\chi^2(8) = 317.9$, $p < 0.0001$. Subsequent model comparisons did not show an effect of sentence type and context type/target item. That is, overall results reveal that the prosodic marking of the target sentences of the verb \leftarrow NOUN relations shows an effect of the examined semantic relations with regard to nuclear accent placement (see figure 5.2).

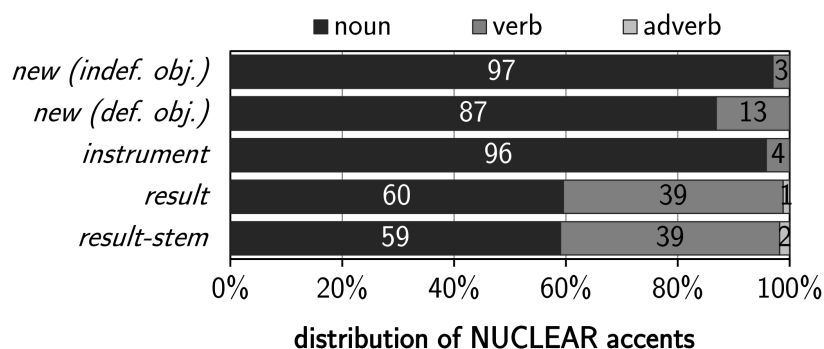


Figure 5.2: (a) verb \leftarrow NOUN: Relative distribution of nuclear accents (x-axis) on the noun, the verb and the adverb in the target sentences ordered according to the noun's level of givenness (y-axis). All sentence types, context types/target items and subjects are pooled for each information status ($n = 168$).

Results generally reveal that nuclear accents are predominantly placed on the noun of the target sentences. Results for nuclear accent placement as a function of the *noun's* level of givenness display that in the two *new* conditions (e.g. (34)⁵) as well as in the *instrument* condition (e.g. (35)) the noun is almost always marked by the nuclear accent. This distribution changes clearly with a higher level of givenness of the noun: When the nouns denote a *result* of the preceding verb the nuclear accent is placed more often (in about 40% of the cases) on the verb instead of the noun (e.g. (36)). The adverb pretty much never receives the nuclear accent.

- (34) $\emptyset \leftarrow$ *new*: nucleus on noun
- ..., *sie verkaufen gerne (die) FotograFIEN*.
 - ..., *dass sie gerne (die) FotograFIEN verkaufen*.

⁵In the following examples the target anaphor is underlined. The position of the nuclear accent is indicated by capital letters. Potential realizations of prenuclear accents are not displayed.

- (35) *fotografieren* ← *instrument*: nucleus on noun
- ..., *sie verkaufen gerne (die) KAmeras.*
 - ..., *dass sie gerne (die) KAmeras verkaufen.*
- (36) *fotografieren* ← *result(-stem)*: nucleus on verb
- ..., *sie verKAufen gerne die Bilder / Fotografien.*
 - ..., *dass sie gerne die Bilder / Fotografien verKAufen.*

This difference in the distribution of nuclear accent placement has been found to be stable throughout the different factors involved in the experimental setup, i.e. for different sentence types (object-final (S-V-Adv-O), see figure 5.3 and verb-final (S-Adv-O-V), see figure 5.4; results are ordered according to the sentence structure) as well as for different context types/target items (see figure 5.5). Moreover, even across speakers we find the overall variation of nuclear accent placement as a function the noun’s level of givenness confirmed (except for speaker F03, F04, F08 and M02; see appendix B.4, tables B.10 and B.11).

A closer look at the different experimental factors shows that in the *result* conditions the nuclear accent falls twice as often on the verb when it is sentence-final (e.g. (36b)) as opposed to object-final sentence structures (e.g. (36a)). Conversely, the noun in the *result* conditions gets more often accented when it is sentence-final, even though it is already activated/given by the context (cf. figures 5.3 and 5.4).

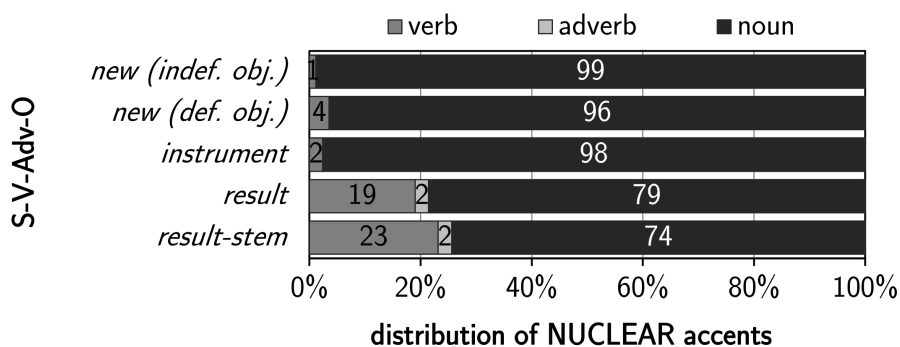


Figure 5.3: (a) verb ← NOUN: Relative distribution of nuclear accents (x-axis) on the verb, the adverb and the noun in object-final target sentences (S-V-Adv-O) ordered according to the sentence structure and the noun’s level of givenness (y-axis). All context types/target items and subjects are pooled for each information status (n = 84).

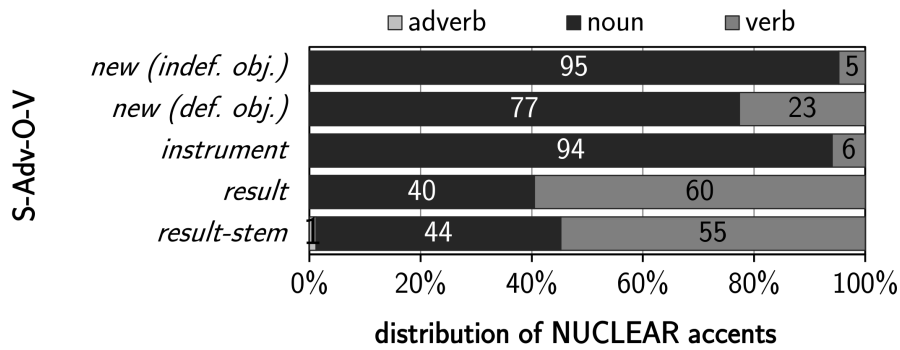


Figure 5.4: (a) verb ← NOUN: Relative distribution of nuclear accents (x-axis) on the adverb, the noun and the verb in verb-final target sentences (S-Adv-O-V) ordered according to the sentence structure the noun’s level of givenness (y-axis). All context types/target items and subjects are pooled for each information status (n = 84).

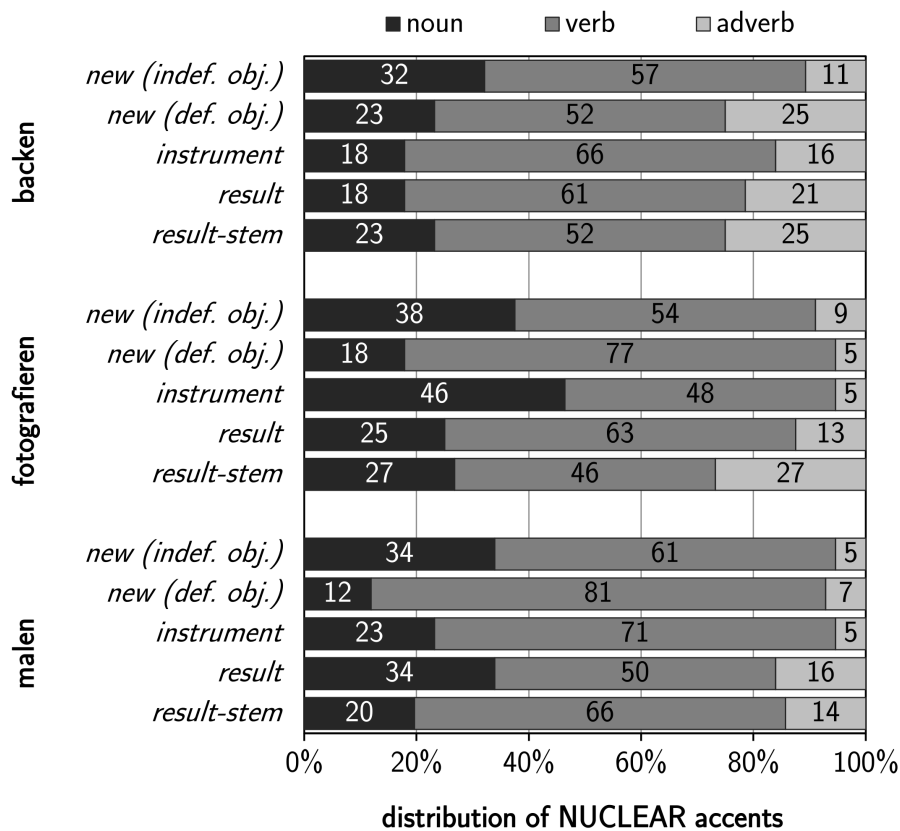


Figure 5.5: (a) verb ← NOUN: Relative distribution of nuclear accents (x-axis) on the noun, the verb and the adverb in the target sentences of different context types/target items ordered according to the noun’s level of givenness (y-axis). All sentence types and subjects are pooled for each information status (n = 56).

Within the *new* conditions indefinite/generic-like nouns turned out to be stronger attractors for the nuclear accent (e.g. (37a)) compared to definite nouns (e.g. (37b)): *Definite new* nouns are less often marked by a nuclear accent (i.e. the nuclear accent falls on the verb, e.g. (37c)) than *indefinite new* nouns and even *instrument* nouns (e.g. (37d)). However, this is only the case when the noun occurs in sentence medial position in the *fotografieren* and *malen* contexts (cf. figures 5.4 and 5.5).

- (37) (*in-*)*definite new* and *instrument*: nuclear accent placement
- a. $\emptyset \leftarrow \dots$, *dass sie gerne FotograFIEN verkaufen.*
 - b. $\emptyset \leftarrow \dots$, *dass sie gerne die FotograFIEN verkaufen.*
 - c. $\emptyset \leftarrow \dots$, *dass sie gerne die Fotografien verKAUfen.*
 - d. *fotografieren* $\leftarrow \dots$, *dass sie gerne die BILder verkaufen.*

With regard to the use of prenuclear accents, in particular in sentences with the nuclear accent on the final element, the production data generally show the following: In object-final sentences the verb is almost always marked by a prenuclear accent (e.g. (38a), 73-83 %) ⁶, sometimes in combination with a prenuclear accent on the adverb (e.g. (38b), 13-24 %). In verb-final sentences the adverb and noun receive more often a prenuclear accent than that they get completely deaccented (e.g. (39a), 47-100 % and (39b), 0-32 %). In general we hardly observed postnuclear prominences. (See appendix B.4, table B.12 for the prosodic marking of the sentence elements.)

- (38) prenuclear accents in object-final (S-V-Adv-O) sentences
- a. \dots , *sie verKAUfen gerne die FotograFIEN.*
 - b. \dots , *sie verKAUfen GERne die FotograFIEN.*
- (39) prenuclear accents in verb-final (S-Adv-O-V) sentences
- a. \dots , *dass sie GERne FotograFIEN verKAUfen.*
 - b. \dots , *dass sie gerne FotograFIEN verKAUfen.*

Finally, the distribution of accent *types* did not show an effect of information status, but speaker-specific preferences. Speakers generally use high or rising pitch accents ((!)H*, L+H*, L*+H) more often than falling pitch accents (L*, H+L*, H+!H*), whereby falling pitch accent types are more common in final sentence position expressing finality of the

⁶In the following examples the target anaphor is underlined. Pitch accents are indicated by capital letters. The nuclear accent is the last pitch accent in the sentence. The percentages are based on the number of sentences with the nuclear accent on the sentence final element (per information status).

utterance. Figure 5.6 displays the distribution of rising and falling nuclear accents on the target noun in combination with the distribution of no accents and prenuclear accents (PN) (see also appendix B.4, table B.12).

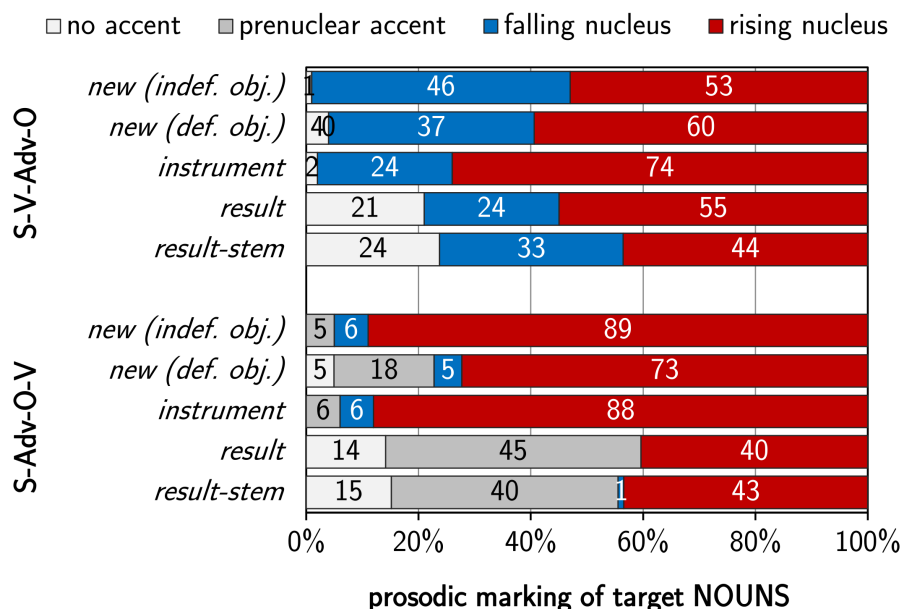


Figure 5.6: (a) verb ← NOUN: Relative distribution of no accents, prenuclear accents and falling and rising nuclear accents (x-axis) on the target noun in the two sentence types ordered according to the noun’s level of givenness (y-axis). All context types/target items and subjects are pooled for each information status (n = 84). (Rising accents comprise (!)H*, L+H*, L*+H GToBI accents and are indicated in red, falling accents comprise L*, H+L*, H+!H* GToBI accent and are indicated in blue.)

5.4.2 Noun-VERB Relations

Likelihood ratio tests revealed a significant effect of the interaction between part of speech and information status on the distribution of nuclear accents: $\chi^2(8) = 48.9$, $p < 0.0001$. Subsequent model comparisons did not show an effect of sentence type and context type/target item. That is, results overall reveal that the prosodic marking of the target sentences of the noun ← VERB relations shows an effect of the examined semantic relations with regard to nuclear accent placement.

However, the results for nuclear accent placement as a function of the *verb*’s level of givenness are less distinct, but show some tendencies (see figure 5.7). Results generally reveal that nuclear accents are most frequently (in over 55% of the cases) placed on the verb of

the target sentences (e.g. (40)⁷). With increasing givenness of the verb, the less often the nuclear accent is placed on the verb, but the more often it is placed on the least given element in the sentence, i.e. the adverb (e.g. (41)). Accordingly, the number of nuclear accents on the noun (e.g. (42)) decreases with increasing givenness of the verb.

- (40) nucleus on verb
 a. ..., *sie fotograFIEren gerne (die) Bauwerke.*
 b. ..., *dass sie gerne (die) Bauwerke fotograFIEren.*
- (41) nucleus on adverb
 a. ..., *sie fotografieren GERne (die) Bauwerke.*
 b. ..., *dass sie GERne (die) Bauwerke fotografieren.*
- (42) nucleus on noun
 a. ..., *sie fotografieren gerne (die) BAUwerke.*
 b. ..., *dass sie gerne (die) BAUwerke fotografieren.*

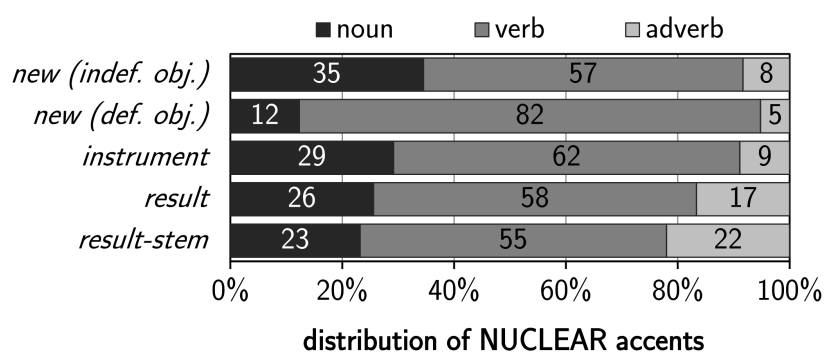


Figure 5.7: (b) noun ← VERB: Relative distribution of nuclear accents (x-axis) on the noun, the verb and the adverb in the target sentences ordered according to the verb's level of givenness (y-axis). All sentence types, context types/target items and subjects are pooled for each information status (n = 168).

The difference in the distribution of nuclear accent placement has been found to be less stable throughout the different factors involved in the experimental setup, i.e. for different sentence types (object-final (S-V-Adv-O), see figure 5.8 and verb-final (S-Adv-O-V), see figure 5.9; results are ordered according to the sentence structure) as well as for different context types/target items (see figure 5.10). In particular, results for target sentences of

⁷In the following examples the target anaphor is underlined. The position of the nuclear accent is indicated by capital letters. Potential realizations of prenuclear accents are not displayed.

the *backen* contexts reveal hardly any differences in prosodic marking with regard to the different semantic relations. Moreover, speakers are in general highly variable in their distribution of nuclear accents across the different semantic relations. However, for some speakers we find the variation of nuclear accent placement on the *adverb* as a function the verb's level of givenness clearly confirmed (i.e. speaker F01, F02, F09, F10 and M03; see appendix B.4, tables B.10 and B.11).

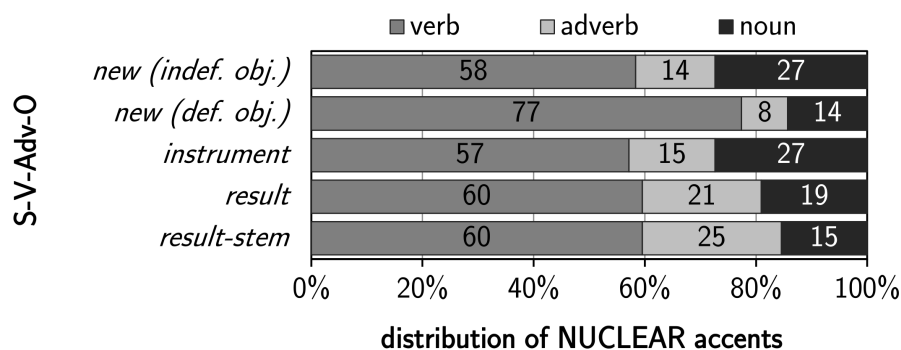


Figure 5.8: (b) noun \leftarrow VERB: Relative distribution of nuclear accents (x-axis) on the verb, the adverb and the noun in object-final target sentences (S-V-Adv-O) ordered according to the sentence structure and the verb's level of givenness (y-axis). All context types/target items and subjects are pooled for each information status (n = 84).

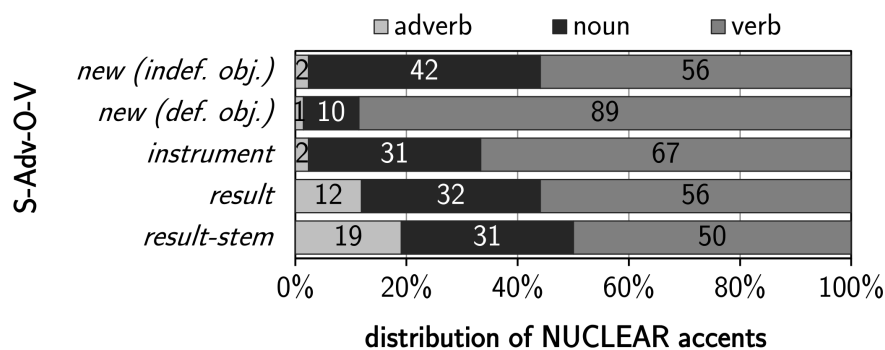


Figure 5.9: (b) noun \leftarrow VERB: Relative distribution of nuclear accents (x-axis) on the adverb, the noun and the verb in verb-final target sentences (S-Adv-O-V) ordered according to the sentence structure and the verb's level of givenness (y-axis). All context types/target items and subjects are pooled for each information status (n = 84.)

A closer look at the different experimental factors shows that a stepwise decrease in nuclear accents on the verb (with increasing discourse givenness) only occurs for verbs in sentence-final position (e.g. (40b), see figure 5.9). Nevertheless, the increase in nuclear accents on

the adverb (with increasing discourse givenness) also occurs in sentences with the verb in medial position (e.g. (41a), see figure 5.8).

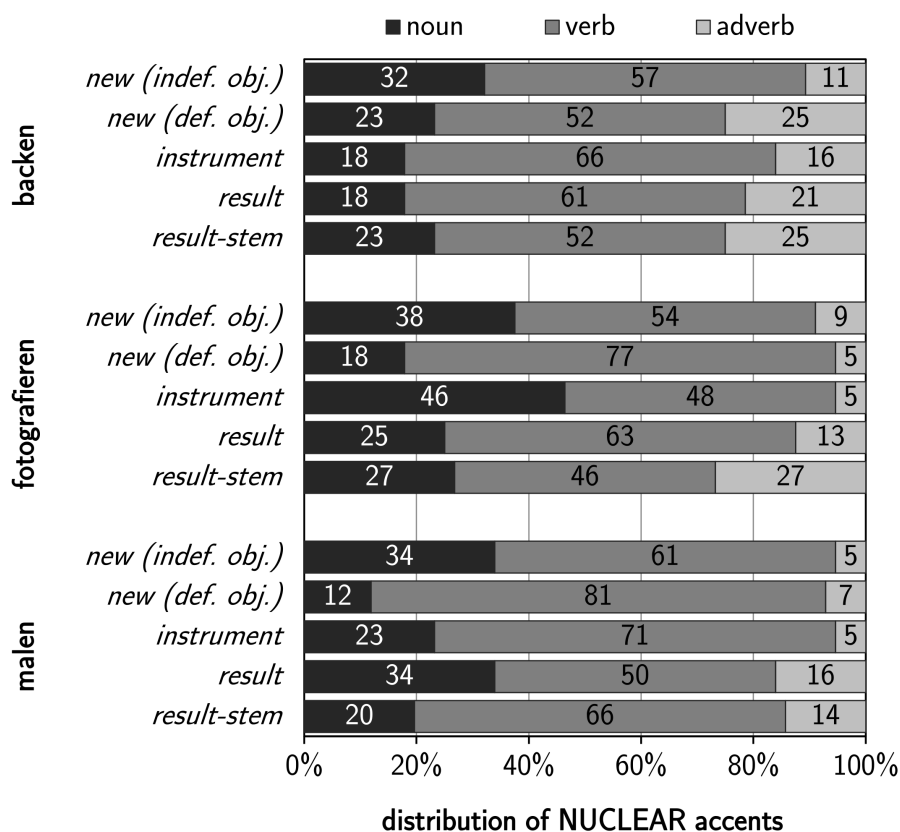


Figure 5.10: (b) noun ← VERB: Relative distribution of nuclear accents (x-axis) on the noun, the verb and the adverb in the target sentences of different context types/target items ordered according to the verb's level of givenness (y-axis). All sentence types and subjects are pooled for each information status ($n = 56$).

Moreover, the distribution of nuclear accents on the adverb in general also reveals stepwise differences, but is also indicative of an almost binary distinction, in particular in verb-final target sentences of the *fotografieren* and *malen* contexts (cf. figures 5.9 and 5.10): The number of nuclear accents on the adverb is clearly higher in the *result* conditions, i.e. when the verb is related to a *result(-stem)* noun, as in the *new* and *instrument* conditions. In the *backen* contexts this distribution is less distinct and in *new* target sentences with definite noun the nuclear accent is comparably often placed on the adverb (e.g. (41)). However, in general the distribution of nuclear accents on the verb and the noun in the target sentences differs substantially within the *new* conditions. In target sentences with an indefinite noun the *new* verb is less often marked by a nuclear accent (i.e. the nuclear accent falls on the noun) than in sentences with a definite noun. However, this effect is stronger in verb-final sentences and only occurs in the *fotografieren* (e.g. (43)) and *malen*

(e.g. (44)) contexts (cf. figure 5.10). These results are in line with the results of the verb \leftarrow NOUN relations (see section 5.4.1) and confirm that indefinite/generic-like nouns are stronger attractors for the nuclear accent compared to definite nouns, even if they are already activated due to previous mention.

Furthermore, the noun relatively often receives the nuclear accent in the *instrument* condition of the *fotografieren* context (e.g. (45a)) as well as in the *result* condition of the *malen* context (e.g. (45b)).

(43) $\emptyset \leftarrow$ **new**: nucleus on (a) noun / (b) verb, *fotografieren* context

a. . . . , **dass sie gerne (die) BAUwerke fotografieren**.

b. . . . , **dass sie gerne (die) Bauwerke fotograFIEren**.

(44) $\emptyset \leftarrow$ **new**: nucleus on (a) noun / (b) verb, *malen* context

a. . . . , **dass sie gerne (die) BLÜten malen**.

b. . . . , **dass sie gerne (die) Blüten MAlen**.

(45) nucleus on noun, (a) *fotografieren* / (b) *malen* context

a. *Kameras* \leftarrow , **sie fotografieren gerne die BAUwerke**.

b. *Kunstwerke* \leftarrow , **sie malen gerne die BLÜten**.

With regard to the use of prenuclear accents, in particular in sentences with the nuclear accent on the final element, the production data generally show the following: In object-final sentences the verb is almost always marked by a prenuclear accent (e.g. (46a), 61-87%)⁸, sometimes in combination with a prenuclear accent on the adverb (e.g. (46b), 8-30%). In verb-final sentences the adverb and the noun are equally often accented and not accented. The most frequent pattern is a prenuclear accent on the adverb (e.g. (47a), 29-38%). In general we hardly observed postnuclear prominences. (See appendix B.4, table B.13 for the prosodic marking of the sentence elements.)

(46) prenuclear accents in object-final (S-V-Adv-O) sentences

a. . . . , **sie fotograFIEren gerne (die) BAUwerke**.

b. . . . , **sie fotograFIEren GERne (die) BAUwerke**.

(47) prenuclear accents in verb-final (S-Adv-O-V) sentences

a. . . . , **dass sie GERne die Bauwerke fotgraFIEren**.

⁸In the following examples the target anaphor is underlined. Pitch accents are indicated by capital letters. The nuclear accent is the last pitch accent in the sentence. The percentages are based on the number of sentences the with nuclear accent on the sentence final element (per information status).

Finally, the distribution of accent *types* did not show an effect of information status, but speaker-specific preferences. Speakers generally use high or rising pitch accents ((!)H*, L+H*, L*+H) more often than falling pitch accents (L*, H+L*, H+!H*). Figure 5.11 displays the distribution of rising and falling nuclear accents on the target noun in combination with the distribution of no accents and prenuclear accents (PN) (see also appendix B.4, table B.13).

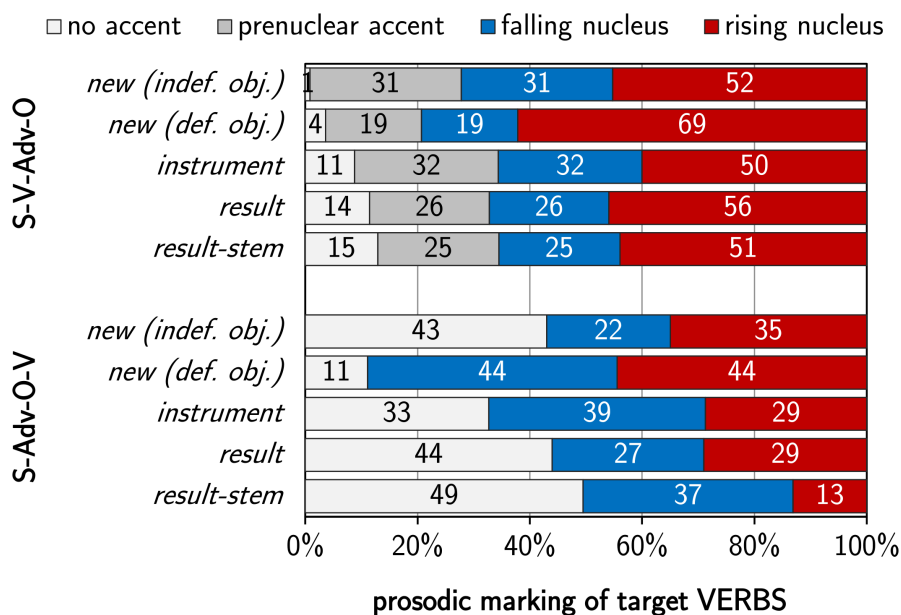


Figure 5.11: (b) noun \leftarrow VERB: Relative distribution of no accents, prenuclear accents and falling and rising nuclear accents (x-axis) on the target verb in the two sentence types ordered according to the verb's level of givenness (y-axis). All context types/target items and subjects are pooled for each information status ($n = 84$). (Rising accents comprise (!)H*, L+H*, L*+H GToBI accents and are indicated in red, falling accents comprise L*, H+L*, H+!H* GToBI accents and are indicated in blue.)

5.5 Discussion

In the presented production experiment on read German nuclear accent placement has been found to be a decisive marker of different semantic relations between different parts of speech, i.e. verbs and nouns.

Even though the results for verb \leftarrow NOUN relations are more distinct than for noun \leftarrow VERB relations the differences in the distribution of nuclear accent placement reveal congruent results with respect to the different semantic relations investigated. That is, in

particular the distribution of nuclear accent placement differs between the group of *result* nouns and the group of *instrument* and *new* nouns.

The differences in the probabilities of nuclear accent placement signal a decrease in activation cost (i.e. a less frequent use of nuclear accents = a decrease in prosodic prominence) for the target verbs/nouns in the *result-stem* and *result* condition. This reflects a stronger semantic relatedness of both types of *result* nouns to the corresponding verb, as well as a difference in activation between *result* and *instrument* nouns. *Instrument* nouns are often prosodically marked like *new* nouns.

In verb \leftarrow NOUN relations differences in activation cost are indicated by the distribution of nuclear accents on the noun and verb in the target sentences. In noun \leftarrow VERB relations differences in activation cost are indicated by the distribution of nuclear accents on the adverb in the target sentences:

As for the verb \leftarrow NOUN relations we found a rather binary distinction in prosodic marking. *Result* nouns have been shown to be less often marked by a nuclear accent than *instrument* and *new* nouns. Hence, *instrument* nouns require considerably more activation cost than *result* nouns which further supports the assumption that the bridging inference or the association of *instrument* information with the verbal target is less essential and close than the association with *result* information.

The results for noun \leftarrow VERB relations provide rather stepwise changes in the prosodic marking. An increase in the verb's level of givenness is reflected by an increase in the number of nuclear accents on the least given sentence element, the adverb.

Thus, hypothesis (III)(b) was confirmed: The nuclear accent placement of the investigated types of semantic relations reflect differences in the degree of activation of the investigated target elements (in anaphor position). That is, the results suggest a decrease in activation/givenness from *result-stem* and *result* to *instrument*, *new (definite object)* and *new (indefinite object)* relations. However, hypotheses (III)(a) and (c) were not confirmed: The presence or absence of accent in general, as well as the distribution of different (nuclear) accent types did not show an effect of the investigated semantic relations.

Interestingly, the presented variations in nuclear accent placement as a function of the target element's givenness are primarily observable in verb-final target sentences. This might be due to the fact that verbal arguments (i.e. the target nouns) and a sentence final position are generally strong attractors for nuclear accent placement (see chapter 3, section 3.4). Accordingly, sentences with the noun in medial position presumably allow for more variation concerning nuclear accent placement than sentences with the noun in final position.

Furthermore, in almost all conditions indefinite/generic-like nouns turned out to be a

strong attractor for nuclear accents, even in sentences where the nouns were already activated due to previous mention (i.e. in noun \leftarrow VERB relations). Indefinite nouns, similar to generic nouns, are less specific (i.e. they do not refer to a particular instance of a category) than definite nouns and therefore probably require more activation cost. Hence, this reflects the common assumption that definiteness compared to indefiniteness/generics expresses identifiability or some kind of familiarity (cf. chapter 2, section 2.3.2).

However, differences in the prosodic marking that are related to the (in-)definiteness of the noun in the target sentences only occurs in the *fotografieren* and *malen* contexts, but not in the *backen* context. This might be due to the fact that the definite noun used in the *new* (and also *result-stem*) condition of the *backen* context (i.e. *das Gebäck*) is a generic noun and not a common noun as the other definite target nouns. Hence, the *new* nouns in the *backen* contexts both have a generic character and therefore reveal no differences in the prosodic marking.

Finally, the prosodic marking of the target sentences in the verb \leftarrow NOUN relations confirms that verbs clearly serve as a source for a noun's level of givenness. The nuclear accent placement varies as a function of the noun's level of givenness due to the relation to a preceding verb.

The prosodic marking of the target sentences in the noun \leftarrow VERB relations only shows a small consistent effect of the verb's level of givenness due to the relation to a preceding noun. Here, variations in prosodic marking are in general quite small, which might be due to the restrictive information structure of the target sentences in the noun \leftarrow VERB relations. Furthermore, there are some differences in the distribution of nuclear accents between the three investigated context types. A possible reason might be that we used different target nouns but identical target verbs and that the quality or association of the nouns, with regard to their semantic role as instrument or result of the target verb, is different between the context types. Furthermore, it possibly makes a difference whether the verb or the noun is the antecedent. Presumably, verbs necessarily or automatically trigger associations with participants (encoded in argument categories, such as nouns or NPs) that are potentially involved in the expressed event, but not the other way round. This means, arguments do not necessarily trigger associations with events they are potentially involved in. As a consequence, we assume that noun \leftarrow VERB relations in general involve more complex bridging processes.

In any case, the production data provide evidence for the informativeness of verbs and their relevance for prosodic adjustments in the process of information packaging.

Chapter 6

Perception of Relations between Nouns and Verbs

6.1 Stimuli

This chapter aims to verify the differences in probabilities of prosodic marking for different types of semantic relations that have been found in the previous production study (presented in chapter 5) from the listener's perspective. Hence, in a follow-up perception experiment we explore the perceived appropriateness of nuclear accent placement with regard to the different semantic conditions (*result-stem*, *result*, *instrument*, *new (definite object)* and *new (indefinite object)*) by using a web-based appropriateness rating task.

In the perception task three prosodically different variants of each target sentence from the production study were tested: We used target sentences with the nuclear accent on either the **noun** (e.g. (48a) and (49a)), the **verb** (e.g. (48b) and (49b)) or the **adverb** (e.g. (48c) and (49c)), resulting in 90 test stimuli per reference type: three prosodic realizations * five types of information status/semantic relations * three target items (*backen*, *fotografieren*, *malen*) * two sentence structures (object-final, verb-final). In order to keep the overall prosodic variation of the target sentences to a minimum we chose target sentences with the nucleus as the only accent in the phrase, which is realized as a high (H*) or rising pitch accent (L+H*). Thus nuclear accentuation on the noun involves deaccentuation of the verb, while nuclear accentuation of the verb involves deaccentuation of the noun.

- (48) nuclear accent placement in object-final sentences (S-V-Adv-O)
a. *Ich habe gehört, sie verkaufen gerne die BILder.*

b. *Ich habe gehört, **sie verKAUfen** gerne die Bilder.*

c. *Ich habe gehört, **sie verkaufen GERne** die Bilder.*

‘I’ve heard they like to sell the pictures.’

(49) nuclear accent placement in verb-final sentences (S-Adv-O-V)

a. *Ich habe gehört, **dass sie gerne die BILder** verkaufen.*

b. *Ich habe gehört, **dass sie gerne die Bilder verKAUfen**.*

c. *Ich habe gehört, **dass sie GERne die Bilder verkaufen** .*

‘I’ve heard they like to sell the pictures.’

Target sentences were selected from the pool of female speakers of the production study. We previously controlled the perceptual equivalence of the respective prosodic realizations of the selected target sentences in an informal perception experiment. No adjustments of the original utterances were made, except for an equalization of the sound level of the test material.

A balanced distribution of all speakers of the production study was not possible for the selection of target sentences. We only chose female speakers and did not vary the speaker for a prosodic realization and sentence type (i.e. semantic relations and context types/target items are pooled; see appendix B.3, table B.9). For some instances that did not occur in the production data (e.g. nuclear accents on the adverb in verb ← NOUN relations) we additionally recorded a 29-year-old female speaker of Standard German (PhD student in Phonetics at the University of Cologne).

6.2 Hypotheses

The production study presented above (see chapter 5) revealed that the prosodic prominence marking (by nuclear accents) of a target element (anaphor) varies depending on its semantic relation to an antecedent. The results suggest a decrease in the degree of activation or givenness from *result-stem* and *result* to *instrument*, *new (definite object)* and *new (indefinite object)* relations between verbs and nouns. With respect to the results of the production study, we hypothesize the following:

- (IV) An increase in an entity’s prosodic prominence by nuclear accent placement is perceived as contextually more appropriate for entities with a decreasing level of givenness.

This means for the perception data, that a decrease in the target element’s level of activation involves higher appropriateness ratings for nuclear accents on the target element and lower appropriateness ratings for nuclear accents on other sentence elements.

6.3 Method

6.3.1 Task

The selected target sentences of the production study (see chapter 5, section 5.1 for the reading/test material) were tested by means of a web-based rating tasks implemented with the ‘SoSci Survey’ software of an online questionnaire named ‘onlineFragebogen (oFb)’ (Leiner, 2014).

Wie gut passt die Melodie der Äußerung (Audio-Datei) in den Kontext?

A: Zu Beginn der jährlichen Wohltätigkeitsveranstaltung fotografieren die Studenten häufig die Gäste.

B: Und dann?

A: ...



gar nicht

sehr gut

Figure 6.1: Sample of experimental design and rating task/scale used in the follow-up perception experiment (verb ← NOUN relation) displaying the *result(-stem)* condition of the *fotografieren* contexts (implemented with the ‘SoSci Survey’ software (Leiner, 2014)).

In this experiment, the test sentences were rated in relation to their corresponding contexts (mini dialogues of production study, see e.g. tables 5.2 and 5.3 in section 5.1).¹ While the target sentence was presented acoustically, the preceding context was presented orthographically. Subjects were able to control when and how often to play a stimulus. The participants’ task was to evaluate ‘how well the melody of a target sentence matches

¹The complete reading material is given in appendix B.1 for verb ← NOUN relations and in appendix B.2 for noun ← VERB relations.

the corresponding context'. Subjects gave their judgements by placing a roll bar on a continuous horizontal line between two end-points and without apparent scaling (visual analogue scale (VAS)). The left pole of the rating scale was labelled *gar nicht* 'not at all', meaning not appropriate, and the right pole was labelled *sehr gut* 'very well', meaning appropriate (see figure 6.1). The responses on the VAS are encoded as interval data ranging from 1 (left pole) to 100 (right pole). Accordingly, higher ratings on this *appropriateness* scale reflect a higher degree of appropriateness.

The two types of reference relations (verb \leftarrow NOUN relations and noun \leftarrow VERB relations) were tested separately in two parallel sub-experiments. This means, in a sub-experiment we only tested test sentences of the same type of reference relation. In the experiments, each test stimulus had to be evaluated once in randomized order. The evaluation was carried out for each test sentence/context on a separate page. In general both experiments are composed of four parts: (1) introduction and description of the task, (2) anonymous questionnaire (personal data), (3) practice section (six stimuli), (4) main section (involving six additional stimuli at the beginning and six additional stimuli at the end of the main section, that did not enter the analysis). In the main part of each sub-experiment in total 90 stimuli had to be evaluated (for details see section 6.1). The two sub-experiments were randomly provided by the same open URL.

6.3.2 Subjects

The two types of reference relations were tested separately with different groups of native German speakers. All subjects were second semester bachelor students at the linguistics department of the University of Cologne with basic expertise in general speech analysis and grew up in seven different German federal states (45-50 % from North Rhine-Westphalia):

- (a) **verb \leftarrow NOUN:** 29 subjects / 72 % female, 28 % male / age: 19-28 years / mean age = 21.8, SD = 2.4
- (b) **noun \leftarrow VERB:** 32 subjects / 81 % female, 19 % male / age: 18-30 years / mean age = 21.9, SD = 3.1

6.3.3 Analysis

We performed a linear mixed effects analysis of the relationship between perceived appropriateness (dependent measure) and nuclear accent placement by using R (R Development Core Team, 2012) and lme4 (Bates, Maechler & Bolker, 2012). We included subjects as

random intercepts. Accent placement, information status (semantic relations), sentence type and context type/target item were included as fixed effects, as well as the interactions between accent placement and information status. We report p-values based on likelihood ratio tests. An effect was deemed to be significant at $\alpha \leq 0.05$. Visual inspection of residuals did not reveal any obvious deviations from homoscedasticity or normality.

6.4 Results

6.4.1 Verb-NOUN Relations

Likelihood ratio tests revealed a significant effect of the interaction between nuclear accent placement and information status on the perceived appropriateness: $\chi^2(8) = 126.7$, $p < 0.0001$. Subsequent model comparisons did not show an effect of sentence type and context type/target item.

Results reveal that in the target sentences of the verb \leftarrow NOUN relations the appropriateness of nuclear accent placement of the **verb** shows an effect of the examined semantic relations (see figure 6.2 and table 6.1). Appropriateness ratings of the nuclear accent placement on the noun and the adverb do not show much variation across the different semantic conditions.

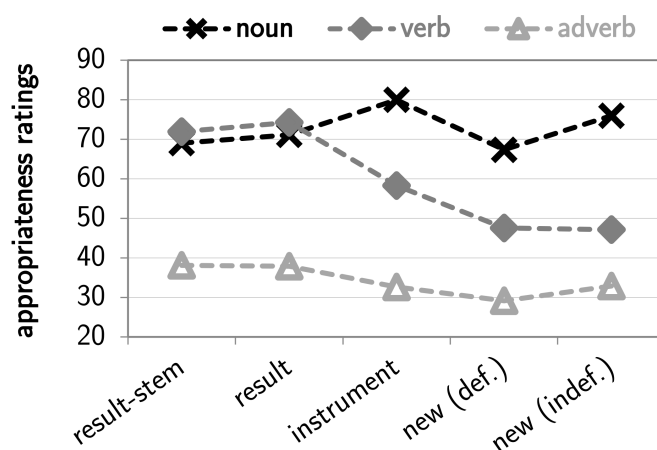


Figure 6.2: (a) verb \leftarrow NOUN: Mean appropriateness ratings (y-axis) of all target sentences with the nuclear accent on the noun, the verb and the adverb ordered according to the noun's level of givenness (x-axis). All sentence types, context types/target items and subjects are pooled.

Nuclear accents on the noun are generally rated as being appropriate (e.g. (50)², (51) and (52)), whereas nuclear accents on the adverb are generally rated as being less appropriate (e.g. (54)). However, sentences with a nuclear accent on the verb (involving deaccentuation of the noun) do show a clear difference in their appropriateness as a function of the *noun's* level of givenness: A nuclear accent on the verb is more appropriate in sentences with *result* nouns (e.g. (53)) than in sentences with *instrument* and *new* nouns. More precisely, there are stepwise changes in the appropriateness of nuclear accentuation on the verb from *result-stem* and *result* through *instrument* to *new (definite object)* and *new (indefinite object)*.

- (50) $\emptyset \leftarrow$ *new*: nucleus on noun
- a. ..., *sie verkaufen gerne (die) FotograFIEN*.
 - b. ..., *dass sie gerne (die) FotograFIEN verkaufen*.
- (51) *fotografieren* \leftarrow *instrument*: nucleus on noun
- a. ..., *sie verkaufen gerne die KAmeras*.
 - b. ..., *dass sie gerne die KAmeras verkaufen*.
- (52) *fotografieren* \leftarrow *result(-stem)*: nucleus on noun
- a. ..., *sie verkaufen gerne die BILder / FotograFIEN*.
 - b. ..., *dass sie gerne die BILder / FotograFIEN verkaufen*.
- (53) *fotografieren* \leftarrow *result(-stem)*: nucleus on verb
- a. ..., *sie verKAUfen gerne die Bilder / Fotografien*.
 - b. ..., *dass sie gerne die Bilder / Fotografien verKAUfen*.
- (54) *fotografieren* \leftarrow *result(-stem)*: nucleus on adverb
- a. ..., *sie verkaufen GERne die Bilder / Fotografien*.
 - b. ..., *dass sie GERne die Bilder / Fotografien*.

Similar to the results of the production study (see chapter 5, section 5.4.1) we generally find that nuclear accents are equally preferred on the noun or verb in sentences with *result* nouns (e.g. (52) and (53)), whereas a nuclear accent on the noun is clearly preferred if it displays a lower level of givenness (i.e. *instrument* and *new* nouns; e.g. (51) and (50)).

²In the following examples the target anaphor is underlined. The position of the nuclear accent is indicated by capital letters.

Furthermore, appropriateness ratings of nuclear accent placement on the noun reflect that *indefinite*/generic-like *new* nouns and also *instrument* nouns are stronger attractors for the nuclear accent than *definite new* nouns: Nuclear accents on *definite new* nouns receive lower appropriateness ratings than nuclear accents on *indefinite new* and *instrument* nouns. This rating pattern is most distinct for target sentences of the *fotografieren* and *malen* contexts (cf. figure 6.4).

The presented differences in the appropriateness ratings as a function of the noun's level of givenness have been found to be more or less stable throughout the different factors involved in the experimental setup, i.e. for different sentence types (see figure 6.3) as well as for different context types/target items (see figure 6.4) (see also table 6.1 for an overview). However, the level of appropriateness of nuclear accent placement on the verb in the *new* conditions differs across different context types/target items. Nuclear accents on the verb are least appropriate in *new* target sentences of the *backen* contexts (e.g. (55)) and most appropriate in *new* target sentences of the *malen* contexts (e.g. (57)), while *fotografieren* contexts (e.g. (56)) take an intermediate position in this respect.

- (55) $\emptyset \leftarrow$ *new*: nucleus on verb, *backen* context
- a. ..., *sie verTEIlEn gerne (das) Gebäck*.
 - b. ..., *dass sie gerne (das) Gebäck verTEIlEn*.
- (56) $\emptyset \leftarrow$ *new*: nucleus on verb, *fotografieren* context
- a. ..., *sie verKAUfen gerne (die) Fotografien*.
 - b. ..., *dass sie gerne (die) Fotografien verKAUfen*.
- (57) $\emptyset \leftarrow$ *new*: nucleus on verb, *malen* context
- a. ..., *sie analySIEren gerne (die) Gemälde*.
 - b. ..., *dass sie gerne (die) Gemälde analySIEren*.

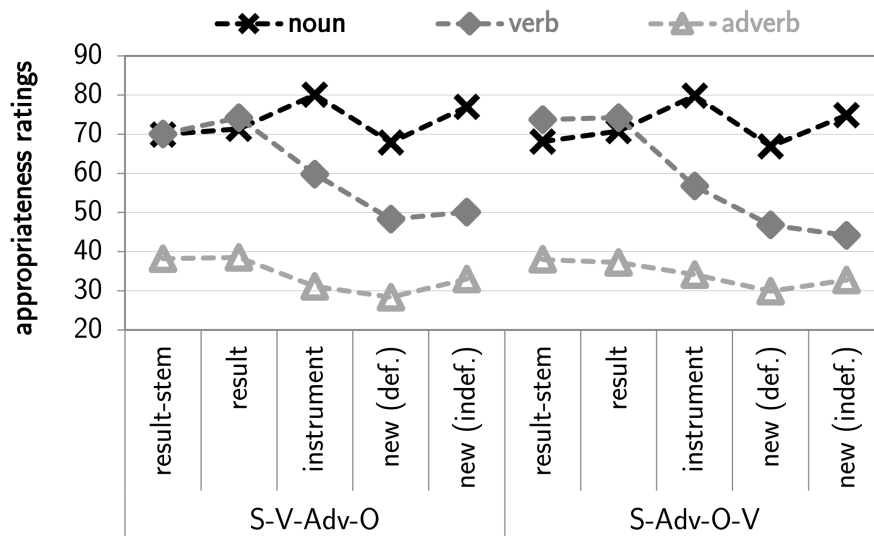


Figure 6.3: (a) verb ← NOUN: Mean appropriateness ratings (y-axis) of target sentences with the nuclear accent on the noun, the verb and the adverb for the two sentences types (object-final and verb-final) ordered according to the noun’s level of givenness (x-axis). All context types/target items and subjects are pooled.

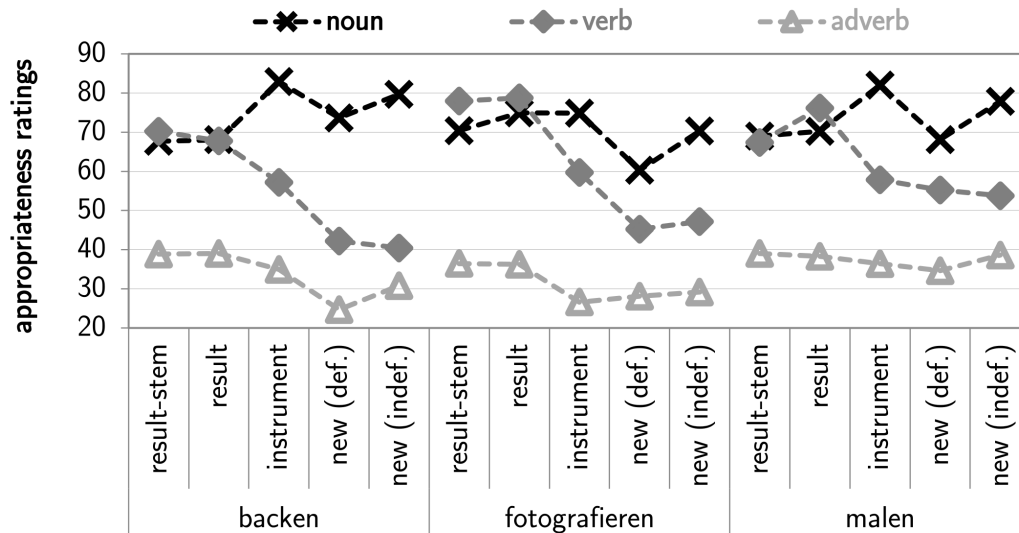


Figure 6.4: (a) verb ← NOUN: Mean appropriateness ratings (y-axis) of target sentences with the nuclear accent on the noun, the verb and the adverb for different context types/target items ordered according to the noun’s level of givenness (x-axis). All sentence types and subjects are pooled.

verb ← NOUN relations: responses on <i>APPROPRIATENESS</i> scale (mean and (SD)) for prosodic realizations										
factors	nucleus on	noun's information status								
		<i>result-stem</i>	<i>result</i>	<i>instrument</i>	<i>new (def. obj.)</i>	<i>new (indef. obj.)</i>				
all	noun	69.0 (25.5)	71.1 (23.3)	80.0 (21.6)	67.4 (27.1)	75.9 (26.0)				
	verb	71.9 (25.4)	74.3 (23.8)	58.3 (28.1)	47.6 (28.6)	47.1 (30.6)				
	adverb	38.1 (28.0)	37.9 (28.3)	32.7 (27.5)	29.1 (24.7)	32.9 (26.3)				
sentence type	S-V-Adv-O	noun	69.9 (24.2)	71.4 (23.8)	80.1 (21.2)	67.8 (26.1)	77.0 (25.0)			
		verb	70.0 (25.8)	74.3 (23.6)	59.8 (27.8)	48.3 (30.5)	50.1 (31.3)			
		adverb	38.2 (26.6)	38.5 (29.6)	31.2 (26.9)	28.4 (23.0)	33.0 (26.2)			
	S-Adv-O-V	noun	68.1 (26.8)	70.8 (22.9)	79.9 (22.2)	66.9 (28.2)	74.9 (27.0)			
		verb	73.8 (24.9)	74.3 (24.1)	56.7 (28.4)	46.8 (26.7)	44.2 (29.9)			
		adverb	38.0 (29.4)	37.2 (27.1)	34.2 (28.2)	29.9 (26.4)	32.8 (26.5)			
context type/target item	<i>backen</i>	noun	67.7 (27.9)	68.1 (25.8)	82.9 (17.6)	73.7 (24.4)	79.7 (24.0)			
		verb	70.2 (24.7)	67.8 (27.1)	57.2 (29.4)	42.2 (28.3)	40.4 (31.1)			
		adverb	38.8 (29.3)	39.0 (28.3)	35.0 (26.5)	24.7 (21.0)	30.8 (25.1)			
	<i>fotografieren</i>	noun	70.4 (25.1)	74.9 (21.5)	74.9 (25.4)	60.3 (28.9)	70.3 (29.0)			
		verb	78.0 (24.8)	78.7 (23.3)	59.7 (30.8)	45.2 (29.3)	47.1 (30.7)			
		adverb	36.5 (27.2)	36.3 (25.6)	26.6 (24.6)	28.1 (25.0)	29.2 (22.9)			
	<i>malen</i>	noun	69.0 (23.5)	70.2 (22.2)	82.1 (20.6)	68.1 (26.5)	77.9 (24.1)			
		verb	67.4 (25.9)	76.1 (19.4)	57.9 (23.9)	55.3 (26.9)	53.8 (29.2)			
		adverb	39.0 (27.9)	38.3 (31.3)	36.4 (30.6)	34.6 (27.1)	38.7 (29.9)			

Table 6.1: (a) verb ← NOUN: Mean response values on the *appropriateness* scale (and standard deviation in parentheses) of all target sentences with the nuclear accent on the noun, the verb and the adverb for different sentence types and context types/target items. All subjects are pooled. Results are ordered according to the noun's level of givenness.

6.4.2 Noun-VERB Relations

Likelihood ratio tests revealed a significant effect of the interaction between nuclear accent placement and information status on the perceived appropriateness: $\chi^2(8) = 119.8$, $p < 0.0001$. Subsequent model comparisons did not show an effect of sentence type and context type/target item.

Results reveal that in the target sentences of the noun ← VERB relations the appropriateness of nuclear accent placement on the **verb** and **adverb** show an effect of the examined semantic relations (see figure 6.5 and table 6.2). Appropriateness ratings of the nuclear accent placement on the noun in general do not show much variation.

A nuclear accent on the textually given nouns is rated as being medially appropriate for all semantic conditions (e.g. (62)³). However, sentences with a nuclear accent on the verb and adverb do show clear differences as a function of the *verb's level* of givenness: With an increase in the verb's level of givenness, nuclear accents on the verb are increasingly less

³In the following examples the target anaphor is underlined. The position of the nuclear accent is indicated by capital letters.

appropriate and nuclear accents on the adverb (i.e. the least given sentence element; e.g. (61)) are increasingly more appropriate. The appropriateness ratings of nuclear accentuation on the verb and adverb change rather stepwise from *result-stem* and *result* through *instrument* to *new (definite object)* and *new (indefinite object)*.

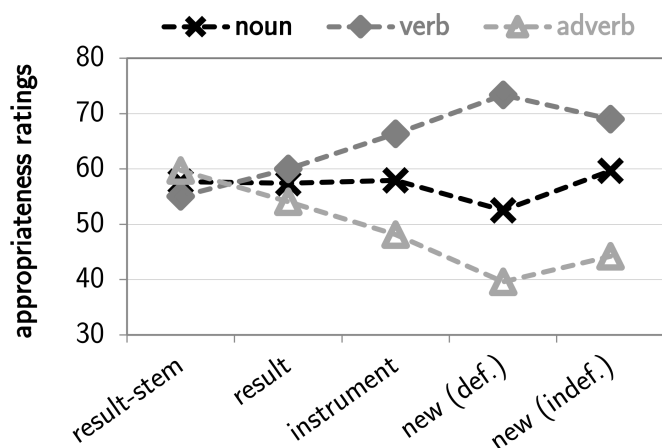


Figure 6.5: (b) noun ← VERB: Mean appropriateness ratings (y-axis) of all target sentences with the nuclear accent on the noun, the verb and the adverb ordered according to the verb’s level of givenness (x-axis). All sentence types, context types/target items and subjects are pooled.

Generally, the *result* conditions do not show a clear preference in prosodic marking (e.g. (60), (61) and (62)), whereas a nuclear accent on the verb is clearly preferred in the *instrument* and *new* conditions (e.g. (59) and (58)).

(58) $\emptyset \leftarrow \textit{new}$: nucleus on verb

- a. ..., *sie fotograFIEren gerne (die) Bauwerke.*
- b. ..., *dass sie gerne (die) Bauwerke fotograFIEren.*

(59) *Kameras* ← *instrument*: nucleus on verb

- a. ..., *sie fotograFIEren gerne die Bauwerke.*
- b. ..., *dass sie gerne die Bauwerke fotograFIEren.*

(60) *Bilder / Fotografien* ← *result(-stem)*: nucleus on verb

- a. ..., *sie fotograFIEren gerne die Bauwerke.*
- b. ..., *dass sie gerne die Bauwerke fotograFIEren.*

- (61) *Bilder / Fotografien* ← *result(-stem)*: nucleus on adverb
 a. ..., *sie fotografieren GERne die Bauwerke.*
 b. ..., *dass sie GERne die Bauwerke fotografieren.*
- (62) *Bilder / Fotografien* ← *result(-stem)*: nucleus on noun
 a. ..., *sie fotografieren gerne die BAUwerke.*
 b. ..., *dass sie gerne die BAUwerke fotografieren.*

Similar to the appropriateness rating of the verb ← NOUN relations (c.f. section 6.4.1) and in line with the results of the production study (see chapter 5, section 5.4.2) nuclear accents on indefinite nouns receive higher appropriateness ratings than nuclear accents on definite nouns within the *new* conditions (e.g. (63)).

- (63) \emptyset ← *new*: nucleus on noun
 a. ..., *sie fotografieren gerne (die) BAUwerke.*
 b. ..., *dass sie gerne (die) BAUwerke fotografieren.*

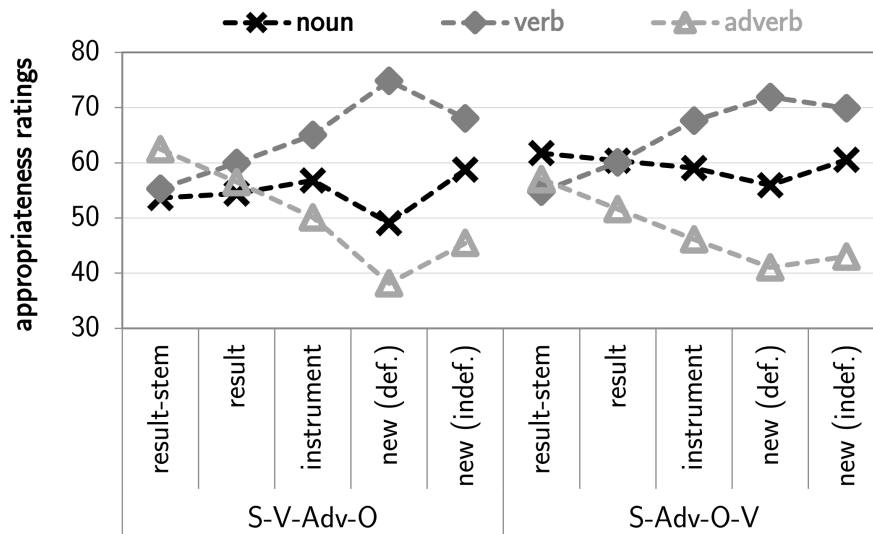


Figure 6.6: (b) noun ← VERB: Mean appropriateness ratings (y-axis) of target sentences with the nuclear accent on the noun, the verb and the adverb for the two sentences types (object-final and verb-final) ordered according to the verb’s level of givenness (x-axis). All context types/target items and subjects are pooled.

The presented differences in the appropriateness ratings as a function of the verb’s level of givenness have been found to be more distinct in object-final sentences (see figure 6.6) and show some variation between the different context types/target items (see figure 6.7) (see

also table 6.2 for an overview). In particular the results for the target sentences of the *backen* context deviate from the overall rating pattern: While the *instrument* condition is similar to the *result* condition and does not show any preference for the position of the nuclear accent (e.g. (64d), (64e) and (64f)), there are extreme differences in the preference for the prosodic marking in the *new* conditions that deviate a bit from the results of the other two context types. In the *new* condition of the *backen* context nuclear accents on the verb are most appropriate (e.g. (64a)) and nuclear accents on the adverb least appropriate (64c) in sentences with definite nouns. In sentences with indefinite nouns, nuclear accents on verbs and nouns are equally appropriate (e.g. (64b)).

(64) nuclear accent placement, *backen* contexts

- a. $\emptyset \leftarrow \dots$, *sie BACken gerne (die) Äpfel.*
- b. $\emptyset \leftarrow \dots$, *sie backen gerne (die) Äpfel.*
- c. $\emptyset \leftarrow \dots$, *sie backen GERne (die) Äfel.*
- d. *Rezepte / Kuchen / Gebäck* $\leftarrow \dots$, *sie BACken gerne die Äpfel.*
- e. *Rezepte / Kuchen / Gebäck* $\leftarrow \dots$, *sie backen gerne die Äpfel.*
- f. *Rezepte / Kuchen / Gebäck* $\leftarrow \dots$, *sie backen GERne die Äpfel.*

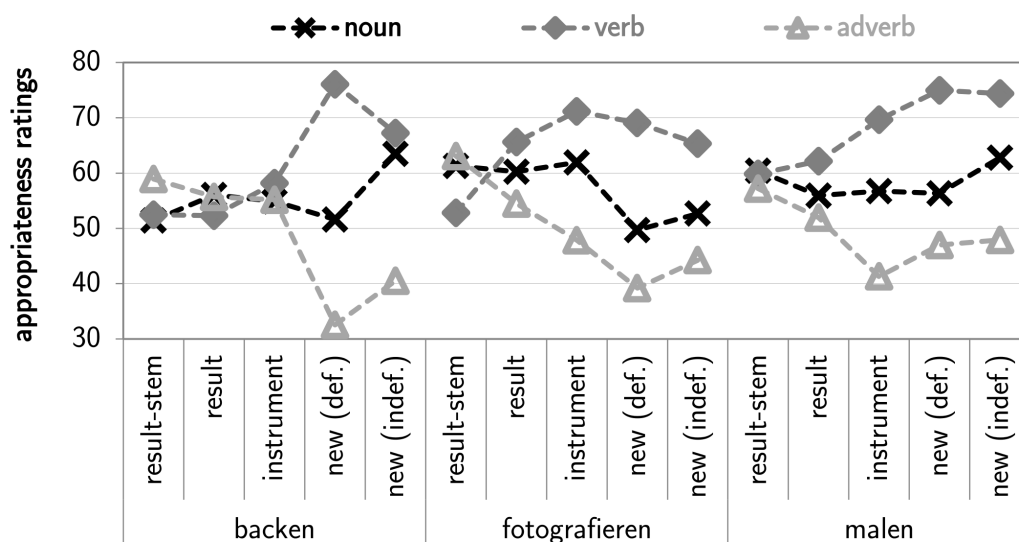


Figure 6.7: (b) noun \leftarrow VERB: Mean appropriateness ratings (y-axis) of target sentences with the nuclear accent on the noun, the verb and the adverb for different context types/target items ordered according to the verb's level of givenness (x-axis). All sentence types and subjects are pooled.

noun ← VERB relations: responses on <i>APPROPRIATENESS</i> scale (mean and (SD)) for prosodic realizations												
factors	nucleus on	verb's information status										
		<i>result-stem</i>		<i>result</i>		<i>instrument</i>		<i>new (def. obj.)</i>		<i>new (indef. obj.)</i>		
all	noun	57.7	(29.1)	57.4	(30.3)	57.9	(30.7)	52.5	(31.2)	59.7	(29.8)	
	verb	55.0	(28.4)	60.0	(27.9)	66.3	(28.0)	73.4	(27.0)	69.0	(29.4)	
	adverb	59.7	(28.9)	54.1	(29.0)	48.1	(28.5)	39.6	(27.0)	44.2	(30.1)	
sentence type	S-V-Adv-O	noun	53.6	(29.4)	54.5	(31.5)	56.8	(31.3)	49.1	(30.6)	58.8	(31.0)
		verb	55.3	(28.5)	60.0	(28.8)	65.1	(29.4)	74.8	(27.2)	68.1	(29.8)
		adverb	62.5	(28.7)	56.5	(28.9)	50.1	(28.6)	38.2	(26.8)	45.5	(29.2)
	S-Adv-O-V	noun	61.7	(28.5)	60.4	(28.9)	59.0	(30.2)	55.9	(31.7)	60.6	(28.6)
		verb	54.8	(28.4)	60.1	(27.2)	67.6	(26.6)	71.9	(26.8)	69.9	(29.1)
		adverb	57.0	(28.9)	51.6	(29.1)	46.1	(28.5)	41.0	(27.3)	43.0	(31.1)
context type/target item	<i>backen</i>	noun	51.5	(28.3)	56.0	(30.3)	54.9	(30.8)	51.6	(30.1)	63.5	(27.6)
		verb	52.5	(29.2)	52.3	(28.6)	58.2	(26.9)	76.1	(25.2)	67.3	(30.8)
		adverb	58.9	(28.8)	55.7	(29.1)	55.2	(28.5)	32.5	(25.1)	40.5	(29.1)
	<i>fotografieren</i>	noun	61.3	(29.8)	60.3	(30.7)	62.0	(30.4)	49.7	(31.6)	52.7	(31.7)
		verb	52.8	(29.3)	65.6	(24.9)	71.2	(26.9)	69.1	(30.1)	65.3	(31.0)
		adverb	63.1	(29.3)	54.5	(28.3)	47.8	(29.1)	39.2	(26.1)	44.3	(30.1)
	<i>malen</i>	noun	60.4	(28.8)	56.0	(30.2)	56.8	(31.0)	56.3	(32.2)	62.8	(29.1)
		verb	59.9	(26.3)	62.2	(28.8)	69.7	(28.6)	75.0	(25.1)	74.4	(25.6)
		adverb	57.2	(28.6)	52.0	(30.0)	41.3	(26.7)	47.0	(28.2)	47.9	(31.0)

Table 6.2: (b) noun ← VERB: Mean response values on the *appropriateness* scale (and standard deviation in parentheses) of all target sentences with the nuclear accent on the noun, the verb and the adverb for different sentence types and context types/target items. All subjects are pooled. Results are ordered according to the verb's level of givenness.

6.5 Discussion

In the presented perception experiment on read German nuclear accent placement has been found to be a decisive prosodic cue for the decoding of different semantic relations between different parts of speech, i.a. verbs and nouns.

Appropriateness ratings of nuclear accent placement in verb ← NOUN relations and in noun ← VERB relations reveal congruent results with respect to the different semantic relations investigated. That is, appropriateness ratings provide stepwise changes from *result-stem* and *result* to *instrument*, *new (definite object)* and *new (indefinite object)* relations. These differences confirm the assumed decrease in activation/givenness of the respective target elements (in anaphor position).

For both types of reference relations the prosodic marking of the **verb** turned out to be an important indicator of the appropriateness in activation cost. A nuclear accent on the verb involves deaccentuation of the noun (and adverb) in the target sentences. Hence, in verb ← NOUN relations higher appropriateness ratings of nuclear accents on the verb signal that low activation cost (= low level of prosodic prominence) of the target

item, i.e. the *noun*, is more appropriate. Conversely, in noun \leftarrow VERB relations higher appropriateness ratings of nuclear accents on the verb signal that high activation cost (= high level of prominence) of the target item, i.e. the *verb*, is more appropriate.

The differences in the appropriateness of nuclear accent placement in general signal no clear preferences in activation cost for the target verbs/nouns in the *result-stem* and *result* condition. This reflects a stronger semantic relatedness of both types of *result* nouns to the corresponding verb, as well as a difference in activation between *result* nouns and *instrument* (and *new*) nouns.

In the verb \leftarrow NOUN relations, results reveal an increase in the appropriateness of nuclear accents on the verb with an increase in the noun's level of givenness. As for noun \leftarrow VERB relations results reveal an increase in the appropriateness of nuclear accents on the verb the less given it is. Moreover, the appropriateness of nuclear accents on the adverb (involving deaccentuation of the verb) increases with increasing discourse givenness of the verb.

Thus, the data suggest that changes in a target element's level of activation do not necessarily involve different appropriateness ratings for nuclear accents on the target element itself but are primarily reflected in different appropriateness ratings for nuclear accents on other sentence elements (as e.g. the verb in verb \leftarrow NOUN relations and the adverb in noun \leftarrow VERB relations). This implies that the probability of deaccentuation of a target element is a more decisive cue for the interpretation of its level of givenness than the probability of nuclear accent placement.

Thus, hypothesis (IV) is mainly confirmed, but would have to be rephrased in order to match the outcome more appropriately (cf. section 6.2): Results reveal that a *decrease* in an entity's prosodic prominence by deaccentuation is perceived as contextually more appropriate for entities with an *increasing* level of givenness.

Similar to the results of the production study (see chapter 5, section 5.5), within the *new* conditions nuclear accent placement on indefinite/ generic-like nouns generally leads to higher appropriateness ratings than nuclear accent placement on definite nouns, even in sentences where the nouns were already activated due to previous mention (i.e. in noun \leftarrow VERB relations). Again, this reflects that indefinite/generic-like nouns are stronger attractors for nuclear accents due to their less specific character.

Furthermore, there are some differences in the appropriateness ratings between the three investigated context types, i.e. results for the *backen* context somewhat deviate from the results for the *fotografieren* and *malen* contexts. A possible reason might be that we used different target nouns but identical target verbs and that the quality or association of the nouns, with regard to their semantic role as instrument or result of the target verb is

different between the context types.

To conclude, the perception data are in line with the production data (see chapter 5) and provide evidence for the informativeness of verbs and their relevance for their prosodic decoding of information status.

Summary and Conclusion

This part presented a carefully controlled production experiment (see chapter 5) and a follow-up perception experiment (see 6) on read German that investigated the probability and appropriateness of (a specific) prosodic marking as a function of different semantic relations between verbs and nouns.

- (a) On the one hand we investigated to what extent the givenness or activation of a noun varies in relation to a preceding verb (verb \leftarrow NOUN relations).
- (b) On the other hand we investigated to what extent the givenness or activation of a verb varies in relation to a preceding noun (noun \leftarrow VERB relations).

In comparison to verbs and (definite and indefinite) nouns that are not derivable from the previous text (*new*), verb-noun relations were explored in which the nouns either denote an *instrument* for creating a related element or the nouns denote the created element itself. In the latter case the noun is either morphologically unrelated to the verb (*result*) or displays the same word stem (*result-stem*).

The production and perception experiments provide corresponding results and generally reflect a stronger semantic relatedness of both types of *result* nouns to the corresponding verb, as well as a difference in activation between *result* and *instrument* nouns. That is, the semantic relation or association between verbs and *instrument* nouns is less close or direct than the relation between verbs and nouns that denote a *result* of the event denoted by the verb. Results for *instrument* relations often conform to the results for *new* (*indef. obj.*) relations. Moreover, results indicate that indefinite/generic-like nouns require more activation cost than definite nouns. In general, the prosodic (de-)coding of the target sentences suggest a decrease in activation from *result-stem* to *result* through *instrument* and *new* relations.

With regard to verb \leftarrow NOUN relations, in production a decrease in the noun's level of activation (i.e. it is less activated/given) is reflected in a higher probability for its marking by nuclear accents. Conversely, an increase in the noun's level of activation

(i.e. it is more activated/given) is reflected in a higher probability for nuclear accent placement on the verb (involving deaccentuation of the noun). Accordingly, in perception the appropriateness of nuclear accents on the verb increases (with the noun's givenness). These results clearly show that a noun's (referential and lexical) information status is affected by the informativeness of a preceding verb.

With regard to noun \leftarrow VERB relations, in production a decrease in the verb's level of activation (i.e. it is less activated/given) is reflected in a higher probability for its marking by nuclear accents. Conversely, an increase in the verb's level of activation (i.e. it is more activated/given) is reflected in a higher probability for nuclear accent placement on the adverb (involving deaccentuation of the verb). Accordingly, in perception the appropriateness of nuclear accents on the verb decreases (with its givenness), while the appropriateness of nuclear accents on the adverb increases. Even though these results are less distinct (at least in production) than for the verb \leftarrow NOUN relations, the results clearly suggest that verbs differ in their degree of activation and should be integrated into a wider notion of information status.

To conclude, the experimental production and perception data generally confirm that nuclear accent placement as well as deaccentuation *can* serve as an important cue for the interpretation of an entity's information status or level of activation/givenness. Differences with regard to the activation cost model turned out to be reflected in the probability and appropriateness of an element's prosodic marking. Accordingly, the results endorse the relevance of different intermediate levels of cognitive activation between the active and inactive poles.

Furthermore, the results of both studies provide evidence for the informativeness of verbs and their relevance for the prosody of information packaging. The prosodic marking of a sentence has been shown to differ as a function of the noun's level of activation which has been induced by a verbal antecedent. Hence, the results confirm that there are more fine-grained differences in a referential and lexical level of an noun's information status when verbs and verb phrases (VPs) serve as a possible source of its accessibility. Furthermore, the prosodic marking of a sentence has been shown to differ as a function of the verb's level of activation which has been induced by a nominal antecedent. Hence, the results reveal that verbs can be assigned an information status themselves, at least at a lexical level.

In sum, this part of the thesis clearly indicates the need to distinguish between a referential and a lexical level of information status. However, differences in the variability of the results for the two types of reference relations suggest that it makes a difference whether the verb or the noun is the antecedent. This leads to the assumption that noun \leftarrow VERB relations in general involve more complex bridging processes than verb \leftarrow NOUN relations.

Part IV

Final

SUMMARY and CONCLUSION

Chapter 7

The Information Status of Nouns and Verbs (in German)

This thesis is concerned with the relation between information status and prosody. Accordingly, different levels, modes and domains of the given-new dimension of information structure have been discussed with respect to the most relevant literature (see part I, chapter 2). Furthermore, the basic features and functions of prosody as well as different studies on the prosodic expression of information structure in intonation languages have been introduced (see part I, chapter 3). Subsequently, different aspects of the (de-)coding of information status in German intonation have been empirically explored by means of different production and perception experiments on read German (see parts II and III). The general aim was to find further evidence for the linguistic relevance of an activation cost model as proposed by Chafe (1994) and Lambrecht (1994). The investigations focused on the relevance of different intermediate levels of activation/givenness and the role of verbal expressions in the givenness dimension.

Part II deals with two perception experiments (see also Röhr & Baumann, 2011; Röhr, 2013; Baumann, Röhr & Grice, 2015) that are based on a previous production study (cf. Röhr & Baumann, 2010; Röhr, 2013; Baumann, Röhr & Grice, 2015). The reading material elicits four different types of information status by varying a referent's/noun's salience in diverse discourse contexts. In comparison to discourse new referents (*unused*), three levels of accessibility/givenness of referents are investigated, with each differing in explicitness and recency of previous mention. In the case of explicit previous mention ((co-)reference), a distinction is made between immediately evoked items (textually *given*), and items whose previous mention is non-immediate or *displaced* (textually accessible). The case of implicit reference represents inferentially accessible information, since it involves

cognitive *bridging* (from a constructed scenario) between an antecedent and an anaphor. The production study revealed stepwise changes in the distribution of (nuclear) accents and different accent types, suggesting a difference in cognitive activation between the two types of accessible information. The results seem to confirm that a bridging inference between an anaphor and its antecedent involves more activation cost than the explicit repetition of a (displaced) referent. That is, (stepwise) changes in a referent's degree of givenness were reflected in corresponding (stepwise) changes in its degree of prosodic prominence.

Two follow-up perception experiments were also carried out as part of this thesis. The aim was to validate whether the varying amount of activation effort expressed by different probabilities in the prosodic marking actually corresponds to the listener's degree of cognitive activation for a referent. The effect of prosody (accent placement/position and accent types) on the listener's perception of a referent's/noun's level of givenness was tested on a selection of target referents of the production study, both in sentences in isolation and in context.

The main findings are that the presence or absence of accent, different accent positions (nuclear, prenuclear) and different accent types (determining factor: rising or falling tonal movement on the accented syllable = presence or absence of an early peak), significantly influence a referent's perceived degree of givenness. Accordingly, differences in accent placement and position significantly differ in their appropriateness as prosodic markers of different degrees of givenness. More precisely, results reveal a stepwise decrease in the perceived degree of a referent's givenness, from deaccentuation and prenuclear accents through low and early peak nuclear accents to high and rising nuclear accents. Accordingly, the appropriateness of deaccentuation and prenuclear accent placement decreases from *given* through *displaced* and *bridging* to *unused* referents while the appropriateness of nuclear accent placement increases.

Part III reports on a production and a follow-up perception experiment (see also Röhr, Baumann & Grice, 2015) that increase the granularity of accessibility and examine the effect of reference relations between different parts of speech, i.e. verbs and nouns, on their prosodic realization. Beside *new* information, i.e. nouns/verbs that are not derivable from the previous text, three different types of accessible/given information are distinguished by using different types of verb-noun pairs. The verbs denote an event of intentionally creating an element (e.g. *fotografieren* 'to photograph') and the corresponding nouns either denote an *instrument* for creating a related element (e.g. *Kameras* 'cameras') or the created element itself, namely the *result*. The noun denoting the result was either morphologically unrelated to the verb (e.g. *Bilder* 'pictures') or displayed the same word stem (labelled *result-stem*, e.g. *Fotografien* 'photographs'). The target nouns and verbs

were part of constructed mini dialogues and occurred in consecutive sentences in both orders. Changes in activation or givenness due to the differences in semantic relations are expected to be reflected in the probability (production) and appropriateness (perception) of particular prosodic realizations.

Production results (see chapter 5) show that *result* nouns denoting a created element (independent of whether morphologically related or not) were less often marked by a nucleus than *instrument* nouns and *new* nouns. This mirrors the stronger semantic relatedness of both types of *result* nouns to the corresponding verb. For the verbs, the differences in prosodic marking are less distinct, but seem to reflect more fine-grained differences in their information status: With increasing discourse-givenness of the verb (from *new* through *instrument* and *result* to *result-stem*), the nuclear accent was placed less often on the verb itself, but increasingly often on the least given element of the target sentence, the adverb. Acceptability ratings by listeners (see chapter 6) verify the different preferences in prosodic marking with regard to the semantic relations under investigation. The more given a target element (noun/verb) is, the more appropriate is its deaccentuation. For target nouns this is indirectly reflected in an increase in the appropriateness of nuclear accents on the verb.

Taken together, the production and perception experiments on read German presented in this thesis indicate that nuclear accent placement (nuclear accent vs. prenuclear accent and deaccentuation) as well as different (nuclear) accent types reflect the speaker's activation effort and the cognitive activation of an entity in the listener's mind. The results provide evidence for the relevance of different intermediate levels of cognitive activation between the poles, indicating that the system of cognitive activation of information may be a continuum. Furthermore, it has been shown that verbal expressions are informative and that their effect on the information structure and its prosody is similar to nominal expressions.

With regard to the research questions formulated in chapter 1, this thesis provides the following insights into the relation between information status and prosody:

- (1) In general, this thesis demonstrates that the pronounced probability and perceived appropriateness of different prosodic categories are effective measures to indicate linguistically/prosodically relevant differences in cognitive activation.
- (2) Differences in probability and appropriateness of prosody reveal that even fine-grained differences in the association between discourse entities (involving intermediate levels in cognitive activation) may be linguistically relevant. It has been found that implicit reference involves more activation cost than the displacement of an explicitly mentioned antecedent. Furthermore, it has been shown that weaker

semantic relations of implicit reference require more activation cost than stronger semantic relations of implicit reference. This suggests that the notion of information status involves gradient (relational) variations rather than categorical distinctions.

- (3) Moreover, results suggest that verbal expressions are informative. Their informativeness has been found to have an effect on the information structure and the prosodic (de-)coding of an utterance. Results confirm that verbs clearly serve as a source for a noun's level of givenness, but also reveal that they can be assigned an information status themselves.

Contemporary annotation schemes do not usually assign an information status to verbal (or adjectival) expressions due to their non-referential character. However, we argue that being referential (in the sense that a linguistic entity refers to a *particular* instance or mental representation of an entity or set of entities (see chapter 2, section 2.3.2)) depends on the linguistic level of observation and is not an essential criterion for an idea to be activated or lit up in the listener's mind. The distinction between referential and non-referential information takes place at word level and not at sentence/phrase level. Hence, ideas that are encoded in argument categories (such as nominal expressions) are referential and represent discourse referents. Ideas that are expressed by the predicate of a sentence (excluding nominal predicate complements) and the corresponding verbal and adjectival expressions represent non-referential information. States and events that are expressed in longer sentences or phrases (e.g. a whole VP) display propositional information and count as referential since the corresponding phrase can be turned into a propositional referent. Admittedly, this shows that verbal expressions do have some kind of referential capacity, which is also reflected in their potential to activate other ideas (depending on their semantic weight).

Nevertheless, we argue that verbal expressions (or rather predicates without their nominal predicate complement) are not per se referential, but that the ideas that they express may be more or less activated at a lexical level, which has been found to be reflected by some variation in nuclear accent placement. This provides evidence for the relevance of a referential and a lexical level of givenness (see chapter 2, section 2.3.1). Moreover, the results suggest that it is even necessary to distinguish between the two levels of givenness in order to be able to account for the information structural effect of verbal (and adjectival) expressions on the prosodic form of an utterance.

- (4) Finally, it has been confirmed that prosody plays an important role in the production and perception of information status. In particular, nuclear accent placement and

deaccentuation, respectively, have turned out to be decisive cues. Furthermore, results suggest that the direction of tonal movement on the accented syllable (rise vs. fall) is a distinctive factor for the (de-)coding of givenness in German. In general, it has been found that an increase in speaker's activation effort (due to a decrease in an entity's givenness) is reflected by an increase in pronounced prosodic prominence (cf. chapter 3, section 3.2). The listener, in turn, is able to interpret the encoded prosodic prominence appropriately with regard to an entity's level of givenness solely based on the acoustic signal as well as in context.

To conclude, this thesis attempted to deal with the complexity of the implementation of givenness by gaining evidence from carefully controlled data. However, if we are to reach a fuller understanding of nominal and verbal expressions and their special relation to givenness at the level of activation, further research on natural language is required. Hence, this thesis aims to encourage further research on the interplay of information status and prosody and the revision of annotation schemes of information status and computationally based annotation tools that involve automatic annotation processes. As a start, we suggest distinguishing between a referential and a lexical level of givenness and integrating different semantic relations between different parts of speech (such as nominal as well as verbal and adjectival expressions) more elaborately into the analysis of information status.

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Appendix A

Additional Material: Part II

A.1 Test Material

Complete reading/test material for all target words. The target sentences are printed in bold face and the target words are underlined. The contexts are alphabetically ordered according to their containing target words:

(Dr.) Bahber – Ballade ‘ballad’ – Banane ‘banana’ – (Dr.) Bieber – Dame ‘lady’ – Janina – Lawine ‘avalanche’ – Nina – Romana – Rosine ‘raisin’

<i>(Dr.) Bahber</i>
CONTEXT 1: (a) new/unused, (b) textually accessible/displaced
<i>„Was werden wir tun?“. (a) „Wir stellen Dr. <u>Bahber</u> ein“, antwortet der Arzt seinen Kollegen. In jedem Viertel gibt es unzählige Apotheken, obwohl die vielen neuen Drogeriemärkte eine starke Konkurrenz für sie darstellen. Mit dieser großen Angebotsvielfalt sind die Kunden oftmals überfordert und bedauern diese Entwicklung. (b) Sie rufen Dr. <u>Bahber</u> an. Nett hört sich Dr. Bahber an. Eine Zusammenarbeit mit ihm als Apotheker könnte sehr angenehm sein.</i>
CONTEXT 2: (c) inferentially accessible/bridging
<i>Die Eltern sind sich unsicher mit einem neuen Medikament, das sie vom Arzt für ihr Kind bekommen haben. So schnell wie möglich brauchen sie qualifizierte Auskunft. (c) Sie rufen Dr. <u>Bahber</u> an. Hoffentlich ist er zu dieser Zeit noch erreichbar.</i>
CONTEXT 3: (d) given
<i>Die Ärzte der Gemeinschaftspraxis möchten gerne mit Dr. Bahber zusammen arbeiten. (d) Sie rufen Dr. <u>Bahber</u> an. Er ist an diesem Angebot sehr interessiert.</i>

Ballade ('ballad')

CONTEXT 1: (a) new/unused, (b) textually accessible/displaced

„Was ist unsere Hausaufgabe?“. (a) „Wir haben die Ballade auf“, antwortet Carla ihrer Mitschülerin. Lyrik ist in Deutsch ihr Lieblingsthema. Leider ist die Lehrerin sehr streng und die Schüler müssen immer viele Texte auswendig lernen. Obwohl Carla in ihrer Freizeit Theater spielt, fällt ihr das sehr schwer. (b) **Sie liest sich die Ballade durch.** Schön hört sich die Ballade an. Dieses Mal wird sie die Hausaufgabe gerne machen.

CONTEXT 2: (c) inferentially accessible/bridging

Anna hat für den Deutsch-Unterricht eine Hausaufgabe zum Thema Lyrik auf. Nach dem Essen wird sie gleich damit anfangen. (c) **Sie liest sich die Ballade durch.** Für diese Hausaufgabe wird sie sicher etwas mehr Zeit benötigen als sonst.

CONTEXT 3: (d) given

Carla muss für den Deutschunterricht als Hausaufgabe eine Ballade auswendig lernen. (d) **Sie liest sich die Ballade durch.** Dieses Mal wird ihr die Hausaufgabe sehr schwer fallen.

Banane ('banana')

CONTEXT 1: (a) new/unused, (b) textually accessible/displaced

„Was hätten Sie gerne?“. (a) „Ich nehme die Banane mit“, antwortet Thomas dem Obsthändler. Normalerweise ernährt er sich sehr ungesund und isst zwischendurch ständig Süßigkeiten. Außerdem treibt er fast nie Sport und wenn doch, dann am liebsten Minigolf. (b) **Er steckt sich die Banane ein.** Lecker sieht die Banane aus. Vielleicht wird er demnächst öfter welche kaufen.

CONTEXT 2: (c) inferentially accessible/bridging

Thomas darf heute im Zoo seinen Lieblingsaffen füttern. Voller Vorfreude wird er sich gleich auf den Weg zu ihm machen. (c) **Er steckt sich die Banane ein.** Vorhin war er dafür extra noch auf dem Markt beim Obsthändler.

CONTEXT 3: (d) given

Thomas hat gerade auf dem Markt eine Banane gekauft. (d) **Er steckt sich die Banane ein.** In Zukunft möchte er sich viel gesünder ernähren.

(Dr.) Bieber
CONTEXT 1: (a) new/unused, (b) textually accessible/displaced
„Was werden wir tun?“. (a) „Wir stellen Dr. <u>Bieber</u> ein“ , antwortet der Oberarzt seinen Kollegen. Obwohl jährlich eine große Zahl an Medizinstudenten erfolgreich ihr Studium absolviert, werden die meisten von ihnen später als Quereinsteiger in einem völlig anderen Beruf tätig sein. Dies ist möglicherweise auf eine geringe Bezahlung und schlechte Arbeitszeiten zurück zu führen. (b) Sie laden Dr. <u>Bieber</u> ein. Gut stellt sich Dr. Bieber an. Mit ihm haben sie sicher die richtige Wahl für die Besetzung der freien Stelle getroffen.
CONTEXT 2: (c) inferentially accessible/bridging
Der Oberarzt und seine Kollegen brauchen für ihr Team einen neuen Orthopäden. Eine Krankenschwester konnte ihnen mit einer guten Empfehlung weiterhelfen. (c) Sie laden Dr. <u>Bieber</u> ein. Es wird sich zeigen, ob er tatsächlich für die Stelle in Frage kommt.
CONTEXT 3: (d) given
Der Oberarzt und seine Kollegen möchten Dr. Bieber gerne als neuen Arzt in ihrem Krankenhaus einstellen. (d) Sie laden Dr. <u>Bieber</u> ein. Mit ihm haben sie sicher die richtige Wahl getroffen.

Dame ('lady')
CONTEXT 1: (a) new/unused, (b) textually accessible/displaced
„Was machen wir?“. (a) „Wir suchen die <u>Dame</u> auf“ , antwortet Isabel ihrem Mann. Die beiden lieben Trödelmärkte und die Geschichten, die sich oftmals hinter den alten Gegenständen verbergen. Einen Kauf tätigen sie niemals ohne die Vergangenheit des Stücks zu kennen. Mittlerweile könnten sie mit ihren vielen Errungenschaften selbst einen Stand eröffnen. (b) Sie sprechen die <u>Dame</u> an. Alt hört sich die Dame an. Sie hat sicher eine Menge interessante Geschichten zu erzählen.
CONTEXT 2: (c) inferentially accessible/bridging
Tom und Isabel möchten an dem Stand des Frauenvereins ein Bild kaufen. Über den Preis müssen sie allerdings erst noch verhandeln. (c) Sie sprechen die <u>Dame</u> an. Es wird sehr schwer sie von einem günstigeren Preis zu überzeugen.
CONTEXT 3: (d) given
Tom und Isabel möchten auf dem Trödelmarkt von einer Dame ein Bild kaufen. (d) Sie sprechen die <u>Dame</u> an. Leider ist sie nicht bereit den Preis zu senken.

A.1. TEST MATERIAL

Janina

CONTEXT 1: (a) new/unused, (b) textually accessible/displaced

„Warum geht ihr?“. (a) „**Wir holen die Janina ab**“, antworten die Mädchen ihrer Mutter. Wenn Besuch ins Haus steht, ist sie immer äußerst angespannt. Ihre Mutter würde am liebsten niemanden ins Haus lassen, bevor sie dort nicht jeden Winkel gründlich geputzt hat. Oftmals backt sie zur Begrüßung auch noch mindestens einen Kuchen. (b) **Sie bringen die Janina rein**. Freundlich sieht die Janina aus. Die Mädchen werden sich mit ihrer neuen Klassenkameradin sicher gut verstehen.

CONTEXT 2: (c) inferentially accessible/bridging

Heute haben sich bei den Vermietern gleich mehrere Kandidaten zur Wohnungsbesichtigung angemeldet. Es klingelt an der Tür. (c) **Sie bringen die Janina rein**. Auf die Vermieter macht sie einen sehr freundlichen Eindruck.

CONTEXT 3: (d) given

Die Mädchen haben Janina heute zum Spielen eingeladen. (d) **Sie bringen die Janina rein**. Vielleicht werden sie demnächst öfter zusammen spielen.

Nina

CONTEXT 1: (a) new/unused, (b) textually accessible/displaced

„Wie haben Sie sich entschieden?“. (a) „**Wir wählen die Nina aus**“, antwortet die Miss-Wahl-Jury dem Moderator Tom. Normalerweise arbeitet er als Sprecher beim Radio. Vor Kurzem wurde ihm dort wegen fehlender finanzieller Mittel gekündigt. Da seine Bewerbungen bisher erfolglos waren, würde er zur Zeit jeden Job annehmen. (b) **Er schaut sich die Nina an**. Klasse sieht die Nina aus. Sie hat den 1. Platz in jedem Fall verdient.

CONTEXT 2: (c) inferentially accessible/bridging

Tom ist für seine Model-Agentur ständig auf der Suche nach neuen Gesichtern. Gleich hat er wieder ein Vorstellungsgespräch. (c) **Er schaut sich die Nina an**. Er könnte sich gut vorstellen sie unter Vertrag zu nehmen.

CONTEXT 3: (d) given

Tom findet die Nina überaus hübsch. (d) **Er schaut sich die Nina an**. Als Model wird sie bestimmt viel Erfolg haben.

Lawine ('avalanche')
CONTEXT 1: (a) new/unused, (b) textually accessible/displaced
„Was machen wir heute?“. (a) „ Wir nehmen die <u>Lawine</u> durch “, antwortet Herr Müller seinen Schülern. Herr Müller ist der beliebteste Lehrer an seiner Schule. Seine Unterrichtsthemen sind viel moderner und interessanter als die der anderen Lehrer. Außerdem ist er dafür bekannt, zu jedem neuen Thema in der Stunde einen kleinen Film zu zeigen. (b) Sie schauen die <u>Lawine</u> an. Sehr schnell sieht die Lawine aus. Die Schüler können es kaum erwarten mehr darüber zu erfahren.
CONTEXT 2: (c) inferentially accessible/bridging
Seit vielen Jahren führt Carlos mit einigen Kollegen geographische Untersuchungen in verschiedenen Skigebieten durch. Erst gestern ist wieder ein schlimmes Unglück passiert. (c) Sie schauen die <u>Lawine</u> an. Sie sind schon sehr gespannt auf die ersten Untersuchungsergebnisse.
CONTEXT 3: (d) given
Was machen die Schüler heute im Unterricht mit der Lawine? (d) Sie schauen die <u>Lawine</u> an. Schon seit Wochen freuen sie sich auf dieses Thema.

Romana
CONTEXT 1: (a) new/unused, (b) textually accessible/displaced
„Was machen wir?“. (a) „ Wir rufen die <u>Romana</u> an “, antwortet Tina ihrer Freundin. Beide sind auf der Suche nach einer guten Russisch-Lehrerin. Weil sie die Kultur dieses Landes lieben, werden sie im nächsten Semester dort studieren. Englisch ist allerdings die einzige Fremdsprache, die die beiden bisher beherrschen. (b) Sie sprechen die <u>Romana</u> an. Klug hört sich die Romana an. Sie wird den Mädchen die Sprache sicher sehr schnell beibringen können.
CONTEXT 2: (c) inferentially accessible/bridging
Tina und ihre Freundin möchten gerne bei einer Privatlehrerin Russisch lernen. Von einem Bekannten haben sie eine gute Empfehlung bekommen. (c) Sie sprechen die <u>Romana</u> an. Hoffentlich hat sie noch Termine frei.
CONTEXT 3: (d) given
Tina und ihre Freundin möchten bei Romana Russisch lernen. (d) Sie sprechen die <u>Romana</u> an. Mit ihrer Hilfe werden sie die Sprache sicher schnell lernen.

Rosine ('raisin')

CONTEXT 1: (a) new/unused, (b) textually accessible/displaced

„Was macht ihr mit dem Brötchen?“. (a) „Wir pulen die Rosine raus“, antworten die Kinder ihren Eltern. Nur am Wochenende und in den Ferien gönnt sich die Familie zum Frühstück etwas vom Bäcker. Für die Kinder ist das etwas ganz Besonderes, denn unter der Woche essen sie jeden Morgen Müsli. (b)) **Sie werfen die Rosine weg.** Ekelig sah die Rosine aus. Heute möchten sie lieber kein Brötchen essen.

CONTEXT 2: (c) inferentially accessible/bridging

Zu zweit sollen die Kinder im Biologie-Unterricht getrocknetes Obst analysieren. Dafür müssen sie davon erst Präparate herstellen, womit die Zwillinge große Probleme haben. (c) **Sie werfen die Rosine weg.** Für eine Untersuchung ist sie auf keinen Fall mehr zu gebrauchen.

CONTEXT 3: (d) given

Was machen die Kinder mit der Rosine? (d) **Sie werfen die Rosine weg.** Sie sah ziemlich verschimmelt aus.

A.2 Selection of Test Stimuli

Information about the speakers in the production study by Röhr & Baumann (2010) and the selected target/test sentences used in the follow-up signal-based and context-based perception experiments (referential givenness):

Subj.	Age	Grown up	Living currently	Occupation
F01	25	Hamminkeln, NRW	Berlin, BE	PhD student
F02	24	Haldern, NRW	Wesel, NRW	student
F03	25	Köln, NRW	Köln, NRW	student
F04	22	Pulheim, NRW	Pulheim, NRW	student
F05	22	Hamminkeln, NRW	Hamminkeln, NRW	student
F06	22	Hamminkeln, NRW	Hamminkeln, NRW	student
F07	24	Wesel, NRW	Dortmund, NRW	student
M01	27	Hamminkeln, NRW	Hamminkeln, NRW	industrial management assistant
M02	31	Brühl/Bornheim, NRW	Köln, NRW	PhD student
M03	25	Wesel, NRW	Dortmund, NRW	student

Table A.12: Speaker information of production experiment by Röhr & Baumann (2010). The coding for subject includes gender information (‘F’ indicates female speakers, ‘M’ indicates male speakers). The *grown up* and *living currently* columns contain information about the city and German federal state.

speaker-word	given	displaced	bridging	new
H*	F05– <i>Dame</i>	F07– <i>Nina</i>	M02– <i>Nina</i>	M03– <i>Rosine</i>
!H*	M01– <i>Romana</i>	F02– <i>Nina</i>	F07– <i>Bahber</i>	M02– <i>Dame</i>
H+!H*	F05– <i>Janina</i>	F05– <i>Lawine</i>	M02– <i>Banane</i>	F06– <i>Rosine</i>
H+L*	F05– <i>Ballade</i>	M03– <i>Romana</i>	M01– <i>Lawine</i>	F04– <i>Dame</i>
L*	M02– <i>Romana</i>	F01– <i>Bahber</i>	F01– <i>Bahber</i>	F01– <i>Romana</i>
L*(PN)	F03– <i>Romana</i>	F03– <i>Ballade</i>	M03– <i>Ballade</i>	F01– <i>Dame</i>
Ø	F03– <i>Banane</i>	F02– <i>Rosine</i>	F02– <i>Lawine</i>	F01– <i>Bieber</i>

Table A.13: Distribution of speakers (‘F’ indicates female speakers, ‘M’ indicates male speakers; cf. table A.11) and target words in the selection of target sentences for the perception studies (referential givenness).

Appendix B

Additional Material: Part III

B.1 Test Material: Verb-NOUN Relations

Reading/test material for all verb ← NOUN relations. The target sentences are printed in bold face and the target words are underlined. The contexts are alphabetically ordered according to their containing target verb, i.e. the antecedent to the anaphoric target noun:

backen ‘to bake’ – *fotografieren* ‘to photograph’ – *malen* ‘to paint’

<i>backen</i> (‘to bake’)
new (indefinite object)
A: <i>Zu Beginn der jährlichen Schulfeier helfen die Mütter häufig beim Dekorieren.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie verteilen gerne <u>Gebäck</u>.</i>
A’: <i>Ich habe gehört, dass sie gerne <u>Gebäck</u> verteilen.</i>
new (definite object)
A: <i>Zu Beginn der jährlichen Schulfeier helfen die Mütter häufig beim Dekorieren.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie verteilen gerne <u>das Gebäck</u>.</i>
A’: <i>Ich habe gehört, dass sie gerne <u>das Gebäck</u> verteilen.</i>
instrument
A: <i>Zu Beginn der jährlichen Schulfeier <u>backen</u> die Mütter häufig mit Rosinen.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie verteilen gerne <u>die Rezepte</u>.</i>
A’: <i>Ich habe gehört, dass sie gerne <u>die Rezepte</u> verteilen.</i>

B.1. TEST MATERIAL: VERB-NOUN RELATIONS

<i>backen</i> ('to bake')
result
A: <i>Zu Beginn der jährlichen Schulfeier <u>backen</u> die Mütter häufig mit Rosinen.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie verteilen gerne die <u>Kuchen</u>.</i>
A': <i>Ich habe gehört, dass sie gerne die <u>Kuchen</u> verteilen.</i>
result-stem
A: <i>Zu Beginn der jährlichen Schulfeier <u>backen</u> die Mütter häufig mit Rosinen.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie verteilen gerne das <u>Gebäck</u>.</i>
A': <i>Ich habe gehört, dass sie gerne das <u>Gebäck</u> verteilen.</i>

<i>fotografieren</i> ('to photograph')
new (indefinite object)
A: <i>Zu Beginn der jährlichen Wohltätigkeitsveranstaltung helfen die Studenten häufig beim Aufbau.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie verkaufen gerne <u>Fotografien</u>.</i>
A': <i>Ich habe gehört, dass sie gerne <u>Fotografien</u> verkaufen.</i>
new (definite object)
A: <i>Zu Beginn der jährlichen Wohltätigkeitsveranstaltung helfen die Studenten häufig beim Aufbau.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie verkaufen gerne die <u>Fotografien</u>.</i>
A': <i>Ich habe gehört, dass sie gerne die <u>Fotografien</u> verkaufen.</i>
instrument
A: <i>Zu Beginn der jährlichen Wohltätigkeitsveranstaltung <u>fotografieren</u> die Studenten häufig die Gäste.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie verkaufen gerne die <u>Kameras</u>.</i>
A': <i>Ich habe gehört, dass sie gerne die <u>Kameras</u> verkaufen.</i>
result
A: <i>Zu Beginn der jährlichen Wohltätigkeitsveranstaltung <u>fotografieren</u> die Studenten häufig die Gäste.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie verkaufen gerne die <u>Bilder</u>.</i>
A': <i>Ich habe gehört, dass sie gerne die <u>Bilder</u> verkaufen.</i>

fotografieren ('to photograph')
result-stem
A: <i>Zu Beginn der jährlichen Wohltätigkeitsveranstaltung <u>fotografieren</u> die Studenten häufig die Gäste.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie verkaufen gerne die <u>Fotografien</u>.</i>
A': <i>Ich habe gehört, dass sie gerne die <u>Fotografien</u> verkaufen.</i>

malen ('to paint')
new (indefinite object)
A: <i>Zu Beginn des jährlichen Seminars behandeln die Lehrer häufig den theoretischen Rahmen.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie analysieren gerne <u>Gemälde</u>.</i>
A': <i>Ich habe gehört, dass sie gerne <u>Gemälde</u> analysieren.</i>
new (definite object)
A: <i>Zu Beginn des jährlichen Seminars behandeln die Lehrer häufig den theoretischen Rahmen.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie analysieren gerne die <u>Gemälde</u>.</i>
A': <i>Ich habe gehört, dass sie gerne die <u>Gemälde</u> analysieren.</i>
instrument
A: <i>Zu Beginn des jährlichen Seminars malen die Lehrer häufig Blumen.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie analysieren gerne die <u>Farben</u>.</i>
A': <i>Ich habe gehört, dass sie gerne die <u>Farben</u> analysieren.</i>
result
A: <i>Zu Beginn des jährlichen Seminars malen die Lehrer häufig Blumen.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie analysieren gerne die <u>Kunstwerke</u>.</i>
A': <i>Ich habe gehört, dass sie gerne die <u>Kunstwerke</u> analysieren.</i>
result-stem
A: <i>Zu Beginn des jährlichen Seminars malen die Lehrer häufig Blumen.</i>
B: <i>Und dann?</i>
A: <i>Ich habe gehört, sie analysieren gerne die <u>Gemälde</u>.</i>
A': <i>Ich habe gehört, dass sie gerne die <u>Gemälde</u> analysieren.</i>

B.2 Test Material: Noun-VERB Relations

Reading/test material for all noun ← VERB relations. The target sentences are printed in bold face and the target words are underlined. The contexts are alphabetically ordered according to their containing target verb, i.e. the anaphor to the nominal antecedent:

backen ‘to bake’ – *fotografieren* ‘to photograph’ – *malen* ‘to paint’

<i>backen</i> (‘to bake’)
new (indefinite object)
A: <i>Nach der Schule kaufen die Mädchen öfters rote Äpfel.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie <u>backen</u> gerne Äpfel.</i>
A’: <i>Ich habe gehört, dass sie gerne Äpfel <u>backen</u>.</i>
new (definite object)
A: <i>Nach der Schule kaufen die Mädchen öfters rote Äpfel.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie <u>backen</u> gerne die Äpfel.</i>
A’: <i>Ich habe gehört, dass sie gerne die Äpfel <u>backen</u>.</i>
instrument
A: <i>Nach der Schule denken sich die Mädchen öfters <u>Rezepte</u> mit roten Äpfeln aus.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie <u>backen</u> gerne die Äpfel.</i>
A’: <i>Ich habe gehört, dass sie gerne die Äpfel <u>backen</u>.</i>
result
A: <i>Nach der Schule verkaufen die Mädchen öfters <u>Kuchen</u> mit roten Äpfeln.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie <u>backen</u> gerne die Äpfel.</i>
A’: <i>Ich habe gehört, dass sie gerne die Äpfel <u>backen</u>.</i>
result-stem
A: <i>Nach der Schule verkaufen die Mädchen öfters <u>Gebäck</u> mit roten Äpfeln.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie <u>backen</u> gerne die Äpfel.</i>
A’: <i>Ich habe gehört, dass sie gerne die Äpfel <u>backen</u>.</i>

fotografieren ('to photograph')
new (indefinite object)
A: <i>Neben dem Studium basteln die Studenten öfters Miniaturbauwerke.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie fotografieren gerne Bauwerke.</i>
A': <i>Ich habe gehört, dass sie gerne Bauwerke fotografieren.</i>
new (definite object)
A: <i>Neben dem Studium basteln die Studenten öfters Miniaturbauwerke.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie fotografieren gerne die Bauwerke.</i>
A': <i>Ich habe gehört, dass sie gerne die Bauwerke fotografieren.</i>
instrument
A: <i>Neben dem Studium beschäftigen sich die Studenten öfters mit <u>Kameras</u> und Miniaturbauwerken.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie fotografieren gerne die Bauwerke.</i>
A': <i>Ich habe gehört, dass sie gerne die Bauwerke fotografieren.</i>
result
A: <i>Neben dem Studium verkaufen die Studenten öfters <u>Bilder</u> von Miniaturbauwerken.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie fotografieren gerne die Bauwerke.</i>
A': <i>Ich habe gehört, dass sie gerne die Bauwerke fotografieren.</i>
result-stem
A: <i>Neben dem Studium verkaufen die Studenten öfters <u>Fotografien</u> von Miniaturbauwerken.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie fotografieren gerne die Bauwerke.</i>
A': <i>Ich habe gehört, dass sie gerne die Bauwerke fotografieren.</i>
malen ('to paint')
new (indefinite object)
A: <i>In ihrer Freizeit beschäftigen sich die Schüler öfters mit tropischen Blüten.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie malen gerne Blüten.</i>
A': <i>Ich habe gehört, dass sie gerne Blüten malen.</i>

malen ('to paint')
new (definite object)
A: <i>In ihrer Freizeit beschäftigen sich die Schüler öfters mit tropischen Blüten.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie malen gerne die Blüten.</i>
A': <i>Ich habe gehört, dass sie gerne die Blüten malen.</i>
instrument
A: <i>In ihrer Freizeit untersuchen die Schüler öfters <u>Farben</u> von tropischen Blüten.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie malen gerne die Blüten.</i>
A': <i>Ich habe gehört, dass sie gerne die Blüten malen.</i>
result
A: <i>In ihrer Freizeit verkaufen die Schüler öfters <u>Kunstwerke</u> mit tropischen Blüten.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie malen gerne die Blüten.</i>
A': <i>Ich habe gehört, dass sie gerne die Blüten malen.</i>
result-stem
A: <i>In ihrer Freizeit verkaufen die Schüler öfters <u>Gemälde</u> mit tropischen Blüten.</i>
B: <i>Warum?</i>
A: <i>Ich habe gehört, sie malen gerne die Blüten.</i>
A': <i>Ich habe gehört, dass sie gerne die Blüten malen.</i>

B.3 Speakers and Selection of Test Stimuli

Information about the speakers of the production study and the selected target/test sentences used in the follow-up perception study (semantic relations):

Subj.	Age	Grown up	Living currently	Occupation
F01	22	Lohne, NI	Köln, NRW	student
F02	20	Essen, NRW	Köln, NRW	student
F03	32	Löningen, NI	Köln, NRW	scientific assistant
F04	19	NRW	NRW	student
F05	27	Hammerkeln, NRW	Düsseldorf, NRW	marketing manager mobile
F06	23	NRW	NRW	student
F07	27	NRW	Köln, NRW	student
F08	25	Detmold, NRW	Köln, NRW	student
F09	22	Unna, NRW	Köln, NRW	student
F10	27	Hammerkeln, NRW	Aachen, NRW	PhD student
M01	38	Wuppertal, NRW	Gevelsberg, NRW	student
M02	22	Düsseldorf, NRW	Köln, NRW	student
M03	28	Dülmen, NRW	Hennef (Sieg), NRW	PhD student
M04	29	Köln, NRW	Köln, NRW	student

Table B.8: Speaker information of the production study (semantic relations). The coding for *subject* includes gender information (‘F’ indicates female speakers, ‘M’ indicates male speakers). The *grown up* and *living currently* columns contain information about the city and German federal state.

nucleus on	verb ← NOUN		noun ← VERB	
	S-V-Adv-O	S-Adv-O-V	S-V-Adv-O	S-Adv-O-V
noun	F07	F08	F0X	F04
verb	F10	F07	F02	F07
adverb	F0X	F0X	F01	F01

Table B.9: Distribution of female speakers (indicated by ‘F’; cf. table B.7) in the selection of target sentences for the perception study (semantic relations). F0X is an additionally recorded 29-year-old female speaker of Standard German (PhD student). Semantic relations and context types/target items are pooled for each cell.

B.4 Results: Production

distribution of NUCLEAR accents		verb ← NOUN relations				noun ← VERB relations			
speaker	information status	noun	verb	adverb	number	noun	verb	adverb	number
F01	<i>new (indef. obj.)</i>	100%	0%	0%	12	8%	42%	50%	12
	<i>new (def. obj.)</i>	83%	17%	0%	12	0%	60%	40%	10
	<i>instrument</i>	100%	0%	0%	12	25%	25%	50%	12
	<i>result</i>	17%	67%	17%	12	0%	25%	75%	12
	<i>result-stem</i>	40%	50%	10%	10	0%	0%	100%	12
F02	<i>new (indef. obj.)</i>	92%	8%	0%	12	33%	58%	8%	12
	<i>new (def. obj.)</i>	83%	17%	0%	12	0%	100%	0%	10
	<i>instrument</i>	100%	0%	0%	12	50%	50%	0%	12
	<i>result</i>	50%	50%	0%	12	17%	67%	17%	12
	<i>result-stem</i>	67%	33%	0%	12	17%	67%	17%	12
F03	<i>new (indef. obj.)</i>	92%	8%	0%	12	25%	75%	0%	12
	<i>new (def. obj.)</i>	92%	8%	0%	12	0%	100%	0%	10
	<i>instrument</i>	100%	0%	0%	12	17%	83%	0%	12
	<i>result</i>	92%	8%	0%	12	17%	83%	0%	12
	<i>result-stem</i>	58%	42%	0%	12	0%	100%	0%	12
F04	<i>new (indef. obj.)</i>	100%	0%	0%	11	58%	42%	0%	12
	<i>new (def. obj.)</i>	92%	8%	0%	12	60%	40%	0%	10
	<i>instrument</i>	100%	0%	0%	12	75%	25%	0%	12
	<i>result</i>	100%	0%	0%	12	67%	33%	0%	12
	<i>result-stem</i>	100%	0%	0%	12	83%	17%	0%	12
F05	<i>new (indef. obj.)</i>	100%	0%	0%	12	58%	42%	0%	12
	<i>new (def. obj.)</i>	100%	0%	0%	12	50%	50%	0%	10
	<i>instrument</i>	92%	8%	0%	12	58%	42%	0%	12
	<i>result</i>	83%	17%	0%	12	50%	50%	0%	12
	<i>result-stem</i>	83%	17%	0%	12	67%	33%	0%	12
F06	<i>new (indef. obj.)</i>	100%	0%	0%	12	25%	75%	0%	12
	<i>new (def. obj.)</i>	75%	25%	0%	12	8%	92%	0%	12
	<i>instrument</i>	100%	0%	0%	12	25%	75%	0%	12
	<i>result</i>	50%	50%	0%	12	17%	83%	0%	12
	<i>result-stem</i>	67%	33%	0%	12	17%	83%	0%	12
F07	<i>new (indef. obj.)</i>	92%	8%	0%	12	42%	42%	17%	12
	<i>new (def. obj.)</i>	100%	0%	0%	12	0%	100%	0%	12
	<i>instrument</i>	100%	0%	0%	12	33%	58%	8%	12
	<i>result</i>	50%	50%	0%	12	17%	75%	8%	12
	<i>result-stem</i>	58%	42%	0%	12	25%	58%	17%	12

Table B.10: Production data displaying the distribution of nuclear accents on the noun, the verb and the adverb in the target sentences ordered according to the target element's level of givenness for female speakers/subjects F01-F07. All sentence types and context types/target items are pooled for each information status.

distribution of NUCLEAR accents		verb ← NOUN relations				noun ← VERB relations			
speaker	information status	noun	verb	adverb	number	noun	verb	adverb	number
F08	<i>new (indef. obj.)</i>	100%	0%	0%	12	8%	92%	0%	12
	<i>new (def. obj.)</i>	92%	8%	0%	12	0%	92%	8%	12
	<i>instrument</i>	100%	0%	0%	12	17%	83%	0%	12
	<i>result</i>	100%	0%	0%	12	8%	92%	0%	12
	<i>result-stem</i>	75%	25%	0%	12	17%	83%	0%	12
F09	<i>new (indef. obj.)</i>	100%	0%	0%	12	0%	92%	8%	12
	<i>new (def. obj.)</i>	83%	17%	0%	12	0%	92%	8%	12
	<i>instrument</i>	100%	0%	0%	12	17%	75%	8%	12
	<i>result</i>	50%	50%	0%	12	17%	58%	25%	12
	<i>result-stem</i>	50%	50%	0%	12	0%	42%	58%	12
F10	<i>new (indef. obj.)</i>	100%	0%	0%	12	0%	75%	25%	12
	<i>new (def. obj.)</i>	100%	0%	0%	12	0%	100%	0%	10
	<i>instrument</i>	100%	0%	0%	12	0%	58%	42%	12
	<i>result</i>	25%	75%	0%	12	0%	17%	83%	12
	<i>result-stem</i>	8%	92%	0%	12	0%	25%	75%	12
M01	<i>new (indef. obj.)</i>	100%	0%	0%	12	67%	25%	8%	12
	<i>new (def. obj.)</i>	83%	17%	0%	12	10%	80%	10%	10
	<i>instrument</i>	100%	0%	0%	12	8%	92%	0%	12
	<i>result</i>	67%	33%	0%	12	67%	33%	0%	12
	<i>result-stem</i>	50%	50%	0%	12	25%	75%	0%	12
M02	<i>new (indef. obj.)</i>	100%	0%	0%	12	92%	8%	0%	12
	<i>new (def. obj.)</i>	92%	8%	0%	12	25%	67%	8%	12
	<i>instrument</i>	100%	0%	0%	12	42%	58%	0%	12
	<i>result</i>	67%	33%	0%	12	50%	50%	0%	12
	<i>result-stem</i>	92%	0%	8%	12	33%	50%	17%	12
M03	<i>new (indef. obj.)</i>	100%	0%	0%	12	25%	75%	0%	12
	<i>new (def. obj.)</i>	75%	25%	0%	12	25%	75%	0%	12
	<i>instrument</i>	67%	33%	0%	12	42%	42%	17%	12
	<i>result</i>	50%	50%	0%	12	8%	67%	25%	12
	<i>result-stem</i>	42%	58%	0%	12	17%	58%	25%	12
M04	<i>new (indef. obj.)</i>	83%	17%	0%	12	42%	58%	0%	12
	<i>new (def. obj.)</i>	67%	33%	0%	12	0%	100%	0%	12
	<i>instrument</i>	83%	17%	0%	12	0%	100%	0%	12
	<i>result</i>	33%	67%	0%	12	25%	75%	0%	12
	<i>result-stem</i>	33%	58%	8%	12	25%	75%	0%	12

Table B.11: Production data displaying the distribution of nuclear accents on the noun, the verb and the adverb in the target sentences ordered according to the target element's level of givenness for female speakers/subjects F08-F10 and male speakers/subjects M01-M04. All sentence types and context types/target items are pooled for each information status.

B.4. RESULTS: PRODUCTION

verb ← NOUN relations: prosodic marking of sentence elements									
element	information status	total	prenucl. accents (PN)		total	nuclear accents (N)		total	number
		no accents	falling	rising	PN	falling	rising		
noun	<i>new (indef. obj.)</i>	1%	1%	1%	2%	26%	71%	97%	167
	<i>new (def. obj.)</i>	4%	3%	6%	9%	21%	66%	87%	168
	<i>instrument</i>	1%	2%	1%	3%	15%	81%	96%	168
	<i>result</i>	18%	4%	19%	23%	12%	48%	60%	168
	<i>result-stem</i>	20%	5%	15%	21%	16%	43%	60%	164
verb	<i>new (indef. obj.)</i>	51%	9%	37%	46%	1%	2%	3%	167
	<i>new (def. obj.)</i>	41%	8%	38%	46%	8%	5%	13%	167
	<i>instrument</i>	48%	9%	39%	48%	2%	2%	4%	165
	<i>result</i>	21%	9%	30%	39%	13%	26%	39%	168
	<i>result-stem</i>	23%	7%	30%	37%	13%	26%	39%	166
adverb	<i>new (indef. obj.)</i>	69%	13%	17%	31%	0%	0%	0%	167
	<i>new (def. obj.)</i>	68%	13%	19%	32%	0%	0%	0%	168
	<i>instrument</i>	73%	12%	15%	27%	0%	0%	0%	168
	<i>result</i>	68%	13%	18%	31%	0%	1%	1%	168
	<i>result-stem</i>	65%	14%	19%	33%	1%	1%	2%	166

Table B.12: (a) verb ← NOUN: Production data displaying the distribution of no accents, (falling and rising) prenuclear accents and (falling and rising) nuclear accents on the noun, the verb and the adverb in the target sentences ordered according to the target noun’s level of givenness. All sentence types, context types/target items and subjects are pooled for each information status.

noun ← VERB relations: prosodic marking of sentence elements									
element	information status	total	prenucl. accents (PN)		total	nuclear accents (N)		total	number
		no accents	falling	rising	PN	falling	rising		
noun	<i>new (indef. obj.)</i>	56%	6%	4%	10%	5%	29%	35%	167
	<i>new (def. obj.)</i>	71%	11%	5%	16%	5%	7%	12%	154
	<i>instrument</i>	56%	8%	7%	14%	7%	23%	30%	166
	<i>result</i>	64%	7%	4%	10%	5%	20%	26%	166
	<i>result-stem</i>	67%	7%	3%	10%	2%	21%	23%	167
verb	<i>new (indef. obj.)</i>	27%	1%	15%	16%	14%	44%	57%	167
	<i>new (def. obj.)</i>	7%	1%	10%	10%	25%	58%	82%	154
	<i>instrument</i>	22%	4%	12%	16%	23%	40%	62%	167
	<i>result</i>	29%	2%	11%	13%	15%	42%	58%	168
	<i>result-stem</i>	32%	3%	10%	13%	23%	32%	55%	167
adverb	<i>new (indef. obj.)</i>	77%	8%	7%	14%	1%	8%	8%	168
	<i>new (def. obj.)</i>	72%	14%	9%	23%	2%	3%	5%	154
	<i>instrument</i>	67%	17%	7%	24%	1%	8%	9%	167
	<i>result</i>	68%	10%	6%	16%	2%	15%	17%	167
	<i>result-stem</i>	61%	11%	5%	17%	2%	20%	22%	167

Table B.13: (b) noun ← VERB: Production data displaying the distribution of no accents, (falling and rising) prenuclear accents and (falling and rising) nuclear accents on the noun, the verb and the adverb in the target sentences ordered according to the target verb’s level of givenness. All sentence types, context types/target items and subjects are pooled for each information status.