

The intonation of accessibility

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Received 28 February 2004; received in revised form 1 February 2005; accepted 5 March 2005

Abstract

A perception experiment investigated the appropriateness of a number of accent patterns in contexts in which a referring expression can be regarded as neither completely given (already active in the listener's consciousness at the time of utterance) nor completely new (inactive), but rather in between the two, i.e. accessible (semi-active). Results clearly show that, for the purposes of intonation, accessible information cannot be treated as a uniform category. In a number of cases, one particular type of pitch accent, H+L* (early peak accent), is significantly preferred over another accent type, H* (medial peak accent), as well as over deaccentuation. These cases comprise whole-part relations, where the referent constituted a part of an already mentioned whole, and the scenario condition, where the referent was predictable from the contextually given schema, or frame. The remaining types of accessible information were shown to be preferentially deaccented, with a second choice for H+L* rather than H*. These cases comprised relations such as converseness, part-whole (in that order only), synonymy, and hypernym-hyponym (in either order). These findings point to the intermediate status of H+L* for the signaling of information states.

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Keywords: Intonation; Prosody; Accessibility; Givenness; Information structure; Deaccentuation

1. Introduction

In studies on the realisation of information structure in West Germanic languages (notably English, German and Dutch), it is commonly assumed that *new* information is marked by a pitch accent, while *given* information is deaccented (i.e. there is no pitch accent where one would otherwise be expected, see [Cruttenden, in press](#)). However, a number of investigations of the prosodic marking of given and new information have gone beyond this dichotomy, taking into account different *types* of accentuation. One such study is [Pierrehumbert and Hirschberg's \(1990\)](#)

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chapter on the interpretation of intonational contours in American English. They claim that both given and new information can be accented, and that it is the type of pitch accent which is used to differentiate between them (low: given; high: new). Two others within the British School (and on British English) are Halliday (1967a) and Brazil et al. (1980). Both, like Pierrehumbert and Hirschberg, allow for given information to be accented. Halliday (1967a:28) claims that contour type and accompanying local pitch range distinguish between given and new (mid-low to low: given; mid to low: new; and additionally high to low: contrastive new). Brazil et al. (1980:13) also claim that the nuclear contour distinguishes given from new but list different tones (falling-rising: given; falling: new).

Furthermore, much of the work done on prosodic marking of information structure has concentrated on the binary distinction between given and new information, rather than different *degrees* of givenness. One exception is Pierrehumbert and Hirschberg (1990) who claim that a particular type of pitch accent can indicate whether information should be inferable, i.e. neither completely given nor completely new. However, most studies which refer to degrees of givenness are predominantly concerned with the morphosyntactic form of referring expressions (e.g. Prince, 1981; Ariel, 1990; Gundel et al., 1993). Only few combine morphosyntax and intonation, notably Allerton (1978) who nonetheless concentrates on accent placement rather than accent or contour type.

In this study, we aim to investigate how far not only accentuation and lack thereof, but also *type* of accentuation can be used to indicate different degrees of givenness, and in particular how they are used in German. Since we are bringing together two only partially intersecting fields of research, we shall first give a short account of the intonation model we are using (section 2) and then take the concept of givenness and introduce the notion of accessibility, providing detail as to the different types of accessibility proposed in the literature (section 3). We then go on in section 4 to describe a perception experiment in which listeners judged the appropriateness of presence or absence of accentuation as well as accent type in contexts in which the type of accessibility is controlled. A discussion of the results follows in section 5.

2. Theoretical background: intonation

In spoken language, intonation serves diverse linguistic and paralinguistic functions, ranging from the marking of sentence modality to the expression of emotional nuances. At the level of phonology, intonation's task is to assign a structure to utterances in terms of phrasing and prominence relations. This structure, which is often realized with a combination of phonetic properties (predominantly perceived pitch, but also entailing loudness, vowel quality, and relative length of syllables and words) is determined phonologically in terms of abstract tonal values at the edges of phrases and on prominent syllables.

In autosegmental-metrical phonology, the currently most widespread framework for representing tone (see Ladd, 1996 for an overview), and the one we shall use here, these tonal values can be either high (H) or low (L) targets which are anchored to the edges of phrases or to prominent elements. This anchoring corresponds to the two major functions which tones can assume: delimiting and prominence-lending. The tones anchored to, or associated with, the ends, or right edges, of phrases are referred to as *edge tones* or *boundary tones*, and the tone or combination of tones anchored to, or associated with, prominence is referred to as a *pitch accent*. The association with prominence is characterized by the association of tones to the lexically stressed syllable of the designated word.

Pitch accents are marked with a star ‘*’ following the tone, e.g. H*. Where a pitch accent consists of more than one tone, the two tones are joined with a ‘+’ sign, and the tone which has the main association with the lexically stressed syllable of the accented word is followed by the star (e.g. H+L* = low tone on stressed syllable preceded by a high tone). There are two basic operations which can affect the tonal values of H tones: downstep, which lowers the H tone in relation to a previous one, and upstep, which raises it. The last fully-fledged accent in a phrase is referred to as the *nuclear* accent. It tends to be pragmatically the most important accent in the phrase, often signaling the main focus of the sentence. In this study we concentrate on nuclear accents.

In German there are various combinations of H and L tones which form pitch accents. The two pitch accents we are concerned with in this study are H* and H+L*. H* is often referred to as (*medial*) *peak* accent, since the high target is realized *on* the accented syllable. By contrast, H+L* is generally referred to as *early peak*, since the high target is reached well before the accented syllable, and it is the low target which is realized on the accented syllable.

We shall illustrate these two pitch accents by providing contexts in which they are said to typically occur: peak accents are commonly used in neutral statements (Fig. 1) or w-questions (Fig. 2; the lines over the text represent schematic pitch contours, capitals in bold face indicate nuclear syllables; these and more examples can also be found in Grice and Baumann, 2002, and in Grice et al., 2005).

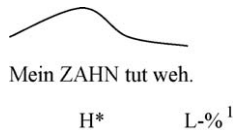


Fig. 1. Schematic contour of the sentence “My tooth hurts” (adapted from Féry, 1993).

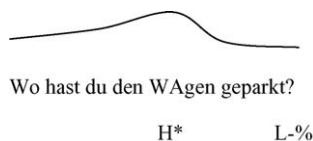


Fig. 2. Schematic contour of the sentence “Where did you park the car?” (adapted from Féry, 1993).

Note that in German, as in English, the nuclear accent is typically placed on the last argument of the phrase unless this argument is pronominalised (Uhmann, 1991; Ladd, 1996). In German this may be followed by unaccented predicates, as is the case in the examples in Figs. 1 and 2.

Early peak accents typically occur in soothing or polite requests, as in Fig. 3.

Other uses of these pitch accents, relating to the marking of information structure, and more specifically to degrees of givenness, will be discussed in sections 4 and 5.

¹ In German ToBI (see Grice et al., 2005), we use ‘-%’ together to mark the tones at the end, or right edge, of the phrase.

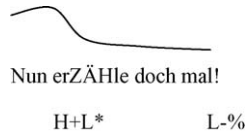


Fig. 3. Schematic contour of the sentence “Just tell me about it!” (adapted from von Essen, 1964).

3. Theoretical background: givenness

3.1. Degrees of givenness

When Halliday (1967b) introduced the terms *given* and *new* in his model of information structure, he defined them as a dichotomy: given information is presented by the speaker as being recoverable from the discourse context, new information is not. This relation of given versus new is largely equivalent to what is often referred to as *background* versus *focus*. Thus, it describes the internal partitioning of an informational unit, which is equivalent to an intonation unit, rather than the cognitive states of single discourse referents.

Some more recent studies on givenness no longer regard the distinction between given and new information as a dichotomy but rather as a continuum. However, the number of degrees of givenness varies considerably, ranging from three to practically infinite (Hajicova, 1993). In his cognitive approach, Chafe (1994:73) defines the three information states in terms of the activation cost a speaker has to invest in order to transfer an idea from a previous state into an active state. If a referent is already active in the listener’s consciousness at the time of the utterance, it is *given*; if a referent becomes activated from a previously semi-active state, it is *accessible*; if a referent becomes activated from a previously inactive state, it is *new*. These three degrees of givenness are illustrated in Fig. 4.

We follow Chafe in referring to the minimal extra category between the poles given and new as *accessible information*. We now define this intermediate category in more detail.

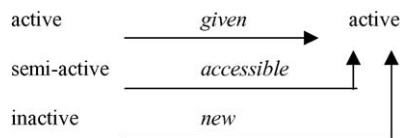


Fig. 4. Chafe’s degrees of givenness.

3.2. Types of accessibility

The category accessible information can be further divided into *textually*, *situationally* and *inferentially accessible* information (Lambrecht, 1994).

Textual accessibility requires an explicit antecedent. It is different from *textual givenness* in that the antecedent is not mentioned immediately prior to the referring expression but is *displaced*. That is, it is not mentioned in the last two or three clauses and is thus only semi-active (see Yule, 1981).

A referent is *situationally accessible* if it is part of the extra-textual context. Lambrecht (1994:99) gives the example of a person in an office saying the following to a friend with reference to some photographs on the wall.

(1) Those pictures sure are ugly.

Although he is not presently aware of the photographs, the speaker assumes that they are hanging on the wall for him to see and therefore part of the situation.

The third category, *inferential accessibility*, is the most complex and diverse one. Inferentially accessible referring expressions (Prince's (1981) *Inferrables*) do not have explicit antecedents. They are (semi-)activated via a *bridging inference* (Clark, 1977) from another entity already present in the listener's discourse model. In Prince's (1981:233) example

(2) I got on a bus yesterday and the driver was drunk.

the entity *the driver* can be inferred from *a bus* assuming the shared piece of knowledge between speaker and listener that buses have drivers. If there are competing antecedents for an inferable item, the 'correct' choice normally depends on the plausibility of the bridging inference (see Gundel, 1996).

Inferential accessibility can be provided by purely logical (lexical) relations like synonymy or hyponymy, or by the establishment of a – generally culture-specific – *scenario* (Sanford and Garrod, 1981), which automatically co-establishes a set of (semi-active) referents. We take the notion of scenario as very closely related to the concept of *schema* (e.g. Tannen, 1979).

This study concentrates on the prosodic marking of textually accessible but displaced referring expressions (i.e. those not mentioned in the immediate context), and different kinds of inferentially accessible items.

3.3. Morphosyntactic and prosodic encoding of accessibility

Most studies on accessible information concentrate on the referents' *morphosyntactic* marking (e.g. Prince, 1981; Ariel, 1990; Gundel et al., 1993). There is some agreement that (at least in English and German) accessible referents are often expressed by a definite NP in subject (and topic) position, such as *the driver* in (2).

The relative agreement on morphosyntactic marking of accessibility is not matched by a similar agreement as to *prosodic* marking – possibly because inferable items in the examples given in the literature are often early in the sentence, or intonational phrase, and would not bear the main (nuclear) accent in the phrase even if they were accented. Since they are in prosodically less salient positions, which makes the identification of an accent more difficult, and since the distribution and strength of prenuclear accents is even more dependent on the rhythmic structure and length of the utterance,² accounts differ considerably as to accentuation of these items. Lambrecht (1994:107), for example, argues that accessible information does not have a direct phonological correlate: it can be either accented or unaccented, the actual choice between the two depending on various discourse factors. Chafe (1994:75), on the other hand, claims that there is no difference between accessible and new referring expressions, since both are generally marked

² Horne (1990) and Terken and Hirschberg (1994) found a tendency towards rhythmic alternation of accents in prenuclear position for English. See also Gussenhoven (1991).

by *accented* full NPs. Brown (1983:75f.), equating pitch prominence with high pitch, claims that inferable entities are marked by pitch prominence, whereas textually evoked but displaced items are not. Allerton (1978:147) subdivides what we called accessible information into *semi-new* and *semi-given*, two categories which can be distinguished by falling versus rising nuclear contours (“separate group fall” versus “secondary rise”³).

A number of recent studies have proposed that not only different types of nuclear contour (i.e. pitch accent plus boundary tone) but also different types of pitch accent alone are used to distinguish between degrees of givenness in the broad sense of the term. For American English, Pierrehumbert and Hirschberg (1990) claim in their compositional approach of intonational meaning that an H* pitch accent followed by a !H* (downstepped H*) marks an inferable item, and an H+!H* pitch accent highlights a predication which is already mutually believed by speaker and listener. We can subsume these two accent types under accents marking accessible information. They claim that new information is marked by an H*, whereas given information is assigned an L* accent (if accented at all). For German, Kohler (1991) proposed the *early peak* contour which might be taken to mark activated information, whereas a medial peak on an accented syllable can be taken to mark newness (see Fig. 5 for illustration). However, early peak refers to the marking of a higher-level semantic–pragmatic relation rather than to a concrete referent at the utterance-level.

The early peak contour is taken to be equivalent to an H+L* or H+!H* pitch accent in GToBI, the medial peak is to an H* pitch accent. Other approaches to assigning meanings to specific types of pitch accent in German largely concentrate on differences in sentence modality and Focus-Background structure (see Grice et al., 2005 for a summary).

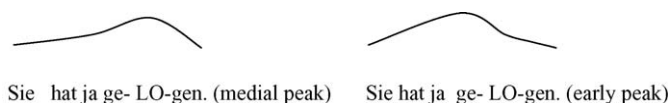


Fig. 5. Schematic contours of the sentence “She actually lied” (adapted from Kohler, 1995).

We claim, following Lambrecht (1994), that the two different levels of encoding, morphosyntax and prosody, correspond to different aspects of givenness. While the morphosyntactic marking expresses the referent’s *identifiability*⁴ based on shared knowledge between speaker and listener – or, in Prince’s terms, the assumed degree of familiarity (according to the speaker) with a referent in the listener’s mind – prosody (in particular pitch accent type) is used to mark the degree of activation of a referent in the assumed (immediate) consciousness of the listener. Finally, a confounding factor for accounts of prosody is the fact that accentuation does not only depend on degree of activation: if speakers wish to present a constituent as particularly newsworthy, they can highlight this constituent *irrespective* of its degree of activation. This is common in contrastive utterances, in which even clearly given items (such as pronouns) may be ‘focussed’ using not only an accent but a particularly salient one involving an

³ In Allerton (1978:147), this category reads “*separate group*” rise, which must be a mistake, since there is only one intonation unit in the example given. We adopt Couper-Kuhlen’s (1986:134) corrected term *secondary rise*.

⁴ The term denotes the listener’s ability to pick out a *particular* referent (or ‘file’) from among all those which can be designated with a particular linguistic expression, and identify it as the one the speaker intends.

extra high pitch peak. Furthermore, accents can simply be placed for rhythmic reasons (see Bolinger, 1985). By concentrating on nuclear accents and carefully controlling the contexts in which the target utterances are produced, we avoid interaction of these factors in our experiment, which will be discussed below.

4. Perception experiment

4.1. Motivation

In an earlier perception experiment in German (Baumann and Hadelich, 2003) the hypothesis was tested whether pitch accent type plays a role in the marking of different degrees of givenness (or levels of activation). In that experiment, target referents were either auditorily or visually primed, or not primed at all, corresponding to given, accessible and new information (see section 3.1). In general, accent type H* was found to be the most appropriate marker for new information, while for given referents pitch accent type H+L* was preferred over H*, although deaccentuation (i.e. no accent at all) was most acceptable. Since there was only indirect evidence for a preferred marking of the category ‘accessible information’, and since only one type of accessibility – namely situational accessibility due to visual priming – had been tested, there was an obvious need for further experiments.

4.2. Hypothesis

The experiment investigates the intonational marking of textually and inferentially accessible referents in sentence final position. The basic hypothesis is that the type of accessibility of a referent correlates with the type of pitch accent (including deaccentuation) used for marking it. We further hypothesize that within the category of ‘accessibility’ there are differences in degree of activation, which are reflected in the preferred choice of intonational marking. In particular, the more active a referent, the more likely deaccentuation is to be the preferred prosodic marker. The less active a referent, the more likely an H* pitch accent is to be preferred. H+L* should take an intermediate position, marking information between the extreme poles of the continuum.

In order to keep the length of the test within reasonable limits, we did not repeat the investigation of Baumann and Hadelich into the intonational marking of new information. Neither did we include totally given referents. This means that we concentrated on the intermediate stages between fully given and fully new.

4.3. Design of test material

4.3.1. Types of accessibility investigated

Eight different relations between a textually given antecedent and an anaphor⁵ (the target referent) were tested with regard to listeners’ preferred pitch accent type on the target referents. The types of accessibility included the same expression recurring after three intervening clauses. This is referred to as **textually displaced**. They also included inferentially accessible relations.

⁵ We adopt the notion of *anaphor* from van Deemter (1992), where the term is not restricted – as in the traditional sense – to proforms, and, as a consequence, to simple identity relations to the antecedents. Rather, an anaphor may be any kind of expression that refers back (directly or via inference) to an already established concept.

These comprised a **scenario** condition (*trial - judge*); symmetrical lexical relations: **synonymy** (*lift - elevator*) and **converseness** (*sister - brother*); and asymmetrical lexical relations: **hypernymy-hyponymy** (*flower - lily*) and **meronymy** (whole-part; *hand - finger*) in both orders.

We restricted our analysis to the above relations largely on the basis of claims and observations by Chafe (e.g. 1987) and Allerton (1978). According to Chafe, a referent can be semi-active for two different reasons. First, it may become ‘merely’ accessible “through deactivation from an earlier state, typically through having been active at an earlier point in the discourse” (1987:29) – **textual displacement**. Apart from a simple decay mechanism, a referent may become less accessible due to interference from competing referents mentioned in the intervening discourse (see Arnold, 1998:22). Second, it may be inferred because it is part of a **scenario**. These two categories will be dealt with in detail below.

4.3.1.1. *Textually displaced*. It is a matter of debate how far away the “earlier point” of a referent’s mention or activation may be to still count as at least semi-active. Clark and Sengul (1979) claim that recency effects are not linear. While they found a significantly higher availability of a referent mentioned in the previous clause compared to a referent mentioned two clauses back, there was no significant effect between referents from two clauses back and referents from three clauses back. We investigated this question in our **textually displaced** condition. For example:

- (3) The hikers passed by an old house. They were exhausted by the long way they had walked and longed for a short rest. The hikers approached the house. One of them knocked on the door.⁶

Note that the recurrence of the same *word* or *lexeme* is crucial for the notion of textual givenness or accessibility – it does not necessarily have to denote the same *referent*. This is exemplified in (4) and (5), denoting non-coreferential (*Italian*) and even non-referential expressions (*jump*) which are still treated as given information (see Buring, in press):

- (4) A: Why do you study Italian?
B: I’m MARried to an Italian.⁷
- (5) A: Don’t jump!
B: But I WANT to jump.

We will come back to the question of coreference in the discussion.

4.3.1.2. *Scenario*. A referent is semi-active if it is part of a scenario (see Sanford and Garrod, 1981) – or of an equivalent concept like a *schema* (see e.g. Tannen, 1979) or *semantic frame* (see Fillmore, 1982). The establishment of a scenario (e.g. ‘in court’) simultaneously co-establishes a set of referents or concepts that are representative of, or constitutive for, the given scenario (e.g. ‘judge’, ‘lawyer’, ‘juror’). They cannot be considered fully given, since they have not been

⁶ In the examples throughout this chapter, antecedents and anaphors are underlined.

⁷ Capital letters indicate obligatory accents.

activated in an explicit and thus direct way, but rather accessible information. Prince's (1981:233) 'bus-and-driver' example (mentioned as example (2) above and repeated here as (6)) is such a case:

- (6) I got on a bus yesterday and the driver was drunk.

We now turn to the categories of accessibility posited by Allerton.

4.3.1.3. *Synonymy and converseness.* Allerton (1978) claims that **synonyms** and anaphors which are in a **converseness** relation to an antecedent, are likely to be deaccented (or, in his terms, 'denuclearized'). Converseness is an antonymic relation (next to antonymy proper and complementarity) expressing the equivalence of two lexical items. It has been chosen from the group of opposites since converseness relations are more often realised as referring expressions, i.e. noun phrases, and because antonyms are more likely to be treated as contrastive or new(sworthy) items, and would thus always be accented. Allerton (1978:141) mentions the following examples:

- (7) Synonymy
Why don't you sit on our settee?
By the way, where did you BUY the sofa?
- (8) Converseness
I've just heard about Derby County's victory over Liverpool.
That's Liverpool's SEcond defeat. (adapted from Allerton's original example)

4.3.1.4. *Hyponymy-hyponymy and meronymy.* A similar tendency to deaccent holds for superordinates (like **hypernyms** or **holonyms**) if they follow their subordinate terms (like **hyponyms** or **meronyms**).⁸ Examples are given in (9) and (10), taken from Allerton (1978:141). Recall that underlining is used to indicate antecedents and anaphors.

- (9) Hyponym-Hypernym
D'you drink whisky?
I'm afraid I don't TOUCH spirits.
- (10) Part-Whole
John's got trouble with his handbrake.
What SORT of car has he got?

However, deaccentuation is not appropriate if the order is reversed:

- (11) Hypernym-Hyponym
D'you drink whisky?
I'm afraid I don't like BOURbon.
but * I'm afraid I don't LIKE bourbon.

⁸ Of the possible meronymic relations, we selected whole-part, which can be regarded as the prototypical meronymic relation (Cruse, 1986:160).

- (12) Whole-Part
 John's got trouble with his car.
 What sort of HANDbrake has he got?
 but * What SORT of handbrake has he got?

Allerton explains this pattern “by the fact that while the hyponym frequently implies the superordinate (Lyons, 1968:455), and the part frequently implies the whole, the reverse applies only rarely in either case. In other words, the use of the hyponym or ‘part’ word involves adding extra information in a way the reverse sequence does not, and this extra ‘new’ information requires some degree of stress” (1978:142).

A similar point is made by van Deemter (1994:21), who accounts for this difference in accentuation in asymmetrical relations by the notion of “concept-giveness”:

- (13) Concept-giveness: An occurrence *w* of a word is concept-given if the same or the previous sentence contains, to the left of *w*, another occurrence *w'*, of an expression, whose reference is known to be subsumed by that of *w*.

He gives the following examples (van Deemter, 1999:7): the anaphoric hypernym *string instruments* (the subsuming term) can be deaccented, as in (14):

- (14) Bach wrote many pieces for viola. He must have LOVED string instruments.

In contrast, the anaphoric hyponym *viola* (the subsumed term) cannot be deaccented, resulting in (15):

- (15) Bach wrote many pieces for string instruments. He must have loved the viOla.
 but * He must have LOVED the viola.

Subsectional anaphors like *viola* in (15), would not be concept-given, but new, and thus have to be accented. Van Deemter does not claim that different types of accent mark different degrees of givenness. He simply regards accents of various phonetic realizations as markers of new information, and lack of accent as a marker of given information.

4.3.2. Experimental materials

4.3.2.1. *Textual material*. All texts were composed of up to four context sentences, a target sentence, and a concluding sentence. The context always included a referring expression that served as an antecedent for the target referent. However, the context varied according to the different lexical relations to be investigated.

In the *textually displaced* condition, the same word occurred as antecedent and anaphor, separated by three clauses.

- (16) Textually displaced: Django ging an die Bar und bestellte einen Whisky. Er war bekannt dafür, dass er den Revolver schneller zog als sein Schatten. Man hatte Respekt vor ihm. Django trank den Whisky. Er brauchte nur einen Zug.

(Django went to the bar and ordered a whisky. He was known for drawing the gun faster than his shadow. People respected him. Django drank the whisky. He finished it in one draught.)

This separation serves the purpose of decreasing the antecedent's degree of givenness by having other concepts or referents occupy the listener's immediate consciousness. However, such a decrease of a referent's givenness is only provided if the referent in question does not function as the topic of the intervening discourse. This is in line with a major claim of Centering Theory (e.g. Grosz et al., 1995), saying that center (or topic) continuation considerably decreases the inference load⁹ placed upon the listener. Thus, we made sure that the target word did not surface as (backward looking) center in the stretch of discourse. On the other hand, we arranged for the antecedent to surface in the same grammatical function (direct object) and in the same position (sentence final argument)¹⁰ as the anaphor. This was done to guarantee a certain degree of accessibility of the target referent in a controlled way, since – according to Terken and Hirschberg – “the properties of grammatical function and surface position may be used by the listener as cues to access potential antecedents in the discourse model, by leading him or her to look for a candidate antecedent with the same properties” (1994:143).

In the *scenario* condition, the antecedent occurs as the topic (i.e. as subject in initial position) of the first sentence in order to immediately establish the “semantic frame” for the target referent. The following three clauses elaborate on the scenario before the target referent is mentioned.

- (17) Scenario: Das Restaurant war vom Feinsten. Schon das Lesen der Karte war ein Genuß. Allerdings hätten wir uns nicht alles bestellen können, was wir gerne gegessen hätten. Unsere Tischnachbarn riefen den Kellner. Sie hatten schon zwei Flaschen Champagner getrunken.

(The restaurant was excellent. It was already a pleasure to read the menu. Nonetheless, we couldn't have ordered everything we would have liked. The people at the next table called the waiter. They had already drunk two bottles of champagne.)

Here, as in all other relations that require an inferential bridge between antecedent and anaphor, center (or topic) continuation was generally avoided, but not with the same strictness as in the textually displaced condition. This was based on the assumption that the cognitive effort which has to be invested to activate an inferentially available referent should be higher than is the case with a textually available referent.

All other conditions displayed only one clause between the antecedent and the anaphor, so as not to further decrease the degree of accessibility.¹¹ However, as in the textually displaced condition, persistence of grammatical function (direct object) and surface position (sentence final argument) between the two referring expressions was maintained.

For the symmetrical lexical relations (*synonymy* and *converseness*), only one context was constructed, assuming that the order of occurrence does not affect the prosodic realization of the anaphor.

⁹ ‘Inference load’ can be considered equivalent to Chafe's aforementioned ‘activation cost’.

¹⁰ The antecedent is sometimes followed by a verb. However, and most importantly, the noun phrase always receives the nuclear accent.

¹¹ The main reason for separating the two referring expressions at all was to increase the fluency and naturalness of the texts.

- (18) Synonymy: Sie hatte gestern für ihr Kind auf dem Markt eine Apfelsine gekauft. Die Vitamine würden ihm gut tun. Die junge Mutter schälte die Orange. Dann legte sie die Scheiben auf einen Teller.

(Yesterday she had bought an orange for her child on the market. The vitamins would be good for him/her. The young mother peeled the orange [synonym].¹² After that, she put the slices on a plate.)

- (19) Converseness: Markus hatte in der fünften Klasse einen ganz besonderen Lehrer. Er hieß Müller und unterrichtete Deutsch und Geschichte. Herr Müller unterstützte seinen Schüler. Markus hat viel von ihm gelernt.

(Markus had a very special teacher in his fifth school year. His name was Müller and he taught German and History. Mr. Müller supported his pupil. Markus had learned a lot from him.)

With the asymmetrical lexical relations (*hyponym-hypernym*, *part-whole* and vice versa), we tried to construct identical contexts for both directions, in which only the two referring expressions in question were exchanged (e.g. the hyponym *Tennispieler* ('tennis player') and its hypernym *Sportler* ('sportsman'); see (20) and (21)). This was intended to minimize unforeseen contextual influences.

- (20) Hyponym-Hypernym: Ole war ein begabter Tennispieler. Er war in seiner Region praktisch unbezwingbar. Die Lokalpresse lobte den Sportler. Vor allem sein Aufschlag war berühmt.

(Ole was a talented tennis player. He was virtually unbeatable in the region. The local press praised the sportsman. It was above all his service which was renowned.)

- (21) Hypernym-Hyponym: Ole war ein begabter Sportler. Er war in seiner Region sehr bekannt. Die Lokalpresse lobte den Tennispieler. Vor allem sein Aufschlag war berühmt.

(Ole was a talented sportsman. He was well-known in the region. The local press praised the tennis player. It was above all his service which was renowned.)

- (22) Part-Whole: Der kleine Martin studierte jede einzelne Seite. Er kannte schon fast alles auswendig. Der Junge liebte das Buch. Es handelte von Dinosauriern.

(Little Martin studied every single page. He already knew almost everything by heart. The boy loved the book. It was about dinosaurs.)

- (23) Whole-Part: Martin war begeistert von seinem neuen Buch. Er wollte alles auf einmal wissen. Der Junge durchstöberte die Seiten. Das Buch handelte von Dinosauriern.

(Martin was enthusiastic about his new book. He wanted to know everything at once. The boy flicked through the pages. The book was about dinosaurs.)

¹² There is no English equivalent to the German synonymy relation *Apfelsine–Orange*.

The target sentences displayed the same morphosyntactic structure over all conditions: a definite full noun phrase as subject (sometimes modified by an adjective), followed by a semantically unmarked verb as predicate,¹³ and a definite full noun phrase functioning as direct object, e.g.

(24) Der Junge betrachtete die Trompete. (*The boy inspected the trumpet.*)

The target word always coincided with the direct object, i.e. its grammatical function as well as its surface position (final) were kept constant.

4.3.2.2. Audio test stimuli. In terms of prosodic structure, we created three different versions of each target sentence. In order to do so, the sentences – naturally spoken by a 30-year-old female speaker of Standard German and digitally recorded in a noise-reduced environment – were resynthesized by using the PSOLA manipulation technique incorporated in the speech analysis tool Praat (see Boersma and Weenink, 1996).¹⁴ We not only resynthesized the nuclear contour of each sentence, but the whole utterance. Although this method slightly reduced the sound quality of the utterances, it ensured comparable quality over of all target sentences.

We ensured that there were two pitch accents in the sentence, i.e. the subject and object nouns. If there is only one accentable element in a phrase, its information load or newsworthiness increases. This is due to purely structural (or rhythmical) reasons, which nevertheless influences the form of the accent. A single newsworthy element in an utterance is more likely to receive a peak accent (H*) than any other type of accent. We avoided such a structural bias by providing another accented item (here: the subject noun) in prenuclear position.

The first part of the target sentences was not changed. The subject noun always received a high prenuclear accent (H*). The target referent, on the other hand, either carried a nuclear H* or H+L* pitch accent, or was deaccented (with a nuclear H* pitch accent assigned to the preceding verb). In order to guarantee equivalent pitch accent types, we adjusted the Hertz values of the pitch accents produced by the speaker, taking her normal values as a point of reference. All nuclear H* pitch accents (on the object noun or verb, respectively) had a peak of 240 Hz in the middle of the accented syllable, preceded by a syllable of 200 Hz and followed by a syllable of 155 Hz. The H+L* pitch accent was characterised by a peak of 240 Hz immediately preceding the accented syllable, followed by a fall to 170 Hz in the middle of the nuclear syllable. The boundary tone of each of the three contours had a value of 150 Hz.

Three different prosodic realizations of a target sentence (here: the scenario example mentioned in (17)) are given in Fig. 6. The intonation contours are schematized by using a line notation, and the pitch accents are annotated according to GToBI (Grice et al., 2005).

Without the last sentence the target sentence would have occurred in paragraph final position. In German, however, especially in read speech, paragraph finality is often marked by an H+L* L-% nuclear contour, which coincides with one of the intonation patterns tested in the experiment. Thus,

¹³ We have already pointed out that in German only the argument receives an accent in unmarked predicate-argument structure. However, some verbs do require an accent, especially if they are semantically ‘heavy’. An example of such a verb is *beneiden* (‘envy’), as in the example given by Uhmman (1991:225):

A: Warum ist Maria sauer? (‘Why is Maria angry?’)

B: Weil sie ihren FREUND beNEIdet. (‘Because she ENvies her BOYfriend.’)

Verbs like these were excluded from the experiment, due to expected accent clashes or other influences on the target referent’s prosodic realization. It could, e.g., increase the acceptability of deaccenting the target referent.

¹⁴ PSOLA allows manipulation of fundamental frequency (and duration) of a speech signal without major degradation of the voice quality. Praat is publicly available at the following address: <http://www.fon.hum.uva.nl/praat>.

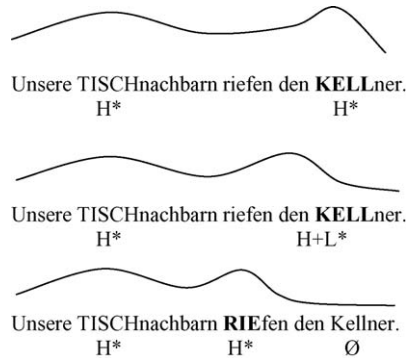


Fig. 6. Schematized intonation contours of the target sentence “The people at the next table called the waiter”. Capital letters indicate accented syllables, bold face letters indicate syllables bearing nuclear accents. The symbol ‘Ø’ indicates lack of accent.

a concluding sentence had to be added in order to avoid an indistinguishable cooccurrence of two different meanings (the degree of accessibility of the target referent and the strength of a discourse unit boundary) resulting in a single intonational form (H+L* L-%) in the target sentence.

We constructed five texts for each relation, and three versions of each target sentence. This resulted in 120 different stretches of discourse. Furthermore, we constructed five practice texts of the same structure. In order to provide some variation, we additionally designed 10 filler texts which included, e.g. pronouns and adverbials (which were missing in the actual target sentences).

4.4. Subjects

Thirty native speakers of German took part in the experiment. They were all undergraduate students, mostly in their first or second semester, and generally naive with respect to the task. Most of the subjects are residents of Cologne and were raised in the West of Germany.

4.5. Experimental setup

The short texts were visually presented on a computer screen (using MS PowerPoint slides), with the target sentence marked in red. Subjects listened to the texts over headphones by clicking on a loudspeaker symbol. Their task was to judge the contextual appropriateness of the target sentence’s intonation patterns on a seven point scale, to be marked on a test sheet. After training in five practice trials, each subject was presented one of six different, pseudo-randomized blocks, consisting of 40 test texts (five per relation) and 10 fillers. Each subject was played only one of the three versions of each target sentence. The task was self-paced, and subjects were allowed to listen to the texts more than once. They were advised to use the full range of the scale.

4.6. Results

The appropriateness judgements were z-transformed so that each subject had a mean score of 0 and a standard deviation of 1. As a general result, we found a highly significant interaction between accent type and type of accessibility ($F(14) = 19.067; p < 0.001$). Table 1 shows a summary of the posthoc tests (Scheffé) that were conducted. The types of accessibility are ordered according to the

absolute preference values for deaccentuation of the respective target referents. The symbol ‘ \gg ’ indicates ‘highly significant preference’ ($p < 0.005$), the symbol ‘ $>$ ’ indicates ‘significant preference’ ($p < 0.05$), and the symbol ‘=’ indicates ‘no significant difference’.

Table 1

Summary of the Results (‘ \gg ’: highly significant preference; ‘ $>$ ’: significant preference; ‘=’: no significant preference)

Type of accessibility	Pitch accent type preferences	Preference values for deaccentuation of target referent	
Converseness	No accent \gg H+L* $>$ H*	-1.18	
Part-whole	No accent \gg H+L* \gg H*	-0.84	Higher preference
Synonymy	No accent \gg H+L* $>$ H*	-0.68	
Hyponym-hypernym	No accent \gg H+L* \gg H*	-0.67	
Hypernym-hyponym	No accent \gg H+L* $>$ H*	-0.55	
Textually displaced	H+L* = no accent \gg H*	-0.18	
Whole-part	H+L* \gg H* = no accent	0.01	
Scenario	H+L* $>$ H* = no accent	0.09	Lower preference

Preference values for deaccentuation: the lower the score, the higher the preference, and consequently the higher the judged appropriateness for deaccentuation.

5. Discussion

The results clearly confirm the basic hypothesis that the factors ‘type of accessibility’ and ‘type of pitch accent’ are highly correlated. However, the order of accent type preferences varies across different semantic relations. The findings indicate that accessible information cannot be treated as a uniform category – at least not in terms of a consistent prosodic marker – which is in line with claims, e.g. by Lambrecht (1994), who argues that there is no direct phonological correlate of accessible information. However, this should not be interpreted as tantamount to saying that the intonational marking of an accessible referring expression is arbitrary. The choice of pitch accent type (including deaccentuation) rather depends on the relation between the antecedent and the anaphor, and – in the case of (some) asymmetrical lexical relations – on the order of occurrence. This will be discussed in detail below.

Let us now have a closer look at each lexical relation. Not surprisingly, the preferred marking of anaphoric **synonyms** is deaccentuation (example (18) repeated as (25)):

- (25) Sie hatte gestern für ihr Kind auf dem Markt eine Apfelsine gekauft. [. . .]
 Die junge Mutter SCHÄLte die Orange.
 (Yesterday she had bought an orange for her child on the market. [...] The young mother peeled the orange [synonym].)

The most readily available interpretation is that *Apfelsine* (‘orange’) and *Orange* are coreferential, i.e. they stand in an identity relation to each other (van Deemter, 1992). Thus, the anaphor represents almost fully active information and consequently does not require an accent. Nevertheless, H+L* is significantly preferred over H*, indicating that, as a second choice, H+L* is more appropriate than H* when marking activated information.

The other symmetrical lexical relation, **converseness**, shows the same preference pattern as synonymy: deaccentuation is preferred over H+L*, which is in turn preferred over H*.

- (26) Markus hatte in der fünften Klasse einen ganz besonderen Lehrer. [. . .] Herr Müller unterSTÜTZte seinen Schüler.
(Markus had a very special teacher in his fifth school year. [. . .] Mr. Müller supported his pupil.)

With the help of the bridging antecedent *Lehrer* ('teacher'), the expression *seinen Schüler* ('his pupil') can be unambiguously identified with the referent *Markus*. Again, if an anaphor is interpreted as coreferential with an antecedent, it can be marked as given information by lack of accent.

The same accent preference distribution (no accent > H+L* > H*) is found in the asymmetrical relations **part-whole** and **hyponym-hypernym**. This can be explained by van Deemter's "concept-givenness" (see section 4.3.1), saying that a superordinate expression following a subordinate one can be deaccented, since the subordinate expression has already established the superordinate concept. Text (27) (repeated from (22)) shows a part-whole example (*Seite-Buch*, 'page-book'), with the nuclear accent shifted to the verb.

- (27) Der kleine Martin studierte jede einzelne Seite. [...] Der Junge LIEBte das Buch.
(Little Martin studied every single page. [...] The boy loved the book.)

The **whole-part** relation showed a highly significant preference of the early peak accent H+L* over both H* and deaccentuation, as in (28) (repeated from (22)):

- (28) Martin war begeistert von seinem neuen Buch. [. . .] Der Junge durchstöberte die SEIten. (H+L*)
(Martin was enthusiastic about his new book. [. . .] The boy looked through the pages.)

That is, the early peak accent is most appropriate for marking this type of accessibility, and the H* accent and deaccentuation are equally unacceptable.

Example (29) (a repetition of (20)) shows a **hyponym-hypernym** (*Tennisspieler - Sportler*, 'tennis player' - 'sportsman') relation.

- (29) Ole war ein begabter Tennisspieler. [. . .] Die Lokalpresse LOBte den Sportler.
(Ole was a talented tennis player. [. . .] The local press praised the sportsman.)

In the case of hyponym-hypernym, although the preference was "no accent > H+L* > H*", like part-whole, the reverse order did not reverse the preferences for accent type. The **hypernym-hyponym** relation produced the same distribution as in the hyponym-hypernym relation (cf. (29) with (30)).

- (30) Ole war ein begabter Sportler. [. . .] Die Lokalpresse LOBte den Tennisspieler.
(Ole was a talented sportsman. [. . .] The local press praised the tennis player.)

How can this result be explained? Let us take another look at the hypernym-hyponym relations mentioned above (as example (15)), e.g.

(31) Bach wrote many pieces for string instruments. He must have loved the viOla.

Another example that requires an accent on the anaphor would be:

(32) As long as she could remember she was in touch with pets. Her parents owned a DOG.

Here, the anaphor denotes either a generic (*the viola* in (31)) or an indefinite term (*a dog* in (32)). Neither of them is a uniquely identifiable individual referent, i.e. the listener cannot identify the speaker's intended referent (see Gundel et al., 1993). The anaphors used in the experiment, however, were definite descriptions denoting unique individual referents, which presumably led to an interpretation of coreference with the antecedent. Thus, *Tennisspieler* ('tennis player') in (30) is rather understood as a synonym of *Sportler* ('sportsman') than as a 'proper' hyponym, resulting in deaccentuation of the anaphor.¹⁵

In order to test the plausibility of this explanation, we can replace the generic anaphor in example (31) with a definite, non-generic one (and slightly modify the content of the sentence):

(33) Bach owned only one string instrument. He must have LOVED the viola.

In (33), deaccentuation of *viola* seems to be much more appropriate than in (31), since an identity-anaphoric interpretation becomes most plausible.¹⁶

What remains remarkable about sequences like (30) is the fact that the anaphor *Tennisspieler* ('tennis player') is presented as already given, although it introduces a new (or at least accessible) piece of information to the discourse (see the citation by Allerton in section 4.3.1). This can be regarded as an economical stylistic device used by the speaker as an instruction to the listener to link the novel information to the most suitable referent in the context. Such an 'accomodation' is not only achieved by deaccentuation but also by definiteness and (syntactic) topicalization. It is commonly used in (spoken and written) news texts, as in the following excerpt from a newspaper article reporting on a trial (Umbach, 2001:265):

¹⁵ Such an interpretation was not intended. It can be explained by our desire to keep the texts of the two relations (hyponym-hypernym and vice versa) as similar as possible in order to minimise unpredictable influences of diverging contexts. Since the structure of all five example texts of the hypernym-hyponym relation was the same – including the same possibility of a coreference reading –, almost all of them (four out of five) showed a significant preference for deaccenting the anaphor.

Note that an identity-anaphoric reading would be impossible in a whole-part relation, due to the intrinsic semantic difference of the two elements—hence the preference of H+L* for marking the anaphor.

¹⁶ The 'identifiability-test' also works in the other direction. Consider two generic versions of the *tennis player-sportsman* relation:

- (a) Er war begeistert von Tennispielern. Vielleicht, weil er SELber Sportler war. (*He was enthusiastic about tennis players. Maybe because he was a sportsman himSELF.*) vs.
 (b) Er war begeistert von Sportlern. Vielleicht, weil er selber TENNispieler war. (*He was enthusiastic about sportsmen. Maybe because he (himself) was a TENnis player.*)

An identity-anaphoric reading in (b) is blocked due to the generic use of *tennis player*. Thus, *tennis player* receives an accent.

- (34) [. . .] This morning the court heard the defendant. The 34-year-old father of two teenage daughters claimed to be innocent.

There is another important aspect which concerns the asymmetry of hyponymy relations. Provided that an identity-anaphoric reading is blocked, as in (repetitions of (14) and (15)).

- (35) Bach wrote many pieces for viola. He must have LOVED string instruments.

and

- (36) Bach wrote many pieces for string instruments. He must have loved the viOla.

the deaccentuation of *string instruments* in (35) and the accentuation of *viola* in (36) have to be attributed to different levels. The deaccentuation of *string instruments* is simply due to cognitive givenness or activation, since the concept *string instruments* is established by the subsumed antecedent *viola*. The accent on *viola* in (36), however, is an expression of focus rather than newness. Whenever a hypernym is mentioned, a set of alternative hyponyms is established, even if their degree of activation is lower than in the reverse case. Mentioning a hyponym is like zooming in (or focussing in a literal sense) on one element of the alternative set. This process is quasi-contrastive (along the lines of Jacobs, 1988; Rooth, 1992) and requires an accent on the hyponym-anaphor. The fact that the anaphor is cognitively semi-activated influences the form of the accent, i.e. H+L* should be the accent's favored surface realization.

If the anaphoric hyponym is coreferential with its hypernym, however, as in our sportsman/tennis player example, the hyponym is likely to occur as part of the background – not as part of the focus –, which decreases the probability of being accented.¹⁷ Thus, the level of the binary pragmatic partitioning of an utterance into a more informative part (focus) and a less informative part (background) blurs the influence of the lexical relation on the target referent's prosodic marking. The interpretation of the target referent as background material becomes possible because the same referent recurs (as 'topic') in the intervening sentence between context and target sentence. The example text discussed above is repeated again as (37), with the assumed focus-background structure of the target sentence indicated. All expressions that refer to the same referent are underlined:

- (37) Ole war ein begabter Sportler. Er war in seiner Region sehr bekannt.

[Die Lokalpresse LOBte]_{Focus} [den Tennisspieler.]_{Background}

(Ole was a talented sportsman. He was well-known in the region.

[The local press praised]_{Focus} [the tennis player.]_{Background})

¹⁷ However, background elements *can* receive an accent, as shown in the following example from Steedman (1991:275), adapted from Jackendoff (1972:260):

A: Well, what about FRED? What did HE eat?

B: [FRED ate]_{Background} [the BEANS]_{Focus}

where FRED is clearly in the background and is accented. Note that our usage of 'background' and 'focus' is equivalent to Steedman's dichotomy of 'theme' and 'rheme'.

Background material can even be (secondarily) accented in sentence-final, i.e. postnuclear, position, as in the following example by Halliday (1967b:209):

A: Have a chocolate?

B: [No, I don't really LIKE]_{Focus} [CHOColates]_{Background}.

The intonation contour proposed by Halliday is a fall on *LIKE* plus a rise on *CHOC*, reinterpreted in autosegmental terms by Grice et al. (2000) as L + H* L- H% with a secondary prominence in the form of a phrase accent on *CHOC*.

Such ‘topic continuity’ (in the sense of Fretheim, e.g. 1994, 1996) or ‘center retention’ (following Centering Theory; see Grosz et al., 1995:210) from the intervening second sentence (*er* (‘he’)) to the target sentence (*Tennisspieler* (‘tennis player’)) was generally avoided in the other relations.¹⁸ However, if coreference is avoided, there is no background material in the target sentence at all. Compare the two hypernym-hyponym relations below: the target referent and hyponym *Hund* (‘dog’) in (38) is coreferential with the two previous instantiations of the discourse topic (*ein Haustier* (‘a pet’) and *es* (‘it’)), making *Hund* (‘dog’) part of the (deaccented) background, but the target referent in (39) does not denote the same referent as the (generic) hypernym *Haustiere* (‘pets’) and the following pronoun *sie* (‘they’). The hyponym *Hund* (‘dog’) is thus part of the focus and more likely to receive an accent.

- (38) Unsere Nachbarn hatten ein Haustier. Es machte viel Freude, aber auch eine Menge Ärger. [Die Kinder versORGten]_{FOCUS} [den Hund.]_{BACKGROUND}

(*Our neighbours had a pet. It was great fun but also caused a lot of trouble. [The children took care of]_{FOCUS} [the dog.]_{BACKGROUND})*

- (39) Unsere Nachbarn hatten Haustiere. Sie machten viel Freude, aber auch eine Menge Ärger. [Die Kinder versorgten den HUND.]_{FOCUS}

(*Our neighbours had pets. They were great fun but also made a lot of trouble. [The children took care of the dog.]_{FOCUS})*

The **scenario** condition showed a significant preference for H+L* over both other types of contour, as in (40) (example (17) repeated):

- (40) Das Restaurant war vom Feinsten. Schon das Lesen der Karte war ein Genuß. Allerdings hätten wir uns nicht alles bestellen können, was wir gerne gegessen hätten. Unsere Tischnachbarn riefen den KELLner. (H+L*)

(*The restaurant was excellent. It was already a pleasure to read the menu. Nonetheless, we couldn't have ordered everything we would have liked. The people at the next table called the waiter.)*

This result strongly suggests that this particular accent type can serve, under certain circumstances, as an ‘accessibility accent’, since it most convincingly encodes the semi-active cognitive state of the referent. For the scenario condition, we can at least claim that relatively prototypical co-established concepts, such as *the waiter* in a restaurant scenario or *the judge* in a courtroom scenario, have the appropriate degree of givenness for being marked by this type of accent.

Judgements on the prosodic marking of **textually displaced** items revealed that H+L* and deaccentuation are equally preferred over H*. The fact that H+L* was not dispreferred suggests that a textually given item recurring after three clauses has a slightly lower degree of givenness than an antecedent’s synonym or hypernym mentioned in the (almost) immediate context. This is possibly due to a necessary search in the working memory in the case of displaced items, which requires a little more activation cost.

¹⁸ Nevertheless, as pointed out by an anonymous reviewer, there are some instances of ‘topic continuity’ in the synonymy and converseness relations, which might be a factor supporting the strong preference for deaccenting the target referents in these contexts.

Interestingly, the distance of three clauses between antecedent and anaphor may cause a referent to be just on the border between accessible and given information, which again suggests a continuum of degrees of activation.

6. Summary and conclusion

We have shown for the purposes of prosodic marking that accessible information cannot be treated as a uniform category. We have further shown that one particular type of pitch accent, H+L*, is appropriate and significantly preferred over another accent type (H*) and over deaccentuation in a number of cases where the referent in question denotes accessible information. These cases comprised whole-part relations where the referent constituted a part of an already mentioned whole, and the scenario condition where the referent was predictable from the contextually given schema or frame.

We have also shown that certain types of supposedly accessible information are preferentially deaccented. These cases comprised the following relations: converseness, part-whole (in that order only), synonymy, and the relation between hypernym and hyponym in either order. The surprising preference for deaccentuation of the anaphor in the hypernym-hyponym relation might be explained by unintended coreference interpretations which also had an impact on the focus-background structure of the target sentences.

In all cases where deaccentuation was preferred, the second choice was H+L* which in turn was significantly preferred over the other pitch accent, H*. This provides indirect evidence for the intermediate status of H+L*.

Baumann and Hadelich (2003) already found that H* is appropriate for signaling new (inactive) information, and deaccentuation for truly given (active) information. Since the experiment reported here has shown that H+L* is appropriate for certain cases of semi-active information, we can place this accent on a scale of intonational marking, along which differing degrees of activation are expressed (see Fig. 7).

This scale also suggests a somewhat iconic use of pitch height, which is compatible with Gussenhoven's (2002, 2004) Effort Code: the higher the pitch on a lexically stressed syllable, the



Fig. 7. Scale of activation degrees and types of pitch accent.

newer (or more newsworthy, in the case of contrastive but active items) the discourse referent. Gussenhoven also claims that the same effect is produced by alignment differences that substitute for differences in pitch height: later peaks are perceived as higher and more prominent than earlier ones. This use of substitute variables can be seen to receive support from the results reported on here. Since the peak in H* is later than that in H+L*, it is interpreted as higher, and therefore taken to mark newer information, whereas H+L* has a very early peak, contributing to the impression of increased givenness.

Acknowledgements

We would like to thank Gudrun Schuchmann for her voice and spontaneity, Philipp von Böselager, Maja Warnking and Doris Mücke for their invaluable help with running the

experiment, Bettina Braun, Stella Neumann and Jürgen Trouvain for comments on the design of the textual material, and Andrea Weber for advice on the statistical analysis. We would also like to thank two anonymous reviewers for their insightful comments.

References

- Allerton, D.J., 1978. The notion of 'givenness' and its relation to presupposition and theme. *Lingua* 44, 133–168.
- Ariel, Mira, 1990. *Accessing Noun-Phrase Antecedents*. Routledge, London.
- Arnold, Jennifer, 1998. Reference form and discourse patterns, Ph.D. thesis. Stanford University.
- Baumann, Stefan, Hadelich, Kerstin, 2003. Accent type and givenness: an experiment with auditory and visual priming. In: *Proceedings of the 15th ICPHS Barcelona*. pp. 1811–1814.
- Boersma, Paul, Weenink, David, 1996. PRAAT, a system for doing phonetics by computer (version 3.4.), Report 132. Institute of Phonetic Sciences of the University of Amsterdam. URL: <http://www.fon.hum.uva.nl/praat/>.
- Bolinger, Dwight, 1985. *Intonation and Its Parts. Melody in Spoken English*. Edward Arnold, London.
- Brazil, David, Coulthard, Malcolm, Johns, Catherine, 1980. *Discourse Intonation and Language Teaching*. Longman, London.
- Brown, Gillian, 1983. Prosodic structure and the given/new distinction. In: Cutler, A., Ladd, D.R. (Eds.), *Prosody: Models and Measurements*. Springer, Berlin, pp. 67–77.
- Büring, Daniel, in press. Intonation, Semantics, and Information Structure. To appear in: Ramchand, Gillian, Reiss, Charles (Eds.), *Interfaces*. Oxford University Press, Oxford.
- Chafe, Wallace, 1987. Cognitive constraints on information flow. In: Tomlin, R.S. (Ed.), *Coherence and Grounding in Discourse*. Benjamins, Amsterdam, pp. 21–52.
- Chafe, Wallace, 1994. *Discourse, Consciousness and Time*. University of Chicago Press, Chicago.
- Clark, Herbert H., 1977. Bridging. In: Johnson-Laird, P.N., Wason, P.C. (Eds.), *Thinking: Readings in Cognitive Science*. Cambridge University Press, Cambridge, pp. 411–420.
- Clark, Herbert H., Sengul, C.J., 1979. In search of referents for nouns and pronouns. *Memory and Cognition* 7, 35–41.
- Couper-Kuhlen, Elizabeth, 1986. *An Introduction to English Prosody*. Edward Arnold, London.
- Cruse, D. Alan, 1986. *Lexical Semantics*. Cambridge University Press, Cambridge.
- Cruttenden, Alan, in press. The de-accenting of given information: a cognitive universal? In: Bernini, G., Schwartz, M.L. (Eds.), *Pragmatic Organization of Discourse in the Languages of Europe (Empirical Approaches to Language Typology, EURO-TYP, Vol. 20-8)*. Mouton de Gruyter, The Hague.
- Féry, Caroline, 1993. *German Intonational Patterns*. Niemeyer, Tübingen.
- Fillmore, Charles J., 1982. Frame semantics. In: *Linguistics Society of Korea (Ed.), Linguistics in the Morning Calm*. Hanshin, pp. 111–138.
- Fretheim, Thorstein, 1994. The accent parameter and the cognitive status of discourse referents. In: Allwood, J., Ralph, B., Andersson, P., Kós-Dienes, D., Wengelin, Å (Eds.), *Proceedings of the 15th Scandinavian Conference of Linguistics*. pp. 95–107.
- Fretheim, Thorstein, 1996. Accessing contexts with intonation. In: Fretheim, T., Gundel, J. (Eds.), *Reference and Referent Accessibility*. Benjamins, Amsterdam, pp. 89–112.
- Grice, Martine, Baumann, Stefan, 2002. *Deutsche Intonation und GToBI*. *Linguistische Berichte* 191, 267–298.
- Grice, Martine, Baumann, Stefan, Benz Müller, Ralf, 2005. German intonation in autosegmental-metrical phonology. In: Jun, S. (Ed.), *Prosodic Typology. The Phonology of Intonation and Phrasing*. Oxford University Press, Oxford, pp. 55–83.
- Grice, Martine, Ladd, D. Robert, Arvaniti, Amalia, 2000. On the place of phrase accents in intonational phonology. *Phonology* 17 (2), 143–185.
- Grosz, Barbara, Joshi, Aravind, Weinstein, Scott, 1995. Centering: a framework for modeling the local coherence of discourse. *Computational Linguistics* 21 (2), 203–225.
- Gundel, Jeanette, 1996. Relevance theory meets the givenness hierarchy. An account of inferrables. In: Fretheim, T., Gundel, J. (Eds.), *Reference and Referent Accessibility*. Benjamins, Amsterdam, pp. 141–153.
- Gundel, Jeanette, Hedberg, Nancy, Zacharski, Ron, 1993. Cognitive status and the form of referring expressions in discourse. *Language* 69, 274–307.
- Gussenhoven, Carlos, 1991. The English rhythm rule as an accent deletion rule. *Phonology* 8, 1–35.
- Gussenhoven, Carlos, 2002. Intonation and interpretation: phonetics and phonology. In: *Proceedings of the First International Conference on Speech Prosody Aix-en-Provence*. pp. 47–57.

- Gussenhoven, Carlos, 2004. *The Phonology of Tone and Intonation*. Cambridge University Press, Cambridge.
- Hajicova, Eva, 1993. *Issues of Sentence Structure and Discourse Patterns, Theoretical and Computational Linguistics*, vol. 2. Charles University, Prague.
- Halliday, M.A.K., 1967a. *Intonation and Grammar in British English*. Mouton, The Hague.
- Halliday, M.A.K., 1967b. Notes on transitivity and theme in English, Part 2. *Journal of Linguistics* 3, 199–244.
- Horne, Merle, 1990. Accentual patterning in ‘new’ vs. ‘given’ subjects in English. Working Papers Department of Linguistics 36, Lund University, pp. 81–97.
- Jackendoff, Ray, 1972. *Semantic Interpretation in Generative Grammar*. MIT Press, Cambridge, MA.
- Jacobs, Joachim, 1988. Probleme der freien Wortstellung im Deutschen. *Sprache und Pragmatik. Arbeitsberichte* 5, 8–37.
- Kohler, Klaus, 1995. *Einführung in die Phonetik des Deutschen*. (Grundlagen der Germanistik 20) Schmidt, Berlin.
- Kohler, Klaus, 1991. Terminal intonation patterns in single-accent utterances of German: phonetics, phonology and semantics. *AIPUK* 25, 115–185.
- Ladd, D. Robert, 1996. *Intonational Phonology*. Cambridge University Press, Cambridge.
- Lambrecht, Knud, 1994. *Information Structure and Sentence Form*. Cambridge University Press, Cambridge.
- Lyons, John, 1968. *Introduction to Theoretical Linguistics*. Cambridge University Press, London.
- Pierrehumbert, Janet, Hirschberg, Julia, 1990. The meaning of intonational contours in the interpretation of discourse. In: Cohen, P.R., Morgan, J., Pollack, M.E. (Eds.), *Intentions in Communication*. MIT Press, Cambridge, Mass, pp. 271–311.
- Prince, Ellen F., 1981. Toward a taxonomy of given-new information. In: Cole, P. (Ed.), *Radical Pragmatics*. Academic Press, New York, pp. 223–256.
- Rooth, Mats, 1992. A theory of focus interpretation. *Natural Language Semantics* 1, 75–116.
- Sanford, Anthony J., Garrod, Simon C., 1981. *Understanding Written Language: Explorations of Comprehension beyond the Sentence*. John Wiley, Chichester.
- Steedman, Mark, 1991. Structure and intonation. *Language* 67, 260–296.
- Tannen, Deborah, 1979. What’s in a frame? Surface evidence for underlying expectations. In: Freedle, R. (Ed.), *Discourse Processing: New Directions*. Ablex, Norwood, NJ.
- Terken, Jacques, Hirschberg, Julia, 1994. Deaccentuation of words representing ‘given’ information: effects of persistence of grammatical role and surface position. *Language and Speech* 37, 125–145.
- Uhmann, Susanne, 1991. *Fokusphonologie. Eine Analyse deutscher Intonationskonturen im Rahmen der nicht-linearen Phonologie*. Niemeyer, Tübingen.
- Umbach, Carla, 2001. (De)accenting definite descriptions. *Theoretical Linguistics* 27 (2–3), 251–280.
- van Deemter, Kees, 1992. Towards a generalization of anaphora. *Journal of Semantics* 9 (1), 27–51.
- van Deemter, Kees, 1994. What’s new? A semantic perspective on sentence accent. *Journal of Semantics* 11, 1–31.
- van Deemter, Kees, 1999. Contrastive stress, contrariety, and focus. In: Bosch, Peter, van der Sandt, Rob (Eds.), *Focus - Linguistic, Cognitive, and Computational Perspectives (Studies in Natural Language Processing)*. Cambridge University Press, Cambridge, pp. 3–17.
- von Essen, Otto, 1964. (1st edition 1956). *Grundzüge der hochdeutschen Satzintonation*. Henn, Ratingen.
- Yule, George, 1981. New, current and displaced entity reference. *Lingua* 55, 41–52.

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