

DECODING INFORMATION STATUS BY TYPE AND POSITION OF ACCENT IN GERMAN

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ABSTRACT

In two perception experiments on read German, we investigate how far different accent positions and accent types are related to degrees of perceived givenness both in sentences in isolation and in context. Results reveal a stepwise decrease in the degree of perceived givenness from deaccentuation and prenuclear accents through low and early peak nuclear accents to high and rising nuclear accents. In addition, the appropriateness of prenuclear accent placement and deaccentuation decreases while the appropriateness of nuclear accent placement increases from *given* through *accessible* to *new* referents. These variations suggest a difference in the cognitive activation of different types of information status, which a listener is able to decode by prosodic means.

Keywords: perception, information status, givenness, cognitive activation, pitch accent, prosody

1. INTRODUCTION

A prosodic investigation of an item's level of givenness requires considering the position of both speaker and listener. In the present paper we thus adopt the cognitive approach proposed by Chafe [2] and Lambrecht [7] who define givenness as the degree of activation of a referent or proposition assumed by the speaker to be in the listener's consciousness at the time of utterance. Following Chafe, we postulate an intermediate level between the poles *given* and *new*, namely *accessible* information. The different types of information status correspond to three steps of cognitive activation (implying differences in *activation cost*): 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*; and if a referent becomes activated from a previously inactive state, it is *new*.

In our study we are concerned with the 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, we distinguish between immediately evoked items, denoted here as *given*, and items whose previous mention is non-immediate or *displaced* [12]. Implicit reference involves cognitive bridging [3] between an antecedent and an anaphor and will be subsumed under the term *inferentially accessible* information.

In terms of prosody, several studies have shown that the commonly assumed dichotomy of new vs. given information and their marking as accented vs. unaccented for West Germanic languages (e.g. [4]) is inappropriate for a general account of information status. That is, for American English [9] and German [6] it has been proved that the *accent type* or, respectively, the *tonal configuration*, is an important cue for encoding a referent's information status. Furthermore, the results of a perception experiment on German [1] have recently been confirmed in a neurolinguistic study using ERPs [11]. It was shown 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. In fact, a production experiment on read German [10] revealed that a range of accent types (including deaccentuation) reflect different levels of activation: The number of pitch accents as well as their prominence-lending cues (higher and later accentual peaks) increase stepwise from *given* through *given displaced* and *inferentially accessible* to *new* referents.

The present paper examines whether different accent types and positions have an effect on the listener's *perception* of a referent's level of givenness. Experiment 1 investigates the perceived degree of a target referent's givenness solely by its prosodic marking, and experiment 2 tests the appropriateness of the prosodic marking on a referent in terms of its information status within a context. Given the results of the production study [10], we formulate the following hypotheses:

Hypothesis 1 (experiment 1): An increase in prominence-lending cues on the target referents triggers a decrease in the degree of perceived givenness if no context is provided.

Hypothesis 2 (experiment 2): An increase in prominence-lending cues on the target referents is perceived as contextually more appropriate for referents with a decreasing degree of activation.

2. METHOD

2.1. Test material

Acoustic recordings from a previous production experiment on read German [10] provide the test material in two perception tasks. The reading

material consists of ten blocks, each containing a different target word embedded in a target sentence whose structure was kept constant in all blocks (see Table 2). The target words are nouns and proper names, with stress on the penultimate syllable and a comparable segmental structure: CV.'C/i:/(CV) or CV.'C/a:/(CV). The blocks are divided into three contexts eliciting four different types of information status of the target words (cf. Table 1).

Table 1: Example reading material for the target word *Banane* ('banana') in English translation.

target word = Ba.na.ne [ba.'na:.nə] banana
German target sentence (a) = „Ich nehme die Banane mit“
German target sentences (b)-(d) = Er steckt sich die Banane ein.
CONTEXT 1: (a) new (b) given displaced “What would you like?” (a) “I’ll take the banana (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 banana . Maybe he’ll buy them more often in future.
CONTEXT 2: (c) inferentially accessible / bridging 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 banana . He’s just been to the green grocer’s at the market especially to get one.
CONTEXT 3: (d) given Thomas has just bought a banana at the market. (d) He pockets the banana . In the future he wants to eat much more healthily.

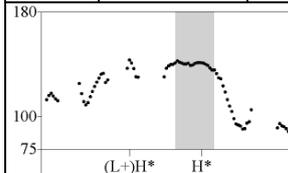
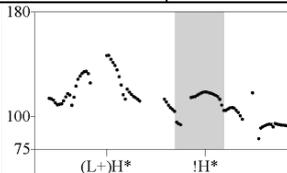
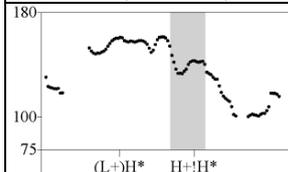
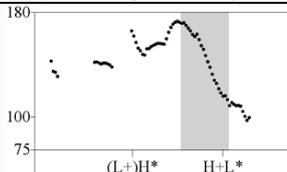
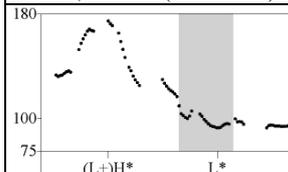
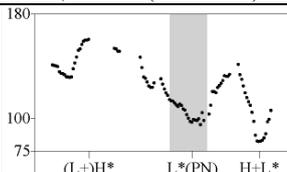
The target word in sentence (a) displays a *new* discourse referent since it is mentioned for the first time and is not derivable from the previous sentence. It can thus be said to be inactive in the minds of speaker and listener [7]. After two or three intervening context sentences with a change in topic, the target word is repeated in sentence (b). This *given* but *displaced* discourse referent is thus no longer fully activated. The second context sets up a scenario: Since the referent in target sentence (c) has not been mentioned before but can be inferred via a *bridging* process from the contextual frame, it can be classified as *inferentially accessible* (Table 1: the banana is inferable from the zoo-and-monkey context). In sentence (d), the target word is a repetition of an antecedent in the immediately preceding context sentence. In contrast to sentence (b), the *given* target word in (d) is already fully activated. Furthermore, only in sentence (d) the target referent is part of the background due to its immediate previous mentioning. In target sentences (a), (b) and (c), the target words are part of a broad focus domain.

Ten native speakers of Standard German read out each block three times in a contextually appropriate manner, adding up to 1200 recorded target sentences. For the perception tasks, we selected seven original target sentences (and their original corresponding contexts) for each information status according to their prosodic realizations. That is, the selected test sentences differed in accent placement and in the

realized accent type on the target word (cf. Table 2): The structure of the target sentences, with the argument in non-final position, allows the nuclear accent either to fall on the target word or on the sentence-final verbal particle. In the former case, the test sentences were realized with one of the following five accent types on the target words, categorized according to GToBI [5]: H*, !H*, H+!H*, L*, H+L*. In the latter case, test sentences were chosen that displayed an H+L* nuclear accent on the verbal particle. In such cases, the target word was either deaccented or received a low prenuclear accent. Furthermore, all 28 test sentences showed a rising accent on the finite part of the separable verb with a peak in medial or late position and a sentence-final low boundary tone.

We controlled both the perceptual and acoustic equivalence of the respective accent types in the selected sentences. No adjustments of the original utterances were made, except for the amplitude of the test material. Each target word and each speaker occurred at least once in the selection of test sentences. Nevertheless, we did not select more than one *combination* of target word and speaker for the experiment.

Table 2: Examples of six F0 contours realized on test sentences (e.g. *Er steckt sich die Banane ein*): five nuclear accents, one prenuclear accent on the target word (accent types and F0 movements between starred tone of target word’s accent and a previous F0 peak in semitones (ST) are given below). The accented syllable of the target word is shaded (e.g. *BaNAne*).

pron. subject	finite part of separab. verb	definite direct object = target referent	verbal particle
0	(L+)H*	nuclear accent	0 L-%
0	(L+)H*	prenuclear accent (PN)	H+L* L-%
0	(L+)H*	deaccented (Ø)	H+L* L-%
(audio file 1)			
			
H*, ST: 0.5 (audio file 2)		!H*, ST: -3.2 (audio file 3)	
			
H+!H*, ST: -3.2 (audio file 4)		H+L*, ST: -7.0 (audio file 5)	
			
L*, ST: -10.8 (audio file 6)		L*(PN), ST: -9.4 (audio file 7)	

2.2. Procedure

Two different online perception experiments were conducted via two open URLs, developed in the style of a semantic differential by means of a professional software package named “*onlineFragebogen (oFb)*” [8].

In experiment 1, the participants’ task was to evaluate whether the target word in a test sentence sounded as if it was (rather) known or unknown. Subjects were told to give their judgements by placing a roll bar on a horizontal line without apparent scaling. The roll bar could be moved from the middle of the line to the left pole “known” or to the right pole “new” (*givenness scale*). No context was given. The test sentence was automatically played twice, separated by a pause of one second, without being presented visually.

In experiment 2, the test sentences had to be rated in relation to their corresponding contexts. For this, the entire context was visually present while it was played once. The task was to evaluate how well the melody of the test sentence fits into the context. The scale used for evaluation was the same as in experiment 1 except for the pole labels. The left pole had the label “not at all”, meaning not appropriate, and the right pole “very well”, meaning appropriate (*acceptability scale*). Experiment 2 consisted of four sub-experiments, each of which contained test sentences originating from one single context type (*given, given displaced, inferentially accessible, new*). For the *new* condition, a short version of the original context was used (cf. Table 1).

In both experiments, each test stimulus had to be evaluated three times in randomised order adding up to 83 stimuli in the main section of experiment 1, and 21 in the main section of experiment 2. The evaluation was carried out for each test sentence/context on a separate page. The participants controlled when to start a stimulus but it could not be played again. Furthermore, both experiments included a short practice section prior to the main section.

2.3. Subjects and analysis

In each of the two experiments the results of 83 native German speakers (64% female, 36% male; no experts in speech analysis) entered the analysis. They were aged between 19 and 75 and grew up in 14 different German Federal States. While the sub-experiment with the *given displaced* condition has 23 participants, 20 subjects participated in the other three sub-experiments each.

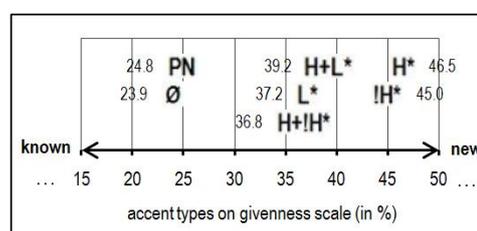
The elicited evaluations were encoded on an interval scale, illustrated as a continuous line in the experimental condition, ranging from 1% to 100% with the lowest value at the left pole (‘known’/ ‘not appropriate’) and the highest value at the right pole (‘new’/ ‘appropriate’).

3. RESULTS AND DISCUSSION

3.1. Perception without context (experiment 1)

As an overall result, the perception of different givenness degrees was significantly influenced by *accent placement* as well as *accent type* on a discourse referent (repeated measures ANOVA: accent position $F(2,83) = 24.406$, $p < 0.001$; accent type $F(6,83) = 22.930$, $p < 0.001$). Results show that deaccentuation and low prenuclear accents led to significantly lower values (24%) on the scale than nuclear accents (41%, all accent types pooled). Moreover, the evaluations of the five different nuclear accent types were distributed in two significant steps, as shown in Fig. 1.

Figure 1: Distribution of accent types (and placement: ‘PN’ denoting prenuclear accents and ‘Ø’ denoting deaccentuation) on the givenness scale in exp. 1.



This implies that a referent realized with no accent or a low prenuclear accent is most likely to be perceived as known, or *given*, whereas a referent that is realized with a high or downstepped accentual peak is perceived least given. Accents showing an F0 minimum on the stressed syllable and/or a falling F0 movement due to an early peak take an intermediate (but significantly distinct) position. Thus, hypothesis 1 was generally confirmed. Interestingly, however, the significant difference between accent types is not necessarily reflected by the tonal value of the starred element but by the presence or absence of an early peak. This holds in particular for downstepped accents (!H*), which were perceived as ‘more given’ if they were preceded by an early peak (H+!H*). This accent type patterns together with H+L* and L* accents, which have a predominant falling part, in contrast to !H* which patterns together with H*, often perceived as rising.

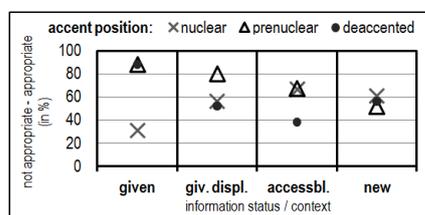
Strikingly, the perceptual differences solely reside in the first half of the evaluation scale which belongs to the side of the “known” pole. This may be due to the definite article, which marks the target referent as ‘familiar’ and prevents the perception of newness.

The above-mentioned rating patterns for accent placement were found for each target word. This reveals that listeners decoded an item’s degree of givenness exclusively by prosodic means, and that the originally produced (intended) information status did not play any role for the givenness ratings.

3.2. Perception with context (experiment 2)

Despite a relatively small number of participants for each of the four sub-experiments the results clearly show that the appropriateness of an item's prosodic marking in terms of accent position differs significantly depending on the discourse referent's information status: the less given a discourse referent, the more appropriate is the prosodic marking by nuclear accents. Conversely, the higher the level of a referent's activation the more appropriate is the prosodic marking by low pre-nuclear accents and deaccentuation (Fig.2). Thus, hypothesis 2 was confirmed in terms of accent position, even for the intermediate activation levels, i.e. *given displaced* and *inferentially accessible* referents.

Figure 2: Distribution of accent placement on the acceptability scale in the four sub-experiments (exp.2).



The ratings were most explicit for *given* target words: deaccentuation and low pre-nuclear accents (88%) were perceived as appropriate, while nuclear accents (31%) were judged as not appropriate (RMAOV: $F(2,20) = 107.118$, $p < 0.001$). Low pre-nuclear accents (80%) also seem to be an appropriate prosodic marker for *given displaced* referents while the appropriateness of nuclear accents (56%) and deaccentuation (52%) remains neutral (RMAOV: $F(2,23) = 12.126$, $p < 0.001$). In the *inferentially accessible* condition, nuclear as well as pre-nuclear accents (67%) were both judged rather appropriate and deaccentuation rather inappropriate (38%) (RMAOV: $F(2,20) = 11.039$, $p < 0.01$). As an exception, we did not find significantly different ratings attributed to accent placement for *new* discourse referents: All accent positions take a neutral position on the acceptability scale. This is probably due to the context question eliciting a broad focus in the target sentence, which leaves room for a wide variety of possible prosodic realizations of the target word.

In terms of different accent types (pre-nuclear accents and deaccentuation included) only *given* target referents confirm hypothesis 2 showing a significantly different distribution on the acceptability scale (RMAOV: $F(6,20) = 48.886$, $p < 0.001$). Nuclear accents with higher and later F0 peaks are perceived as less appropriate prosodic markers for given discourse referents.

4. CONCLUSIONS

In general, our hypotheses were confirmed and both perception experiments provided corresponding results.

Since deaccentuation and (low) pre-nuclear accents were mostly interpreted as encoding given items, their appropriateness as a prosodic marker increases with a higher degree of a referent's activation. Conversely, nuclear accents were perceived as more appropriate the newer, or less activated, a referent was. Interestingly, a low pre-nuclear accent seems to be somewhat appropriate for all types of information status.

Moreover, the stepwise changes in the appropriateness of different accent positions among the four types of information status provide further evidence for the relevance of different intermediate levels of cognitive activation between the poles *active* and *inactive*.

Similar to the results of the production data, accents with an F0 minimum on the stressed syllable or an early peak seem to take an intermediate position between accents with a high or downstepped F0 peak on the one hand and pre-nuclear accents and deaccentuation on the other (exp.1 and *given* condition of exp.2).

The main result is even more remarkable since the test material was spoken by a number of different speakers, and evaluated by a heterogeneous group of listeners. Still, we could show that a referent's prosodic marking by different accent positions and nuclear accent types can serve as the decisive cue for decoding its information status or level of givenness.

5. REFERENCES

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