MULTIPLE CONTRASTIVE ACCENTS IN GERMAN PRODUCTION: SYNTACTIC AND RHYTHMIC FACTORS

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ABSTRACT

The prosody of utterances containing one focused constituent is well investigated in German. However, little is known about the realisation of multiple contrastive accents in double-focus contexts. The present study addresses syntactic and rhythmic factors affecting the occurrence of multiple contrastive accents. In particular, we compare the prosodic marking of double-focused argument-predicate constructions and argument-argument constructions and their rhythmic environment, predicting that a pitch accent might be omitted if its production were lead to a pitch accent clash (i.e. two accented syllables directly following each other). The present results show that in focused contexts, predicates are less accentable than arguments and that pitch accent clashes are generally avoided. Both factors, syntactic status and rhythm contraints, should be taken into account in models of focus-to-accent mapping.

Keywords: pitch accent clash, contrastive focus, rhythm, predicate focus

1. INTRODUCTION

Consider example (1):

(1) Did Fred repair the car?
No, he BROKE the BIKE.

The answer contains two contrastive accents, indicating corrections with respect to the preceding question (capital letters indicate focus marked by pitch accent throughout the paper). The realisation of multiple contrastive accents in an utterance can be determined by several factors. Not only do multiple contrastive accents pertain to discourse structure, but also to less explored factors like syntactic category and rhythm. In German broad-focus declaratives, it is well established that the sentence accent falls on the internal argument of the predicate when both are adjacent to one another (cf. SAAR, [7, 5, 16] e.g. in *...weil Fred AUtos repariert* "because Fred cars repairs" the sentence accent falls on the argument *Autos*). In contrastive (single) focus environments (e.g.*...weil Fred Autos repaRIERT, nicht kaputt macht* "because Fred cars rePAIRS, not breaks them", stress-assignment rules and information structure principles (focus-to-accent mapping) interact in such a way that the focused constituent attracts the most prominent accent (e.g. [16], for empirical evidence see [3]). While single foci have been widely investigated, it is not uncommon that utterances have multiple contrastive accents, a case that, to our knowledge, has so far received less attention. Utterances with a more complex discourse structure result in a likewise more complex interaction with prosody, thereby also leading to a higher production effort (cf. [6]).

In the present paper, we therefore investigate the occurrence of double-contrastive accents in double-focus contexts. In particular, we test whether the likelihood of double-accent realisations is influenced by **syntactic factors**, namely type and relation of focused constituents (predicate, argument), and **rhythmic factors,** namely the avoidance of pitch accent clashs.

Syntactic factors: Our first research question refers to the role played by type and relation of focus constituents on the realisation of multiple contrastive accents. While cases tested in previous work (cf. above) can be interpreted in light of SAAR and focus-to-accent mapping principles, for double-contrastive focus contexts (as in example (1)), predictions regarding accent realisations are not entirely straightforward. Comparably to broad-focus cases, the contrastive accent may exclusively fall on the argument, rendering the predicate unaccented. Alternatively, **both** the argument and the predicate may receive a contrastive accent on their own (see, for instance, [8, 14]). According to the literature, predicates are less prominent than arguments ([13, 10]). We therefore hypothesised that even in double-contrastive focus contexts, speakers will place a contrastive accent solely on the argument of the predicate. We compare the prosodic marking of focused argument-predicate constructions to sentences in which two adjacent arguments are contrastively focused. Since arguments are highly ac-

centable ([13, 10]), we expected that in a double (contrastive)-focus context, **both** arguments will be prosodically marked with a pitch accent, following focus-to-accent-mapping in German.

Rhythmic factors: Our second research question addresses whether rhythmic properties additionally contribute to the realisation of multiple contrastive accents. Several studies have shown that rhythm contributes to variation in pitch accent placement (e.g. [9, 12, 4, 15]). Specifically, it has been found that speakers tend to avoid two adjacent accented or stressed syllables. Pitch accents may be omitted, or shifted in order to avoid such a clash. For instance, in (2), an example from a German radio news corpus, the accent would be expected on *Bank* but was realised on *Dresdner* in order to avoid a clash with the following accented word *Ponto* ([12]).

(2) ... des Vorstandssprechers der DRESdner Bank, PONto
... the board spokesman of the Dresdner Bank, Ponto

In the current study, we investigate how the preference for clash avoidance is affected in a context requiring two adjacent (contrastive) accents. On the basis of the aforementioned studies, we hypothesised that speakers will avoid the realisation of a pitch accent when its production would lead to a clash. Furthermore, since it has been shown that the reading modality affects the influence of rhythm on speech production (cf. [9, 15]), we instructed one group to mentally prepare the mini-dialogue before producing it (prepared reading) and a second group to read out the mini-dialogue as soon as it appeared on the screen (unprepared reading).

To test our hypotheses, a study based on a sentence-reading task was specifically designed to investigate whether double-focus constructions always surface with two contrastive accents regardless of the type of constituent and their syntactic relation on the one hand and rhythmic contraints on the other hand.

2. THE STUDY

The data for the current study was elicited via a reading production experiment.

2.1. Participants

Sixteen (8 men, 8 women) German native speakers participated in the experiment. Their mean age was 30 years. All participants were naïve as to the purpose of the experiment and none of them had known speech or reading disorders.

2.2. Stimuli

In order to test the realisation of two accents in a double-focus environment, a set of stimuli containing a VP consisting of an argument and a verb (AV) was constructed. This stimulus type was compared to a different set of sentences containing two focused adjacent arguments (AA). In both constructions, focus on both constituents (verb and argument in AV and both arguments in AA) was elicited by a context question that presented alternatives for each of the constituents (see examples 3 and 4 below). In order to investigate influences of the rhythmic environment on the prosodic realisation of the two constructions, two conditions per sentence type were included: one eliciting pitch accents on succesive syllables, which therefore directly follow each other (**clash** condition) and one condition in which the potential pitch accents are separated by an unaccented intervening syllable (**no clash** condition). Examples are given below. Since length matters in the distribution of accents (cf. [10]), the stimuli were designed to have comparable lengths (8 words and 10 syllables in the AV construction, 8 words and 13 syllables in the AA construction, both starting from the embedded clause).

(3) **Context:** Hat Konrad gesagt, dass Heinz in Bonn den Pfleger gefeuert hat?
Did K. say that H. in Bonn has fired the nurse?
clash: Nein, er hat gesagt, dass Heinz in Bonn den ARZT ANgestellt hat.
No, he said that H. in Bonn has hired the doctor.
no clash: Nein, er hat gesagt, dass Heinz in Bonn den ARZT verHAFtet hat.
No, he said that H. in Bonn has arrested the doctor.

(4) **Context:** Hat Frank das Essen Pflegerinnen gegeben?
Did Frank give the food to nurses?
clash: Nein, er hat gesagt, dass Frank das GeSCHENK MAlerinnen gegeben hat.
No, he has given the present to painters.
no clash: Nein, er hat gesagt, dass Frank das GeSCHENK MaSSEUrinnen gegeben hat.
No, he has given the present to masseuses.

Two control conditions were added to each sentence type, in order to see whether the participants understood the dialogues correctly. In the AV-construction either the argument (FOC1) or the verb (FOC2) was contrasted. In the AA construction either the first argument (FOC1) or the second (FOC2)

was contrasted.

2.3. Procedure

Twelve sentences per condition (clash, no clash, FOC1, FOC2) and construction type (AV or AA) were distributed over 4 lists using a Latin Square Design. One list contained 24 (12 AV and 12 AA) experimental sentences and 24 filler sentences. The participants were sitting in an anechoic chamber. The sentences were presented on a screen, preceded by instructions and a context story that was designed to make the question-answer pairs more plausible. Half of the participants were instructed to first silently read both question and answer and then produce it. The other half of the participants were instructed to read out the dialogue as soon as it appeared on the screen. Since questions were also recorded, we could check for unnatural productions in the question that may be responsible for deviant productions of the target sentence. The participants controlled the appearence of each new dialogue by pressing a key on a keyboard. The presence of a pitch accent was judged by two annotators on the basis of their acoustic impression.

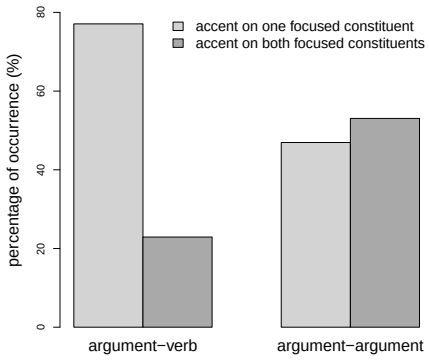
2.4. Analysis

All statistical analyses were performed in R 3.1.2 ([11]), using the function glmer with the package lme4 ([2]). To investigate the relationship between number of pitch accents and sentence construction under a double-focus marking, we performed a generalised linear mixed effects analysis using the logit link function. As fixed factors, we included the type of sentence construction (AV vs. AA), the condition (clash vs. no clash) and the reading task (prepared vs. unprepared). As random factor, we included an intercept for subjects. In order to exclude a possible frequency effect of word collocation (noun+verb or noun+noun), we run a corpus-based analysis and included frequency values of the collocations in the model. This factor, however, did not show any effect and therefore was not considered further. All reported p-values were obtained by likelihood ratio tests comparing the model including the effect in question to the model without the effect in question. (cf. e.g. [1]). We started with the model containing only the random effect for subject and subsequently added the factors mentioned above. Factors that did not significantly improve the model were removed from the model.

3. RESULTS

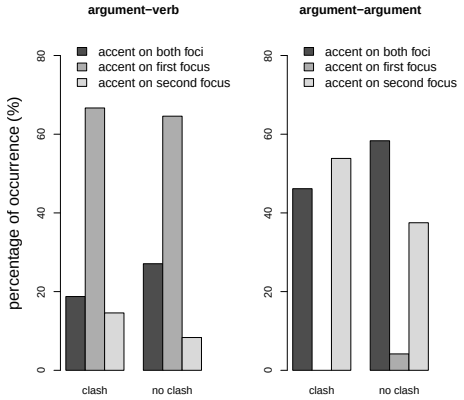
The sentence type (AV vs. AA) significantly affects the probability of a pitch accent on both focused constituents (β =1.8446, *se* = 0.3981, *z-value* = 4.633, $p < .0001$): Figure 1 shows the distribution of two pitch accents over the two sentence constructions. In the AA-construction (right panel) pitch accents on both focused constituents are used in 53% of all sentence productions, while in the AV-construction (left panel), pitch accents on both focused constituents (argument **and** verb) were only produced in 23 % of all sentences.

Figure 1: The distribution (in percentage) of pitch accents on both focused constituents in the argument-verb and the argument-argument construction



The manipulation of the rhythmic environment approached significance (β = 0.6596, *se* = 0.3699, *z-value* = 1.783, $p = 0.074$): pitch accents on both focused constituents were more often produced when there was an unaccented intervening syllable between the pitch accented syllables of the respective constituents (no clash). In the clash-condition, subjects predominantely produced only one accent, namely on the constituent where the accent would fall in a broad-focus sentence (see Fig. 2). The reading task (prepared vs. unprepared) did not have a significant effect on the probability of two pitch accents. Since it did not improve the statistical model, it was not included. The control conditions (FOC1 and FOC2) were produced with the expected focus-marking in 95% of cases in the AV-construction and in 85% of cases in the AA-construction.

Figure 2: The effect of rhythm on the realisation of accents on focused constituents in the argument-verb and the argument-argument construction



4. DISCUSSION

The current study examined the influence of syntactic category and rhythmic clashes on the realisation of multiple accents in a double-focus context. To this end, we elicited sentences containing a double-contrastive focus on the argument and the adjacent predicate and sentences containing a double-focus on two adjacent arguments. In both sentence constructions the rhythmic context was manipulated in such a way that there was a pitch accent clash condition and a no-clash condition (i.e. with one unstressed syllable in-between the two potentially accented syllables). Concerning the syntactic category, the results show that when the argument and its adjacent predicate are both contrastively focused, German speakers produced only one contrastive accent on the argument in the majority of all cases. By contrast, in sentences in which two adjacent arguments are both contrastively focused, German speakers produced two accents significantly more often (Fig.1). This difference in multiple accent realisation supports the idea of a different degree of accentability of predicates (cf. [13, 10]) also in a contrastive environment. We do not consider the occurrences of two accents in the AV-construction as misproductions but rather as some speakers' stylistic choice to attend to the more effortful marking of the contrast (cf. [8]). There is a theoretical possibility that speakers may have processed the argument-predicate as one focused unit, that is, the argument-predicate constructions could have been interpreted as the only alternatives to each other (e.g., Heinz always either "fires the nurse" or "hires the doctor"). If so, we would expect speakers to produce only one accent. This is more likely to happen when the argument-predicate collocation is very frequent and merges into one focus domain (e.g., "reads a book"). However, in our study frequency of argument-predicate collocation did not affect the probability of accent realisation.

As far as rhythmic aspects are concerned, two accents were preferred in the no-clash environments, whereas the number of double-accents was significantly reduced in the clash environments (Fig. 2). This finding is in line with previous studies (e.g. [9]) and additionally shows that rhythm can override information structure principles such as the prosodic marking of contrastive focus. Importantly, we consider it highly plausible that participants were aware of the different information structure configurations across the mini-dialogues: The productions of the control conditions reflect an appropriate semantic processing, i.e. in the one-focus conditions (FOC1 and FOC2), they produced a pitch accent as required by the context. Interestingly, reading modality did not affect the prosodic realisation of double focus. This finding suggests that the interaction between information structure and prosody has an immediate effect on speech production. On the other hand, we cannot exclude that in the unprepared condition, speakers may have pre-read the answer since the whole question-answer pair was presented on the screen at the same time. This issue will be taken into account in the design of future studies.

5. CONCLUSION AND OUTLOOK

The current study provides empirical evidence on the limited accentability of predicates compared to arguments in information-structurally marked contexts and confirms the influence of rhythmic clash on accent distribution. Future studies will further investigate the role of rhythm in the prosodic marking of information structure by concentrating on double-argument constructions. Additionally, the acceptability of single-accent realisations in clash conditions will be examined in a comprehension study. Furthermore, an ERP study on silent reading is currently conducted in order to test whether clash avoidance plays a role in implicit prosody, thereby deepening our understanding on the role of prosody in sentence processing.

6. ACKNOWLEDGEMENTS

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