

## Articulatory Marking of Focus in German

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### Introduction

This study reports on a production experiment investigating articulatory means of encoding different focus structures in German. Previous investigations in this field have been restricted to words in maximally diverging focus structures (contrastive focus vs. background) and thus to the accented-unaccented dichotomy (Cho 2005; Avesani et al. 2007). It is thus unclear from these studies whether the articulatory differences found, such as greater jaw lowering or lip aperture in contrastive focus, are simply due to the presence of an accent, or whether they involve the expression of additional prominence or emphasis as well (Dohen et al. 2006), suggesting that differences in articulation might be found independently of whether a word is accented or not.

We concentrated on lip kinematics (Byrd 2000) in CVC target syllables, comparing different types of focus (contrastive, non-contrastive) and different sizes of focus domain (broad, narrow), as well as comparing focus and background. The lip parameters investigated are greater displacement, longer duration, higher peak velocity and lower stiffness, all of which may enhance the sonority and the prominence of the vowel.

### Methods and Results

Three native speakers of Standard German were recorded with a Carstens AG100 Articulograph, with sensors placed on the vermillion border on the upper and lower lip. Four disyllabic words were constructed in the frame *Doktor B/V:/ber*, where V: (/i:/, /a:/, /o:/ or /u:/) is the vowel in a fictitious surname. Each target name was produced in four focus structures (seven repetitions), making a total of 112 tokens per speaker.

#### Question-Answer-Pairs:

1. Will Norbert Doktor Bahber treffen? *Does Norbert want to meet Dr.. Bahber?*  
[ Melanie ]<sub>focus</sub> will Doktor Bahber treffen.
2. Was gibt's Neues? *What's new?*  
[ Melanie will Doktor Bahber treffen ]
3. Wen will Melanie treffen? *Whom does Melanie want to meet?*  
Melanie will [ Doktor Bahber ]<sub>focus</sub> treffen.
4. Will Melanie Doktor Werner treffen? *Does Melanie want to meet Dr. Werner?*  
Melanie will [ Doktor Bahber ]<sub>focus</sub> treffen.  
(Answer lit.: *Melanie wants Dr. Bahber to meet*) Focus marked with [...]<sub>focus</sub>

#### test words in:

background  
broad focus  
narrow focus  
contrastive focus

*Accent Types:* Although all three speakers deaccented backgrounded items, only DM and AH used accent types to distinguish between different focus structures (Table 1).

Table 1: Most frequently produced accent types per focus condition

speaker	background	broad focus	narrow focus	contrastive focus
DM	∅	!H*	^H*	^H*
AH	∅	!H*	!H* H* ^H*	^H*
WP	∅	^H*	^H*	^H*

*Articulation:* Figure 1 provides averaged trajectories for the distance between the upper and lower lip (Lip Aperture) during the production of the target word B/i:/ber for speaker DM (left) and speaker AH (right). Going from background through broad and narrow to contrastive focus we found an increase in displacement, duration and peak velocities. Differences reached significance not only when comparing background to contrastive focus, a result which is to be expected, given the literature on other languages (Cho 2005;

Avesani et al. 2007), but also when comparing broad and contrastive focus, where the target syllable is accented in both cases.

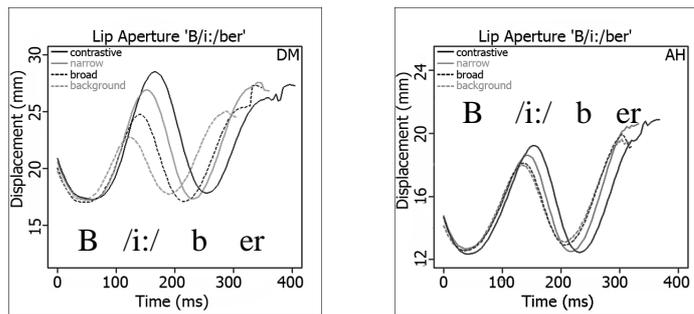


Figure 1: Averaged contours for Lip Aperture, speaker DM and AH, target word B/i:/ber

Figure 2 provides medians and quartiles for stiffness in the opening gesture for the speakers DM and AH, where stiffness is related to the relative speed of the articulatory movement (time-to-peak velocity provided similar results). Contrastive focus tokens have significantly lower stiffness than backgrounded ones, as found for English in Beckman et al. (1992). Our data also revealed significantly lower stiffness values in contrastive as opposed to broad focus contexts.

In a mass-spring model (Byrd 2000), the articulatory adjustments can be accounted for by rescaling of the respective gestures which includes a change of the stiffness and target parameters. However, speakers behave differently: we found non-linear rescaling for DM and linear rescaling for AH.

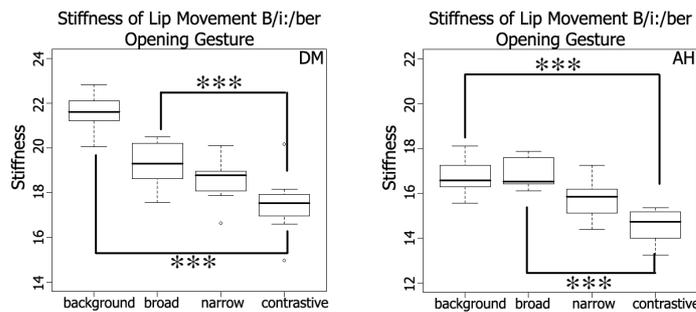


Figure 2: Stiffness (ratio of peak velocity to maximum displacement), speaker DM and AH

In sum, we found systematic differences in a number of articulatory parameters corresponding to sonority expansion between the marking of constituents as background on the one hand, and as contrastive focus on the other, in particular larger displacements and lower stiffness on the latter. We show that sonority expansion is not simply a concomitant of accentuation, since we also found comparable differences in articulatory adjustments when comparing broad and contrastive focus. Thus we show that speakers of German differentiate between linguistic categories relating to focus structure not only by means of accentuation, but also by varying aspects of their supralaryngeal articulation patterns resulting in the enhancement of the syntagmatic contrast between consonants and vowels on and around the target syllable.

## References

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