Durational cues of Standard German Plosives: A comparison between Austrian, German, and Swiss speakers

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The present study contrastively analyzes the acoustic cues of word-initial plosives in Standard German, as pronounced by Austrian, German, and Swiss speakers. German belongs to the so-called 'aspirating' languages [1] and distinguishes homorganic lenis and fortis plosives in word-initial position mainly along the short-to-long lag *Voice Onset Time* (VOT) spectrum [2, 3]. The role of *closure duration* (CD) and of *fundamental frequency effects* (CF0) of the vowels immediately following the plosives is not entirely clear yet [4, 5]. Whereas the standard plosives in the varieties spoken in Austria and in Germany have been analyzed separately [2, 3, 6, 7], no work has been done on Swiss Standard German so far; moreover, there are no previous studies which compare plosives in the three national varieties of Standard German. In this contribution we investigate the durational contrasts of German plosives realized in terms of VOT and CD. We hypothesize that German speakers will most clearly distinguish contrasting homorganic plosives by effectively using both VOT and CD (H1), whereas Austrian speakers will make less use of the two acoustic cues for plosive discrimination (H2). As regards Swiss speakers, we expect to find smaller VOT differences, whereas CD might play a major role considering their dialectal background [8] (H3).

A reading task with a list of German interrogative sentences was conducted, where the target word containing a word-initial plosive is under focus (e.g., /t/ in *Magst du lieber **tanzen** oder singen?*), following the procedure used by [8]. Three groups of university students were recruited in Frankfurt, Vienna, and Zurich; ten native speakers from each group have been analyzed (mean age = 22, age range 18-29 years). All subjects are female, except for two male German speakers and one male Swiss speaker. The speakers were recorded producing a total of 48 interrogative sentences (3 places of articulation x 2 phonation types x 2 vowels x 4 repetitions). The vowels preceded by the initial plosives of the target word were restricted to the low vowels <a> and <o> only. Overall, a total of 1,440 tokens (48 words x 30 subjects) were analyzed. The target acoustic features of the initial plosives were manually segmented and annotated in Praat [9]. The proportions of VOT and CD durations relative to the duration of the target word were calculated in order to control the speech rate of the collected recordings, as proposed in [3].

The results of VOT proportions show that both plosive type and place of articulation have a significant effect in each of the three groups. German speakers most effectively used VOT as an acoustic cue to distinguish lenis and fortis plosives (see Fig. 1). Regarding place of articulation, the more anteriorly the plosives were articulated, the smaller the VOT proportions were for all subject groups, except for the velar fortis plosives of German speakers. CD proportions also appear to be influenced by both plosive type and place of articulation, but differed in the three groups. In general, lenis stops had higher CD proportions than fortis stops in Austrian and German speakers, but the opposite occurred in Swiss speakers. The effect of place of articulation was shown to vary depending on the plosive type. For fortis stops, the CD proportions decreased from bilabial to velar stops (see Fig. 2). In lenis stops, however, the length of the articulatory tract seems to influence CD proportions only in German and Swiss speakers, but not in Austrian speakers.

So far, the results confirm the three hypotheses as regards VOT, whereas for CD the situation is less clear; at least, Austrian and Swiss speakers seemed to make a slightly different use of CD. All in all, however, university students seem to pronounce the plosives of Standard German in a rather similar way.

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Figure 1. *VOT proportions (percentage of lenis VOT in relation to fortis VOT) across the three German varieties*

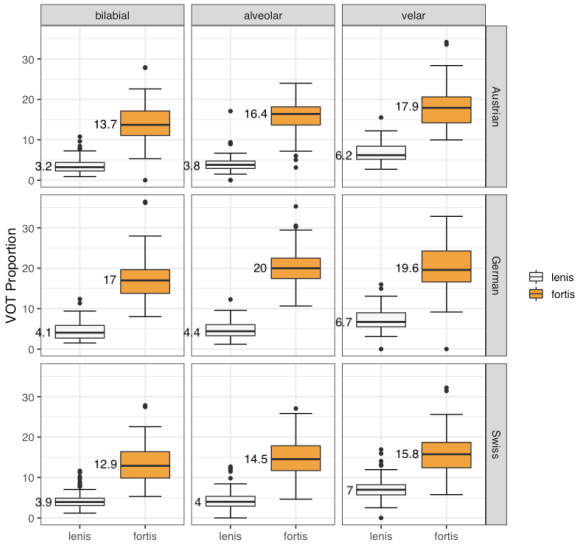
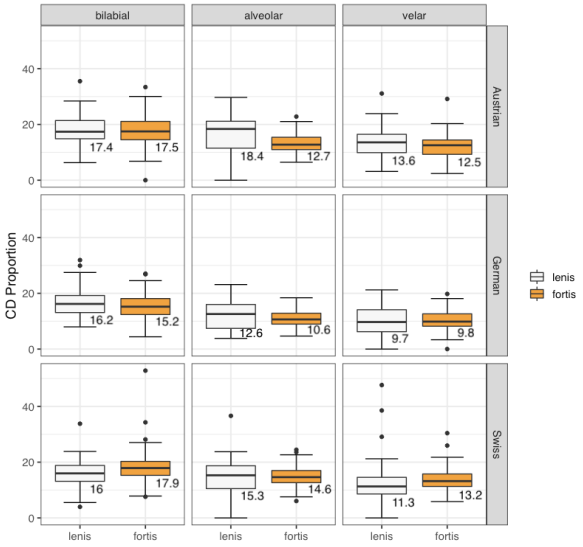


Figure 2. *CD proportions (percentage of lenis CD in relation to fortis CD) across the three German varieties*



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