The voicing of lenis plosives in Zurich German:
a sociophonetic marker of (multi-)ethnolectal speech

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ABSTRACT

Since the turn of the millennium, the emergence of so-called (multi-)ethnolects has been observed in different cities of German-speaking Switzerland. This way of speaking differs significantly from traditional Swiss German dialects. However, a sociophonetic investigation of these varieties is lacking for the time being.

The present study provides an acoustic analysis of plosive voicing in two groups of Zurich German speakers. Traditional Swiss German dialects are reported to show a contrast between two categories of homorganic plosives (fortis vs. lenis) which is based on closure duration, but not on voicing. We compared the proportion of voicing in lenis plosives of 20 speakers with a multicultural and of 10 speakers with a monocultural background. Our results support the view that multicultural speakers of Zurich German do indeed use voiced lenis plosives as a sociophonetic marker, whereas monocultural speakers adhere to the traditional fortis-lenis pattern.

Keywords: Sociophonetics, (Multi-)ethnolects, Swiss German dialects, Voiced plosives

1. INTRODUCTION

In the last decades, new ways of speaking – so-called (multi-)ethnolects – have been observed in multiple European cities with relatively high proportions of migrants (cf. §2). In this study, we investigate a particular phonetic feature that distinguishes (multi-)ethnolectal Zurich German from the dialect of monolingual speakers who only acquired Zurich German before kindergarten.

Traditionally, voiced plosives are lacking in Zurich German (as in all Alemannic varieties spoken in Switzerland). Instead of the feature [±voice], these dialects display a so-called fortis/lenis distinction (cf. §3). However, many immigrant languages represented in German-speaking Switzerland (such as Albanian, Serbian, or Portuguese) do have voiced plosives in their phoneme inventories. Therefore, voiced plosives may arise as a sociophonetic 'marker' (in the sense of [17]) in Swiss German dialects.

The present contribution is organized as follows. First, we will give a few hints at the growing body of research on (multi-)ethnolects in Europe (§2). Afterwards, the fortis/lenis distinction in Swiss German dialects will be presented (§3). 'Swiss German' serves as an umbrella term for the various Alemannic dialects spoken in German-speaking Switzerland (Zurich German is one of them). After a section dedicated to data collection and analysis (§4), the results will be presented (§5) and discussed (§6).

2. (MULTI-)ETHNOLECTS

New vernaculars of adolescents have emerged in urban areas all over Europe since the new millennium. In neighborhoods with relatively high proportions of migrants, new linguistic practices have developed. These vernaculars differ on several linguistic levels from the language varieties traditionally spoken in the respective area and probably serve the expression of group identity, being indexical of 'otherness' with respect to the host country. While syntactic and lexical differences are most noticeable, there are also differences in phonetic features both on the segmental level [13] and on the suprasegmental level [10, 26, 28].

(Multi-)ethnolects first arose as varieties of Germanic languages, in particular in Scandinavian countries [22], Great Britain [6, 14, 26] and in Germany [1, 13], but particular forms of migrant youth speech have also been investigated in France [10, 20], for example. While the relevant features seem to differ with regard to the norms of the standard language, there are also commonalities between different (multi-)ethnolects, at least in Germanic languages. For example, a reduction of complexity can be witnessed on the syntactic level, such as the absence of locative prepositions (e.g. *I'm going countryside* [14], *geh'mer Tankstelle* 'Let's go gas station' [1], *Ich bin HB* 'I am main station' [27]). In addition, certain borrowings can be found regardless of the host languages (i.e., from Arabic *wallah* used as a generic intensifier in Danish [21] or German [9]). Regarding prosody, a tendency towards a (non-Germanic) syllable-timed rhythm has been proposed for several (multi-)ethnolects of Germanic languages [1, 27, 28].

In the present paper, we investigate a segmental feature of the (multi-)ethnolect spoken in Zurich, i.e., the voicing of the traditionally voiceless lenis plosives /b̥ d̥ ɡ̊/.

3. FORTIS AND LENIS PLOSIVES IN SWISS GERMAN DIALECTS

Since the late 19th century, the terms 'fortis' and 'lenis' have been used for the description of a contrast in intensity and duration made between plosives in Swiss German dialects [23, 30]. In phonetic transcription, the voiceless lenis stops of Swiss German dialects are usually represented by adding the diacritic for devoicing to the symbols of voiced plosives [b̥ d̥ ɡ̊] (cf. [11]). Acoustically and perceptually, the most relevant phonetic features have proven to be of durational nature [29]. Overall duration, and in particular closure duration (but not VOT), differs significantly between fortis and lenis plosives (see [18] for a research overview). A significant difference of closure duration was found not only in Zurich German [8, 29], but also in other Swiss German dialects [12, 15]. Recently, it has been discovered that fortis and lenis stops also yield F0 differences in the following vowels [18].

Regarding Swiss German (multi-)ethnolects, it has been claimed that the voicing of lenis plosives is one of its most salient features [25, 27]. For the time being, however, the evidence for this claim is purely anecdotal. Thus, the present study provides the first empirical investigation of plosive voicing in a Swiss German ethnolect. Furthermore, a considerable number of studies have investigated the durational properties of fortis and lenis plosives (following the 'classical' claim by Winteler [30]), whereas it appears that voicing itself has not been systematically examined either in Swiss German plosives (with the exception of [5]). Nevertheless, voicing of lenis stops may occur, at least occasionally, also in 'native' Zurich German [18].

Thus, in order to verify the fundamental hypothesis of our study, i.e., (multi-)ethnolectal speech differs from traditional Swiss German with respect to the voicing of lenis plosives, we analyzed two different groups of speakers, one with a multicultural and one with monocultural background. In the next section, we present the recorded informants, the speech material and the analysis procedure.

4. DATA AND METHODS

The data was collected from two different groups of adolescent and young adult speakers, which we labelled MULTI and MONO. These two terms refer to the members of the group either having a multicultural sociolinguistic background or having a mostly monocultural background. The main focus of our study is on the multicultural group, while the monocultural group serves as a control group.

4.1. Speakers

The first group of speakers (MULTI) is a sample set of an ongoing research project which aims at describing the sociophonetic features that characterize (multi-)ethnolects spoken Zurich. The second group (MONO) forms a subset of the speakers recorded for a previous study which analyzed F0 effects of fortis and lenis plosives in Zurich German [18].

4.1.1. Multicultural speakers

The multicultural group is composed of 20 speakers (12 females; mean age = 13.60 years; $SD = 0.50$). Most of the adolescents in this group spoke additional languages to Zurich German before they entered kindergarten, and some of them acquired Zurich German after kindergarten. Their self-reported use of Swiss German (the umbrella term used in the questionnaire) started on average with 4.35 years ($SD = 3.09$). The heritage languages of the multicultural group include – but are not limited to – the following (in alphabetical order): Albanian, French, Kurdish, Portuguese, Punjabi, Serbian, Singhalese, Somali, and Tamil. In most cases both parents are citizens of another country. The speakers are all part of the same social network because they attend two parallel classes of the same secondary school located in a predominantly multicultural neighborhood of Zurich [24]; in about half of the cases, they also go to the same class.

4.1.2. Monocultural speakers

In the 'control group', there are 10 speakers (all females; mean age = 24.30 years; $SD = 4.92$). Not only are these informants ten years older than those of the multicultural group, they also have a different educational status, given that all of them are university students. Most of them also know additional languages (such as English, French, or Italian), but they learned those languages only in a classroom setting. Though the speakers of this group did not meet, they surely share the same sociocultural background.

4.2. Material

From both groups, read speech was recorded in a battery of carefully designed test sentences. The MULTI group produced bilabial, alveolar, and velar lenis plosives which occurred word-initially and word-internally in meaningful sentences read aloud. The MONO group produced target words embedded in carrier sentences which contained including bilabial and alveolar lenis plosives word-initially.

In the multicultural group, there were 10 sentences for each of the three investigated plosives: 5 word-initially and 5 in word-internal position, resulting in

30 occurrences per speaker and 600 data points in total. To avoid assimilation effects, all plosives occurred after vowels and 25 of them occurred in intervocalic position. In the monocultural group, there were 10 sentences each for the two investigated plosives, resulting in 20 analyzed occurrences per speaker and 200 data points in total. All plosives occurred in prevocalic position, six of them in intervocalic and nine in postnasal position – the remaining five plosives occurred after a trill.

For both groups, the recordings consist of read-aloud speech. Note that Swiss German is a non-standard variety and therefore no official orthography exists. In both cases the sentences were written according to the orthography principles established by Dieth [7], and speakers were familiarized with some of these principles prior to the recordings. For the multicultural group, recordings were made in a separate empty room at the adolescents' school (sample rate 44.1 kHz; 16-bit encoding). Recordings for the monocultural group were made in a recording booth in the University of Zurich Phonetics Laboratory (sample rate 48 kHz; 24-bit encoding). In both cases, sentences were presented individually on a computer screen in random order.

4.3. Data Analysis

We carried out an acoustic analysis of the lenis plosives and their proportion of voicing. Subsequently, we tested statistically whether there was an effect of sociolinguistic background and/or place of articulation. It was expected that the proportion of voicing depended on vocal tract length (i.e., the more front the place of articulation of the plosive the bigger the proportion of voicing) [19].

4.3.1. Acoustic Analysis

The target lenis plosives were manually identified in each sentence of each MONO and MULTI speaker. For each plosive, we calculated the proportion of voicing using Praat [4]. To do so we used the function 'Voice Report' (VR), which returns, among other things, the 'fraction of locally unvoiced frames' in a segment. When this number is subtracted from 1, the result is the portion of the segment which is acoustically periodic as a result of vocal fold vibrations (i.e., the proportion of voicing), ranging from 0 (completely unvoiced) to 1 (completely voiced).

4.3.2. Statistical Analysis

Statistical analyses were carried out with the R software (version 3.2.2) and its lmerTest package (v. 2.0-20; [16]). We ran mixed-effects regression models on degree of voicing of lenis plosives (i.e., proportion of voicing) [3]. We performed two analyses.

First, we examined the difference in voicing of plosives between the two sociolinguistic groups (monocultural vs. multicultural). The fixed part of the model comprised the factor 'Background' (MONO vs. MULTI) and the random part of the model included random intercepts for participants and sentences.

Second, since the multicultural speakers produced plosives at three places of articulation /b̥ d̥ ɡ̊/ whereas the monocultural speakers only produced bilabial and alveolar plosives /b̥ d̥/, we ran separate models for the two groups in order to examine the effect of the factor 'Plosive' (i.e., place of articulation). In these models, the fixed part was composed of 'Plosive' and the random part of the model included random intercepts for participants and sentences, and a random slope allowing for the effect of 'Plosive' to differ across participants.

Significance of the main effects and interactions were assessed using a p-value (from the Satterthwaite approximation for degrees of freedom implemented in the lmerTest package) below 0.05 for the main effects and a t-value above 1.96 for the estimates. Following Baayen [2], in order to ensure that the results in our final models were not driven by a few atypical data points, residuals larger than 2.5 times the standard deviation were considered outliers and removed.

5. RESULTS

First, the proportion of voicing as a function of the sociolinguistic background (MONO vs. MULTI) was compared. A bigger proportion of voicing was expected for the multicultural speakers, based on previous evidence in exemplary studies [25, 27]. Then, the two groups were analyzed separately because they did not produce the same plosives (/b̥ d̥/ vs. /b̥ d̥ ɡ̊/). Here, the proportion of voicing as a function of 'Plosive' was investigated for the two groups separately.

5.1. Effect of Sociolinguistic Background

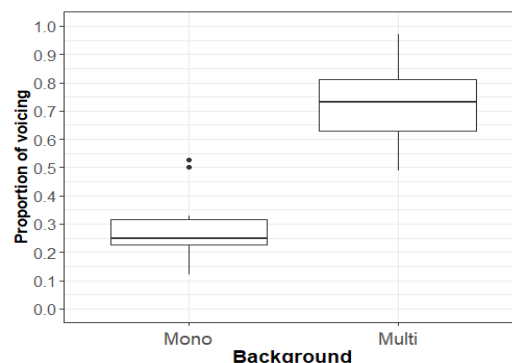**Figure 1**: Proportion of voicing as a function of sociolinguistic background.

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Figure 1 presents the proportion of voicing as a function of the sociolinguistic background. As can be seen, an effect of sociolinguistic background is present: despite the presence of two outliers among the monocultural speakers, multicultural speakers present a significantly higher proportion of voicing than monocultural speakers (0.72 and 0.29, respectively; $\beta = 0.47$, $SE = 0.05$, $t = 8.61$; $F(1, 38) = 74.10$, $p < .001$).

5.2. Effect of 'Plosive'

Figures 2a and 2b present the proportion of voicing as a function of plosive and sociocultural group. As far as the monocultural speakers are concerned (Fig. 2a, top), no considerable voicing difference is observed between the two plosives /b̥ d̥/ (0.34 and 0.25, respectively; $\beta = -0.09$, $SE = 0.05$, $t = -1.69$; $F(1, 18) = 2.86$, $p = .11$). The two outliers observed in the monocultural group (Fig. 1) are tokens of the plosive /b̥/ with a high degree of voicing (Fig. 2a). Nevertheless, the absence of a difference between the two plosives in monocultural speakers was not due to the presence of these two outliers.

Figures 2a and 2b: Proportion of voicing as a function of the plosive and sociolinguistic background.
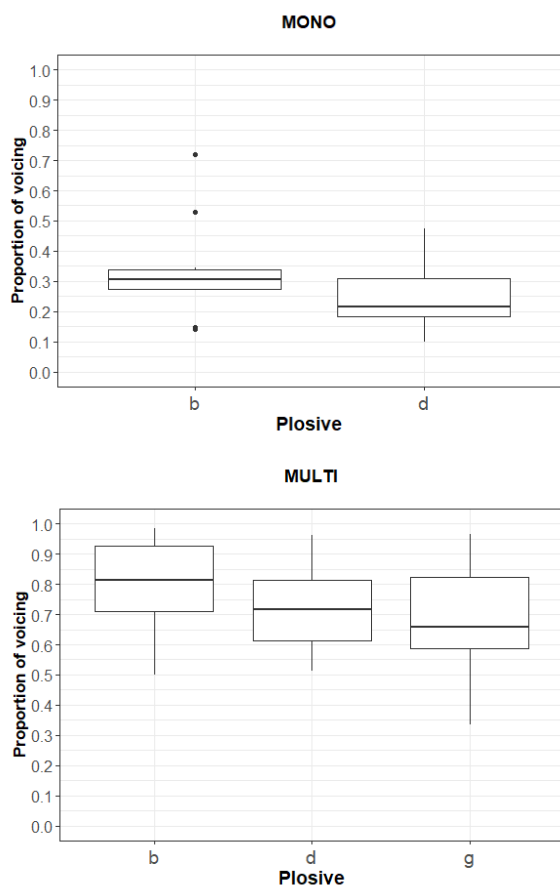
Regarding the multicultural speakers (Fig. 2b, bottom), a significant effect of plosive is observed (/d̥/ in comparison with /b̥/: $\beta = -0.54$, $SE = 0.01$, $t = -2.69$; /g̊/ in comparison with /b̥/: $\beta = -0.12$ $SE = 0.02$, $t = -5.77$; $F(2, 27) = 16.72$, $p < .001$). Bilabial plosives show a higher proportion of voicing than the alveolar ones (0.78 and 0.72, respectively). In turn, alveolar plosives are more voiced than velars (0.67).

6. DISCUSSION

Regarding the proportion of voicing of lenis plosives in different varieties of Zurich German, we have found a difference between the two groups (MONO vs. MULTI). It is true that there is voicing of lenis plosives in both groups. But whereas the occasional voicing among monocultural speakers can be explained by interspeaker variation and contextual assimilation (for instance, a fully voiced bilabial lenis stop is reported by [18] after /m/ of the preceding word), the multicultural speakers' rather consistent voicing is not as easily explained because all plosives in the test sentences occurred in postvocalic position.

One possible explanation comes from interference. Whereas traditional Swiss German lacks a voicing contrast in plosives, most of the (additional) native languages of the multicultural speakers have this distinction which they might then transfer also to their pronunciation of Zurich German.

In addition, we found a difference between the places of articulation produced by the multicultural speakers. The proportion of voicing is largest for the bilabial plosives, followed by alveolar and velar ones. This effect of vocal tract length on the proportion of voicing can be explained by aerodynamic reasons, for why voiced velar stops are hard to produce [19].

By contrast, we could not find any difference between proportion of voicing for the bilabial and alveolar plosives produced by the monocultural speakers. This could be due to interspeaker variability as well as the smaller sample size ($n_{Mono} = 10$ vs. $n_{Multi} = 20$).

In conclusion, the results of our study suggest that the voicing of plosives in Zurich German may constitute a sociophonetic marker, hence an expression of identity in (multi-)ethnolectal speakers. However, other explanations are also conceivable (e.g., gender or/and age). Nevertheless, it is clear that different community norms exist between the two groups investigated in our study.

7. ACKNOWLEDGEMENTS

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