Merging and splitting processes in Mountain Silesian: A comparison to the Standard German vowel system

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Abstract

The study presented here investigates the vowel system of Mountain Silesian, an East Middle German dialect spoken in Poland. This dialect lacks rounded front vowels that are typical for Standard German. An acoustic analysis of one speaker revealed that these vowels tend to merge with the production of their unrounded counterparts. Nevertheless – though being unrounded – they still statistically differ from their counterparts in the formant domain. An identification test showed that Standard German listeners behave differently in categorizing these vowels. While one group hears two phonetically distinct categories, another group perceives a continuous deviation from the prototypical unrounded vowel within a single category.

1. Introduction

German is a West Germanic language with a complex dialectal structure. Its main dialectal groups – Upper German, Middle German and Low German – are geographically stratified from West to East over the Southern part of Germany, Northern Switzerland and Austria including German-speaking minorities in France and Italy (where Upper German is spoken), Central Germany including German-speaking minorities in Belgium, Luxemburg, France and Poland (where Middle German is spoken) and Northern Germany including a German-speaking minority in Denmark (Low German). These subgroups differ in their phonetic sound systems according to the extent medieval consonant and vowel shifts have changes [1], [2]. As a supra-regional common language (with rather slight differences in regional and national varieties) Standard German is spoken over the entire area (see [3] and [4] as well as Figure 1 for the sound system of Northern Standard German).

The present study investigates the vocalism of the East Middle German dialect of Mountain Silesian which is an endangered dialect of the Middle German dialect group. It was spoken in the region of Giant Mountains, in the former Prussian province of Silesia, until the great population transfer after World War II. It is still spoken by some elderly refugees that moved to Western Germany in that time and by some people who remained in the Polish counties of Opole and Śląsk. After the end of the Cold War and the fall of the Iron Curtain, German has been legally established as an "official support language" in Polish municipalities with a German minority of more than 20% of the inhabitants [5].

In dialectological descriptions the vowel system of Silesian – like other Mid German dialects – is characterized by the absence of rounded front vowels ([yː ʏ øː œ]) as compared to Standard German (modern New High German). These vowels have been said to be lost in the transition period from Middle to New High German [6]. Nevertheless, a deviant impure realization (*Verdumpfung*) of these vowels has been reported earlier in the literature [7], yet no acoustic data were provided.

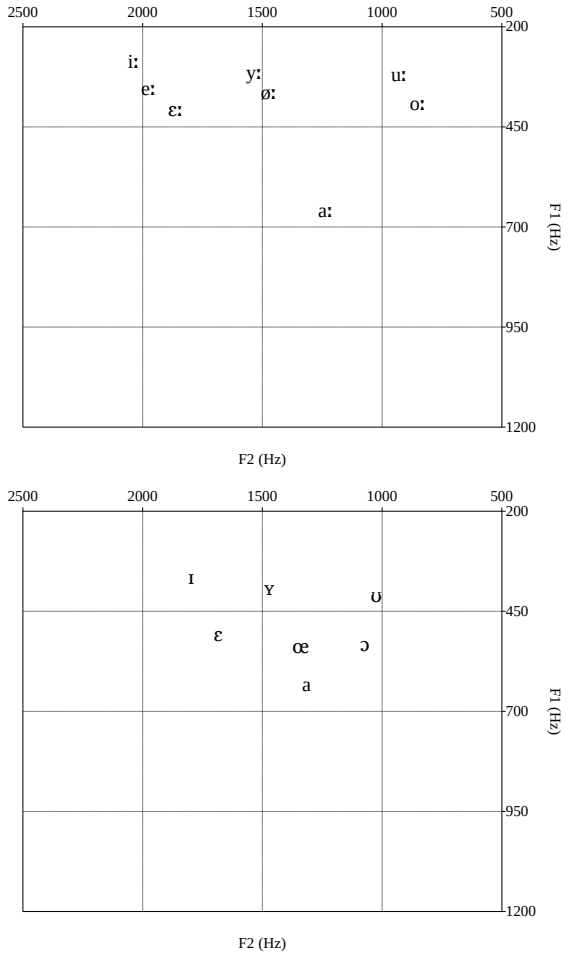

Figure 1: *Standard German long (above) and short (below) vowels in a database of read speech plotted according to [4].*

Since dialectological research did not utilize experimental phonetic methods, the purpose of our present investigation is to undertake a first acoustic analysis of Mountain Silesian monophthongs. The study primarily focuses on the formant structure of high front vowels ([iː ɪ yː ʏ]), but also discusses the other Standard German monophthongs ([eː ɛː ɛ aː a oː ɔ uː ʊ øː œ]) that are realized as monophthongs in Silesian too. One should keep in mind that Mountain Silesian contains additional monophthongs corresponding to Standard German

diphthongs ([aɪ aʊ ɔɪ]). These are not included in the present study.

2. Acoustic Analysis

2.1. Speaker and method

Recordings of a male speaker born in Nimptsch (Silesia) in 1896 (approximately 65 years old at the time of the recordings) served as data for the analysis. The speaker was a Mountain Silesian dialect poet whose recitations are still available as digitized CD publications [8]. From these recordings word-stressed monophthongs were segmented and labelled in Praat [9]. All vowels were segmented along the voiced part of the F2 duration and labelled phonologically to determine the vowel categories as expected for Standard German. They were analyzed for F1, F2 and F3 formant frequencies by means of an LPC analysis (10 coefficients, 25 ms analysis window in 5 ms steps with a pre-emphasis of 6 dB per octave above 50 Hz) on the signal down-sampled to 9200 Hz. F1, F2 and F3 frequencies were calculated as mean formant frequencies between the 40% and 60% points of the vowel duration.

2.2. Results

The results are given in Figure 2 as F1/F2-plots, separately for long and short vowels. In order to illustrate a merging of rounded and unrounded high and upper-mid monophthongs, in Figure 2 these are labelled phonologically in the sense that the transcription represents the vowels that would be expected in a Standard German pronunciation. Lower-mid and low vowels are transcribed phonetically.

In a first inspection, the plots show (i) nearly complete acoustic overlaps of underlying high front rounded and unrounded long vowels, (ii) a lowering of F1 in underlying upper-mid long vowels that also leads to an overlap with the high long vowels, (iii) the emergence of a long lower-mid back vowel (by shifting a subset of Standard German /aː/), and, finally, (iv) the emergence of two low vowels mainly differing in F1 (the lower one based on a splitting of Standard German /eː/), thus showing a diversification in the system when contrasted to Standard German. For short vowels, (v) high and upper-mid vowels do not overlap or at least not to the same extent than long vowels do. However, (vi) the emergence of two low vowels (by a splitting of Standard German /a/) is evident in this case, too.

In a second step, a statistical analysis was calculated (Kruskal-Wallis rank-order analysis of variance) on high front vowels (underlying rounded [yː] *vs* unrounded [iː]). As opposed to the first inspection of the F1/F2-plots the statistical test revealed that the two long vowels do not fall into a complete merger, instead they show highly significant differences in all three formant values (F1: $H=104.12$, $p<0.001$; F2: $H=416.26$, $p<0.001$; F3: $H=93.60$, $p<0.001$).

3. Perceptual Analysis

3.1. Method and participants

To evaluate the ability of Standard German listeners to perceive the acoustic difference between the two variants of Silesian [iː] (underlying /iː/ *vs* /yː/) an identification experiment was designed.

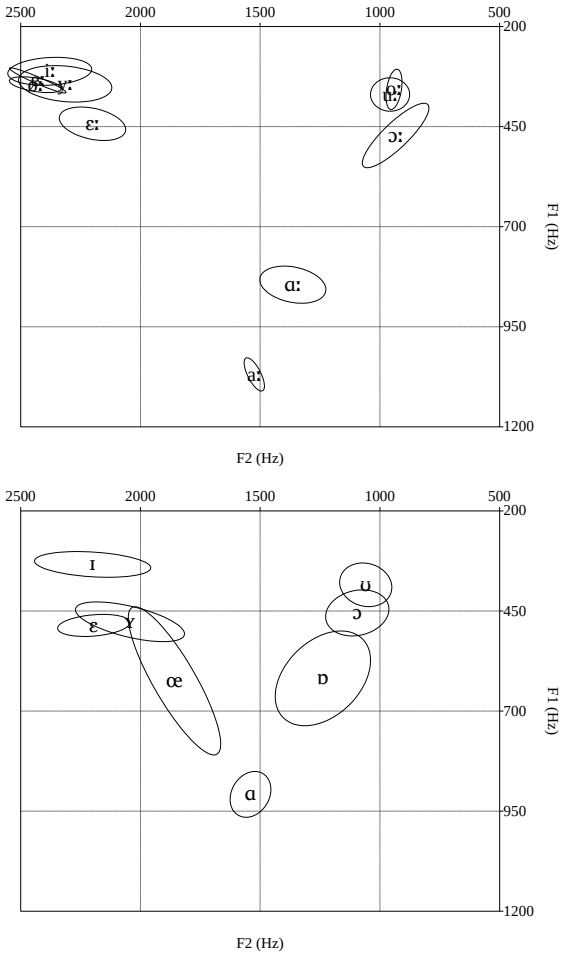

Figure 2: *F1/F2 plots of Mountain Silesian long vowels (above) and short vowels (below) (1σ-ellipses).*

By means of the Klatt formant synthesizer [10] a 5-step continuum of steady-state 4-formant vowels was synthesized in equidistant Hz-steps with fixed F4 (see Table 1). Bandwidths were set to 50 Hz for F1, 150 Hz for F2 and 250 Hz for F3 and F4. Vowel duration was kept constant at 140 ms, f_0 at 180 Hz (declining to 160 Hz in the final part) for all stimuli.

Ten repetitions of each stimulus were arranged in random order with an inter-stimulus interval of 4000 ms and presented to 11 participants (10 female and 1 male undergraduate students of linguistics, all native speakers of Northern German) via loudspeakers in a lecture room. None of the participants had prior experience with Silesian dialects.

They were informed that they will hear vowel-like sounds and asked to mark on an answer sheet whether the vowels they heard were <i> or not <i>. This procedure was chosen, since the [y]-like Silesian vowel cannot be properly named for listeners unfamiliar with this dialect.

	Stimulus 1	Stimulus 2	Stimulus 3	Stimulus 4	Stimulus 5
F1 (Hz)	312	320	328	336	343
F2 (Hz)	2378	2362	2346	2330	2314
F3 (Hz)	3087	3036	2985	2834	2883
F4 (Hz)	3550	3550	3550	3550	3550

Table 1: *Stimulus continuum: steady-state formant frequencies of F1 to F4.*

3.2. Results

The identification scores for all participants (percent /i/ and non-/i/ responses) are presented in the upper part of Figure 3.
To determine inter-individual variation in the response behavior the individual results were inspected.
This inspection showed that two different response strategies were applied. One subgroup (5 participants) showed a clear /i/-category with more than 90% /i/ responses on stimulus 1 and a sharp category boundary near stimulus 3 ('good' categorizers). The second subgroup (6 participants) was unable to establish two distinct and adjacent categories ('bad' categorizers). They preferred non-/i/ responses for most of the stimuli (see middle and lower part of Figure 3).

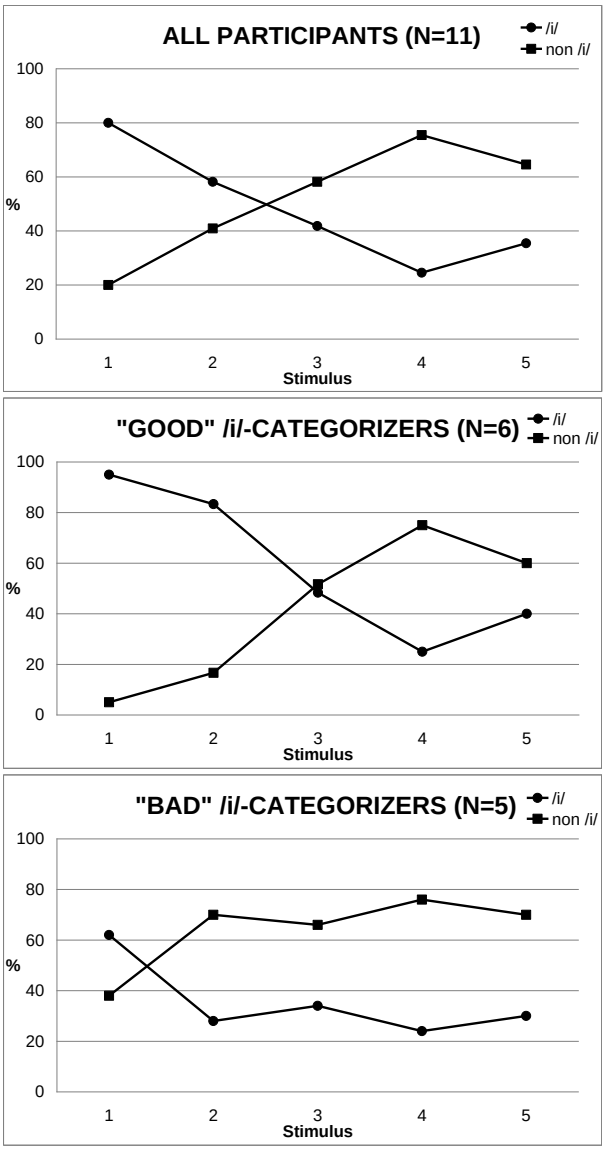

Figure 3: *Identification test results (percent /i/* vs *non-/i/ responses). Upper graph: average values for all participants. Middle graph: 'good' categorizers. Lower graph: 'bad' categorizers.*

4. Discussion

The acoustic analysis presented here showed that Mountain Silesian monophthongs differ overall from their counterparts in Standard German pronunciation, thus confirming earlier dialectological and impressionist phonetic descriptions, e.g. [1], [6], [7].
First, due to shifting and splitting there are additional lower-mid and low vowels. Second, upper-mid vowels merge with high vowels. Third, front rounded vowels appear as unrounded and tend to merge with their underlying unrounded counterparts. Nevertheless, the statistical analysis revealed that this merging is incomplete.
The perceptual analysis was undertaken to determine whether Standard German listeners perceive these high front vowels as distinct categories or not. The results showed that listeners behave different in categorizing these monophthongs. 'Good' categorizers recognize the deviant production of underlying rounded vowels and classify them as non-/i/. 'Bad' categorizers merge both vowels in perception, although they are acoustically different. Such a group-specific behavior is surprising at first sight. One could argue that this result is due to the fact that the listeners were no native speakers of Silesian, but this would be true for the "good" categorizers as well.
The situation resembles a finding by Labov ([11], p. 360) on the Albuquerque dialect of West American English, where his informant showed small, but consistent acoustic differences in F1 and F2 values for [u] and [ʊ]. Nevertheless, in a perception test the speaker was unable to perceive the destinction he had produced before, whereas another subgroup of listeners (of the same dialect) could. His 'bad' categorizer's failure to separate this acoustic distinction is not in agreement with the principle that sounds should be in free variation, if native speakers of the language cannot discriminate between them ([11], p. 357).
Also in our present study, small, but consistent acoustic differences could be measured for the Silesian speaker. Again, a subgroup of 'bad' categorizers could not distinguish the stimuli, whereas 'good' categorizers could (although they did not have a label for the second category, since they were not speakers of the dialect from which the stimulus parameters were extracted). A subsequent study employing Silesian listeners is planned to determine whether the same perceptual subgrouping can be found for native speakers of the dialect as well.

5. References

[1] Wiesinger P. 1983. Die Einteilung der deutschen Dialekte. In Besch W., U. Knoop, W. Putschke and H.E. Wiegand (eds.). *Dialektologie. Ein Handbuch zur deutschen und allgemeinen Dialektforschung.* Zweiter Halbband. Berlin: Mouton de Gruyter. 807-900.

[2] Vennemann T. 1988. Die innergermanische Lautverschiebung und die Entstehung der germanischen und deutschen Dialekte. In Jazayery, M.A and W. Winter (eds.). *Languages and cultures: Studies in honor of Edgar C. Polomé*. Berlin: Mouton de Gruyter. 749-761.

[3] Kohler K. 1999. German. In IPA (ed.), *Handbook of the International Phonetic Association*. Cambridge: Cambridge University Press. 86-89.

[4] Simpson A.P. 1998. Phonetische Datenbanken des Deutschen in der empirischen Sprachforschung und der phonologischen Theoriebildung. *AIPUK* 33.

[5] Pelka D. 2006. *Der deutsch-polnische Sprachkontakt in Oberschlesien am Beispiel der Gegend von Oberglogau.* Berlin: Trafo.

[6] Unwerth W. von 1908. *Die schlesische Mundart in ihren Lautverhältnissen grammatisch und geographisch dargestellt.* Breslau: Marcus.
[7] Reiter N. 1960. *Die polnisch-deutschen Sprachbeziehungen in Oberschlesien*. Wiesbaden: Harrassowitz.
[8] Schenke E. 2006. *Bei uns derrheeme. Ernst Schenke spricht eigene Gedichte in schlesischer Mundart*. Reutlingen und Belheim-Schnellbach: Heege und Lindenbaum [Audio-CD].
[9] Boersma P. and D. Weenink 2001. PRAAT, a system for doing phonetics by computer. *Glot International* 5 (9/10). 341-345.
[10] Klatt D. 1980. Software for a cascade / parallel formant synthesizer. *Journal of the Acoustical Society of America* 67. 971-995.
[11] Labov W. 1994. *Principles of Linguistic Change. Vol. 1: Internal Factors*. Oxford: Blackwell.