

REGIONAL DIFFERENCES IN THE REALIZATION OF STANDARD GERMAN VOWELS

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ABSTRACT

The socially high standard regional realization of German vowels shows systematic differences in quality of monophthongs and diphthongs, in vowel duration and height of F0. Especially the speech varieties spoken in Vienna and in East Middle German area are compared with each other.

METHODS

For the comparison of the vowel qualities a F1/F2-plane has been used in which the scales are presented linearly between 200 and 510 Hz, logarithmically above 510 Hz (practically the mel-

scale is simulated). Instead of plotting the vowel means on the F1/F1-plane as dots a vowel quality is described as a circle of 1 Bark size around the mean value of the vowel type (see Fig. 1 and /1/). The Bark-circle, based on the critical band concept /2/, and considered as a mobile (not as a fixed entity), freely moving on the F1/F2-plane, is used assuming that it is capable to show the psycho-acoustic vowel distances. An IBM and MSX compatible computer program BARKFLF2 is used for plotting. The formant measurements were as follows:

1) SPS-method developed by M. Karjalainen. FFT-spectrum analysis has been carried out with a time window comprising either one glottal period or 30 ms. The monophthongal vowel formants have been

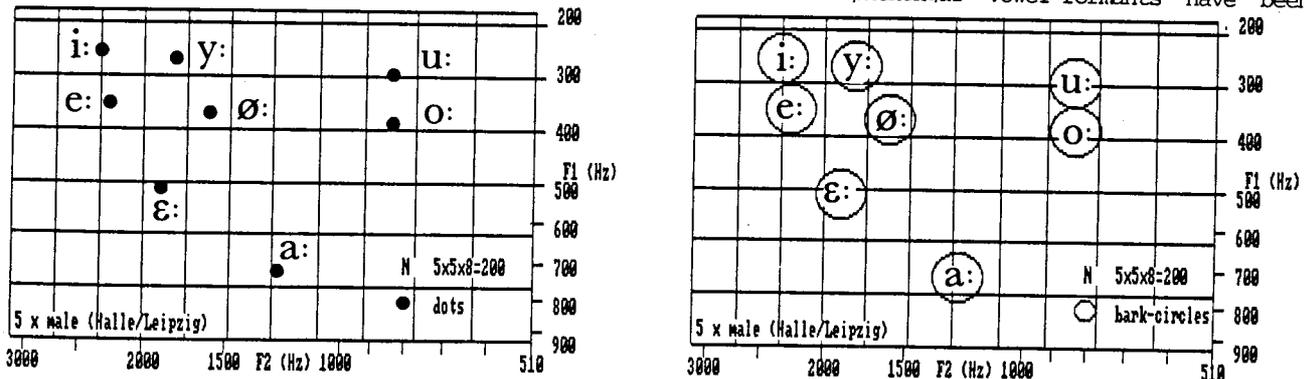
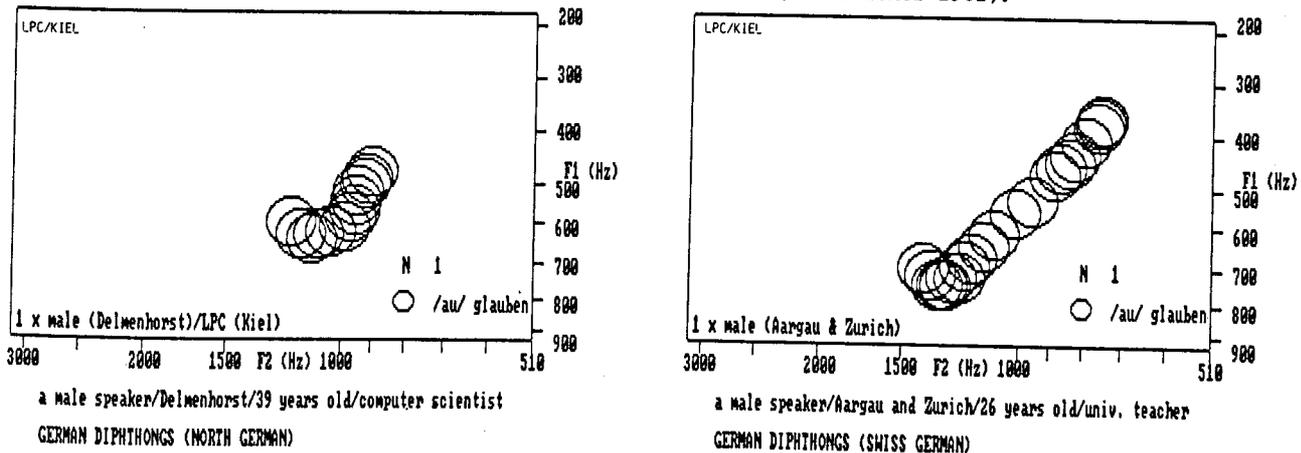


Fig. 1. The means of German long vowels on the F1/F2-plane. The representation of vowels as dots (1a) does not show whether their distances are audible or not. The representation as freely moving 1 Bark size circle (1b) shows that the distance between the close and mid vowels is audible. The lines indicate the boundaries of critical bands (cf. Zwicker 1961).



a male speaker/Delmenhorst/39 years old/computer scientist
GERMAN DIPHTHONGS (NORTH GERMAN)

a male speaker/Aargau and Zurich/26 years old/univ. teacher
GERMAN DIPHTHONGS (SWISS GERMAN)

Fig. 2. A diphthong can be presented as Bark-circles on the F1/F2-plane in 10 ms time intervals /au/ in glauben in North German (2a) shows a shorter gliding than that in Swiss German (2b).

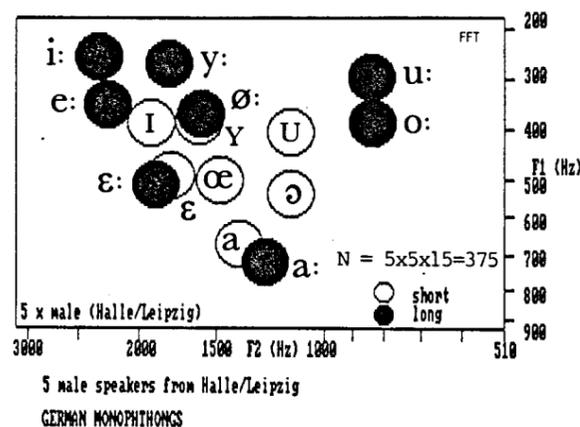


Fig. 3a. The system of 15 German monophthongs of East Middle German on the basis of 5 male speakers.

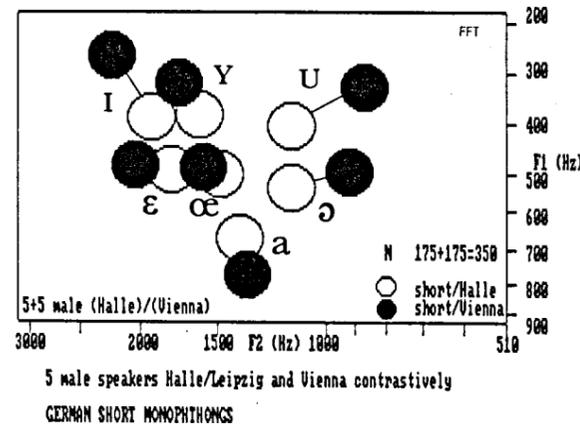


Fig. 4a. Comparison of the short monophthongs between East Middle German and in Viennese German.

measured at the temporal mid point of the vowels.
 2) Mainly diphthongs were analyzed by means of the LPC-method (SSP-method) available at the University of Kiel (Institut für Phonetik und digitale Sprachverarbeitung).

QUALITY OF MONOPHTHONGS

The vowels of five male informants from East Middle German area (Halle/Leipzig, EMG) and from Vienna were compared with each other. A material consisting of (5+5)×90 isolated one syllable words was analyzed. Each vowel class of the 15 primary stressed monophthongs and 3 diphthongs comprised 5 word examples. All the informants had university background as students or teachers. The five speakers from EMG area were students or teachers of speech science and therefore they can be assumed to be good representatives of Standard German. The means of the EMG and Viennese monophthongs (Fig. 3a and 3b) and their comparisons (Fig. 4a and 4b) show following main differences. The long monophthongs have almost the same quality, but Viennese German (=ViennG) has a more back quality in /u:/ and /o:/ (or possibly they are more

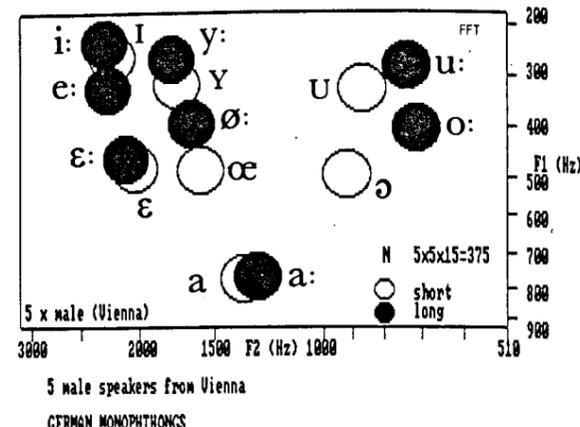


Fig. 3b. The system of 15 monophthongs of Viennese German on the basis of means of 5 male speakers.

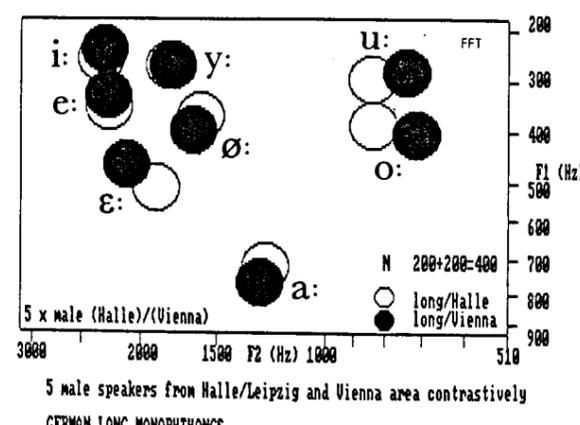


Fig. 4b. Comparison of the long monophthongs between East Middle German and in Viennese German.

round because of their longer duration; cf. the chapter on duration). /i:/ and /e:/ have a slightly closer quality in ViennG than in EMG. The open /:/ tends to be closer in ViennG than in EMG. /a:/ is more open in ViennG than in EMG. The short monophthongs are considerably more centralized in EMG than in ViennG. This concerns also the vowel /a/. The differences are in the cases of /I/, /U/ and /:/ more than 1 Bark. In the cases of /a/, /:/ and /Y/ almost 1 Bark. Only in /ε/ the difference is smaller. The vowels /a/ and /a:/ of ViennG show almost the same quality /a/ being slightly more fronted (but not centralized). In EMG the difference between the series /i:, y:, u:/ and /e:, ø:, o:/ comprises practically only 1 Bark which means psycho-acoustically the smallest possible distance. When the formant data from Rausch /3/ (see Fig. 5) are plotted on the Bark F1/F2-plane it can be seen that they show very similar monophthongal structure with the EMG data obtained here. The background of the informants in Rausch was probably West Middle German (WMG). Also the data concerning the means of three informants from Berlin in Jørgensen /4/ show similar structure in spite of the

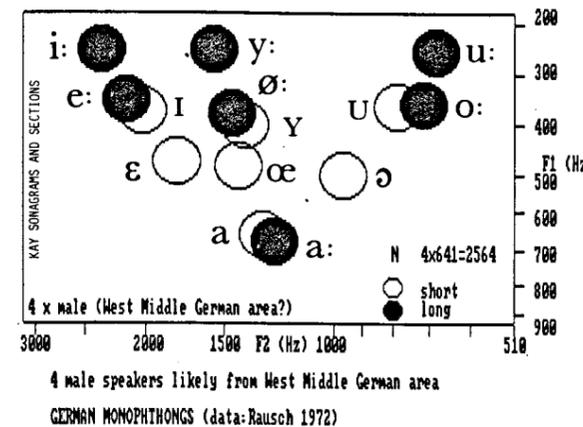


Fig. 5. The system of 14 German monophthongs on the basis of data from Rausch (1972).

considerable differences in the test arrangements. It is remarkable that the comparison with the results obtained by Delattre /5/ shows that the best monophthongal vowel structure on the basis of listening synthetic F1&F2 stimuli corresponds more to that of ViennG than to that of EMG or WMG (= results by Rausch). /a/ is not centralized but slightly fronted compared with /a:/. /I, Y, U/ are only slightly centralized like in ViennG. Delattre does not tell, whether his listeners came from the South. It can also be argued that the synthesis of lax vowels is no easy task. If the 14 vowel qualities obtained by Delattre represent some kind of deep structure of German monophthongs in general we can say that the centralization of the Middle and North German vowels depends on the rapid speech delivery, i.e. on the performance (cf. durations). Fig. 7a shows that the centralization of the short monophthongs is even stronger in the vowels of a male speaker from Hamburg (North German). The series /I, Y, U/ is more open than the series /i:, ø:, o:/. The series /ε, œ, ɔ/ comes close to /a:/. Fig. 7b shows that the monophthongal system of a Swiss male speaker resembles much that of ViennG, but his /u:/ has a lower F2 on an average.

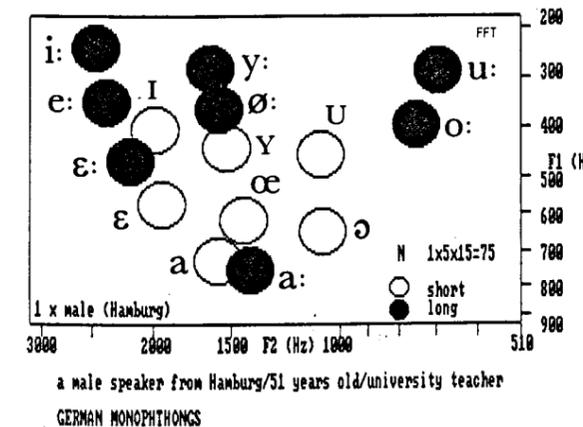


Fig. 7a. The idiolectal system of monophthongs of a North German male speaker from Hamburg.

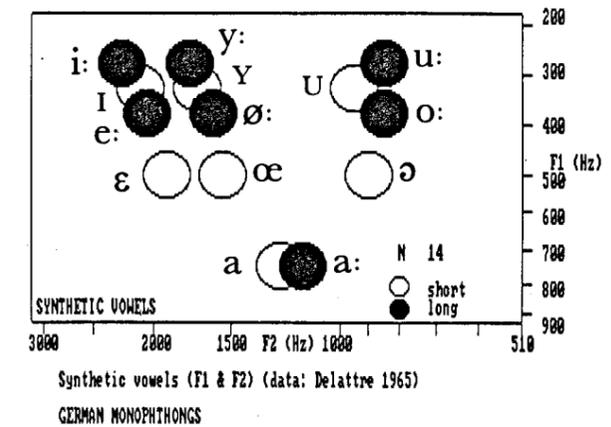


Fig. 6. The system of German 14 monophthongs on the basis of synthetic stimuli (Delattre 1965).

QUALITY OF DIPHTHONGS

The glide of diphthongal quality is described in two idiolects by means of starting and end point of the glide (Fig. 8). The means of 5 words for each class of diphthongs were analyzed. The diphthongs of a male East Middle German speaker show minor span of gliding than that of a male Viennese speaker. The same feature distinguishes also the North German and the Swiss speaker in Fig. 2. A more explicit quality seems to be a common feature for the monophthongs and diphthongs in ViennG. In both varieties of German the first element of /ai/ is a front vowel, whereas that of /au/ is a back vowel. In /ai/ of EMG that vowel is ε, in /ai/ of ViennG œ. In ViennG the first element of /oi/ is more a central than a back vowel.

RELATIVE AND ABSOLUTE DURATION OF VOWELS

Fig. 9 shows that the relative duration of the 15 monophthongs in EMG and in ViennG is similar, but the absolute durations are much shorter in EMG. The quantity quotient V:V was 2.3 in EMG and 2.1 in ViennG.

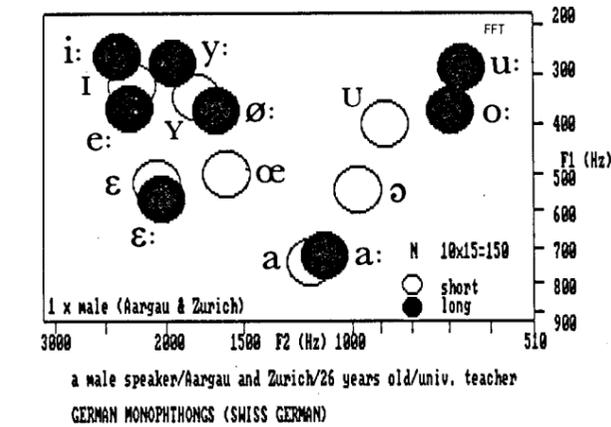


Fig. 7b. The idiolectal system of the monophthongs of a male Swiss speaker from Aargau and Zurich.

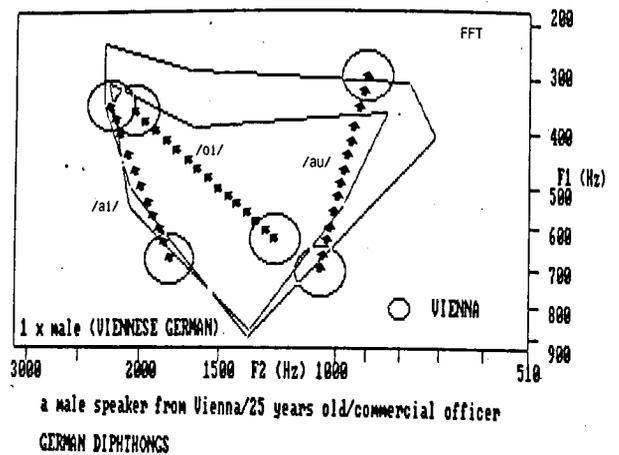
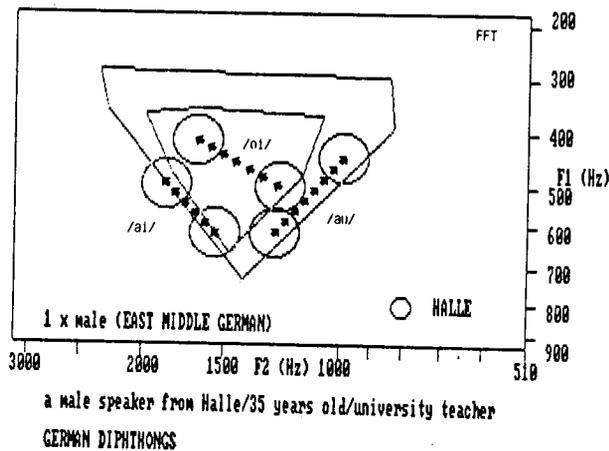


Fig. 8. The idiolectal qualities of the diphthongs of an East Middle German male speaker (8a) and a male speaker of Viennese German (8b). The lines combine the mean values of their short/long vowels. The circles show the starting and end points of the diphthongal glides.

Comparison of two idiolects showed that the diphthongs were ca. 10 % longer than the long monophthongs in EMG and ViennG.

FUNDAMENTAL FREQUENCY OF VOWELS

Fig. 10 shows that the fundamental frequency of the monophthongs in ViennG is systematically higher than in EMG. The short and long close vowels are higher than the other monophthongs in ViennG. This might be in connection with the 5 degree openness system of vowels in the Viennese German Dialect. The variation of the F0 height is smaller in EMG.

CONCLUDING REMARKS

The following features are characteristic for East Middle German (and probably also for North German): centralization of the short monophthongs, smaller dispersion of the total vowel area, shorter gliding of the diphthongs, shorter duration of all types of vowels, lower level of F0. The Viennese German vowels (and probably those of South German in general) are more explicit in quality. Following explanations can be considered: 1) more careful

pronunciation of ViennG because of the dialect/Standard diglossia; 2) more rapid speech delivery of East Middle German and North German; 3) difference in the articulation base; 4) 5 degree vowel openness system in Viennese Dialect and its interference in the socially higher speech form. Further details in /6/.

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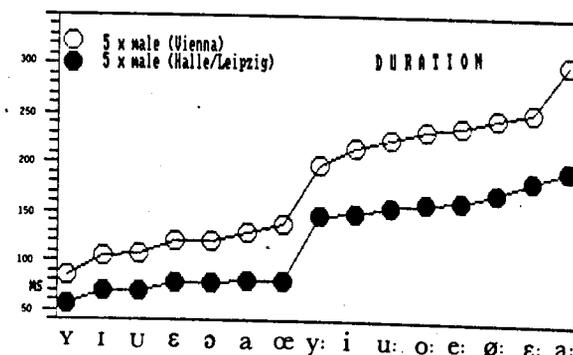


Fig. 9. Durations of the 15 monophthongs in East Middle German and Viennese German contrastively.

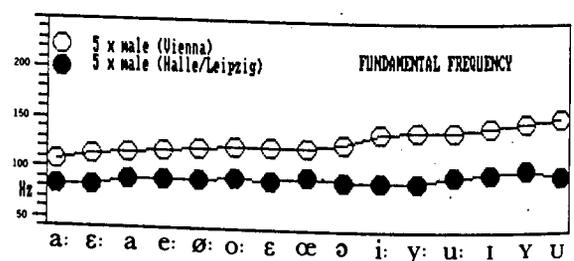


Fig. 10. The F0 height of the 15 monophthongs in East Middle German and Vienn. German contrastively.