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Boersma, P.P.G.; Pelzer, Joppe Anna

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DIPHTHONGIZATION IN THREE REGIONAL VARIETIES OF SWEDISH

Joppe Anna Pelzer and Paul Boersma

University of Amsterdam
joppelzer@gmail.com, paul.boersma@uva.nl

ABSTRACT[1]

This study investigates diphthongization in three Swedish varieties that the literature has regarded as different: Lund, Linköping and Stockholm. In all three varieties, the high vowels /iː/, /yː/, /ʉː/ and /uː/ turn out to only marginally glide, if at all, and /eː/ exhibits clear diphthongization of a centralizing nature. For /oː/, a similar centralization is found in Stockholm, but none is found in Linköping, and the reverse is found in Lund. /ɛː/, /øː/ and /ɑː/ do not diphthongize, but /ɛː/ and /øː/ are realized strikingly low in all three varieties, suggesting an alternative transcription as /æː/ and /œː/. An additional finding is that geminate consonants are hardly longer than singleton consonants, so that the fundamental Swedish binary distinction between VCː and VːC syllable types nowadays has to rely on differences in vowel duration, vowel quality, and diphthongization. Diphthongization may thus be an instrument in the maintenance of auditory contrast.

Keywords: Swedish, diphthongs.

1. JUSTIFICATION

The vowels of Swedish are sometimes described as nine long vowels (/iː yː ʉː uː eː øː oː ɛː ɑː/) and eight short vowels (/ɪ ʏ ɵ ʊ ɛ œ ɔ a/) [17]. This may be appropriate for underlying phonological forms, but in their phonetic realization many long vowels tend to be diphthongs, as has been remarked upon by [14, 8] and investigated in depth by Bleckert [4] for Södermanland.

In this study we broaden the language sample and focus on three different regional varieties, namely those of Stockholm, Linköping (East Götaland) and Lund (south-west Scania), each of which is known for its specific features. On the basis of work by Bruce [6, 7] we expect that all three varieties exhibit diphthongization, though possibly in different fashions.

We focus on the long vowels, using the somewhat arbitrary labels /iː yː ʉː uː eː øː oː ɛː ɑː/ for the vowels in all three varieties (simplifyingly disregarding potential phonological differences between the varieties), as well as on the basic Swedish binary contrast between VːC and VCː syllables (e.g. *glas* /glɑːs/ 'glass' vs. *glass* /glasː/ 'ice cream'), which may be related to the issue of diphthongization as we will see.

2. THE THREE VARIETIES

2.1. Lund

In the traditional dialects of south-west Scania the nine long vowels start more open and, for the non-front vowels, more front and less rounded than where they end: they are [ei øy ø̟ʉ̟ əu ɛe œœ ɜo aɛ a̟ɔ] in IPA transcription adopted from a figure by Bruce [7: 122]. It will be interesting to see if /oː/ diphthongizes in Lund, and if so, whether it manifests itself as a diphthong from front to back as above, or centralizing as has been reported for standard Swedish by [19, 11, 12, 9, 8]. It will also be interesting to see if /øː/ patterns with the open-mid vowels as above, a state of affairs that was also suggested by Bleckert's [4: 170–174] decision not to include /øː/ in the list of diphthongized vowels in central Sweden.

2.2. Linköping

Bleckert [4: 147] classifies Linköping as having no diphthongs, whereas Bruce [7: 194] states that in the varieties of East Götaland the high vowels end in glides, /eː/ and /oː/ move from higher-mid to lower-mid, and /øː/ is a lower-mid monophthong. It will also be interesting to see if diphthongs occur, and if so, our questions for /oː/ and /øː/ are similar to those for Lund.

2.3. Stockholm

The Stockholm accent used to have /ɛː/ merged into /eː/ [7: 201], but this is reportedly on the way out, being nowadays often realized as a separate vowel as low as [æː] [13]; likewise, /øː/ was reported as [œː], and /ɑː/ as [ɒː]. We will look for possible confirmation or changes.

3. METHOD

Each of twenty-four speakers (eight from each town: four females and four males) spoke 128 grammatical Swedish sentences that ended in a target word that received sentence focus. Each of the 9 long vowels

appeared in four C_0V:C and four C_0V:Ca(s) words, and each of the 7 short vowels (all except /ʊ/, which has a very restricted distribution) appeared in four C_0VC: and four C_0VC:a(s) words (with another consonant following C: in a few cases; see data files and scripts at http://www.fon.hum.uva.nl/archive/).

The start and end times of the vowels and the following consonants were annotated with a TextGrid in Praat [5]. The formants were analyzed at the 20, 50 and 80 percent points with the Burg algorithm in Praat, using the following settings: time step 0.001 s, number of formants 5.0, formant ceiling 5500 Hz for women and 5000 Hz for men, analysis duration 0.025 s, and pre-emphasis from 50 Hz.

4. THE LONG VOWELS

Figures 1, 2 and 3 show the median F1 and F2 values at 20, 50 and 80 percent into the vowel, for the three varieties (pooled over both equally present sexes and over all following consonants). In statistical tests below, we sometimes compute *F1 diphthongization* as the change in F1 in going from the 20 to the 80 percent point. Tests are performed using linear mixed-effects modelling in R [16, 2] with three to five fixed effects: the binary predictor Sex (of the speaker; female coded as -0.5, male as +0.5), the binary predictor Voicing (of the following consonant; voiceless coded as -0.5, voiced as +0.5), the binary predictor Alveolarity (of the following consonant; non-alveolar coded as -0.5, alveolar as +0.5), and sometimes a ternary or binary predictor Variety or a binary, ternary or quaternary predictor Vowel (coded as needed). The models also have random slopes for Alveolarity and Voicing (and, if included as a fixed effect, Vowel) for each of the 24 speakers, and random slopes for Sex (and, if included, Variety) for each of the 128 words. The optimization criterion is restricted maximum likelihood [1], and the numbers of degrees of freedom are estimated with Satterthwaite's method [15]. The exploratory nature of our study dictates that we generalize from *p*-values above 0.001 only by hedging this with the auxiliary "may". Our analysis scripts contain more details.

4.1. The long high vowels

The high vowels /iː/, /yː/, /ʉː/ and /uː/ have been described to turn into a glide at the end, which is mainly palatal for /iː/ and /yː/ and mainly labial for /ʉː/ and /uː/ [9, 4]. In the vowel charts this should lead to a falling F1 in all cases, together with a rising F2 for /iː/ and /yː/ and a falling F2 for /ʉː/ and /uː/. This prediction is compatible with what we see in the vowel charts, for all three varieties, although our statistical test does not detect an overall effect.

Figure 1: The long vowels in Lund Swedish.

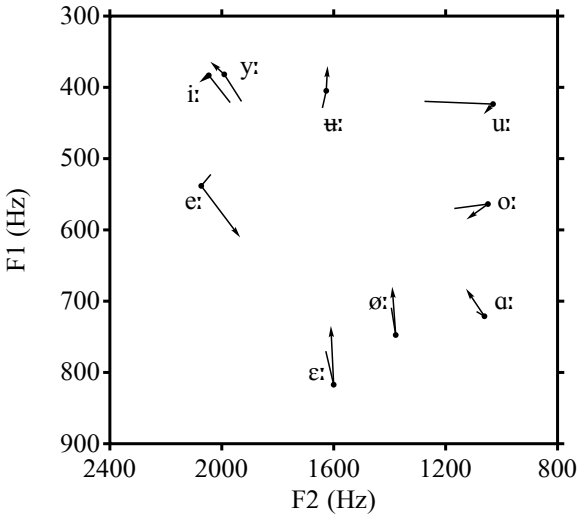


Figure 2: The long vowels in Linköping Swedish.

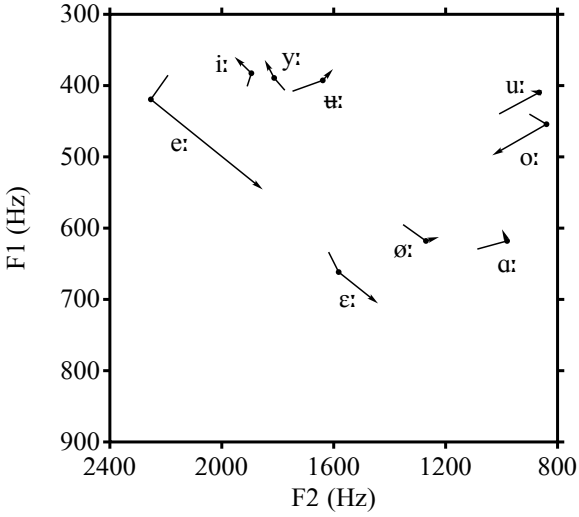
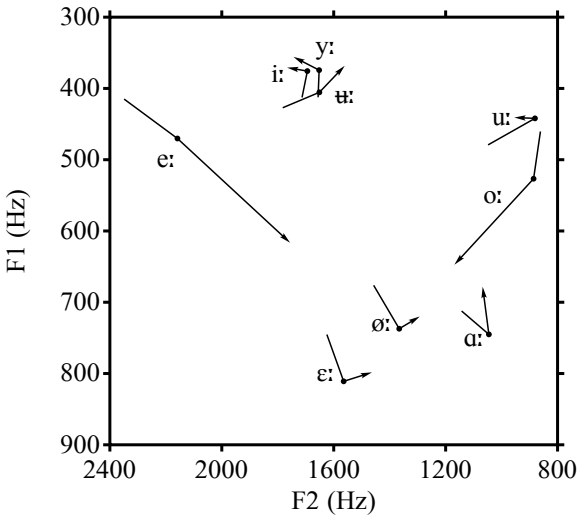


Figure 3: The long vowels in Stockholm Swedish.



The front-gliding vowels /iː/ and /yː/ lie remarkably close to each other. Both vowels are quite central in Stockholm and to some extent in Linköping, affirming Björnsten & Engstrand's [3] findings on the central nature of the "Lidingö-i", a "buzzing" [17] variant of this vowel. The average of these two vowels is further front than /ʉː/ (Vowel coded as F2 at 50%: $p = 0.0006$), an effect that may be stronger in Lund than in the average of Linköping and Stockholm (with Variety included in the model, and coded as +2/3 for Lund and +1/3 for Stockholm and Linköping; $p = 0.028$). Diphthongization of /ʉː/ may be produced strongest in Stockholm, possibly in order to distinguish it from nearby /iː/ and /yː/.

The back vowel /uː/ seems to be the diphthong [ɨʊ] or [ʉʊ] in Lund, which may still echo the traditional Scanian diphthongs. In Stockholm, /uː/ may be less closed than /iː/ ($p = 0.0061$) and /yː/ ($p = 0.0061$).

4.2. The long mid vowels

For all three varieties, /eː/ appeared to be the long vowel that was most clearly diphthongized. Especially in Linköping and Stockholm, the F1 of /eː/ rises from roughly 400 to 600 Hz. In these two varieties, /eː/ also starts remarkably far front and close, whilst strongly centralizing towards the end, thus resulting in [iə] rather than [eə]. These results are quite similar to those found on the pronunciation of /eː/ by Bleckert [4: p.171] as far as F1 is concerned. However, the starting F2 for Stockholm seems to be much higher than in [4], suggesting that Bleckert's informants realized /eː/ less front.

As seen in Bruce's [7] vowel chart for western and southern Scanian diphthongs, one would expect Lund /eː/ to be realized starting mid, raising to higher-mid towards the end. Instead, the realization in Lund is similar to that in Linköping and Stockholm, and opposite to Bruce's description. This can be due to the ever-growing influence of Stockholm Swedish on the rest of the country and the pressure coming from standard Swedish that the Scanian varieties are under.

After /eː/, /oː/ has been reported to be next-most amenable to diphthongization. Lund Swedish may still show its Scanian roots, as /oː/ does not centralize and seems to move more backward and/or less forward than in the average of Linköping and Stockholm, by 301 Hz in terms of F2, although this is not statistically significant as measured by the effect of Variety on F2 diphthongization ($t[11.44] = -1.360$, $p = 0.20$). On the other hand, /oː/ is more strongly vertically diphthongized in Stockholm than in the average of Lund and Linköping, by 131 Hz in terms of F1, which follows from the statistical test that yields a significant ternary effect of Variety on F1 diphthongization ($t[17.73] = 3.973$, $p = 0.00092$; Variety was coded as +2/3 for Stockholm and +1/3 for Lund and Linköping).

For both /ɛː/ and /øː/, no extreme diphthongization is found. Whereas /ɛː/ and /øː/ appear to be moving towards back and low in Linköping and Stockholm, Lund seems to yet again show the opposite: instead of a downward movement, the vowels seem to go up at the end, perhaps showing their Scanian origin [7].

Apart from diphthongization, we have to note that /ɛː/ and /øː/ are realized strikingly low in all three varieties. Especially comparing these vowel charts to the one by Engstrand [10], we can spot discrepancies for both /ɛː/ and /øː/. Whereas Engstrand claimed rounded /øː/ to be equal in height to unrounded /eː/ (higher-mid), /øː/ is instead realized as [œː] in all three varieties, or even as [œ̝ː] in Stockholm. Looking at the height of the front rounded vowel and at its patterning with /ɛː/, there seems to be no reason to continue to label it as /øː/: the label /œː/ seems generally more appropriate. Similarly, /ɛː/, which Engstrand classified as mid, is realized [æː]-like in all three varieties. Most striking is that these realizations are on a par with, if not lower than, the realization of /ɑː/, which Engstrand considered to be clearly low. The low realizations for /ɛː/ and /øː/ are not surprising for Stockholm, because Kotsinas [13] already noted them; the present study, however, shows that these lower pronunciations have spread across the country.

4.3. The long low vowel

The so-called low vowel /ɑː/ may actually be higher than /ɛː/ in all three varieties, suggesting that it is indeed (close to) [ɔː] ($0.005 \leq p \leq 0.014$). Confirming [9, 10], /ɑː/ does not seem to diphthongize, but like /øː/ it could benefit from a labelling update.

5. PHONOLOGICAL CONTEXT

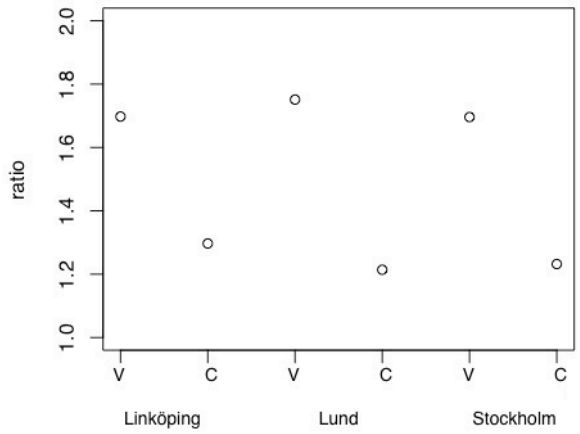
The mixed-effects models do not show reliable influences of phonological context, i.e. whether the following consonant was voiced or voiceless and whether it was alveolar or not, on the degree of F1 or F2 diphthongization.

6. CONSONANT AND VOWEL RATIOS

For the three cities under scrutiny, we computed the durations of all vowels and the following consonants. The mean durations were mostly similar in all three places, though both short and long consonants seemed to be lower in duration in Linköping than in Stockholm and Lund. The average consonant duration ratios (Cː/C) were computed as 1.297 for Linköping, 1.214 for Lund and 1.232 for Stockholm.

The vowel ratios were calculated in similar fashion and also appeared to be relatively close to each other. The V:/V ratios for Linköping, Lund and Stockholm were 1.698, 1.751 and 1.696 respectively. All consonant and vowel ratios are shown in Fig. 7.

Figure 7: Vowel and consonant ratios for Linköping, Lund and Stockholm.



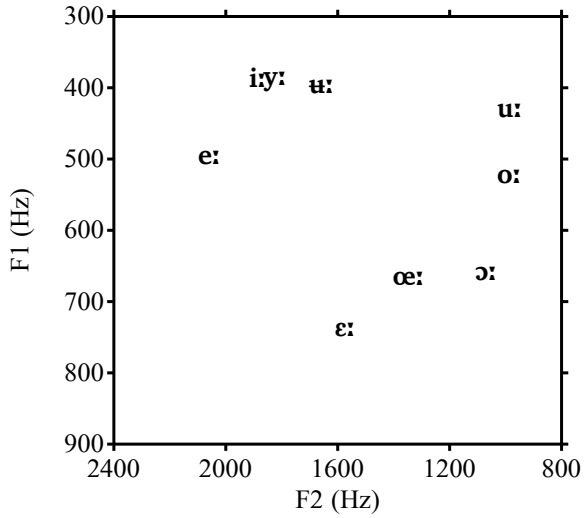
These results are very similar to earlier findings by Schaeffler [18]. The consonant ratios are very low (close to 1) for these three varieties of Swedish, making the label "geminate" for the long consonants doubtful. The vowel ratios are greater, but not close to 2. We could therefore expect that third cues, such as vowel quality and diphthongization, have become important cues for the binary syllable contrast in all three varieties.

7. DISCUSSION

In conclusion, high vowels glide slightly, with /ʉː/ diphthongizing strongly in Stockholm, possibly to distinguish itself from close /iː/ and /yː/, which are strongly central [3]. As for higher- and lower-mid vowels, /eː/ shows centralizing diphthongization in all three varieties; /oː/ shows clear diphthongization in Stockholm and perhaps a slight shift backwards in Lund, as expected on the basis of work by Bruce [7]. Interestingly, /oː/ does not diphthongize in Linköping, even though most literature [8, 14, 7, 17] stated that higher-mid vowels tend to centralize. Bleckert [4: 175] did consider Linköping to be a variety with predominantly monophthongal vowels, but this does not correspond with the clear diphthongization of /eː/ that we found. Whilst Eklund & Traunmüller [8] excluded /ɛː/ and Bleckert [4] excluded /øː/ from the diphthongizing vowels, both vowels seem to diphthongize a little in all three varieties. However, the realizations of /ɛː/ and /øː/ are strikingly low. /ɑː/ does not diphthongize, but is realized slightly higher than anticipated.

On the basis of the vowel charts of the three varieties, we would like to propose a division of the Swedish long vowels in which we no longer have four long-vowel heights but only three: high for /iː yː ʉː uː/, mid (or higher-mid) for /eː oː/, and low (or lower-mid) for /ɛː œː ɔː/ (or /æː œː ɒː/). Fig. 8 shows the long vowels, with the medians of Figs. 1–3 averaged over the three varieties and the three measurement points.

Figure 8: Average vowel chart for Swedish.



As far as further research is concerned, most opportunities lie in the extent of including more varieties of Swedish and examining their consonant ratios. For this study, the consonant ratios for all three varieties lie around 1.2, meaning that the "long" consonant is only slightly longer than the "short" consonant. The vowel ratios for all three varieties lie around 1.7. These results are in line with earlier findings by Schaeffler [18]. However, in order to truly measure the influence of the consonant ratio on diphthongization, a variety from either the north of Sweden or Swedish-speaking Finland with a relatively high consonant ratio should be included. As all three varieties with a low consonant ratio show signs of diphthongization, it would be interesting to see whether diphthongization is equally prevalent in varieties with higher consonant ratios. Nevertheless, this study functions as a stepping stone for additional research including other varieties of Swedish to broaden the sample and further investigate the importance of consonant duration in relation to diphthongization.

[1] This paper is an abridged and corrected version of the first author's BA thesis.

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