The acoustics of Estonian Swedish long close vowels as compared to Central Swedish and Finland Swedish

Eva Liina Asu[1], Susanne Schötz[2] and Frank Kügler[3]
[1]Institute of Estonian and General Linguistics, University of Tartu
[2]Department of Linguistics and Phonetics, Centre for Languages and Literature, Lund University
[3]Department of Linguistics, Potsdam University

Abstract

This pilot study investigates the phonetic realisation of Estonian Swedish long close vowels comparing them with Central Swedish and Finland Swedish counterparts. It appears that in the Rickul variety of Estonian Swedish there is a distinction between only three long close vowels. The analysed vowels of Estonian Swedish are more similar to those of Central Swedish than Finland Swedish, as measured by the Euclidean distance. Further research with more data is needed to establish the exact vowel space and phonetic characteristics of Estonian Swedish dialects.

Introduction

This study is a first step in documenting the phonetic characteristics of Estonian Swedish (ES), a highly endangered variety of Swedish spoken historically on the islands and western coast of Estonia. Despite its once flourishing status, ES is at present on the verge of extinction. Most of the Estonian Swedish community fled to Sweden during WWII. Today only a handful of elderly native ES speakers remain in Estonia, and about a hundred in Sweden.

ES has received surprisingly little attention and was not, for instance, included in the SweDia 2000 project (Bruce et al., 1999) because there were no speakers from younger generations. To our knowledge, ES has not been analysed acoustically before; all the existing work on its sound system has been conducted in the descriptive framework of dialect research (e.g. E. Lagman, 1979). Therefore, the aim of this study is to carry out the first acoustic analysis of ES by examining the quality of close vowels. In this pilot study we will focus on ES long close vowels comparing them to those of Finland Swedish (FS) and Central Swedish (CS), the two varieties of Swedish that have had most influence on ES in recent times.

Swedish is unique among world's languages because of a number of phonologically distinct contrasts in the inventory of close vowels (cf. Ladefoged and Maddieson, 1996). It has been shown, however, that there is considerable variation in the realisation of these contrasts depending on the variety of Swedish (Elert, 2000, Kuronen, 2001). Thus, the study of close vowels seems like a good place where to start the acoustic analysis of ES sound system.

General Characteristics of Estonian Swedish

Swedish settlers started arriving in Estonia in the Middle Ages. During several centuries, they continued coming from various parts in Sweden and Finland bringing different dialects which influenced the development of separate ES varieties. ES dialects are usually divided into four dialect areas on the basis of their sound system and vocabulary (see Figure 1).

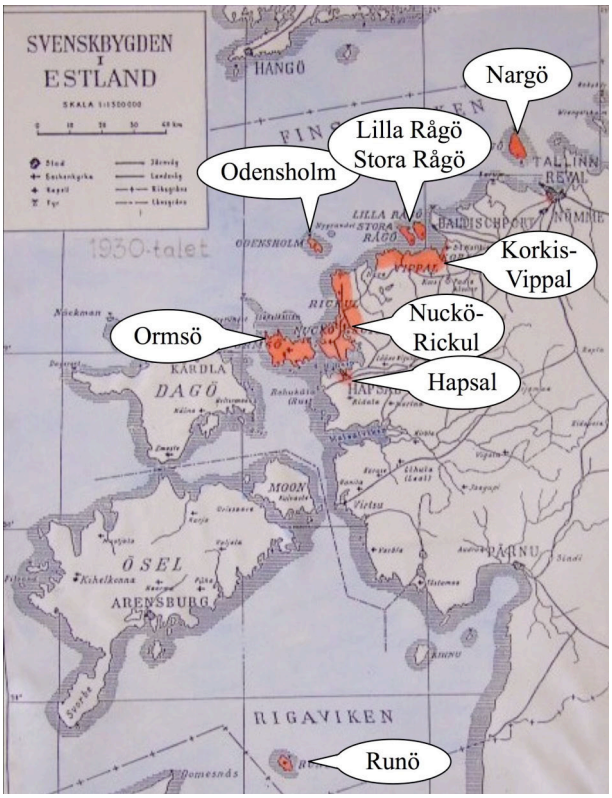

Figure 1. The main dialect areas of Estonian Swedish in the 1930s (from E. Lagman 1979: 2).

The largest area is the Nuckö-Rickul-Ormsö area (including Dagö) followed by the Rågö-Korkis-Vippal area. Separate dialect areas are formed by the Island of Runö and the Island of Nargö. E. Lagman (1979: 5) claims that connections between the different dialect areas were not particularly lively which made it possible for the separate dialects to retain their characteristic traits up to modern times.

Another factor which has shaped ES is the fact that until the 20th century, ES dialects were almost completely isolated from varieties of Swedish in Sweden, and therefore did not participate in several linguistic changes that occurred for instance in Standard Swedish (Tiberg, 1962: 13, Haugen, 1976), e.g. the Great Quantity shift that took place in most Scandinavian varieties between 1250 and 1550. ES, as opposed to Standard Swedish, has retained the archaic 'falling' diphthongs, e.g. *stain* 'sten' (stone), *haim* 'hem' (home) (E. Lagman, 1979: 47). Starting from the end of the 19th century, however, ES came gradually in closer contact with above all Stockholm Swedish and Finland Swedish. It was also around that time that the so called 'high' variety of ES (*den estlandssvenska högspråksvarianten*) appeared in connection with the development of the education system. This was the regional standard that was used as a common language within the ES community.

According to E. Lagman (1979: 5) the main features of ES dialects resemble most those of the variety of Swedish spoken in Nyland in South Finland. Lexically and semantically, the ES dialects have been found to agree with Finland Swedish and North Swedish (Norrbotten) dialects on the one hand, and with dialects in East Central (Uppland) and West (Götaland) Sweden and the Island of Gotland on the other hand (Bleckert, 1986: 91). It has been claimed that the influence of Estonian on the sound system of ES is quite extensive (Danell, 1905-34, ref. in H. Lagman, 1971: 13) although it has to be noted that the degree of language contact with Estonian varied considerably depending on the dialect area (E. Lagman, 1979: 4).

Swedish long close vowels

Of the three varieties of Swedish included in the present study, it is the CS close vowels that have been subject to most extensive acoustic and articulatory analyses. Considerably less is known about FS vowels, and no acoustic data is so far available for ES vowels.

CS exhibits a phonological four way contrast in close vowels /iː – yː – ʉː – uː/ where / iː/, / yː/ and /ʉː/ are front vowels with many similar articulatory and acoustic features, and /uː/ is a back vowel (Riad, 1997). While /iː/ is considered an unrounded vowel and /yː/ its rounded counterpart, /ʉː/ has been referred to as: (1) a labialised palatal vowel with a tongue position similar (but slightly higher) to [øː], but with a difference in lip closure (Malmberg, 1966: 99-100), (2) a close rounded front vowel, more open than [iː] and [yː] (Elert, 2000: 28; 31; 49), (3) a further back vowel pronounced with pursed lips (*hopsnörpning*) rather than lip protrusion as is the case with /yː/ (Kuronen, 2000: 32), and (4) a protruded (*framskjuten*) central rounded vowel (Engstrand, 2004: 113).

The two vowels /iː/ and /yː/ display similar F1 and F2 values (Fant, 1969), and can be separated only by F3, which is lower for /yː/. Malmberg (1966: 101) argues that the only relevant phonetic difference between /ʉː/ and /yː/ can be seen in the F2 and F3 values.

An additional characteristic of long close vowels in CS is that they tend to be diphthongised. Lowering of the first three formants at the end of the diphthongised vowels /ʉː/ and /uː/ has been reported by e.g. Kuronen (2000: 81-82), while the diphthongisation of /iː/ and /yː/ results in a higher F1 and lower F2 at the end of the vowel (Kuronen, 2000: 88).

In FS, the close vowels differ somewhat from the CS ones, except /uː/ that is rather similar in both varieties. FS /iː/ and /yː/ are pronounced more open and further front than their CS counterparts. Acoustically, these vowels are realised with lower F1 and higher F2 values than in CS (Kuronen, 2000: 59). In FS, the close central /ʉː/ is pronounced further back than in CS (Kuronen, 2000: 60; 177). There is some debate over as to whether the characteristics of FS are a result of language contact with Finnish (Kuronen, 2000: 60) or an independent dialectal development (Niemi, 1981).

The quality of the rounded front vowel /yː/ in the 'high' variety of ES is more open than in Standard Swedish (Lagman, 1979: 9). The rounded front vowel /yː/ is said to be missing in ES dialects (Tiberg, 1962: 45, E. Lagman, 1979: 53) and the word *by* (village) is pronounced with an /iː/. It seems, though, that the exact realisation of the vowel is heavily dependent on its segmental context and the dialect, and most probably also historical sound changes. Thus, in addition to [iː] /yː/ can be realised as [eː], [ɛː], or [ʉː] or as a diphthong

[iœː] or [iʉː] (for examples see E. Lagman, 1979: 53). Considering this variation, it is nearly impossible to predict how /yː/ might be realised in our ES data. Based on E. Lagman's comment (1979: 5) about ES being most similar to the Nyland variety of FS, we can hypothesise that ES vowels would be realised closer to those of FS than CS. Yet, we would not expect exactly the same distribution of close vowels in ES as in FS or CS.

Materials and method

Speech data

As materials the word list from the SweDia 2000 database was used. The data comprised three repetitions of four words containing long close vowels: *dis* (mist), *typ* (type), *lus* (louse), *sot* (soot). When recording the ES speakers, the word list had to be adapted slightly because not all the words in the list appear in ES vocabulary. Therefore, *dis* was replaced by *ris* (rice), *typ* by *nyp* (pinch) and *sot* by *mot* (against).

Four elderly ES speakers (2 women and 2 men) were recorded in a quiet setting in Stockholm in March 2009. All the speakers had arrived in Sweden in the mid 1940s as youngsters and were between 80 and 86 years old (mean age 83) at the time of recording. They represent the largest dialect area of ES, the Rickul variety, having all been born there (also all their parents came from Rickul). The ES speakers were recorded using the same equipment as for collecting the SweDia 2000 database: a Sony portable DAT recorder TCD-D8 and Sony tie-pin type condenser microphones ECM-T140.

For the comparison with CS and FS the word list data from the SweDia 2000 database from two locations was used: Borgå in Nyland was selected to represent FS, while CS was represented by Kårsta near Stockholm. From each of these locations the recordings from 3 older women and 3 older men were analysed. The Borgå speakers were between 53 and 82 years old (mean age 73), and the Kårsta speakers between 64 and 74 years old (mean age 67).

Analysis

The ES data was manually labelled and segmented, and the individual repetitions of the words containing long close vowels were extracted and saved as separate sound and annotation files. Equivalent CS and FS data was extracted from the SweDia database using a Praat script. The segmentation was manually checked and corrected.

A Praat script was used for obtaining the values for the first three formant frequencies (F1, F2, F3) of each vowel with the Burg method. The measurements were taken at the mid-point of each vowel. All formant values were subsequently checked and implausible or deviant frequencies re-measured and corrected by hand. Mean values were calculated for the female and male speakers for each variety. One-Bark vowel circles were plotted for the female and male target vowels [iː, yː, ʉː, uː] of each variety on separate F1/F2 and F2/F3 plots using another Praat script.

In order to test for statistically significant differences between the dialects a two-way ANOVA was carried out with the between-subjects factors dialect (3) and gender (2), and a dependent variable formant (3).

Finally, a comparison of the inventory of long close vowels in the three varieties was conducted using the Euclidean distance, which was calculated for the first three formants based on values in Bark.

Results

Figure 2 plots the F1 and F2 values separately for female and male speakers for each of the three dialects. It can be seen that the distribution is roughly similar for both female and male speakers in all varieties.

There is a significant effect of dialect on F2 for the vowel /iː/ ($F(2, 10) = 8.317$, $p<0.01$). In ES, the F2 is significantly higher than in CS and FS. For the vowel /yː/ there is a significant effect of dialect on F1 ($F(2, 10) = 7.022$, $p<0.05$). The ES target /yː/ has a higher F1 than the other two varieties.

The F2 of the vowel [ʉː] is significantly lower in FS than in ES and CS ($F(2, 10) = 61.596$, $p<0.001$); the vowel is realised furthest back in FS.

For the vowel /uː/ there is a significant effect of dialect on both F1 ($F(2, 10) = 4.176$, $p<0.05$) and F2 ($F(2, 10) = 22.287$, $p<0.001$). F2 is lowest in FS.

It can be seen in Figure 2 that in CS, the three vowels /iː/, /yː/ and /ʉː/ cluster close together on the F1/F2 plot. The vowel qualities are, however, separated on the F3 dimension, as shown in Figure 3 where the F2 and F3 values are plotted against each other. FS /yː/ has a significantly lower F3 than that of ES and CS ($F(2, 10) = 10.752$, $p<0.01$).

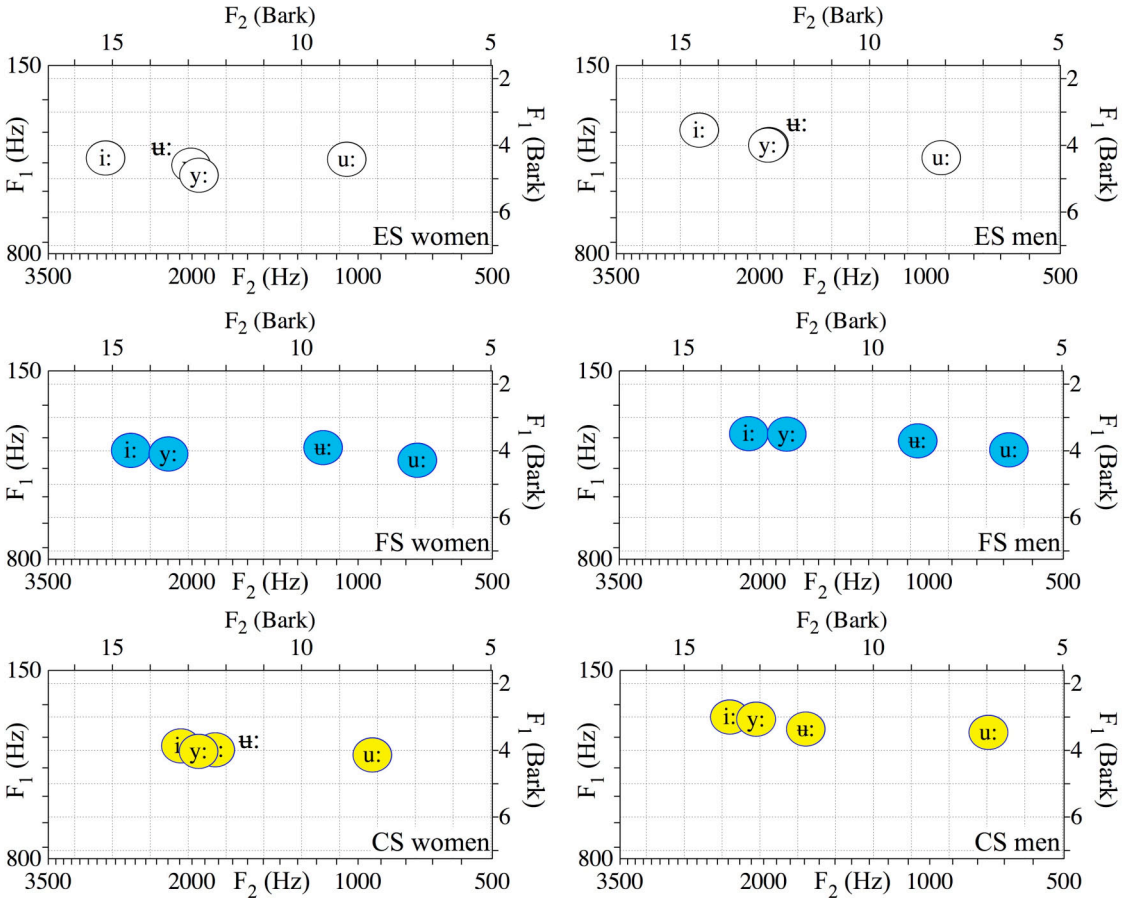

Figure 2. F1/F2 plots of long close vowels for female and male speakers of Estonian Swedish, Finland Swedish and Central Swedish.

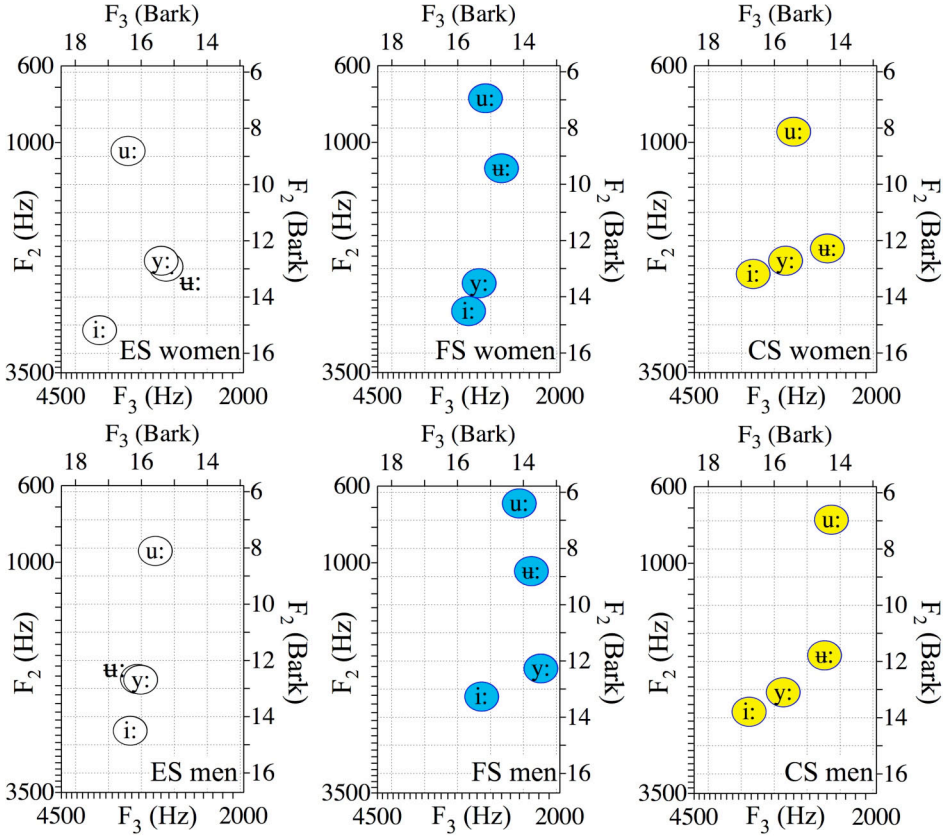

Figure 3. F2/F3 plots of long close vowels for female and male speakers of Estonian Swedish, Finland Swedish and Central Swedish.

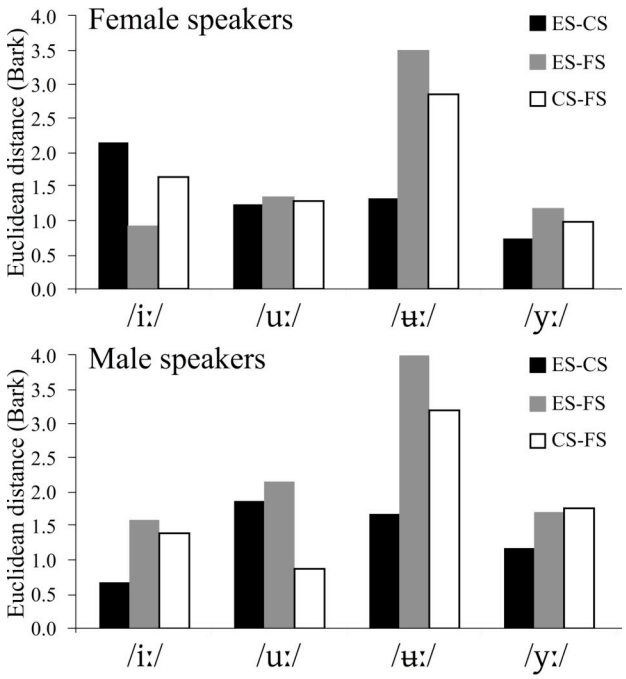

Figure 4. The Euclidean distance for the first three formants (in Bark) for female and male speakers.

Figure 4 shows the Euclidean distance between dialects of long close vowels for female and male speakers. The black bars display the distance between ES and CS, grey bars between ES and FS, and white bars between CS and FS. Except for /iː/ in female speakers, the long close vowels of ES are closer to CS than to FS (a two-tailed t-test reveals a trend towards significance; t=-1.72, p=0.062).

Discussion

Our results show that at least this variety of ES (Rickul) has only three distinct close vowels: /iː/, /yː/ and /uː/. There is an almost complete overlap of the target vowels [yː] and [ʉː] in ES. The plotted F1/F2 vowel space of close ES vowels bears a striking resemblance to that of Estonian which also distinguishes between the same three close vowels (cf. Eek and Meister, 1998).

As pointed out above, earlier descriptions of ES refer to the varying quality of /yː/ in different dialects (cf. E. Lagman 1979: 53). Auditory analysis of the vowel sound in the word *nyp* reveals that the vowel is actually realised as a diphthong [iʉː] by all our ES speakers, but as we only measured the quality of the second part of the diphthong (at only one point in the vowel), our measurements do not reflect diphthongisation. It is also possible that if a different test word had been chosen the quality of the /yː/ would have been different.

Similarily, the present analysis does not capture the diphthongisation that is common in CS long close vowels.

As shown by earlier studies (e.g. Fant, et al. 1969) the close front vowel space in CS is crowded on the F1/F2 dimension, and there is no clear separation of /iː/ and /yː/. In our data, there also occurs an overlap of [iː] and [yː] with [ʉː] for female CS speakers. All three vowels are, however, separated nicely by the F3 dimension.

It is perhaps worth noting that the mean F2 for /iː/ is somewhat lower for CS female speakers than male speakers. This difference is probably due to one of the female speakers who realised her /iː/ as the so called Viby /iː/ which is pronounced as [ɨː].

Our results confirm that the FS /ʉː/ is a close central vowel that is acoustically closer to [uː] than to [yː] (cf. Kuronen, 2000: 136), and significantly different from the realisations of the target vowel /ʉː/ in the other two varieties under question.

The comparison of ES with CS and FS by means of the Euclidean distance allowed us to assess the proximity of ES vowels with the other two varieties. Interestingly, it seems that the results of the comparison point to less distance between ES and CS than between ES and FS. This is contrary to our initial hypothesis based on E. Lagman's (1979: 5) observation that the main dialectal features of ES resemble most FS. However, this does not necessarily mean that the language contact between CS and ES must account for these similarities. Given that the ES vowels also resemble Estonian vowels a detailed acoustic comparison with Estonian vowels would yield a more coherent picture on this issue.

Conclusions

This paper has studied the acoustic characteristics of long close vowels in Estonian Swedish (ES) as compared to Finland Swedish (Borgå) and Central Swedish (Kårsta). The data for the analysis was extracted from the elicited word list used for the SweDia 2000 database. The same materials were used for recording the Rickul variety of ES.

The analysis showed that the inventory of long close vowels in ES includes three vowels. Comparison of the vowels in the three varieties in terms of Euclidean distance revealed that the long close vowels in ES are more similar to those of CS than FS.

Much work remains to be done in order to reach a comprehensive phonetic analysis of ES vowels. More speakers need to be recorded from different varieties of ES to examine in closer detail the dialectal variation within ES. In the following work on ES vowels, we are planning to carry out dynamic formant analysis in order to capture possible diphthongisation as well as speaker variation.

Acknowledgements

We would like to thank Joost van de Weijer for help with statistical analysis, Gösta Bruce for advice and discussing various aspects of Swedish vowels, and Francis Nolan for his comments on a draft of this paper. We are also very grateful to our Estonian Swedish subjects who willingly put up with our recording sessions. We owe a debt to Ingegerd Lindström and Göte Brunberg at *Svenska Odlingens Vänner* – the Estonian Swedes' cultural organisation in Stockholm – for hosting the Estonian Swedish recording sessions. The work on this paper was supported by the Estonian Science Foundation grant no. 7904, and a scholarship from the Royal Swedish Academy of Letters, History and Antiquities.

References

Bleckert L. (1986) Ett komplement till den europeiska språkatlasen (ALE): Det estlandssvenska materialet till första volymserien (ALE I 1). Swedish Dialects and Folk Traditions 1985, Vol. 108. Uppsala: The Institute of Dialect and Folklore Research.

Bruce G., Elert C.-C., Engstrand O., and Eriksson A. (1999) Phonetics and phonology of the Swedish dialects – a project presentation and a database demonstrator. Proceedings of ICPhS 99 (San Francisco), 321–324.

Danell G. (1905–34) Nuckömålet I–III. Stockholm.

Eek A., Meister E. (1998) Quality of Standard Estonian vowels in stressed and unstressed syllables of the feet in three distinctive quantity degrees. Linguistica Uralica 34, 3, 226–233.

Elert C.-C. (2000) Allmän och svensk fonetik. Stockholm: Norstedts.

Engstrand O. (2004) Fonetikens grunder. Lund: Studentlitteratur.

Fant G., Henningson G., Stålhammar U. (1969) Formant Frequencies of Swedish Vowels. STL-QPSR 4, 26–31.

Haugen E. (1976) The Scandinavian languages: an introduction to their history. London: Faber & Faber.

Kuronen M. (2000) Vokaluttalets akustik i sverigesvenska, finlandssvenska och finska. Studia Philologica Jyväskyläensia 49. Jyväskylä: University of Jyväskylä.

Kuronen M. (2001) Acoustic character of vowel pronunciation in Sweden-Swedish and Finland-Swedish. Working papers, Dept. of Linguistics, Lund University 49, 94–97.

Ladefoged P., Maddieson I. (1996) The Sounds of the World's Languages. Oxford: Blackwell.

Lagman E. (1979) En bok om Estlands svenskar. Estlandssvenskarnas språkförhållanden. 3A. Stockholm: Kulturföreningen Svenska Odlingens Vänner.

Lagman H. (1971) Svensk-estnisk språkkontakt. Studier över estniskans inflytande på de estlandssvenska dialekterna. Stockholm.

Malmberg B. (1966) Nyare fonetiska rön och andra uppsatser i allmän och svensk fonetik. Lund: Gleerups.

Niemi S. (1981) Sverigesvenskan, finlandssvenskan och finskan som kvalitets- och kvantitetsspråk. Akustiska iakttagelser. Folkmålsstudier 27, Meddelanden från Föreningen för nordisk filologi. Åbo: Åbo Akademi, 61–72.

Riad T. (1997) Svensk fonologikompendium. University of Stockholm.

Tiberg N. (1962) Estlandssvenska språkdrag. Lund: Carl Bloms Boktryckeri A.-B.