Durations of phonologically long segments in native and foreign accented Swedish

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Abstract

Phonological features in a specific language could be expected to be reflected in realizations of second language speech. Swedish is known to have a quantity distinction involving duration in vowels, postvocalic consonants and vowel spectrum in stressed syllables.

Three speakers with respectively Swedish, Spanish and Estonian as their first language were recorded when telling a short story in Swedish. Durations in phonologically long segments were measured. The native Estonian speaker showed mostly longer durations than the other two, and the native Spanish speaker showed mostly shorter durations than the other two. The shorter durations of the Spanish speaker were expected, since Spanish does not have a quantity distinction, and it seems as though the Estonian speaker exaggerated the duration feature in her Swedish.

Introduction

The background of the present study is an attempt to evaluate the usefulness of a simplified prosodic strategy for teaching Swedish pronunciation to immigrants. The strategy focuses on "stress induced increase of segment duration" and is thoroughly described in Thorén (2008). The proper aim of the present study is to test the effect of manipulated durations in foreign accented Swedish and the present paper reports some preliminary production data from the recordings intended for manipulation.

Swedish is often described as having distinctive word stress and a vowel quantity distinction as main temporal prosodic contrasts. The vowel quantity distinction is known to involve vowel duration, spectral differences between long and short vowel allophones and complementary consonant length. E.g. Elert (1964) has shown that the quantity distinction is consequently associated with durational differences in both vowels and consonants. Fant & Kruckenberg (1994) concluded furthermore that duration is a main phonetic correlate of perceived stress in Swedish. The simplified pedagogic description ranks vowel and consonant lengths equally and all phonological length is seen as a consequence of stress. Every syllable regarded as "strong" must in the educational setting be lengthened and the length must be associated with either the vowel or the post-vocalic consonant. Further motivation for taking an interest in stress induced increase of duration is given in Thorén (2008).

Can we measure "how well" a speaker of e.g. Swedish as a second language realizes the temporal patterns of Swedish without checking every segment and the expected duration of the segment as a consequence of speech rate, voicing, openness, stress, phonological length, pre-pausal position etc? The lengthening of phonologically long sounds – by giving them increased duration, is the pedagogical formula, but how can we treat it in experiments? Traunmüller & Bigestans (1988) found a neat connection between vowel duration and utterance duration for perceived Swedish quantity categories, but if we want to elicit spontaneous speech, most utterances are incomparable due to different length.

One of the intentions of the study is to find out whether the temporal patterns of Estonian – a language which utilizes duration to a greater extent than Swedish, having a three grade quantity distinction – and Spanish – a language without any phonological length distinction – are transferred into their pronunciation of Swedish.

The question is: Are there typical properties in the Swedish L2-speech of specific L1-speakers that are reflected in absolute or relative durations of phonologically long sounds in Swedish?

Measurements

Considering e.g. speech rate as a factor that influences segment duration (Fant et al. 1991) it is assumed that measures of absolute durations would not give robust information of how the speakers treat the segments that should receive extra duration according to Swedish phonological rules. First it must be decided what words are suitable to be regarded as "stressed". Prominence degrees "accented" and "focused" are mostly clear on linguistic basis, but there is "secondary stress" in a sentence perspective (Anward & Linell 1976) occurring typically in verbs followed by a stressed particle or similar types of lexicalized verb phrases. These words are on the borderline between stressed and unstressed categories and can lose their quantity signals at fast speaking rates (Thorén 2008: 32).

Choice of speakers

A native Spanish and a native Estonian speaker were chosen. The Spanish speaker sounded very "choppy" and staccato-like and gave an impression of having equal shortness of all syllables, although sentence stress and word stress were signalled unambiguously. The Estonian speaker seemed to have a temporal pattern in her Swedish that resembled a native one. Both had unmistakable foreign accent and none of them was a beginner in Swedish. These two speakers seemed ideal to record and have rated for intelligibility and listener friendliness. Their recorded speech was also assumed to provide good raw material for improved and deteriorated duration patterns.

Method

In order to elicit productions of many identical words, three native speakers of respectively Swedish, Estonian and Spanish were recorded when telling a short story inspired by a short cartoon showing a boy playing football in the road, being hit by a car, going by ambulance to the hospital and then coming back home with crutches and his leg in plaster, and in this condition playing with his ball again. The Swedish speaker was the last to be recorded and he was explicitly asked to include as many words as possible from a list elicited from the two other speakers, in order to obtain many common words for comparison.. Each recording lasts between 1 and 2 minutes. Words that were unambiguously stressed were measured with respect to durations of phonologically long sound and the duration of the entire word. Relative durations are defined as segment duration divided by (word duration minus duration of the segment of interest). Words that were unambiguously stressed were nouns, verbs and an adjective, which are all typical content words. Measurements were made in Praat (Boersma & Weenink 2001).

Result

Figure 1 below shows absolute durations of phonologically long segments. The typical case is that the Spanish speaker has durations shorter than the other two, and that the Estonian speaker has durations equal to or mostly higher than the native Swedish speaker. The pattern is similar for both vowels and consonants. The segments produced by the Swedish speaker are in three words (*bil* 'car', *tappar* 'looses/drops', *kommer*, 'comes') longer than the corresponding segment produced by the Estonian speaker.

The Spanish speaker shows a remarkably stable shortness of his vowels, whereas the Estonian speaker shows the greatest variation in absolute vowel durations. The native Swedish speaker has an intermediate degree of variation.

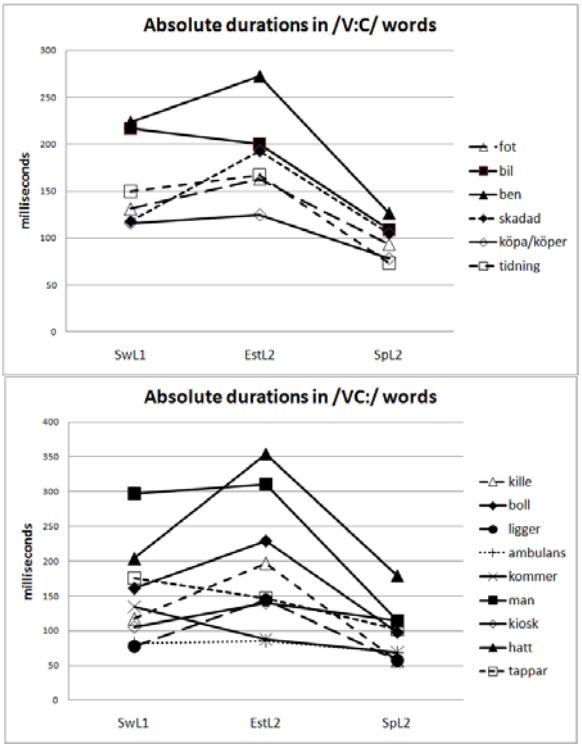

*Figure 1.Upper panel: Absolute durations of phonologically long vowels. Lower panel: Absolute durations of phonologically long consonan*ts.

This pattern comes back in the consonant durations, but with greater variations for all three speakers.

Figure 2 shows relative durations for all phonologically long segments. The pattern from the absolute durations are reflected also in this measure.

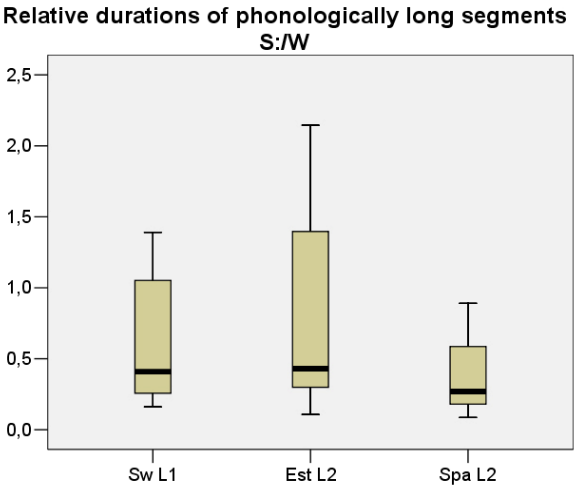

*Figure 2. Duration ratios for all phonologically long vowels and consonants in common words. Segment duration is divided by word duration minus the duration of the long seg*ment.

Discussion

The results confirm the expectation that a native speaker of Spanish would use duration to a lesser extent than an Estonian speaker when speaking Swedish. Surprisingly, the Estonian speaker not only applies the temporal pattern of Swedish, but exaggerates it in so far as to give phonologically long segments – both vowels and consonants – even longer durations than the native Swedish speaker does. Had we only looked at absolute durations, one could suspect that a slower speaking rate was the main cause of the longer durations, but as the relative durations show the same pattern, the result can be assumed to reflect a true tendency.

It should be admitted that also the relative measures are problematic since words can be followed by a pause, which in turn can cause a final lengthening of e.g. a final unstressed syllable. This is frequent in the present recordings since the speakers hesitated rather often while looking at the pictures and figuring out how they would continue. Final lengthening in unstressed syllables would render the word a longer duration without increasing the duration of the segment of interest, thereby reducing the segment/word-ratio. The continued study will hopefully show whether increased durations in the Spanish speaker will influence the perception of his speech by native Swedish listeners.

The greater variation of the segments produced by the Estonian speaker could be explained by the three-degree quantity distinction in Estonian, involving "short", "long" and "over-long" as phonological categories. These categories are mainly relying on segment duration, e.g. Engstrand & Krull (1994). The Estonian speaker can be assumed either to vary segment duration in Swedish as a result of great variation in her first language, or as a result of perceiving the variation in Swedish segment duration as corresponding to different distinctive length categories in her L1. The longer durations produced by the Estonian speaker could also be the result of a distinct speaking style (Fant et al. 1991).

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