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# Vowel quantity in West Swedish - the villain of the piece?

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## **Abstract**

*With a view to verify whether the vowel quantity is a critical part of the essence of the West Swedish dialect, manipulations of the vowel quantity in one-word utterances were carried out by means of synthetic speech. In order to distinguish the role of the vowel quantity when identifying West Swedish, a perception test was produced. The results suggest that the vowel quantity is an indispensable part of the identity of West Swedish and a required variable when synthetically reproducing the same.*

## **Introduction**

Most Swedish people are familiar with the prominent sound of the West Swedish dialect spoken in the city of Gothenburg. Although easily identified, this dialect is quite contradictory since it appears we have difficulties in distinguishing exactly what contributes to its significant sound. In order to synthetically reproduce the West Swedish dialect it is of great importance to know exactly which features make up the essence of this dialect. Previous experiments aiming at synthetically reproducing the West Swedish dialect through manipulation of solely the intonation has been unsuccessful (Bruce and Gårding, 1978). It was suggested that the failure is due to the durations of vowels and consonants which in West Swedish apparently differ from that of other main Swedish dialects. Consequently, in addition to the intonation, at least one more variable is required when synthetically reproducing a convincing imitation. Additionally, the results of a former study made of the Gothenburg dialect (Segerup, 1998) indicate that the vowel quantity is of great importance for the impression of West Swedish. Hypothetically this prosodic feature is the number one candidate for the missing variable.

The identity of a dialect is considered to be within the realization of the focal gesture (Bruce and Gårding, 1978, Gårding, 1992) and as expected, this was confirmed in the former study of West Swedish (Segerup, 1999). In this paper the study of imitation was used as a method for learning more about the dialect spoken in the city of Gothenburg. The outcome of native South Swedish speakers' imitation provide us with fruitful information about the most characteristic features and further guide us to the essence of the Gothenburg dialect. The study shows that the most crucial features of a convincingly native-like imitation is firstly: the realization of the focal gesture and secondly: the vowel quantity (and thirdly: the vowel quality). The overall results of the acoustic analysis show that in all imitations most of the short vowels in stressed vowel plus consonant sequences are generally shorter than in the native dialect. However, it is particularly the results of one imitator and that of the reference, a native speaker of the dialect, that reveal the importance of the vowel quantity. The prosodic feature of quantity was namely considered the number one contribution to this successful imitation. The acoustic analysis shows that in the imitation the auditorily perceived short vowels are the closest to those of the native speaker. In the acoustic analysis the quantity ratio of stressed vowel plus consonant sequences were accounted for and the results show that the vowel generally constitutes 15-35 % of the VC sequence and accordingly the consonant(s) constitutes 65-85 % of the VC sequence in words such as *hackor*, *träffade* and *raspig*. All told, in addition to the realization of the focal gesture, the vowel quantity is suggested to be a conclusive characteristic feature of West Swedish and part of the essence of this dialect.

# The investigation

## Aim, hypotheses and hope

The aim of this study is to kill two birds with one stone and investigate the role of the vowel quantity in West Swedish by means of synthetic speech. The main issue is to verify the distinguished role of the vowel quantity when identifying the West Swedish dialect. The basic idea of the investigation is to manipulate the duration of the stressed vowel plus consonant sequence in two-syllable accent I and accent II words. For every word a number of versions will be produced and further serve as an input to a perception test. I have hopes that the results of the perception test will speak in favor of the hypothesis that in order to synthetically give a convincing impression of West Swedish, the subjects will prefer the alternative version where the stressed vowel in short vowel plus long consonant sequences constitutes between 15-35 % of the sequence. Further I would expect this to cause a compensatory effect, i.e. when the vowel constitutes 15-35% of the sequence this will bring about a lengthening of the vowel in the second syllable. Therefore I expect the subjects to prefer an alternative version where the second vowel is prolonged. Regarding the VC sequences containing a long stressed vowel, I expect the subjects to prefer an alternative trigger where the stressed vowel is prolonged and consequently, the following consonant sequence is relatively short. Finally, I have hopes that this study will be the springboard and perhaps the first step to a future synthesis system assigning correct durations regarding the West Swedish dialect.

## Material, method, perception test and subjects

Ten one-word utterances representing both accent I and accent II were pronounced in different contexts and recorded by means of a portable dat recorder. A native speaker of the standard variety of the West Swedish dialect spoken in Gothenburg was used as reference. The relevant words are the following;

accent I: tecken Polen pollen vaken viner  
accent II: täcken pålen pällen vaken viner

The data was transferred to a Sun workstation and segmented in the Praat program. The different versions of every word were produced by means of the TTS system LUKAS (Lund University Concatenative Synthesis) and the MBROLA system (Filipsson and Bruce, 1997). The existing system for generating the intonation contour of the West Swedish dialect, INTRA (Frid, 1999), was adjusted in accordance with the pitch contour of the referent speaker. A general pattern for the two pitch accent gestures was produced leading to a refined set of intonation rules for West Swedish (see forthcoming master's thesis on synthetic speech in West Swedish). The intonation was a fixed parameter, i.e. the whole F0 gesture is maintained within the stressed vowel in the different versions, when manipulating the quantity variable. When producing the alternative versions of every word, the point of departure was the vowel quantity of the native speaker. For instance, if the stressed vowel in the native version constitutes 40 % of the VC sequence this would generate at least four synthetic triggers in which the vowel constitutes 20-, 30-, 40- and 50 % of the syllable, respectively. The same procedure was repeated regarding the second syllable. 24 linguistically trained/experienced subjects were involved in the perception test; 12 native speakers of the South Swedish dialect and 12 native speakers of the West Swedish dialect, göteborgska. For every word (a total of 10) the subjects were able to listen to each alternative trigger as many times- and in any order as he or she liked to. Among 5-8 alternative triggers the subjects' task was to single out the version that they apprehend as typical for the Gothenburg dialect.

## Results and conclusions

The data accounted for here is based on results from the 12 South Swedish speakers. The expectations of the results of the perception test were fulfilled and the hypotheses confirmed:

- In three out of four cases, the major part of the subjects prefer the alternative version of phonologically short vowel plus consonant sequence where the stressed vowel constitutes 15-20 % of the sequence and the following vowel constitutes 55-75% of the VC sequence (see figure 1:a, c, d.). In the fourth case (see figure 1:b) there is no such preference. This might be a consequence of the F0-contour.

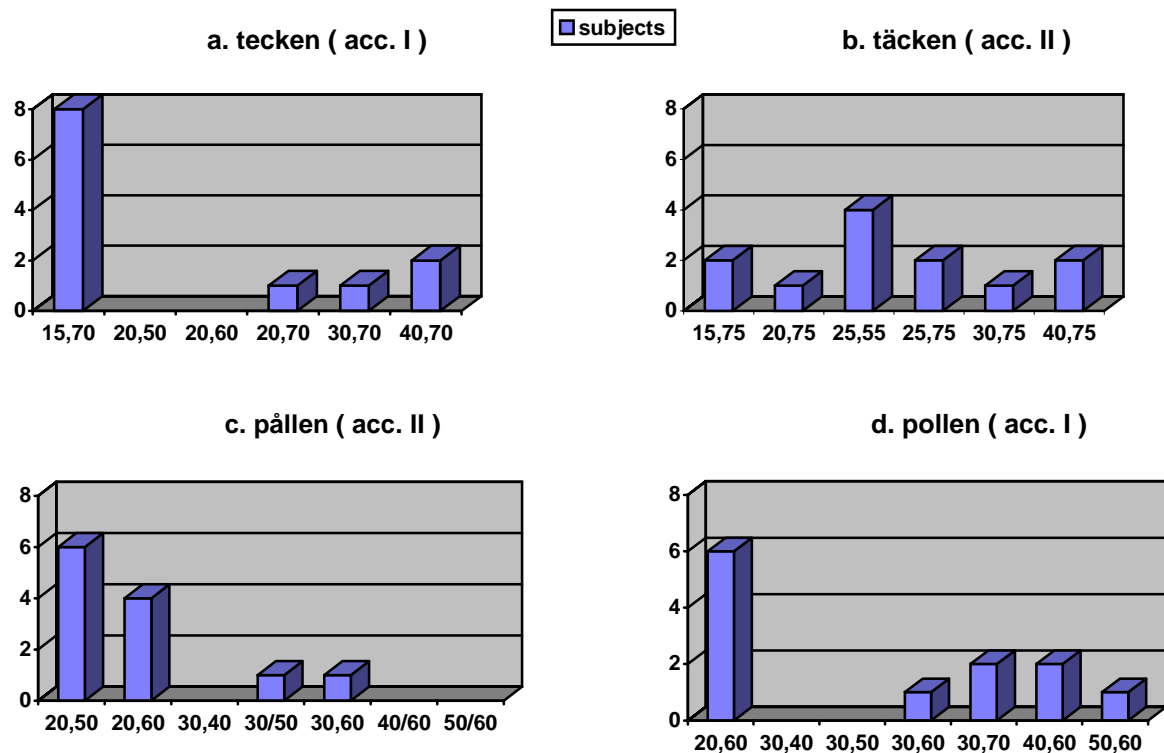


Figure 1. 1<sup>st</sup> number represents the % of V in stressed syllable. 2<sup>nd</sup> number represents the % of V in the 2<sup>nd</sup> VC sequence. The charts also show the number of subjects who prefer each alternative version.

- Regarding the stressed phonologically long vowels (see figure 2: a, b, c, d, e, f) the results are more variable. Subjects generally prefer the versions where the long vowel constitutes 60-85% of the VC sequence regardless of accent, but only in accent I words do the subjects generally prefer a relatively short vowel in the second syllable. Again, the F0-contour might contribute to this difference between accent I and accent II words.
- Note that 4 subjects prefer the version of the accent II word *viner* (see figure 2:e) where the stressed vowel constitutes 45 %- and the second vowel 75 % of the VC sequence, respectively while 5 subjects prefer the version where the stressed vowel constitutes 75%- and the vowel of the second syllable constitutes 45% of the VC sequences, respectively. This could be yet another indication of the existence of the compensatory effect in West Swedish. To put it simply, the subjects seem to listen for the combination of something short and something long in the word, regardless of order.

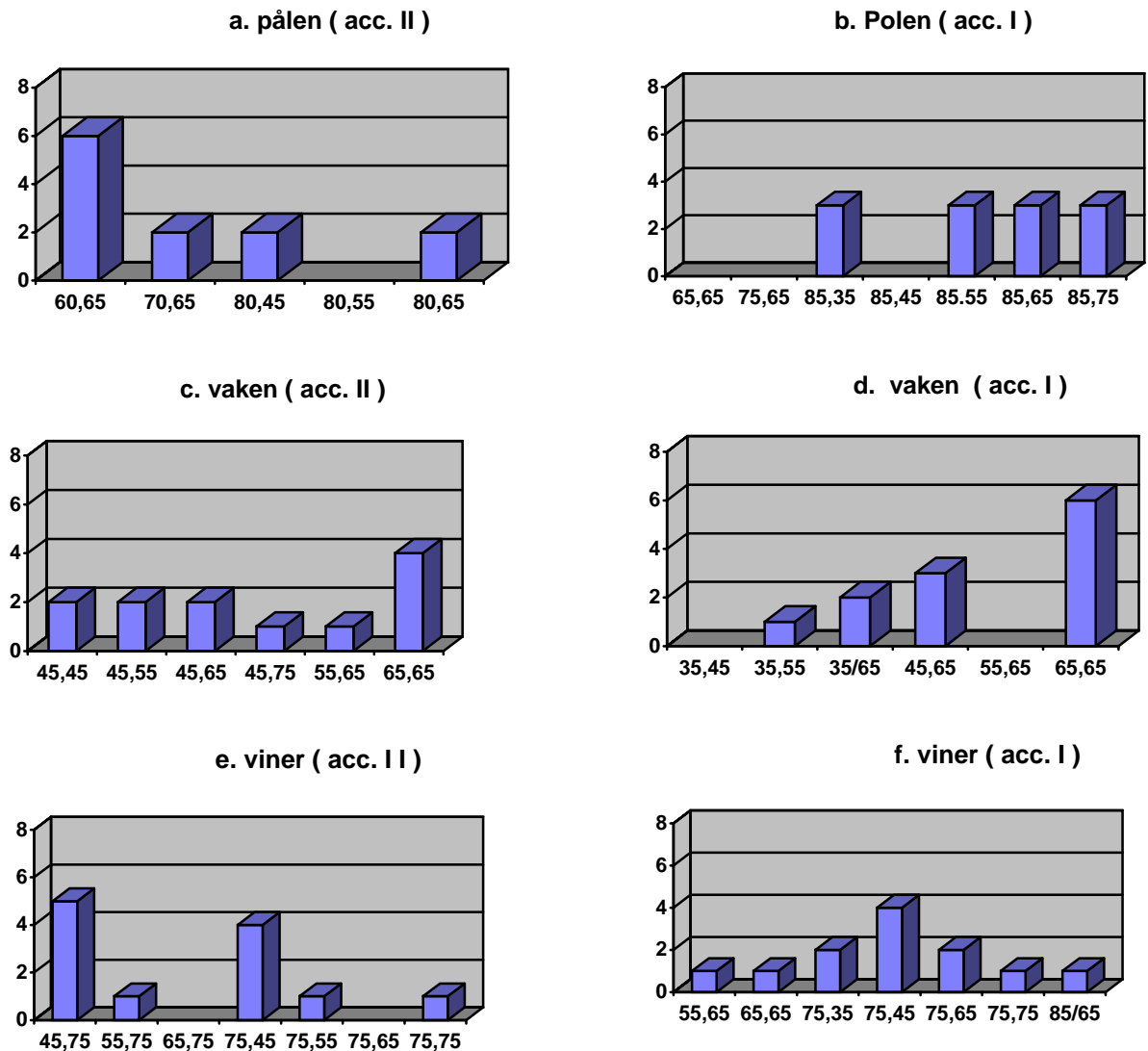


Figure 2. 1<sup>st</sup> number represents the % of V in stressed syllable. 2<sup>nd</sup> number represents the % of V in the 2<sup>nd</sup> VC sequence. The charts also show the number of subjects who prefer each version.

Conclusively, according to this study the vowel quantity *is* an indispensable part of the essence of West Swedish and a required variable in synthetic imitation. In other words: the villain of the piece!

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