

LENGTH ACQUISITION OF STRESSED SYLLABLES IN SWEDISH BY DUTCH L2 LEARNERS

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Abstract

In Swedish stressed vowels are either long or short. If the vowel is short, it must be followed by a long consonant, if it is long a following consonant has to be short. This interdependence of length of stressed vowels and following consonants is absent from the Dutch phonological system, and is therefore likely to present problems for Dutch students learning Swedish.

In order to test this hypothesis the following experiment was set up: 5 first year and 5 second year students were recorded while reading a word list containing thirty minimal pairs. Their production was compared with that of two native speakers who each read the list twice.

The distinction in length between vowel and consonant in the two types of sequence (V:C and VC:) was made relatively well by both groups of students. The main difference between the Dutch students and the native speakers was found in the ratio of duration between long and short vowels and between long and short consonants, the most significant deviations showing up in certain segments like /u/, /i/, /l/ and /r/. The difference between first and second year students turned out to be very small; in fact, the first year students did better than the second year students, who, however, spoke much faster (absolute duration in ms). The failure of both groups of Dutch students to make a big enough distinction between the short and the long variant of a number of segments in Swedish confirms the hypothesis that negative transfer from Dutch plays a significant role when Dutchmen learn Swedish.

1. Introduction

One of the goals of contrastive grammar is to predict what elements of the grammar of a language will present learning difficulties for native speakers of a given other language who learn L as a second language (L2). The sounds and constructions of the native language (L1) are likely to be transferred to L2, especially when they are similar but not identical in the two languages. Transfer from L1 in L2 acquisition appears to be more prominent in phonology than in morphology or syntax (Hammarberg, 1985).

Although there is a clear relation between segmental and prosodic features in speech production, L2-instruction tends to emphasize the role of segmental features, and to

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neglect prosody. This is unfortunate, since prosody plays an important role in speech recognition, as was shown by Gårding (1974). Putting an accent (be it a word accent or a phrase accent) in the wrong place may make speech incomprehensible.

In Swedish, length is a characteristic of the stressed syllable and hence a prosodic feature (in Swedish grammatical tradition usually called *kvantitet* 'quantity'), although it manifests itself as a feature of either the vowel or the following consonant. In a stressed syllable, both main and secondary, the vowel is either long, in which case it cannot be followed by a long consonant, or short, in which case it has to be followed by a long consonant. Apart from quantity a main syllable has tonal word accent too, either accent 1 ('acute') or part of accent 2 ('grave'; this accent is only found in di- and polysyllabic words). It can, moreover, be the locus of a phrase or sentence accent. The stressed syllable in Swedish is hence characterized by the following three prosodic aspects: accentuation, quantity and word accent. Of these prosodic aspects quantity seems to be the most important for language understanding. In an experiment with synthetic speech Bannert (1978) was able to show that a wrong quantity was more damaging to the intelligibility of a word than a wrong word accent.

In Standard Dutch (ABN) consonants are always short, as are the vowels according to Cohen *et al.* (1978²: 16). Nootboom & Slis (1976), on the other hand, assume that there are four vowels that have both a long and a short variant from a phonological point of view [a: a, e: ɪ, ø: œ, o: ɔ]. In Dutch difference in vowel length (if at all present at the phonological level) is always accompanied by a difference in vowel quality. In Swedish all vowels and consonants have long and short variants, which are only in about half of the cases qualitatively distinct.

2. Purpose

The main purpose of the project (Ölander, 1999) was to establish a pattern in the acquisition of the quantity in the stressed syllable in Swedish by students of Swedish with Standard Dutch as mother tongue. More specifically the following questions were addressed:

1. Do Dutch students make enough contrast between short and long segments in the stressed syllable? (Is the long segment significantly longer than the short segment in a sequence VC?)
2. Do Dutch students make enough contrast between short and long vowels, respectively between long and short consonants? (Are the long vowels/consonants significantly longer than their short counterparts?)
3. Do second year students (more than 200 hours of instruction in Swedish) score better than first year students (less than 70 hours of instruction in Swedish)?
4. Are the pronunciation errors made by Dutch students of Swedish in some way caused by the phonology of their L1?

3. Method

3.1 Material

For this study thirty minimal word pairs in Swedish were selected, and presented in a list, together with sixty other words in random order. The legend in Figures 1 and 2 specifies which 30 word pairs were actually used. By offering the words in a list, not in a text, the influence of sentence prosody on the 'quantity' of the stressed syllable was minimized. Criteria for the selection of the minimal pairs were:

- All vowels had to occur at least once in the list;
- All consonants with long and short variants (with the exception of the supradentals) had to occur at least once;
- All words had to have the same word accent (grave);
- All consonants had to occur in three different contexts: after a front vowel, a central vowel and a back vowel;

3.2 Subjects

The subjects were five first year and five second year students of Swedish at the University of Amsterdam, plus two native speakers of Standard Swedish (*rikssvenska*). Criteria for the selection of subjects were:

- All subjects had to be women between 18 and 28 years of age;
- Both first and second year students had to have Standard Dutch as their mother tongue;
- First year students should not have studied Swedish before going to university, while second year students should not have spent a longer period of time in Sweden;
- Native speakers should not know Dutch and had to have Standard Swedish (*rikssvenska*) as their mother tongue.

3.3 Procedure

The speech was recorded on DAT tapes in an anechoic room. The subjects were allowed to read the words once, before they were recorded. They could ask questions whenever they were not familiar with the meaning of a word. The digitized audio files were analysed using the speech editing program *Praat*, developed by Paul Boersma at the Institute of Phonetic Sciences at the University of Amsterdam. A sample frequency of 48kHz with 16 bit resolution was used. The phoneme boundaries were determined by hand both by listening and by looking at the oscillograms.

Contrast in V:C sequences

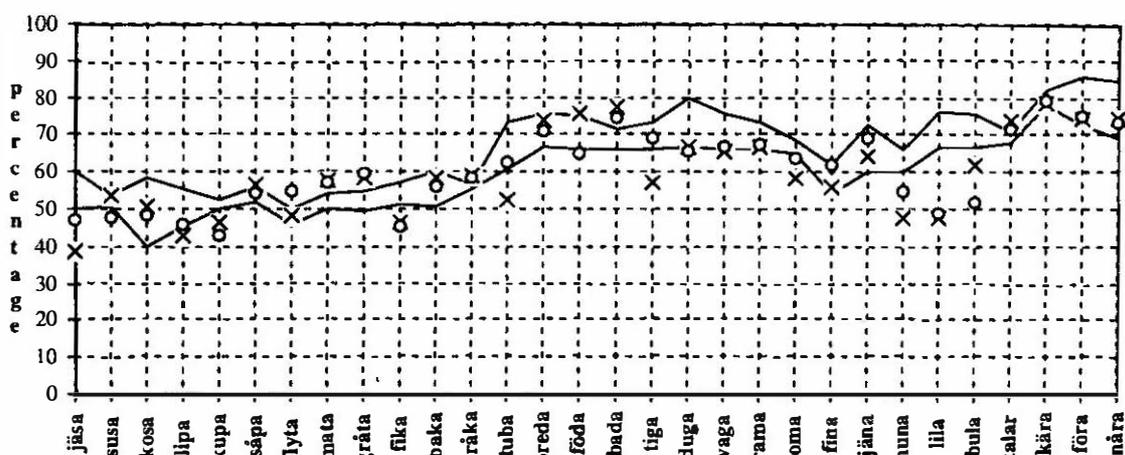


Fig. 1. The duration of the long vowel in V:C sequences in per cents of the duration of the sequence V:C, in the test words indicated. For first and second year students the average is indicated. For native speakers the minimum and maximum score is indicated. Second year (x) n=5. First year (o) n=5. Native speakers n=4 (two native speakers times two recordings).

Contrast in VC: sequences

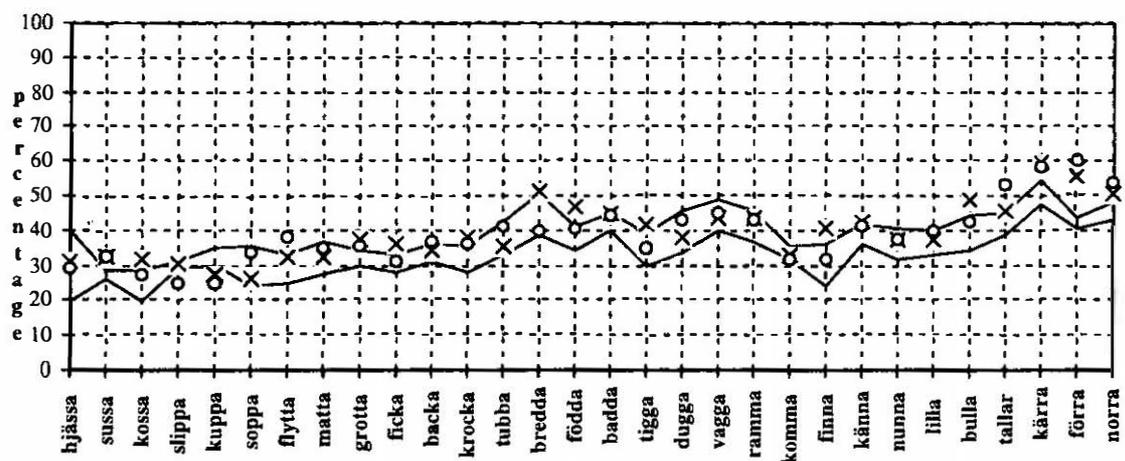


Fig. 2. The duration of the short vowel in VC: sequences in per cents of the duration of the sequence VC:, in the test words indicated. For first and second year students the average is indicated. For native speakers the minimum and maximum score is indicated. Second year (x) n=5. First year (o) n=5. Native speakers n=4 (two native speakers times two recordings).

4. Results

The contrast within the syllable is formed by the ratio between the duration of the long and the short segment. For the sequence v:C (long vowel/short consonant) the contrast ratio is represented as the proportion of the long vowel as part of the sequence (in per cents); for the sequence VC: (short vowel/long consonant) as the proportion of the short vowel as part of the sequence. The average standard deviation is 3% for native speakers and 7.5% for students.

The contrast between long and short segments in the sequences with a long vowel v:C was made relatively well by the students. Only if C is a lateral, there is a rather great difference between students and native speakers (Figure 1).

With the sequences VC: the students scored even better. Only when C: was an [r] did their speech deviate from the standard (Figure 2).

The difference in duration between short segments and the corresponding long segments is expressed in the 'vowel quotient' (V/VV) and the 'consonant quotient' (C/CC). For both quotients the students did not attain the same values as the native speakers, as was regularly the case with the contrast ratio within the syllable. The average standard deviation, too, is bigger in this case: 6% for the native speakers, 16.5% for the students.

For seven out of nine vowels the difference between the students and the native speakers is relatively large. Students do not make a big enough difference between long and short vowels. This is especially the case with the high vowels /ɪ/ and /i/. For these vowels the average quotient for students is 65% and for native speakers 50% (Figure 3).

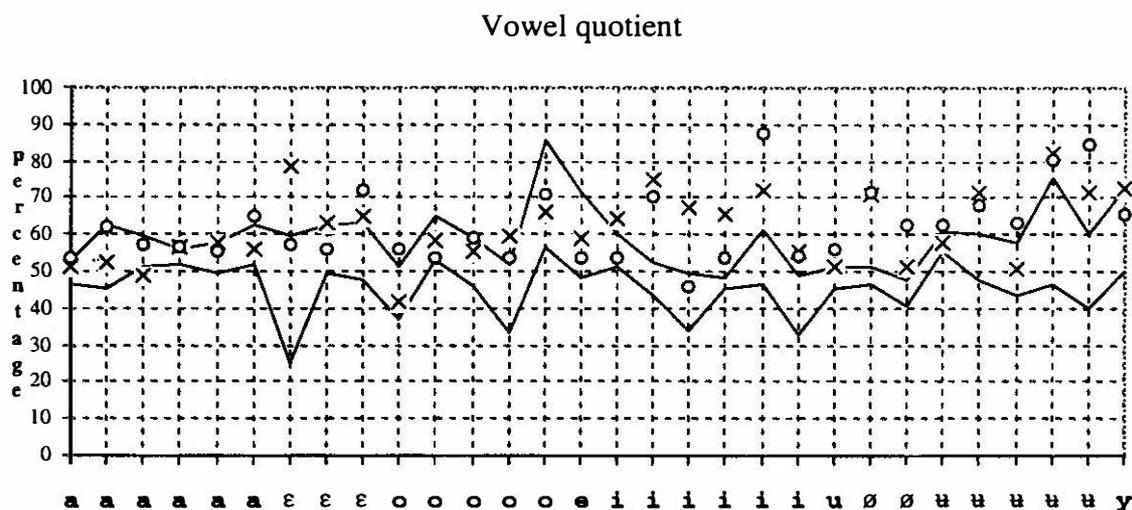


Fig. 3. The duration of the short vowel in per cents of the long vowel: the vowel quotient. Vowels are grouped. For first and second year students the average is indicated, while for native speakers the minimum and the maximum score is indicated. Second year (x) n=5. First year (o) n=5. Native speakers n=4 (two native speakers times two recordings).

Consonant quotient

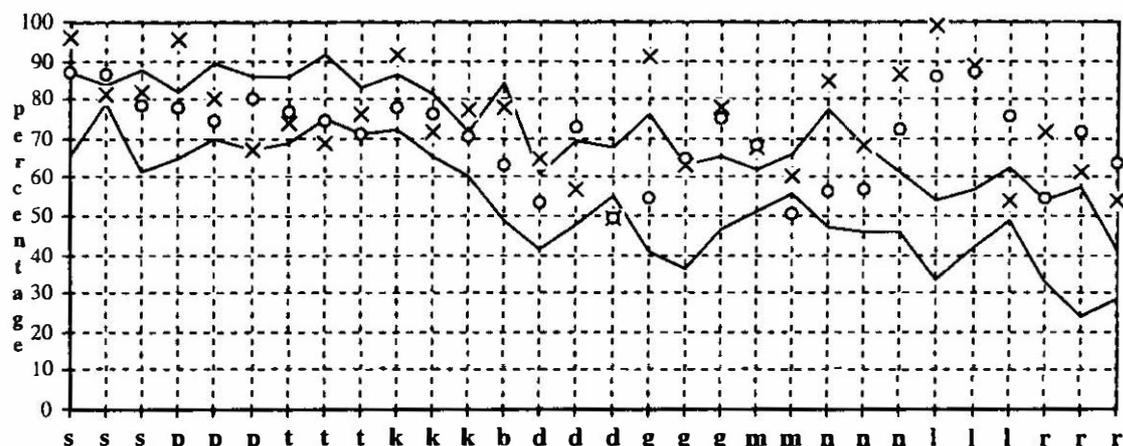


Fig. 4. The duration of the short consonant in per cents of the long consonant: the consonant quotient. The order of the consonants is the same as in Figures 1 and 2. For first and second year students the average is indicated, while for native speakers the minimum and the maximum score is indicated. Second year.(x) n=5. First year (o) n=5. Native speakers n=4 (two native speakers times two recordings).

The consonant quotient shows a considerable difference between students and native speakers when C is /l/, /r/ or /g/. For these three consonants the average quotient for students is 70%, against 45% for native speakers (Figure 4).

For a further analysis per pair of words and per subject, vowel and consonant duration measurements are compared in diagrams, of which Figure 5 is one example for the word pairs *lila-lilla* and *talar-tallar*. The contrast between the vowel and consonant duration for a minimal word pair per subject is indicated by means of two measurement points in the diagram. The two points of a pair of words are connected by a line. In this way patterns are made visible, so that subject groups (students vs. natives) can be compared with one another, whilst individual differences still show up. The native speakers generally show a consistent and ideal behavior: short vowels are combined with long consonant durations and vice versa, leading to parallel lines under 45° as in the lower row of Figure 5. Data similar to those in Figure 5 demonstrate that the patterns of the students with regard to the pairs of words containing /i/ and /ʌ/ are capricious. Here the ratio of duration was realised by means of either a reverse contrast or a contrast that was too short. In the pair of words containing /a/ the absolute duration is relatively long. However, the ratio of duration within the syllables is made much better.

5. Discussion

The results show that both big and small deviations of the ratio of duration occur within the same categories. From this a (either positive or negative) transfer from Dutch as L1 may be inferred.

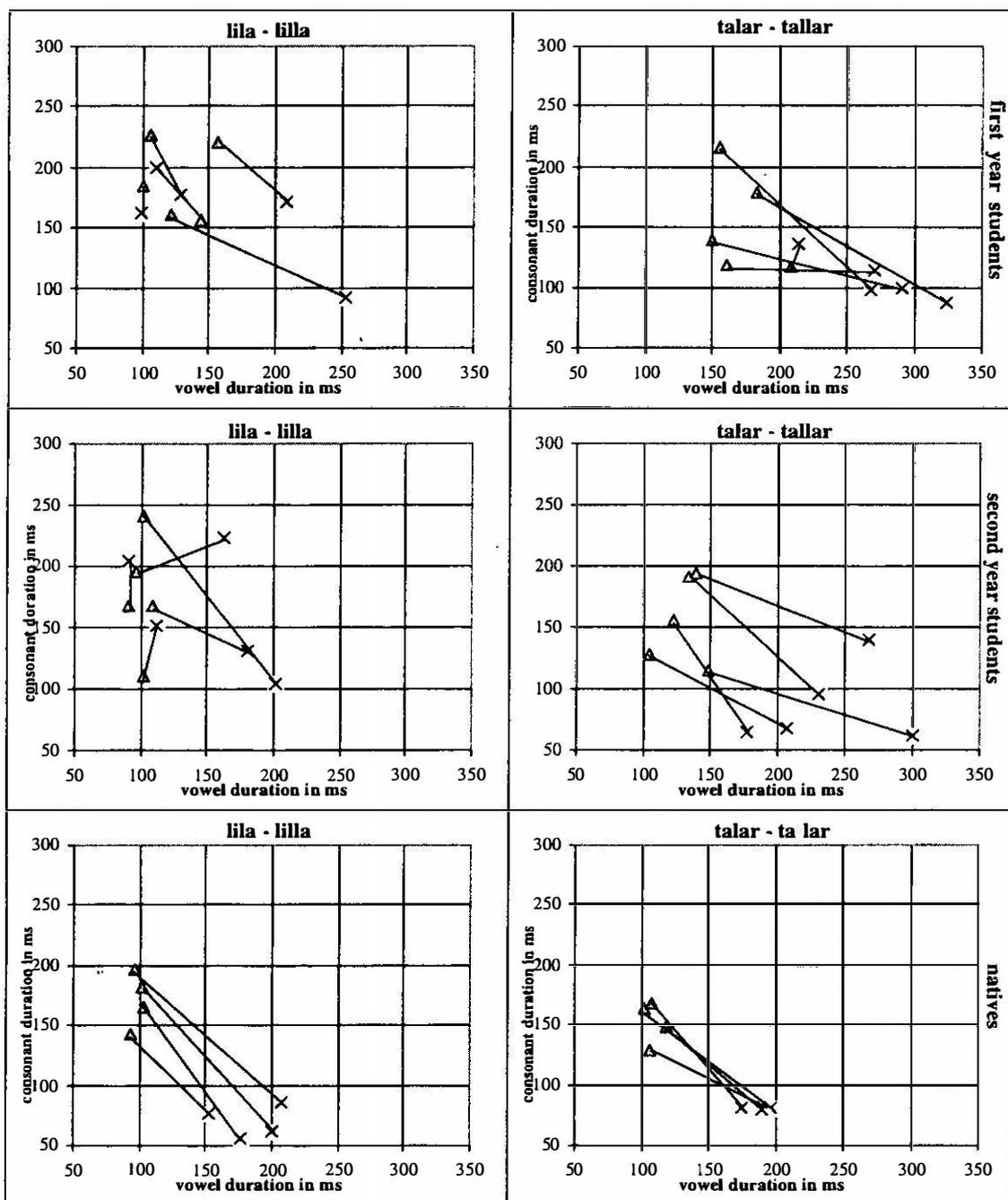


Fig. 5. Duration measurements for the word pairs *lila-lilla* (left-hand column) and *talar-tallar* (right-hand column). The x-axis indicates the vowel duration ([i:], [i] or [ɑ:], [a]) and the y-axis the consonant duration [l] in ms. The sequence V:C is indicated by the symbol x, the sequence VC: by the symbol Δ. Each line combines the related word pairs per person in the three subgroups (upper row: first year students; middle row: second year students; lower row: native speakers).

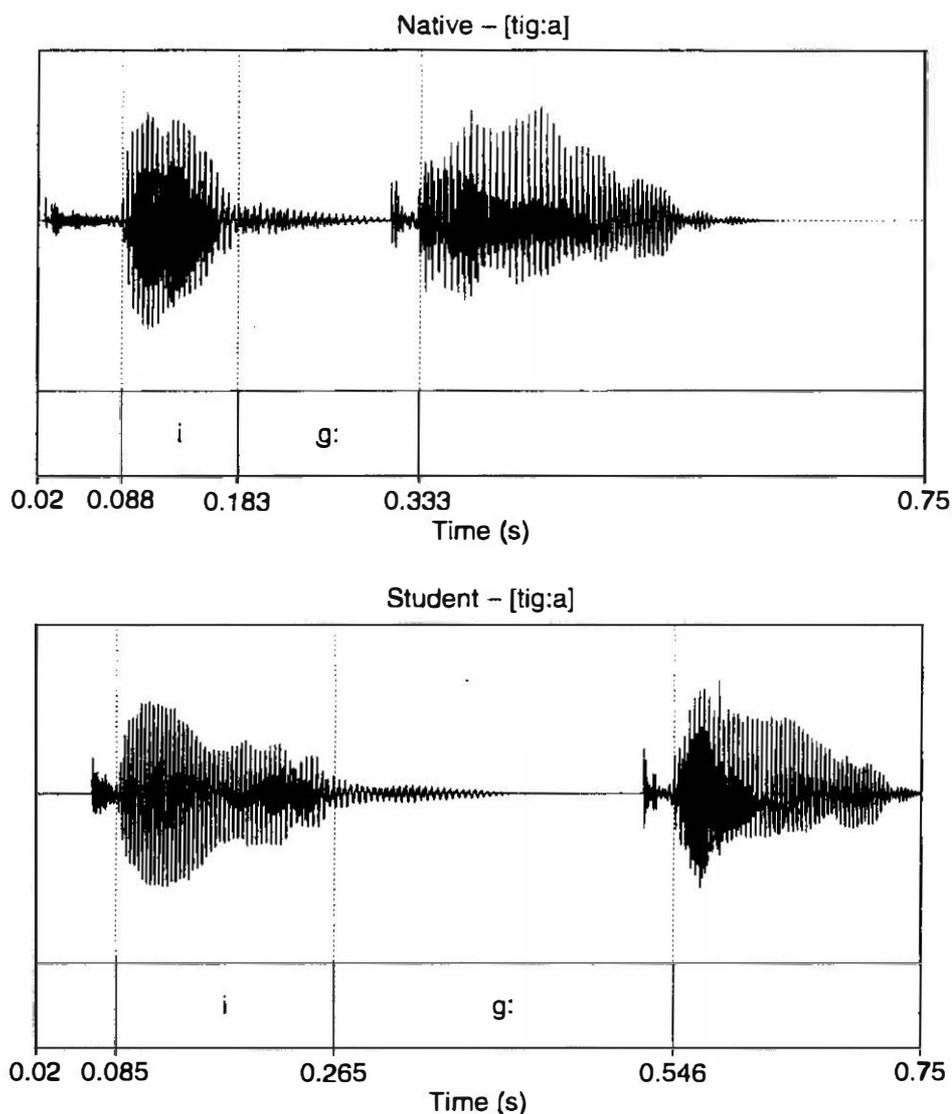


Fig. 6. Oscillogram of 2 productions of [tig:a], one by a native speaker, the other by a student.

5.1 Phonemes with large deviations

First of all there are no phonologically long consonants in Dutch at all. Furthermore, our results show that especially the difference between the long and short variants of /l/, /r/ and /g/ in Swedish present great difficulties for Dutch students. Interference may have played a role in the case of the voiced stop /g/. Since Dutch has no voiced velar stop, but only a voiceless one, /g/ is often produced as a /k/ (see oscillogram in Figure 6). As far as the liquids /r/ and /l/ are concerned, here the quality of the adjacent vowels may have influenced the ratio of duration. To explore this further a spectral analysis is needed.

The vowels that show most deviations, like e.g. /i/ [i:, i] and /ʌ/ [ʌ:, ʌ] differ both in quantity and in quality from their Dutch counterparts.

5.2 Phonemes with small deviations

The smallest deviations occurred with the vowels /o/ [o:, ɔ] and /a/ [ɑ:, a]. These segments are almost identical in both languages, both in quantity and in quality. In the case of /a/, however, there is this difference between the two languages that the colour of the long and the short sound is exactly the reverse. Long /a/ is in Swedish the back vowel [ɑ:] and in Dutch the front vowel [a:], whereas short /a/ is [a] in Swedish, but [ɑ] in Dutch. The results show nevertheless that the students had little difficulty with the quantity of the /a/ sounds in Swedish. Since there is a direct relation between the quantity (duration) and the quality of the vowel in the stressed syllable, a spectral analysis of the pronunciation of the /a/ sounds would have been interesting.

5.3 Realisation of the ratio of duration

The results indicate that students are aware of the fact that long sounds in Swedish should be very long, but they seem to be less aware of the big difference that has to be made between long and short sounds. Short sounds were relatively often pronounced too long.

5.4 Ratio of duration and quality

The results indicate which segments can be expected to present learning problems. The students had serious difficulties with the word pairs that exemplified the short and long variants of /i/ and /ɨ/, which differ considerably from their counterparts in Dutch. This suggests that for Dutch learners of Swedish the combination of difficulties of a qualitative and a quantitative nature tends to impair performance.

5.5 Ratio of duration and speech rate

A significant difference between first and second year students was found in the rate of speech: second year students needed significantly less time for most of the VC syllables in the corpus than first year students, see Table 1. This, together with the worse results in V- and C-quotient and in contrast for second year students, indicates that these students play less attention to a correct timing of the segments in a stressed vowel-consonant sequence, when they have learned to speak faster during the latter stages of their studies.

Table 1. The average duration in ms of the long and short vowels and consonants, as well as of the whole syllables, in the two types of sequences (V:C and VC:).

	1st year students	2nd year students	natives
V:	220 ms	200 ms	200 ms
C	150 ms	130 ms	120 ms
V:C	370 ms	330 ms	320 ms
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V	130 ms	110 ms	100 ms
C:	210 ms	180 ms	180 ms
VC:	340 ms	290 ms	280 ms

6. Conclusions

The results obtained in this experiment show that the errors Dutch learners of Swedish make when trying to realise the quantity distinctions in the stressed syllable, follow a clear pattern. Students of both levels turned out to make the same kind of mistakes, and to do well in the same kind of contexts:

1. The contrast in the two types of syllable (V:C vs. VC:) was made relatively well by both groups of students.
2. Students of both levels make relatively too little difference between long and short segments.
3. The difference between first and second year students was relatively small, both as to the ratio of contrast within the syllable and to the difference of duration between short and long segments. For the corpus as a whole the results for second year students are actually worse than those for first year students. The biggest difference between both groups of students was found in the rate of speech. The first year students had a significantly lower speech rate than the second year students.
4. A contrastive analysis of the results suggests that there is both a negative and a positive transfer from Dutch. The results for the pairs of words with /o/ and /a/ could e.g. be a consequence of positive transfer. Examples of negative transfer are possibly the long vowels /i/ and /u/.

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