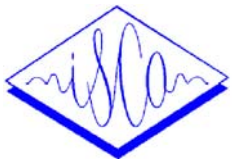

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On the Development of a Quantity Typology for Swedish Dialects

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Abstract

This article reports first results of a quantity typology study of Swedish dialects, conducted within the Swedia2000 project (see also www.swedia.nu). The examination of recordings from 20 different areas suggests three preliminary types of quantity distinctions: one type shows the usual Swedish complementary quantity distinction, one type uses an additional quantity pattern and one type shows remarkable amounts of pre-aspiration.

1. Introduction

1.1. The Swedia Project

The project "The phonetics and phonology of the Swedish dialects around the year 2000" (Swedia 2000) is currently carried out by the Phonetics sections of three Swedish universities (Stockholm, Lund, Umeå). One of its most important objectives is to analyze Swedish dialects in terms of typological relationships and differences. Several phonetic-phonological variables have been chosen for investigation, with phonological quantity as one of the main topics. An extensive description of the project can be found in [1], for example.

1.2. Phonological quantity in Swedish

Swedish, like many other languages, uses phonological quantity only in lexically stressed syllables. However, like Norwegian and Icelandic it belongs to a special type of languages in which quantity operates on a sequence of a vowel and the following consonant(s). This means that a long vowel is always followed by a short consonant (if any) and a short vowel is followed by a long consonant or a consonant cluster. This kind of inverse relationship between vowels and consonants is normally termed 'complementary quantity'(cf. e.g. [2]). Historically the Swedish quantity pattern has evolved from quantity patterns which resemble the modern Finnish ones: Vowel length and consonant length were used independently in Old Swedish. Accordingly, there existed also 'short' sequences (VC) and 'overlong' sequences (V:C:). There is evidence (e.g. [3], [4], [5]) that these two sequence types still exist in some dialects of Modern Swedish.

2. Material and subjects

Within Swedia 2000, recordings were made in about 100 dialect areas all over Sweden and the Swedish-speaking parts of Finland to get a representative selection of Swedish dialects.

For the Northern part of Sweden, recordings were made in 34 different areas. Normally, there were 12 subjects recorded for each dialect, including 3 older men, 3 older women, 3 younger men and 3 younger women. Up to now, we have analyzed the data of the category 'older men' from about 20 different places, therewith covering a major part of Northern Sweden and the Swedish-speaking areas of north-west Finland.

The material used were Swedish monosyllabic CVC minimal pairs like 'dit' ('there') vs. 'ditt' ('your') with one of the words having a CV:C pattern in Standard Swedish and the other one having a CVC: pattern in Standard Swedish. The consonant in the coda was always a voiceless plosive, mostly /t/, in one case /k/. For the recordings, each word was first said once by the investigator and then repeated five times by the subjects.

3. Methodological considerations

3.1. Linguistic typology and quantity

A linguistic typology aims to develop a classification of languages on the basis of linguistic criteria. That means in our case that we are looking for a classification of the Swedish dialects, based on the phonetic manifestations of the quantity contrast. As long-term objectives we will relate this classification to typological classifications of Swedish dialects in other linguistic domains (e.g. tonal patterns) and to quantity patterns in other languages. Furthermore, as we collected data from different age groups, we hope to get insights concerning the variability and stability of the quantity patterns which, for example, make it possible to formulate hypotheses about sound change.

In order to develop our typology, we have to look for suitable parameters along which the dialects can be classified and assigned to different types. On the one hand, this process has to start with a certain selection of possible parameters tested against the data. On the other hand, the initial set of parameters may well have to be re-examined, as the upcoming results might suggest alternative classes. Therefore, we started with a set of fundamental questions which were supposed to lead to a first categorization. We do not claim, though, that these questions can describe all possible typological differences. Our fundamental questions were:

- Do the durational patterns of phonetic segments reflect phonological quantity differences?
- If so, in which way?
- Are there other features accompanying durational distinctions?
- Are there other features operating instead of durational distinctions?

3.2. Criteria for sound segmentation

The quantity material within Swedia was designed to minimize segmentation problems. Thus, most of the words were a plosive-vowel-plosive combination. The beginning of the vowel was marked at the point where a fundamental increase of formant energy was visible in the spectrogram. This usually coin-

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cides with the first visible glottis pulse in the time signal, which was used as an additional criterion. The end of the vowel was set to the end of periodicity in the time signal. A further criterion was loss of energy in higher formants.

At an early stage of the segmentation process it became evident that a simple vowel-consonant segmentation was not maintainable, at least in some of the dialects. Sometimes there were quite distinctive amounts of preaspiration before the consonant closure and it was therefore decided to segment this phase separately. The criterion used for the segmentation of this phase was the existence of fricative noise with or without formant structure. There is already evidence that preaspiration can play a role in Swedish, sometimes even a normative role ([6]). Moreover, our own investigations show quite regular and distinctive patterns of preaspiration in two of the dialects examined so far (see [7] and below).

3.3. Measuring phonological quantity

The examination of the data itself requires a decision about the domain and manner in which durational measurements should be analyzed. We have decided to look initially at duration ratios within the VC-sequence. This seems a natural consequence of the structure of complementary quantity, but there are also additional arguments for this kind of analysis.

Firstly, we know from other prosodic domains, for example tonal features, that linguistic distinctions are normally expressed relatively rather than absolutely. Thus, it seems quite straight-forward to presume that long segments are perceived as long not only because their duration exceeds a certain value but also because they are 'long' in relation to surrounding elements. Secondly, and even more importantly, there is already strong evidence that Swedish keeps the relation of vocalic and consonantal elements constant in the VC-domain, even with different speech rates (cf. eg. [8]). Therefore, measuring the relative duration of vowels and consonants within the VC-domain provides us with values that should be independent of speech rate.

4. Results - phonological quantity patterns in Northern Swedish dialects

4.1. The overall picture

Figure 1 shows the mean relative durations for V:C and VC: syllables for the 20 dialects. The bars show the relative duration of vowels (black), the preaspiration phases (light grey) and the consonants (dark grey). Each recording area is represented by two bars. The upper bar always represents the values for Standard-Swedish V:C syllables, the lower bar represents the values for VC: syllables. As can be seen from figure 1, the durational relationships in most of the dialects seem to follow the Standard Swedish ones. Some dialects show a certain amount of preaspiration with two dialects (Arjeplog and Vemdalen) standing out in this respect, in terms of relative length of preaspiration as well as in terms of differences between V:C and VC:-words. These two dialects will be described below and in [7].

It is obvious that the mean values in figure 1 can only serve as a first and rather rough estimation of the quantity patterns in the dialects. Calculating the relative durations over all speakers of a certain dialect and grouping them in only two - Standard Swedish - categories implies certain presumptions which maybe do not hold for all dialects.

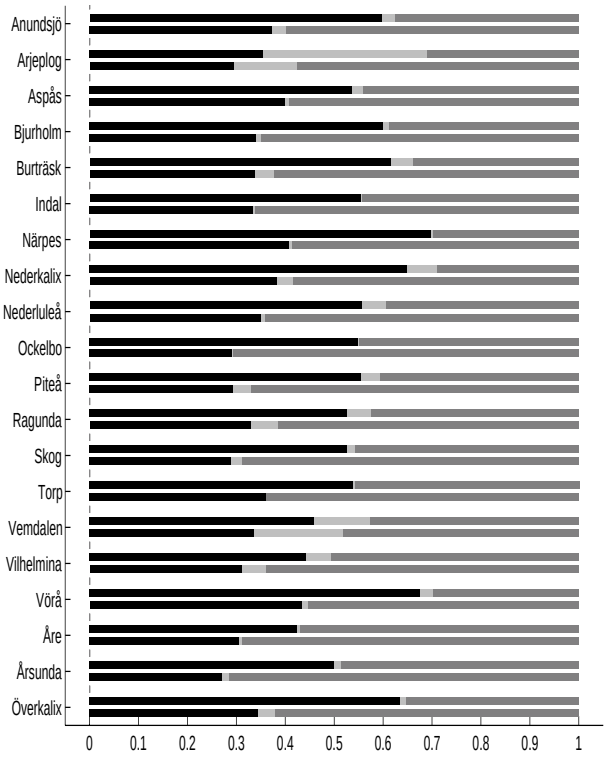

Figure 1: Relative duration of vowels, preaspiration and consonants

That is to say, one cannot take it for granted that all dialects show only two patterns of quantity. Furthermore, although the target words for the recordings were carefully selected, it cannot entirely be precluded that some words in some dialects have different word forms, different sound structures and the like. Averaging preaspiration is also problematic as it emerged as a highly individual feature in some dialects. The calculations were therefore only used as a point of departure for more detailed analysis. Examples of such analyses are given below.

4.2. Complementary quantity

Even a more detailed analysis shows that many dialects follow the Standard Swedish complementary quantity pattern. Three dialects spoken in eastern Sweden (namely Ockelbo, Skog and Årsunda) can serve as examples. Figure 2, figure 3 and figure 4 show raw durational data for the three dialects. The figures display the absolute duration of the consonantal segments on the y-axis in relation to the whole duration of the vowel-consonant sequence on the x-axis. Short consonants are displayed as full circles, long consonants as empty circles. (The amount of preaspiration in these dialects was small enough to be neglected, at least for the current purpose).

All figures show a more or less clear-cut separation of the categories, with 'Ockelbo' maybe being the best example. The duration of the whole VC-sequences lies between 200 and 600 ms, suggesting a remarkable variation in speech rate. Although there is some variation for both categories, the plots suggest a more or less linear increase of consonant duration with sequence duration. This indicates that the relative duration of the consonants (and thus, of the vowels as well) remains stable, irrespective of individual speech rate variations. This confirms

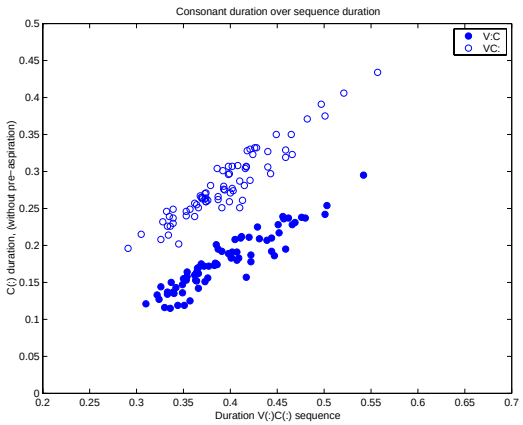

Figure 2: Duration of long and short consonants over whole sequence duration. Place of recording: Ockelbo

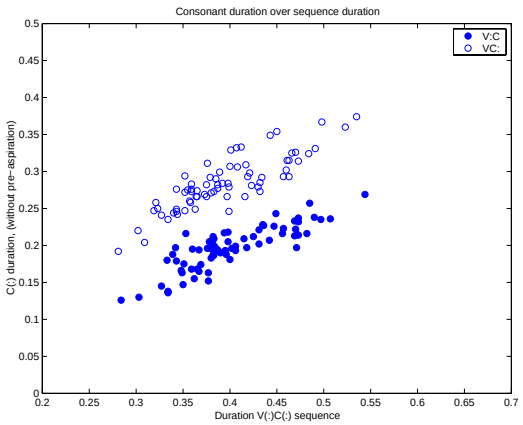

Figure 3: Duration of long and short consonants over whole sequence duration. Place of recording: Årsunda

the results of Sock et al. [8] which also found stable sound-to-sequence-ratios for Swedish with different speech rates.

Furthermore, the two classes do not seem to differ in overall duration. This is exactly what we would expect for a complementary quantity distinction: There is a stable durational difference between long and short consonants as well as between long and short vowels, while the duration of the VC-sequence is more or less the same for the two classes.

It is interesting to note that the differences between V:C and VC:-rhymes found here are higher than those normally reported for Standard Swedish. For example, our recalculations of data from Elert [2] under similar conditions resulted in 42% for the long vowel and 28% for the short vowel. This fits quite well with our data from a Standard Swedish reference speaker who showed a long vowel ratio of 43% and a short vowel ratio of 27%. The difference between long and short vowels can thus be described as about 14 percentage units. In comparison to that, the three dialects described here show all values of over 20 percentage units.

It is therefore possible to conclude that at least three dialects in Northern Sweden show a stable complementary quantity pattern for the recorded material. The durational differences between the categories for these dialects (measured in percentage points) exceed the Standard Swedish ones to a remarkable extent. This greater difference seems primarily to be reached by a relatively 'longer long vowel'.

Other dialects which might belong to this category are Anundsjö, Indal, Nederkalix (although the data is rather restricted in this case), Piteå, Torp and Närpes. But as we also found more complex patterns in these dialects, a more detailed analysis is necessary here.

4.3. Overlength

The dialect of Vörå, a community in the North Western part of Finland, showed a distinctly different pattern from that of Standard Swedish. Figure 5 shows the relative vowel durations over rhyme duration for one of the three speakers. The plot includes data for 5 (in one case: 4) repetitions of 10 words (5 minimal pairs in Standard Swedish).

The values clearly split into three groups rather than into two as in Standard Swedish. Some of the 'short vowel words' show a pattern which resembles short vowels in other dialects

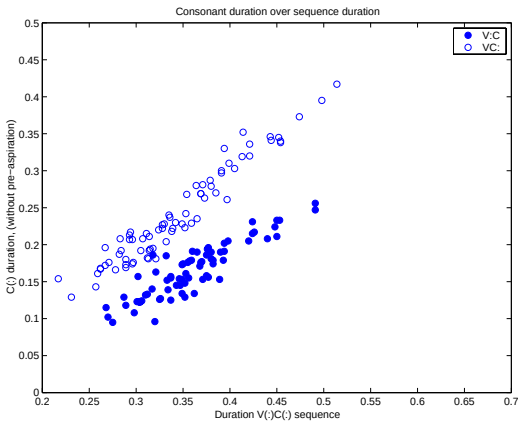

Figure 4: Duration of long and short consonants over whole sequence duration. Place of recording: Skog

occupying about 30% of the syllable rhyme. In contrast, other words have vowels with relative durations as long as about 50% of the rhyme. The words in this group also show a tendency to be longer than those of the other two groups (cf. figure 5).

The long vowels of this speaker show remarkably high values with around 70% of the whole sequence duration. Also Figure 1 shows that the dialect of Vörå is among the dialects with the 'longest long vowels'.

The pattern found here has already been described in the literature and is normally termed 'overlength'. As mentioned before, it is considered to be a reflection of Old Swedish quantity relations. Phonologically, it is normally described as a V:C: sequence. Nyström ([9]) has presented data from Älvdalen in North Dalarna in middle-west Sweden which almost matches our data. He found three types of syllable rhymes as well. The Älvdalen V:C sequences had a relative vowel duration of about 80%. In V:C: sequences, the relative vowel duration was about 60% and the VC: sequence had about 45% relative vowel duration.

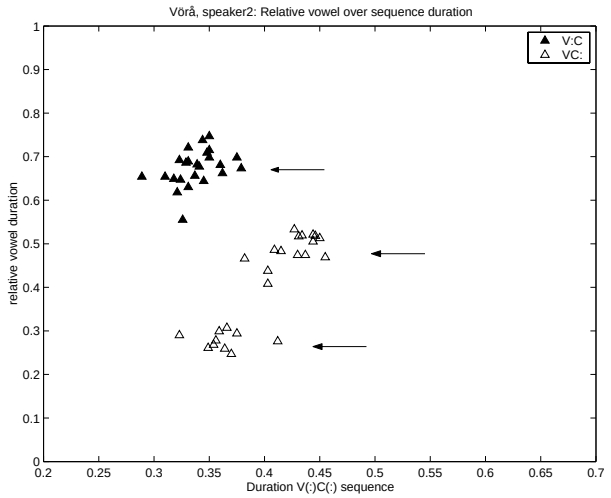

Figure 5: Relative duration of vowels over whole sequence duration. Place of recording: Vörå

4.4. Pre-aspiration

The results for the two dialects which showed the most remarkable amounts of pre-aspiration have been described elsewhere [7]. Thus, only the most important results shall be reported here.

A closer analysis of the dialect of Vemdalen showed that the pattern emerging from figure 1 is slightly misleading. The durations clearly indicate that some of the Standard Swedish V:C words have a pattern of their own. If the durations are used to re-classify the words, three different patterns emerge quite clearly: (1) words with long vowels, no pre-aspiration and short consonants, (2) words with short vowels, a preaspiration phase and - at least phonetically - short consonants, and (3) words with short vowels and long consonants (up to now we found only one word which falls into this category).

The situation in Arjeplog is different. In this dialect, the difference between 'long' and 'short' vowels is rather small, and both categories have values which resemble those for short vowels in other dialects (cf. also figure 1). The values for the consonants still have rather typical relative durations for short and long consonants, and this relationship is maintained by a longer or shorter preaspiration phase after the vowel. Thus, we have found two sequence types in our material; both have a phonetically short vowel, followed by either a rather long preaspiration phase and a phonetically short consonant, or a short preaspiration phase and a phonetically long consonant (see [7]).

5. Discussion

Which types of quantity distinctions does our preliminary data suggest? Firstly - and not surprisingly -, there is strong evidence for a group of dialects showing quantity patterns reflecting true complementarity between the vowel and a following consonant. Compared to Standard Swedish, this group of dialects seems to have greater relative differences between long and short vowels (and thus also between long and short consonants).

Secondly, we found one dialect which presumably still uses the Old Swedish V:C: sequence. Interestingly, this phenomenon is accompanied by a comparatively great difference of about 40 percentage units between the long and short segments in V:C and VC: sequences. If we suggest that the perception of a quantity contrast relies on relations in the vowel-consonant-sequence, then this great difference might reflect a tendency to widen the durational range so that the three categories can be maintained.

In a third type of dialects the quantity contrast is accompanied rather regularly by preaspiration. The patterns of preaspiration in these two dialects are rather different from each other, however. Thus it is not yet clear whether these two dialects belong together or whether each forms a class of its own.

Nevertheless, as these two dialects add a third durational component into the VC sequence, we have to separate them from dialects which only use vocalic and consonantal duration in a complementary way.

6. Conclusion

This study has dealt with differences in quantity patterns in 20 Northern Swedish dialects. We have not reached the point yet where we can give a thorough typological description of these dialects. It has been possible, however, to set up three tentative classes or 'types'. Our on-going research will deal with the question whether our classifications can be supported by additional material. It is quite likely that more data will give reason to a further subgrouping, especially of the class 'complementary quantity'.

7. Acknowledgements

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8. References

[1] Bruce, G.; Elert, C.-C.; Engstrand, O.; Wretling, P., 1999. Phonetics and Phonology of the Swedish Dialects - A Project Presentation and a Database Demonstrator. In *Proceedings 14th ICPhS San Francisco*. 321–324.

[2] Elert, C.-C., 1964. *Phonologic Studies of Quantity in Swedish*. Uppsala: Almqvist & Wiksell.

[3] Freudenthal, A. O., 1889. Vöråmålet. In *Skrifter utgivna af Svenska litteratursällskapet i Finland*. vol. XII.

[4] Ivars, A.-M., 1988. Närpesdialekten på 1980-talet. In *Studier i nordisk fonologi*. vol. 70.

[5] Pamp, B., 1978. *Svenska dialekter*. Natur och Kultur, Stockholm.

[6] Helgason, P., 1999. Phonetic Preconditions for the Development of Normative Preaspiration. In *Proceedings 14th ICPhS San Francisco*. 1851–1854.

[7] Wretling, P.; Strangert, E.; Schaeffler, F., 2002. Quantity and Preaspiration in Northern Swedish Dialects. submitted to Speech Prosody 2002.

[8] Sock, R.; Löfqvist, A.; Perrier, P., 1996. Kinematic and Acoustic Correlates of Quantity in Swedish and Wolof: A Cross-Language Study. In *Proceedings of the 1st ESCA ETRW on Speech Production Modeling*. 81–84.

[9] Nyström, G., 2000. Språkhistorien och vår tids Svenska dialekter. Nya rön om Älvdalsmålets fonologi och morfologi. In *Nordsvenska 11*. Institutionen för litteraturhistoria och nordiska språk, Umeå universitet.