Rhythm in regional variants of Standard Danish

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ABSTRACT

The acoustic analysis is an attempt to establish the durational correlates of differences in perceived rhythm in six regional variants of Standard Danish. Durational relations between vowels and consonants in disyllabic sequences vary considerably across the six regions, but the correlation with differences in perceived rhythm is nearly nil. Fo patterns seem to be the main determinants of perceived rhythm.

INTRODUCTION

Space limitations make this a very sketchy and rather glossed-over presentation of the results. A complete account is forthcoming.

The analysis is based on a material recorded for intonation investigation purposes (Grønnum 1991, 1992), and is motivated by my clear auditory impression from the recordings that the six regions concerned differ with respect to the internal rhythmical organization of the stress group (or the foot, i.e. the succession of a stressed and all succeeding unstressed syllables). They are: Copenhagen, Næstved (South Zealand), Aalborg (North Jutland), Tønder (West South Jutland), Sønderborg (East South Jutland) and Bornholm (an island south of Sweden).

Note that I am not studying the effect of *systematically* varying parameters that may influence the perception of rhythm (duration, intensity, pitch, phonological structure). I am rationalizing after the fact: looking for acoustic differences in recordings that appear auditorily to be different rhythmically at the level of the prosodic stress group.

TIMING

Insofar as the stress-timed versus syllable-timed dichotomy is operative at all (Dauer 1983, Eriksson 1991, Miller 1984), all of the varieties under investigation here are stress-timed, and the rhythmic groups all fall under the heading *falling* or *trochaic/ dactylic*, i.e. their durational, pitch and other characteristics are such that the accent unmistakably falls on the first syllable in the sequence.

The search for durational parameters that would differentiate the speech samples from the six regions was successful only for the 'V(:)/C(C) and 'V(:)/$_{\circ}$V ratios in 16 stress groups of rather varying segmental and syllabic structure. The material in the analysis presented here consists of 5 immediately comparable 'VN$_{\circ}$V sequences (V = low front or mid, N = [m/n]), extracted from non-final position in three short utterances, recorded six times by two speakers from each region. Initial consonants in the stressed syllable are excluded from calculation, because vowel onset seems to determine the onset of the unit within which temporal compensations may take place (Fant and Kruckenberg 1989, Fischer-Jørgensen 1982, Strangert 1985), and stressed vowel onset also constitutes the boundary between successive Fo patterns (Thorsen 1984).

The results are presented in Fig. 1, which represents an average over items and

speakers. The correlation between the two parameters is high ($r=0.96$, $p<0.001$). Næstved (N) appears with the relatively longest and Sønderborg (S) with the relatively shortest stressed vowels, respectively. Aalborg (A), Bornholm (B) and Copenhagen (C) rather cluster in the middle of the continuum, and Tønder (T) is located somewhat more towards the lower end.

AUDITORY EVALUATION

Four colleagues in the department were supplied with tapes which contained 2x9 different complete utterances by each of two speakers from each region. (On the assumption that perceived rhythmical differences between different regions will cut across any type of stress group in any position. And, further, that measurable differences in any type of directly comparable structure, thus also 'V̆N$_{\circ}$V̆, will be representative of differences under other segmental conditions.) They were asked to evaluate the foot internal rhythm of each region in terms of 11 pairs of antonymous adjectives. They found the task extremely difficult (and two adjective pairs meaningless), and the averages (over 4 listeners and 4 groups of adjectives) as presented in Fig. 2 must be taken cum grano salis. Certain aspects nevertheless stand out: nowhere do Næstved and Sønderborg constitute the extremes, as one would have expected from Fig. 1, on the contrary; and regions that cluster in Fig. 1 do not invariably do so in Fig. 2. Note specifically Tønder and Copenhagen. I would have expected, ceteris paribus, that the longer the 'beat' (the stressed vowel), the higher the score on 'regular' etc., and the lower the score on the remaining three groups of adjectives. But, of course, everything is *not* equal and listeners are apparently not reacting to durational relations per se to any (great) extent. (However, they were *not* asked to judge *durations*, and I cannot really know how they understood 'foot internal rhythm'; nor how, exactly, they interpreted the adjectives.) The other obvious candidate then is Fo/pitch:

STRESS GROUP PATTERNING IN THE SIX VARIETIES

Fig. 3. depicts stylized models of the very different Fo patterns of the six variants.

Perceived rhythm may well be the result of an interplay between segment duration and its associated Fo movement, granted that Fo movement may make segments appear different in duration, ceteris paribus (Lehiste 1976, Hombert 1977, Sundberg 1973). But perceived rhythm may not even be any direct correlate of 'pitch-corrected' durations (even if we knew exactly how to quantify them in this kind of material), pitch may play its own, more direct role, although how I cannot venture to speculate at present. (I also suspect that much less easily quantifiable idiosyncratic factors, like voice quality, speech rate and over-all fluency, come into play.)

On the above assumptions, let me attempt a very tentative outline of an explanation of the more pertinent facts as they appear in the figures. But note that no single aspect can unambiguously account for the scores in Fig. 2. Durations *and* the *total* Fo pattern are probably evaluated holistically, and thus there will be apparent contradictions in the statements to follow: Tønder is irregular, vivacious (and inciting) due both to its shortish and rising 'V and to the very large and steep fall. Sønderborg will be comparatively more regular but less vivacious due to its less extensive and steep fall (in spite of its even shorter 'beat'). Copenhagen may be regular and energetic due to the fact that the two significant events, the Fo turning points, are located comparatively early in the sequence, but dull for its rather limited range and the modest slope of the fall.

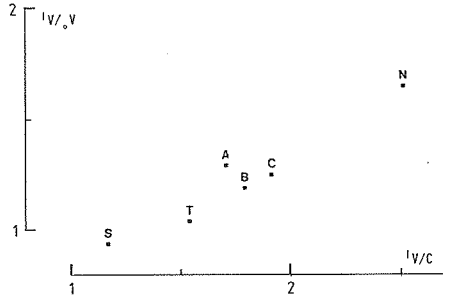

Figure 1. *Ratio of stressed vowel to post-tonic consonant duration plotted against the ratio of stressed to post-tonic vowel duration; see further the text.*

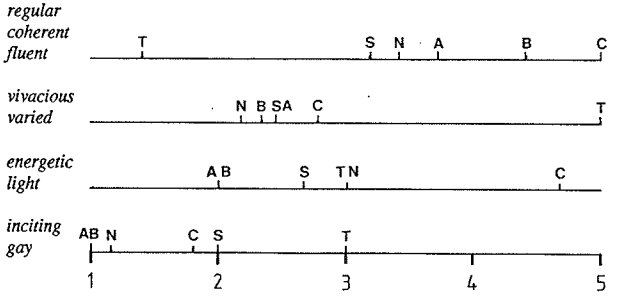

Figure 2. *Auditory evaluation of the stress group internal rhythm in the six varieties investigated; see further the text.*

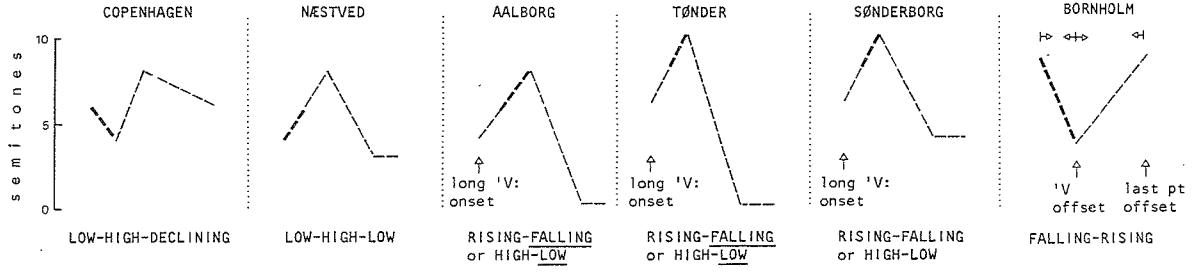

Figure 3. *Model stress group patterns from the six varieties investigated. Heavy lines denote stressed vowels. Horizontal arrows delimit movements which may be expanded or compressed in time. Vertical arrows depict turning points which anchor segmental events. The patterns are characterized auditorily beneath each frame.*

Bornholm may be regular due to the frequency constant 'highs' and 'low' but heavy and dull by virtue of its not very large range, and particularly its pronouncedly *falling*-rising pattern. Aalborg may be rather regular but heavy and dull for its slow movements, and perhaps also because the fall lands at the bottom of the range (but cf. Tønder!). Næstved is perhaps monotonous and dull both for its long 'beat', the limited range and the modest slopes but, curiously, not very regular.

FINAL REMARKS

In and of itself this little experiment naturally does not tell us very much besides the fact that perceived rhythm is not directly correlated to durational relations in the foot. Nor does it pretend, of course, to exhaust questions of timing in the six varieties. Obviously, other structures besides the simple 'V̆N$_{\circ}$V̆ sequences would have to be included. But the results raise a host of questions - with obvious implications for speech synthesis - which can only be answered through a multitude of experiments with synthetic manipulation of duration and Fo. They would demonstrate the significance of and the requirements for appropriate realizations of stress group patterns (in terms of magnitude, slopes and timing of Fo events relative to the segmental structure) in conjunction with the proper durational relations, for any given variant.

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