Final Lengthening in Danish

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Final lengthening means that speakers slow down their speech rate in the last syllables of an intonation phrase in order to signal its upcoming end. However, according to Grønnum [1], final lengthening is relatively modest in Danish. She suggests that this might cause problems for speakers of languages with final lengthening to recognize when a Danish utterance is finished. In an ongoing investigation of intonation and prosody in Danish, the use of final lengthening in Danish talk-in-interaction is also investigated. The sample is small, and it is for several reasons a difficult to calculate the speech rate, but it is suggested that there is a tendency for the conversation partners to use of speech rate differences at least in turn-final position.

INTRODUCTION

In many languages, final lengthening is used at the end of intonation phrases for signaling an upcoming major boundary. However, in Danish, final lengthening is moderate. Grønnum [1] suggests that this causes problems for speakers of other languages, for example English and Swedish, in recognizing the end of a Danish utterance. Recognizing completion points is an important cue for a smooth turn-taking [2].

In an ongoing investigation of the prosodic design of questions in Danish conversations, speech rate is one of the analyzed parameters. It was then observed that that the beginning of a question is on average spoken faster than at the end of the question, albeit with a great variation.

Since Grønnum's findings are based on speech from laboratory settings [1; 3], the question asked here is if the special affordances of authentic talk-in-interaction, putting the conversations partners under a strong pressure to be clear in signaling their intentions, might influence their conversational behavior.

METHOD

The speech data comes from recordings from the Danish part of the Talkbank.org. The sound quality of this kind of recordings is not always the best for prosodic analysis, but authentic talk-in-interaction is difficult to document in a laboratory.

Two different sets of data are analyzed: First, conversational questions were extracted from three of the recordings, following the definition of conversational questions in Selting [4]. Second, a small case study of indefinite pronoun *noget* ("something") was conducted.

The prosodic analysis was conducted using the freely available computer program PRAAT [5].

At this point, there are four different methods for measuring final lengthening known to me, all with their advantages and disadvantages:

1) The simplest method is to measure the speech rate of the syllables in the beginning vs. in the end the intonation phrase. The syllables should have the same status with respect to accentuation, because one of the prosodic correlates of accented syllables in Danish is a longer duration. Thus, I have compared the unstressed syllables before the first accent with unstressed syllables following the last of intonation phrases.

2) The cleanest method is to measure the very same lexical word in an early/medial vs. late position of the intonation phrase. Again, you have to control for accentuation [1]. Constructed sentences are probably the easiest way to obtain this kind of data for comparison. However, in the Danish data the pronoun *noget* ("something") was used repeatedly both in utterance-final and utterance-medial position, and often in an unaccented use, and so I made a case study of *noget*.

3) Another method consists in measuring the duration variation of the single phones by a speaker and comparing it to the mean phone duration of that same speaker [6]. This makes sense. For example, the phone [s] in my data always has a long duration in comparison to other consonant phones; long enough to make a difference in a comparison based on single syllables. However, this method is laborious, requiring the segmentation and labelling of a fairly large amount of speech data. Since I, like Hansson [7], do not have a speech recognizer for automatic segmentation, I will not use this method.

4) Hansson [7] instead uses a method developed by Dankovičová [8], which phonological consists in measuring and comparing the individual phonological words within the intonation phrases. This method requires you to define what a phonological word is. In Swedish, a phonological word contains an accented word [7]. Therefore, the Danish so-called "stress group" (*trykgruppe*), which is the basic rhythmic and tonal unit [1; 3], seems to suggest itself as a correspondence. Pre-accent syllables and words with hesitation prolongation were discarded from the analysis.

Hansson [7] found that the first prosodic word was always very fast (maybe a "final shortening" phenomenon). The reliable, significant difference was found between the penultima and the ultima phonological word. I have thus calculated the speech rate for these phonological words.

Speech rate is usually measured by dividing the number of spoken syllables with their total duration in seconds. This turned out to be a problem, primarily due to the frequent use of *schwa*-assimilation in Danish [1; 3]: Unstressed endings often contain a *schwa*-vowel (written as <e>), for example *stor-e* ("big" + inflection ending). In spontaneous speech, the *schwa*-ending is often assimilated and fused together with a preceding or following sound. The result is often a prolongation of the fused sound Sometimes the syllabicity remains, sometimes it is lost. I often found it difficult to decide if I was dealing with one or two syllables. However, as I am a native speaker of Southern Swedish, which is close related to Danish, I decided to trust my judgement and count only the syllables that I could hear. This is still problematic, because the loss of syllabicity but addition of prolongation will make the syllable longer than an "ordinary" syllable; but still shorter than the same syllable followed by an intact ending.

For illustration, the utterance in (1) contains four *schwa*-assimilations/reductions in the last phonological word (capitals mark accented syllables). The speech rate is then based on five syllables, while the corresponding standard forms of the words contain nine syllables (2):

(1) *har i wEEkend-Arbejd non gang os*
"do you have weekend work sometimes, too"

(2) har i wEEkend-Arbejd**-e** nogl**-e** gang**-e** ogs-**å**.

I have not yet found a solid solution to the syllable count.

RESULTS

Table (1) shows the speech rate in syllables/second for the question types yes/no question with inversion (V1), yes/no question without inversion (V2) and question-word questions (WH). The questions are extracted from the conversations *Anne og Beate, Gamledage* and *Kartofler & Broccoli*:

Tab. 1: Question type and the speech rate in syl/sec

Quest type	Pre-accent	Post-accent	First Phon Word	Penultima Phon Word	Ultima Phon Word
V1 17 it.	10,4 4,7-16,7 17 items	7,2 2,2-11,7 16 items	8,1 3,8-13,0 14 items	6,0 45-8,3 5 items	6,8 3,6-11,9 12 items
V2 11 it.	8,4 5,2-12,0 10 items	7,0 4,3-11,9 6 items	5,7 4,1-7,2 5 items	6,1 1 item	4,4 2,7-6,6 5 items
Quest type	Pre-accent	Post-accent	First Phon Word	Penultima Phon Word	Ultima Phon Word
WH 11 it.	10,9 7,4-17,6 6 items	6,4 3,6-11,1 6 items	6,9 4,0-8,7 6 items	6,8 6,4-7,0 3 items	5,1 3,3-6,7 6 items
ALL 39 it.	9,9 5,8-15,5 33 items	6,9 3,7-11,6 27 items	6,9 4,0-9,6 25 items	6,3 5,5-7,7 9 items	5,4 3,2-8,4 23 items

I then did a case study of the indefinite pronoun *noget* ("something). The examples are extracted from *Kartofler & Broccoli* and *225_deller*, which contain the same three speakers. *Noget* is pronounced like anything from one syllable, one syllable with prolongation and two syllables. Since I now had the advantage of dealing with the same word, I decided to measure the duration of *noget* in milliseconds instead. In addition, I calculated the part *noget* made up of the phonological word of which it is part. Accented occurrences of *noget* were excluded. The results show that it makes sense to divide the occurrences into categories depending on the position of *noget* in the turn (turn-final = a speaker change follows); the expression *så no* "such things", which divides into intonation phrase-final and non-phrase final occurrences; and finally the phrase-internal occurrences of *noget*.

Tab. 2: Speech rate of noget *in ms, its part of the phonogical word in percentage and categorized by position in the turn*

Position	Length	Part of phonological word,
Turn-final 7 items	254 ms 220-286 ms	45% 31-59%
så no, last word 5 items	147 ms 65-235 ms	28% 15-45%
så no, not last word 5 items	145 106-221 ms	16% 10-22%
Other positions in intonation phrase, 17 items	186 124-300 ms	36% 24-84%

DISCUSSION

Although the variation in speech rate is great within each of the examined categories, the average length of pre-accent and post-accent syllables in the questions shows that the speech rate generally seems to be faster in the beginning than in the end of an intonation phrase. In contrast to Hansson's study of Southern Swedish [7], the speech rate of the first and penultima phonological word does not seem to differ much in the Danish data. However, the ultima phonological word seems to be slightly slower than the penultima phonological word. The question is if this change in speech rate is large enough to be discernable to listeners.

The case study of *noget* ("something") indicates that it is really the turn-final position that is important for final lengthening, not the phrase-final position in general. Incidentally, all the questions are turn-final, most often one intonation phrase corresponding to a whole turn. This might explain the speech rate differences in the questions.

More data needs to be analyzed, but up to this point I am suggesting that there is a tendency for final lengthening in Danish talk-in-interaction, at least as a cue for turn-final phrases, making it an available cue for turn-taking.

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MATERIAL

The examples are extracted from the Danish part of Talbank (https://samtalebank.talkbank.org), a freely available collection of conversation-analytical material. The questions are extracted from Sam2 *Anne og Beate* (10:08 min), Sam3 Gamledage (13:08 min) and Sam3 *Kartofler & Broccoli* (44:38 min). The occurrences of *noget* ("something") are extracted from Sam3 *Kartofler & Broccoli* and Sam3 *225_deller* (50:01 min).

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