

Effect of collocational strength on Estonian speech rate on the example of the verb *olema* 'be'

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Abstract

This study is about how collocational strength between words has an effect on word duration in Estonian. We measured the durations of the verb *olema* 'be' and computed its co-occurrence frequencies with following words. We present the evidence, that the collocational strength shortens the duration of the verb *olema* and that contextual predictability is a significant feature to be considered in developing models of word duration.

1 Background

While recording an Estonian corpus for corpus-based synthesis some fluctuations of the speech rate were observed, even though the text was read out by a professional radio announcer. The slowings down could be due to difficult clusters (the corpus was required to contain all diphones possible in Estonian, however rare (see Piits et al. 2007), which could, in turn, occur in rare words. A quickening rate, however, could have to do with frequent words as well as collocational phrases. It has been argued before that the high frequency of a word and the predictability of its context may have a reducing effect on the pronunciation of the word (Pluymaekers et al. 2005, Bell et al. 2003). In some cases the effects of word frequency and contextual predictability on word duration have been studied in combination (M. L. Gregory et al. 1999).

In Estonian, the word has a very important role both in grammar and phonetics, while the

morphology is extremely rich. The aim of the present study is to find out if, apart from word frequency, Estonian word length could in any way depend on the collocational strength between the words. Our scrutiny is focused on the verb *olema* 'be' as the most frequent word in Estonian.

2 Hypothesis

Collocational strength between words has an effect on word duration, i.e. words occurring side by side more often tend to be pronounced more rapidly.

3 Material

The material consisted of news recordings from two radio newsreaders (10 and 15 minutes of speech) and speech synthesis corpus (51 minutes of speech material). We measured the durations of the verb *olema* 'be' and computed collocation strengths between a word form and its right neighbour.

The Estonian verb *olema* has 34 different forms. Our material contained 11 such forms, some of them (*on* 'is, are', *oli* 'was', *pole* 'is/are not') belonging to the most frequent word forms in Estonian. To enable comparison of the different forms our measurements were restricted to the duration of two stem sounds, e.g. [*on*], [*ol*]e, p[*ol*]nud. The connections with right neighbours were analysed separately for each word form. The co-occurrence frequencies were computed from Corpus of Written Estonian (newspaper subcorpus). In computing collocation strength the frequency of occurrence of the word form was also taken into account.

4 Analysis

We investigated how collocation strength might correlate with the durations of *olema* forms and what role it might play in predictive models. A moderate negative correlation between the collocation strength and the length of the *olema* verb forms was observed with all three readers (-0.432, -0.455 and -0.469 respectively). The hypothesis was tested by means of different statistical methods (linear regression, CART trees), enabling to disclose small, hidden, but possibly significant effects between input and output (Sagisaka 2003).

A simple durational model was compiled to predict the duration of the verb *olema* 'be' from collocation strength, length of phrase, position of the verb in the phrase, and a binary characteristic indicating whether a concrete verb form had just one syllable or more. According to the resulting models there were two features – the binary one and collocational strength – that were significant for all readers. The position of the verb *olema* 'be' in the phrase was shown as significant only by the CART tree drawn for the male reader. Consequently, in the material studied collocational strength does have an effect on the durations of the verb *olema* 'be'.

5 Conclusion

The pilot study demonstrated that the strength of collocation between words shortens the duration of the Estonian verb *olema* 'be' and that contextual predictability is a significant feature to be considered in developing models of word duration. Whether this indicates a stable relation between input and output or an occasional hidden one is a question pending further research involving measurement of collocation strength and durations of other words on more copious speech material.

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