

# Downtrends in Different Types of Question in Estonian

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## Abstract

The present paper investigates the issue of downtrends in different types of yes/no question in Estonian. The types that are compared comprise those beginning with an interrogative particle *kas* (whether), tag questions ending with the particle *või* (or), and morphosyntactically unmarked questions. It appears that these differ with respect to the slope of the fall in prenuclear accents and the step between the final prenuclear and nuclear accent. Tag and unmarked questions show a similar prenuclear slope but differ in the step; *kas*-questions have a significantly different slope from the other two types. A further comparison is made with statements, revealing that the question type most similar to statements is the *kas*-question. It is suggested that this is because the questioning particle in the beginning of an utterance signals a question immediately, and thus less intonational marking is needed. The other two types of question are either not marked morphosyntactically at all, or have marking only at the very end, and consequently a larger degree of intonational marking is used for conveying interrogativity.

## 1. Introduction

The issue of the intonation of different utterance types, although frequently addressed in many languages, has not been studied in any depth in Estonian. In the general linguistics literature on Estonian, one can find only occasional and not very specific references to the intonation of questions. Intonation is regarded as a possible means, although not an important one, for signalling a question [3, 12]. It is considered to be an additional rather than a primary device which can be used alongside grammatical markers such as interrogative particles, inversion and tags [3]. Similarly, in the closely related Finnish, it has proven to be problematic to pinpoint a specific interrogative intonation. [8] gives a list of intonational means that can be used for expressing interrogativity in Finnish; these include an initial high F0 peak, a high intonation level of F0, and less commonly, a final rise.

A reason for it being hard to establish the exact status of interrogative intonation, as suggested by [9], is the fact that Finnish uses a variety of grammatical forms for expressing a question. This can be contrasted with yet another Finno-Ugric language, Hungarian. Both Estonian and Finnish have several syntactic and lexical means for marking a yes/no question, whereas in the more distantly related Hungarian, the form of yes/no questions is identical to statements. Therefore, in Hungarian, the only way for making a distinction between statements and questions is by means of intonation [4], whereas Estonian and Finnish tend to prefer some sort of morphosyntactic marking, and may or may not use intonation for additional marking purposes. The case becomes more complicated when a morphosyntactically unmarked question

is used, which in both Estonian and Finnish is one of the many possible forms of the yes/no question. Statements and questions in Estonian have a globally falling pitch, and therefore a comparison between the downtrends of unmarked yes/no questions and statements is of particular interest.

Research into the issue of declarative versus interrogative intonation in a range of languages has led to a universal claim that questions have a higher pitch than statements (see [6] for references). There is no reason to believe that Estonian should behave differently and the few studies that have addressed the topic provide some preliminary confirmation. A perceptual study [14], using monosyllabic synthesised Estonian utterances as its stimuli, shows that higher pitch contours are perceived as questions whereas lower ones as statements. [2] compare the nuclei of statements and questions that start with an interrogative particle, and find that in Estonian the nucleus of a question has on average a higher pitch than that of a statement. It is suggested that this could be the result of a phonological choice (an upstepped nucleus) which may or may not be used by the speaker to signal a question. Similarly, in Estonian speech synthesis, the so called focused questions have been modelled with a step-up on the final accent [13]. It is, however, not at all clear what is meant by ‘focused’ and more research is needed in this field.

Some research into the acoustic correlates of interrogativity suggests that the intonation of different types of question can form a continuum from the most morphosyntactically marked to unmarked questions. For example, [5] shows for Danish, and [6] for Dutch, that declination, which is steepest for declarative utterances, is suspended or reversed in morphosyntactically unmarked questions; between these two extremes lie utterances with word order inversion and/or an interrogative particle, and non-final utterances. This model represents the so called ‘global’ or ‘superpositional’ side of the debate concerning the modelling of declination, which is opposed to the ‘local’ or ‘linear’ model [11]. In the ‘global’ model, F0 is a combination of a global component or overall line whose domain is the whole intonational phrase, and a succession of local F0 movements defining accents, whereas in the ‘local’ model, the F0 of each accent is determined locally, i.e. with respect only to the preceding accent, and any global trend arises as a by-product of the individual accents. However, according to [10] ‘superposition versus linear’ is not the real issue but rather whether the model incorporates ‘look-ahead’ or advanced planning (i.e. whether it takes into account the number of accents in the phrase). The experiment reported in this paper is relevant to this issue, but its implications will not be elaborated here.

The present study builds on [1] where the intonation of two types of Estonian question is compared. It appears that intonation plays a more important marking role in the case of morphosyntactically unmarked questions than in those marked by an interrogative tag, the difference between the

two types being manifested in the height of the nuclear accent. The aim of this paper is to add a third type of yes/no question to this comparison, and additionally, to make a comparison with the intonation of statements.

## 2. Method

### 2.1. Materials and procedure

This study includes the three most commonly occurring yes/no question types: (1) yes/no questions beginning with the question word *kas* (whether), where the questioning particle is added at the beginning of a declarative utterance without inversion (hence *kas*-questions), (2) tag questions, which are formed by adding the particle *või* (or) or its colloquial form *või* at the end of a declarative utterance, and (3) morphosyntactically unmarked questions which are identical in their form to statements.

The data was controlled for the number of accented and unaccented syllables. Each utterance contained four accents, separated by either one or three unaccented syllables, which means that the utterances consisted of either disyllabic feet (i.e. one accented plus one unaccented syllable), or tetrasyllabic feet (i.e. one accented plus three unaccented syllables). Three different meaningful utterances were constructed for each type of foot structure. All utterances start with a proper noun (the name of a person) followed by a verb in an unaccented position; the rest of the syntactic structure in the utterances varies slightly consisting of adverbials of place or time, or direct or indirect objects, and in one case an object complement (an infinitive of a verb). The two types of foot structure were used in the design in order to test, using Estonian, alternative models of downtrends, but this topic will not be discussed in detail in the present paper.

The data was recorded by five native speakers of Standard Estonian who were all females in their 20s from Tartu. The recordings were carried out in a quiet environment, using a Sony TCD D8 portable DAT tape recorder. The subjects read the utterances from four separate lists of similar semi-randomised blocks - one for each utterance type - where each utterance was repeated 5 times. The material of each speaker comprises 120 utterances.

### 2.2. Analysis

The data was digitised at 16 kHz on a Silicon Graphics Unix workstation. An F0 contour was computed for each utterance using Xwaves+. Utterances that contained a reading error or where a narrow focus was used on one of the accents were excluded from the analysis. Each utterance was measured at 13 or 14 points depending on the type. The following F0 values were measured for all types of utterances: the initial F0, the F0 maxima corresponding to the four accent peaks, the beginning and end of the three troughs between the accents, the beginning of the low sequence after the final accent, and the utterance final F0 value. For tag questions, an additional measurement was taken before the tag, i.e. at the end of the last content word. The time of each F0 value measured was also recorded. The measurements were taken in Hz but converted to semitones (st) in order to make a perceptually relevant comparison between the data of the 5 speakers. The present paper is only investigating downtrends in accent peaks (H\*), leaving the analysis of trough values for future work.

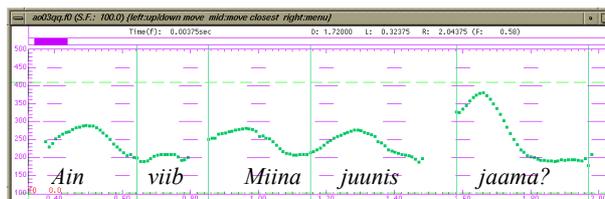


Figure 1: F0 trace of an unmarked question: 'Ain takes Miina in June to the station?'

All accents measured in questions were labelled as H\*+L. In statements, the nuclei were realised in two different ways: in addition to an H\*+L, a frequently occurring realisation on the nucleus was a low level accent, which in [2] is preliminarily called 'total downstep'. Such realisations of the nucleus were not measured and since they did not present a peak had to be excluded from the analysis.

In [1] the intonation of two types of question is compared by means of the height of accent peaks, but a more appropriate metric might be a value characterising the slope. At the same time it becomes evident from [1] that a separate treatment of nuclear and prenuclear accents is necessary. Figure 1 gives an example of an F0 trace of an unmarked question. As can be seen, it would be impossible to characterise this utterance with one trendline through accent peaks. It was therefore decided to use two separate metrics: prenuclear slope, and step from the final prenuclear to the nuclear accent. The prenuclear slope was calculated by subtracting the accent 1 value (a1) from the accent 3 value (a3), and for the step the accent 3 value was subtracted from the accent 4 value.

## 3. Results

Paired samples t-tests within each utterance type showed no significant difference in the realisation of pitch between the utterances of disyllabic and tetrasyllabic feet, which enabled the pooling of these two types. Means were calculated of the available repetitions within each type of question and statements. For the statistical analysis of the data, repeated measures analyses of variance (MANOVA) were used.

### 3.1. Prenuclear slope in questions and statements

Figure 2 plots the slopes from a1 to a3 for each utterance type. There is a significant effect of utterance type on the prenuclear slope ( $F(1.31, 5.23) = 19.9, p = 0.005$ , Greenhouse-Geisser correction). Planned comparisons using paired samples t-tests (conducted on the means of each utterance type) showed a significant difference of slope between tag and *kas*-questions ( $t(4) = -7.5, p < 0.01$ ), and between unmarked and *kas*-questions ( $t(4) = -11.6, p < 0.001$ ). However, there is no significant difference between the slope of tag and unmarked questions ( $t(4) = 1.1, p > 0.05$ ). Furthermore, planned comparisons of the slopes of each question type with statements revealed a significant difference between the slope of statements and tag questions ( $t(4) = -4.9, p < 0.01$ ), and statements and unmarked questions ( $t(4) = -3.9, p < 0.05$ ), but not between the slope of statements and *kas*-questions ( $t(4) = -0.4, p > 0.05$ ).

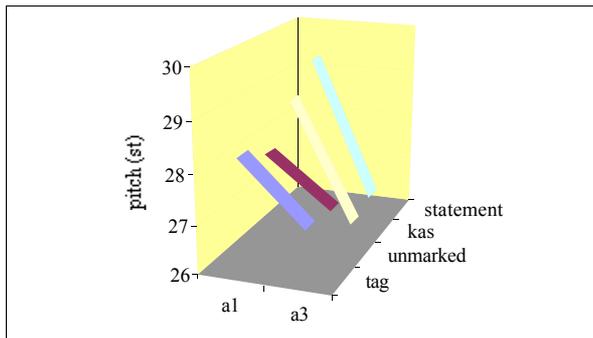


Figure 2: Prenuclear slopes in three types of question and statement (averaged over 5 speakers).

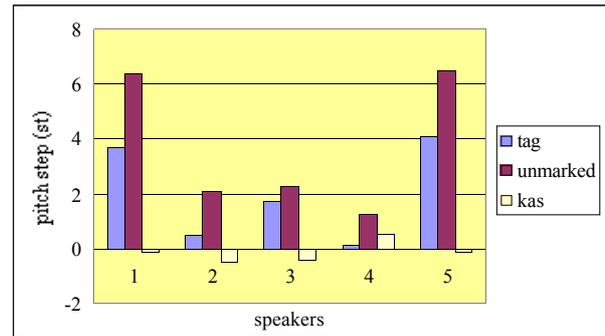


Figure 4: Steps from the final pre-nuclear to nuclear accent in three types of question for 5 speakers.

### 3.2. Step from final pre-nuclear to nuclear accent

It was possible to test the effect of utterance type on step from the final pre-nuclear accent to the nuclear accent only for the three types of question, because as discussed earlier, a large number of statements did not end in an H\*+L but in a low level downstepped accent. For a meaningful comparison, enough statement data would have been available only for two out of five speakers.

The analysis indicates a significant effect of utterance type on step ( $F(2,8) = 9.5$ ,  $p < 0.05$ , Sphericity Assumed). Planned paired samples t-tests showed a significant difference between the step of tag and unmarked questions ( $t(4) = 4.1$ ,  $p < 0.05$ ), and between unmarked and kas-questions ( $t(4) = -3.2$ ,  $p < 0.05$ ). The difference between the step of tag and kas-questions, however, was non-significant ( $t(4) = -2.5$ ,  $p > 0.05$ ).

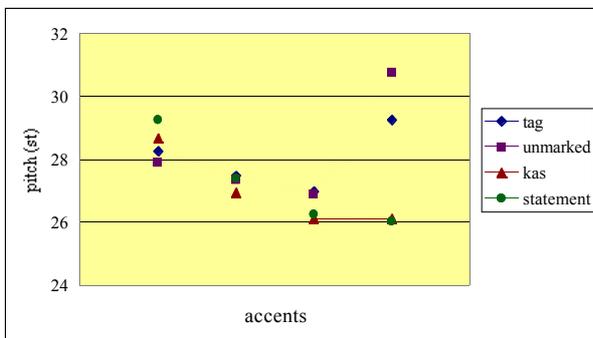


Figure 3: Summary of pitch trends for three types of question and statements.

Figure 3 plots the four accent peak values for all the utterance types averaged over five speakers. It has to be noted that tentatively the step value for statements is also plotted (even if it was not included in the statistical analysis).

Although the step size in tag questions looks much greater than in kas-questions, the failure to attain a significant result may be partly due to the wide variation in absolute step size between speakers and the idiosyncratic behaviour of one speaker. It can be seen from Figure 4 where the step sizes in the three types of question for each speaker are compared, that Speaker 4 shows a different trend for kas-questions. Her kas-questions have a step-up rather than a step-down, which can be seen for the other four speakers.

## 4. Discussion

The results show that the intonation of the three different types of yes/no question under investigation differs in many ways. The pre-nuclear accents in all types have a globally declining slope. Tag and unmarked questions have a similar pre-nuclear slope, but the crucial difference lies in the step size from the final pre-nuclear to the nuclear accent: the step in unmarked questions is significantly larger than in tag questions. The pre-nuclear slope in kas-questions, on the other hand, is steeper and does not differ from the slope in statements. The step size in kas-questions differs significantly from that in unmarked questions but not from that in tag questions. The latter can be explained by the relatively large variation between speakers in step of both kas-questions and tag questions. It seems that in kas-questions, both step-up and step-down are possible realisations.

These results can be interpreted in the light of previous work done on other languages [e.g. 5, 6] and a small-scale investigation of Estonian [1] where it is argued that less morphosyntactic marking in questions means a larger degree of intonational marking. The interrogative particle in the beginning of a kas-question signals a question immediately, which explains the steeper pre-nuclear slope similar to statements. In unmarked and tag questions, the slope is less steep; the morphosyntactic marking of interrogativity is lacking completely or appears only at the very end of the utterance, and is thus compensated by intonational marking. The fact that these two types of question differ with respect to the step to the nuclear accent gives evidence of a 'trading relation' between intonation and morphosyntax: the interrogative tag following the nucleus in tag questions is anticipated by a smaller step-up on the nucleus. Also, perceptually, it is an advantage for a listener to have, in the absence of an initial interrogative particle, an early intonational cue to interrogativity. This is in keeping with [7] who argue for Dutch that the marking of interrogativity is distributed over the whole utterance.

It is too early to involve Estonian in the declination debate. Preliminarily, the fact that the utterances with two different types of foot structure (initially designed to be tested against models of declination) did not differ significantly in their slopes and steps seems to lend support to the 'linear' side of the debate. On the other hand, the results of this study summarised in Figure 3 seem to speak in favour of the existence of some global patterns for different sentence-types.

They suggest a continuum of slopes of Estonian utterances as has been, for example, postulated for Danish [5].

## 5. Conclusions and further research

The aim of the present paper was to make a comparison between the intonation of three different types of yes/no question in Estonian, and additionally, compare them to statements. The data comprised morphosyntactically unmarked questions, tag questions, yes/no questions beginning with an interrogative particle *kas* (*kas*-questions), and statements.

The results support the view according to which there is a 'trading relation' between morphosyntactic and intonational marking in questions. The results also lead us to suggest that there is an interrogative intonation in Estonian, which in unmarked and tag questions is manifested by less declination in the prenuclear slope and a step-up on the nuclear accent. *Kas*-questions, however, look very similar to statements and do not seem to be marked intonationally in any reliable way.

It is planned to investigate the downtrends in troughs and to develop a more complete model of global trends in Estonian utterance types. Further research could also include samples of spontaneous speech data in order to investigate whether, and how far downtrends that are present in tightly controlled read data are realised in colloquial speech.

A more detailed study of the declinational properties of Estonian would contribute to the general debate about modelling intonation. More thorough knowledge of the intonation of different utterance types has immediate practical value for the development of Estonian speech synthesis.

## 6. Acknowledgements

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