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ON THE TEMPORAL STRUCTURE OF ESTONIAN SECONDARY-STRESSED FEET*

Abstract. The article focuses on Estonian words of two and more feet, comparing the temporal structures of the feet in words of four to six syllables that consist of short primary- and secondary-stressed syllables. A phonological introduction to the problem of secondary stress in Estonian is followed by the treatment of lengthening of vowels in secondary-stressed feet. The article then analyses duration ratios on the basis of phonetic data. The pronunciations of the western and eastern peripheries of Estonia — western Saaremaa and eastern Võrumaa — are compared to follow possible regional differences in Standard Estonian. It appears that only in Saaremaa the unstressed vowel in a secondary-stressed foot has generally lengthened, and the duration ratios of the secondary-stressed foot are similar to that of the primary-stressed foot. In both areas the temporal structure of feet depends on the general structure of the prosodic word.

Keywords: Estonian, prosody, quantity, foot, secondary stress.

1. Main structure of Estonian feet

The stem of a simple word may have 1—9 syllables in Estonian, cf. *au* 'honour' and *va·stasti*:*kusta*:*tama*:*tuma* 'not being placed opposite each other anymore (Gen.)'. Usually Estonian words contain 1—6 syllables. A stem may be followed by an inflectional formative that may consist of a number of syllables, and a word may end in the emphatic enclitic *-gi*, e.g. *va·stasti*:*kusta*:*tama*:*tuma*:*teta*:*gi* 'even without not being placed opposite each other anymore (Gen.)'. With the exception of a few monosyllabic words that are usually unstressed in the sentence and form a foot, leaning against a stressed word,[1] a word has at least one stressed syllable.

In an Estonian simple word the position of stresses, and thus the division of the word into feet, generally follows the trochaic rhythm structure, whereas the first syllable carries the primary stress (e.g. *pa·rane*:*sin* 'I

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[1] In certain syntactic positions unstressed words may carry stress, where occurring together with other unstressed words, and form feet in order to ensure the sentence rhythm, cf. *Aga ma· ju nä·gin*! 'But I saw it!'.

recovered', *e·lasi:me* 'we lived').[2] A trisyllabic simple word typically consists of a single foot in contemporary Estonian, where the stressed syllable is followed by two unstressed syllables (*ho·bune* 'horse', *ho·bused* 'horses'). Previously it was assumed that such words carry a secondary stress in the second syllable in case the last syllable is short (*ho·bu:ne* 'horse') or in the third syllable if the last syllable is long (*ho·buse:d*, see Ariste 1946 : 91). Later the final third syllable was claimed to carry the secondary stress only when including a diphthong (*ho·busei:d* 'horses (Part.)') or a consonant cluster (*ho·buse:lt* 'from the horse', see Ariste 1963 : 119).

If a prosodic word has five syllables or a larger odd number of syllables, the last secondary-stressed foot is usually trisyllabic (*pa·rane:sime* 'we recovered', *e·lasi:megi* 'actually we lived'). However, in multi-foot words morphological constraints enable trisyllabic primary-stressed feet where the stressed syllable is followed by two unstressed syllables. For example, the action noun marker *-mine* and a number of derivational affixes usually form a foot of their own, e.g. *pa·ranemi:se* 'of recovery', *e·lami:segi* 'even lodgings'; nevertheless in such cases it is possible to apply also the trochaic model, such as *pa·rane:mise* 'of recovery'.

Historical syncope has given rise to monosyllabic feet that can be immediately followed by a foot with a secondary-stressed syllable, especially before certain derivational affixes (*e·estla:ne* 'Estonian'). These conditions have caused such a situation where in Estonian it is impossible to predict the division of longer simple words into feet on the basis of the number of syllables. In addition, one can observe alternations caused by the dynamics of the stress system and regional differences.

The relation between word quantity and secondary stress has been discussed extensively in the previous prosodic descriptions of Estonian. The first set of problems concerns the question how the quantity of the primary-stressed foot affects the position of secondary stress. Another research problem is whether the quantity oppositions are the same in secondary-stressed and primary-stressed feet.

Already Paul Ariste pointed to the impact of the durational relations of the non-initial syllables on the structure of the primary-stressed foot and, thus, the complex nature of the word as a prosodic whole. For example, secondary stress in a five-syllable word may fall on the fourth syllable if followed by a geminate (*i·lusama:te* 'of more beautiful (Pl.)', see Ariste 1963). Neither P. Ariste nor the earlier Estonian grammatical tradition determined quantity degrees in secondary-stressed feet outside gradational affixes. Accordingly, it was claimed that the secondary-stressed feet have a more simple structure by comparison with primary-stressed feet. Ilse Lehiste (1965) was the first to break away from this tradition, postulating that stresses and quantities are independent of each other in Estonian and that one can distinguish between all three quantity degrees in a syllable following a Q3 syllable. Taking into account that a Q3 syllable alone may constitute a foot, one can conclude from I. Lehiste's claim that in Estonian

[2] Some interjections (e.g. *aitä·h* 'thanks', *ennäe·* 'look') and many foreign words (*idee·* 'idea') are excluded from this general scheme because their stress is not on the initial syllable. One should take into account that the letters *p, t, k* stand for geminate stops on the syllable boundary and the letters *b, d, g* stand for short voiceless stops.

the structures of primary-stressed and secondary-stressed feet are in principle similar.

The study on Estonian word phonology by Mati Hint focused on syllable structures, stating the existence of three kinds of quantity contrasts even in the final syllable of a word (Hint 1973 : 58). M. Hint's comprehensive rules highlighted an extensive stress variation and in addition to the neutral patterns also emphatic patterns that P. Ariste had treated separately from the usual main and secondary word stress. Tiit-Rein Viitso (1975), when reviewing the thesis by M. Hint, claimed that the differences in the previous treatments of Estonian secondary stress could have arisen from different language competence. His lists of stress patterns (e.g. Viitso 1979 : 139—140) reveal differences in the structures of primary- and secondary-stressed feet. According to T.-R. Viitso, a secondary-stressed syllable may be followed only by an unstressed syllable, and the word-final long syllables tend to be unstressed, with the exception of after two unstressed syllables (*e·lajali:k* 'beastly'; cf. Viitso 2003 : 16—18).

The previous definitions of secondary stress and secondary-stressed feet in Estonian are mostly based on the language competence of the authors. The differences could have been caused by differences in perception. The following empirical study is an attempt to characterize the structure of secondary-stressed feet in two peripheral areas of Estonia and proceeds from phonetic evidence. The analysis will focus on the comparison of duration ratios in primary- and secondary-stressed feet of short syllables for which there exist also some data of earlier phonetic measurements (Lehiste 1968; Sepp 1980).

2. Lengthening of unstressed vowels in secondary-stressed feet and the problem of foot isochrony

Foot isochrony is a major feature of Estonian prosody (see Ross, Lehiste 2003) which explains lengthening of the vowel of an unstressed syllable that follows a short stressed syllable. It means that the vowel of an unstressed syllable is consistently longer than the short vowel of a preceding stressed syllable, that is, the duration ratio of V2 to V1 is more than 1.20. It has been pointed out that the ratio differs considerably depending on the speaker's dialect background; the difference is the greatest (> 1.50) in south-eastern Estonia and on western Estonian islands (Sepp 1980 : 98—101; Ariste 1941) and smaller in the north-eastern coastal dialect (< 1.25) where this vowel lengthening occurs only at the absolute end of the word. Central Estonian pronunciation remains somewhere in the middle between these two extremes (1.25—1.40), which is the closest to Standard Estonian pronunciation (Sepp 1980 : 99).

The lengthening of the vowel of an unstressed syllable has been usually measured in the second syllable of disyllabic words, in which case connexion of this lengthening of unstressed vowel with word-final lengthening remains open. I. Lehiste (1968), however, showed by analysing the speech of a North Estonian informant that the vowel in the second syllable undergoes lengthening also in trisyllabic and tetrasyllabic words (in a disyllabic word V2/V1 = 1.21, in a trisyllabic word 1.28, in a tetrasyllabic word 1.33). The measurements showed a similar lengthening of the unstressed vowel also in the secondary-stressed foot of tetrasyllabic words, even to a greater

extent (V4/V3 = 1.63). I. Lehiste claims on the basis of her results that an Estonian tetrasyllabic word is divided into two disyllabic units that are similar to a disyllabic word (Lehiste 1968 : 301). Thus, in this case there is no difference between the primary- and secondary-stressed feet, and foot isochrony operates also in secondary-stressed feet.

Arvi Sepp (1980) studied the temporal structure of the short feet of two-, four-, and six-syllable words on the basis of test sentences read by six informants. Five of the informants had a northern or central Estonian background, one descended from southern Estonia. The speech of all the informants revealed lengthening of the unstressed vowel of the primary-stressed foot. The tetrasyllabic test word *ka·vala:ma* 'more cunning (Gen.)' was pronounced with lengthening of the unstressed vowel in the secondary-stressed foot by all the speakers (V2/V1 = 1.36; V4/V3 = 1.57; in the speech of southern Estonian informant V2/V1 = 1.48, V4/V3 1.62, see Sepp 1980 : 96). But the six-syllable word *ka·vala:male:gi* 'even to the more cunning' revealed a difference — unlike the other speakers the speech of the informant with the South Estonian background did not show lengthening of the unstressed syllable in trochaic secondary-stressed feet. Accordingly, at least in the pronunciation of the same informant the lengthening of the final-syllable vowel of the tetrasyllabic word must have been caused by word-final lengthening. In the case of the alternative pronunciation where the word was divided into two trisyllabic feet (*ka·valama:legi*), this informant, however, lengthened the vowel of the unstressed syllable that follows the stressed syllable of a secondary-stressed foot. The possible difference, on the one hand, between the northern and central Estonian pronunciation, and the southern Estonian pronunciation, on the other, was manifested also in the fact that while in the first case the vowel of the stressed syllable of the secondary-stressed foot was shorter than the preceding vowel of the unstressed third syllable, then it was longer in the southern pronunciation (Sepp 1980 : 95). A. Sepp's findings show that in northern Estonian the structure of Q1 primary- and secondary-stressed feet is similar, but southern Estonian reveals some specific differences. The latter enable us to divide the pronunciation of Estonian into at least two basic types.

When describing the basic phonological rules of the prosody of Setu South Estonian, which is spoken in the farthest south-eastern periphery from central Estonia, Paul Kiparsky and Karl Pajusalu (2001) postulated the difference between lexical and non-lexical feet. According to this approach, in Setu lengthening of an unstressed vowel occurs only in primary-stressed feet and feet with a lexical secondary stress (see also Pajusalu 2002 : 202 et seq.). The following part of this article checks by means of acoustic phonetics whether this hypothesis is more broadly valid in southern Estonian and can be supported by data from the insular dialect in the western Estonia.

3. Secondary-stressed feet in the usage of western Saaremaa and eastern Võrumaa

3.1. Research material and method

In order to carry out the study, in 2004 we recorded three middle-aged (born 1948—1971) males and females in the parishes of Anseküla, Kihelkonna, and Mustjala in western Saaremaa, and three middle-aged (born

1946—1974) males and females in the parish of Rõuge in Võrumaa in south-eastern Estonia. The informants were asked to read 4-to-6-syllable words in a three-word sentence in Standard Estonian; the test word was positioned in the middle of the sentence. The test included altogether 140 words having as different as possible structures of primary- and secondary-stressed feet. The present study analyses 37 words with the CVCV(CV) structure of the secondary-stressed foot. The informant text was recorded with a Sony TCD-D 100 DAT tape recorder, using an AKG D40S microphone. The acoustic analysis was carried out by PRAAT software, we measured the durations of all the speech sounds. The position of secondary stresses and the quantity of feet were established by the authors of the article by ear.

3.2 Secondary-stressed feet in tetrasyllabic words

The quantity of the primary-stressed syllable served as a criterion for dividing the tetrasyllabic words under discussion into three groups: (1) Q1 words with primary-stressed feet, e.g. *ta·gada:gi* 'even to ensure', *sa·geda:mad* 'more frequent ones'; (2) Q2 words with primary-stressed feet, e.g. *kõi·guta:gu* 'may they rock', *oo·datu:mad* 'more welcome (guests)'; (3) Q3 words with primary-stressed feet, e.g. *kõi·kuda:gi* 'even to rock', *au·sama:ga* 'with more honest'. Table 1 shows the duration ratios of Q1 words with the primary-stressed feet.

Table 1

Vowel durations (ms) and duration ratios in Q1 tetrasyllabic words

	N	V1	V2	**V2/V1**	V3	V4	**V4/V3**
Võrumaa	10	95	110	**1.16**	79	77	**0.97**
Saaremaa	11	72	91	**1.26**	55	78	**1.42**

Table 1 shows that in the case of a Q1 primary-stressed foot the southern Estonian data from Võrumaa do not reveal any lengthening of the unstressed syllable of a secondary-stressed foot. It is in line with A. Sepp's observation (1980) about southern Estonian usage on the basis of the pronunciation of six-syllable words. The pronunciation of Saaremaa, however, does show lengthening, and, similarly to previous studies of northern Estonian pronunciation, it exceeds even in a secondary-stressed foot that of a primary-stressed syllable. Both in Võrumaa and Saaremaa the lengthening of the vowel in the unstressed syllable of a primary-stressed foot is less in comparison with the characteristic lengthening of disyllabic words in these areas. Also, our additional analysis shows that in the disyllabic words of the same informants from Võrumaa the ratio of the vowel in an unstressed syllable to that in a primary-stressed syllable is over 1.5.

3.3 Secondary-stressed feet in pentasyllabic words

In pentasyllabic words secondary stress may be positioned in a different way. Both in Võrumaa and Saaremaa it is more common that a disyllabic primary-stressed foot is followed by a trisyllabic secondary-stressed foot, as in *sa·geda:maga* 'with more frequent' pro *sa·gedama:ga*. In both areas only one informant used the second possibility in such words. In our data

the Q3 primary-stressed foot is regularly disyllabic, e.g. *o·kkali:sega* 'with thorny'. There are no trisyllabic primary-stressed feet in pentasyllabic words. Marginally in Võrumaa this word type can carry a secondary stress in the second syllable, whereby the word has two secondary stresses, as in *o·kka:lise:ga* 'with thorny'. A trisyllabic primary-stressed foot was common only in Q1 and Q2 words if the fourth syllable carried a morphologically-conditioned secondary stress, e.g. *pi·kenemi:se* 'of lengthening (Gen.)'. But the morphological positioning of the secondary stress may not work if there is a geminate on the boundary between the second and the third syllable. Thus, four people from Võrumaa and three from Saaremaa pronounced *re·duta:mise* 'of hiding (Gen.)' and *sa·kuta:mise* 'of tugging (Gen.)', and this foot structure was also common in such words as *re·duta:nuga* 'with a person who had been in hiding' and *sa·kuta:nuga* 'with a person who had tugged', where the affix *-nu* remained without a morphological secondary stress. Table 2 below provides an overview of the duration ratios of feet in pentasyllabic Q1 words.

Table 2

Vowel durations (ms) and duration ratios in pentasyllabic Q1 words

Secondary stressed syllable		N	V1	V2	**V2/V1**	V3	V4	V5	**V4/V3**
S3	Võrumaa	9	100	102	**1.02**	79	90	88	**1.14**
	Saaremaa	10	95	91	**0.96**	57	72	82	**1.26**
									V5/V4
S4	Võrumaa	7	95	71	**0.75**	62	67	80	**1.19**
	Saaremaa	5	107	96	**0.90**	80	92	125	**1.36**

The vowel of an unstressed syllable does not undergo lengthening in a primary-stressed foot of pentasyllabic words either in Võrumaa or Saaremaa. In the case of a trisyllabic primary-stressed foot in Võrumaa the vowel of an unstressed second syllable is even much shorter than the vowel of a stressed syllable. The last unstressed vowel of a primary-stressed foot (V3) is slightly shorter than the stressed vowel of a secondary-stressed foot (V4), whereas it is more so in Saaremaa than in Võrumaa. In a disyllabic secondary-stressed foot the unstressed vowel is lengthened to a greater extent. The latter could be explained by a different durational distribution between the syllables in a trisyllabic foot but also by a possible additional impact of the final lengthening of the word. However, regardless of the secondary stress the third syllable is pronounced most shortly, which points to a certain durational similarity of both pronunciation patterns.

3.4 Secondary-stressed feet in hexasyllabic words

In the case of hexasyllabic words it appears that often a word consists of two trisyllabic feet. This pattern is prevalent in words with Q3 primary-stressed feet, e.g. *hu·kkunuke:sega* 'with the little perished one' and *au·tuimake:seta* 'without the most dishonest little one'. In southern Estonian usage of Võrumaa the second syllable can marginally carry an additional

secondary stress, e.g. *hu·**kku**:nuke:sega*. The Võrumaa informants pronounced Q1 hexasyllabic words more frequently with one secondary stress, e.g. *sa·gedama:gagi* 'even with more frequent'; the western Saaremaa informants, on the other hand, pronounced them more often with two secondary stresses, e.g. *sa·geda:maga:gi*. The Võru informants, however, usually pronounced Q2 words with a trochaic pattern, as in *sa·**kuta**:mise:gi* 'even of tugging'. Table 3 below presents the data about hexasyllabic words consisting of short syllables.

Table 3

Vowel durations (ms) and duration ratios in hexasyllabic Q1 words

Secondary stressed syllable		N	V1	V2	**V2/V1**	V3	V4	**V4/V3**	V5	V6	**V5/V6**
S3, S5	Võrumaa	9	109	131	**1.20**	79	140	**1.77**	117	125	**1.07**
	Saaremaa	4	106	153	**1.44**	99	144	**1.45**	130	152	**1.17**
											V4/V5
S4	Võrumaa	3	102	99	**0.97**	78	123	**1.58**	115	112	**0.93**
	Saaremaa	7	88	85	**0.97**	59	94	**1.59**	80	57	**0.85**

By comparison with pentasyllabic words both in Võrumaa and Saaremaa hexasyllabic words are pronounced much more slowly. If a word is pronounced as three trochees, the lengthening of the unstressed syllable will become more prominent in both regions both in the primary stressed foot and the first secondary-stressed foot. The first secondary-stressed foot is pronounced with an extensive lengthening of the vowel of the unstressed syllable, which corresponds to the typical extent of a disyllabic word. One might assume that the words with the maximum middle foot have been pronounced similarly to compound words. The second secondary-stressed foot reveals a negligible lengthening of the unstressed syllable, and it could be related to the final lengthening of the word.

Similarly to the trisyllabic feet of pentasyllabic words, the trisyllabic feet of hexasyllabic words do not involve the half-length vowel of the unstressed syllable following the stressed syllable. It does not occur either in primary-stressed or secondary-stressed feet. Nevertheless in hexasyllabic words with trisyllabic feet the duration ratios are in several ways similar to the ratios of hexasyllabic words pronounced as three trochees. These words, too, reveal a similar V4 and V3 ratio although V4 is stressed and V3 unstressed. In both cases the shortness of V3 and protractedness of V4 are remarkable. Apparently, there are similar durational patterns of hexasyllabic words where the position of the secondary stress is determined by other parameters than duration, and stress has no significant impact on the duration of syllables.

4. Conclusions

Our analysis of the pronunciation of Võrumaa and Saaremaa informants shows that multi-foot words in Estonian cannot be interpreted as identically structured sequences of feet. Tetrasyllabic, pentasyllabic, and hexa-

syllabic words are characterized by specific durational patterns. At this the lengthening of the vowel in an unstressed syllable is not a permanent feature. It is absent from the secondary-stressed feet of Q1 words in the southern Estonian pronunciation of Võrumaa, or it occurs minimally at the end of a word, which could be explained at least partly by word-final lengthening. The first secondary-stressed foot in hexasyllabic words is an exception; here one can observe extensive lengthening in both regions. Such words could be interpreted as following the pronunciation pattern of compound words. The western Saaremaa pronunciation revealed lengthening of the secondary-stressed foot in the trochaic feet of tetrasyllabic and pentasyllabic words. But similarly to Võru, such lengthening was not revealed in trisyllabic feet, even after a primary-stressed syllable of pentasyllabic and hexasyllabic words. The duration ratios of a trisyllabic foot are different from those in a disyllabic foot.

Regardless of the position of the secondary stress, in both peripheries of Estonia pentasyllabic and hexasyllabic words are characterized by a similar basic pattern of the temporal structure of the word. The third syllable is the shortest; the following fourth syllable is much longer regardless of the fact whether it is stressed or unstressed. The temporal structure do not have a decisive role in the positioning of the stress. To do this, future studies will have to focus on fundamental frequency and intensity.

The results of the article show that there is a need to study the prosodic structure of Estonian multi-foot words as a whole. In doing so the local background of informants should be taken into consideration.

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КАРЛ ПАЮСАЛУ, ТООМАС ХЕЛП, ПЯРТЕЛ ЛИППУС, ЭЛЛЕН НИЙТ, ПИРЕ ТЕРАС, ТИЙТ-РЕЙН ВИЙТСО (Тарту)

СООТНОШЕНИЕ ДЛИТЕЛЬНОСТЕЙ РЕЧЕВЫХ ТАКТОВ С ВСПОМОГАТЕЛЬНЫМ УДАРЕНИЕМ В ЭСТОНСКОМ ЯЗЫКЕ

В статье рассматриваются эстонские слова с двумя и более речевыми тактами, при этом сопоставляются длительности речевых тактов у слов с главным и второстепенным ударением, состоящих из коротких слогов (от четырех до шести). После фонологического обзора проблематики второстепенного ударения в эстонском языке авторы сосредотачивают свое внимание на удлинении гласных безударного слога. Далее анализируются соотношения длительностей гласных в речевых тактах с помощью фонетических измерений. Сопоставляя данные, полученные на западной и восточной окраинах Эстонии — запад о-ва Сааремаа и восток Вырумаа, в статье прослеживаются возможные региональные различия в произношении общеэстонского языка. Оказывается, что на о-ве Сааремаа гласный безударного слога по сравнению с гласным предшествующего ударного слога больше удлинился, чем в Вырумаа, и соотношения длительности такта с второстепенным ударением близки с таковыми ударного слога. И все же в обоих ареалах длительности тактов зависят от общей просодической структуры слова. В определенных многотактовых структурах слов гласный безударного слога не удлиняется даже в такте с главным ударением — и это как в Вырумаа, так и на Сааремаа. Результаты работы показывают, что просодическую структуру многотактовых слов следует изучать как единое целое. При этом необходимо обращать внимание на происхождение информантов.