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WHY SYLLABIC QUANTITY? WHY NOT THE FOOT?

1. The alternatives

The research into Estonian quantity has reached a point where many scholars have abandoned the doctrine of three phonological quantity degrees for all Estonian vowels and consonants.

Now, besides the doctrine of ternary contrasts there are other competing theories of quantity in Estonian: 1) the quantity patterns are defined by the segmental structure and prosody of the stressed syllable, and 2) the quantity patterns are realized in the two-syllable sequence (or the foot, or the stress group, or the *Sprechtakt*), the ratio of durations of the first and the second syllables being the most important cue in the perception of quantity degrees. The second view is strongly supported by phoneticians Arvo Eek, Einar Meister, Ilse Lehiste and Kalevi Wiik.

The paper propounds arguments in favour of the syllable: the domain of prosodic patterns in Estonian is the foot (stress group, *Sprechtakt*), but only the structure of the stressed syllable is relevant in determining the quantity degree of both the syllable and the foot; the second or/and third syllable(s) of the foot have no direct influence on the quantity of the first stressed syllable, except the fact that the feet with the first syllable in Q1 or Q2 must have at least two syllables. But this is a phonotactic constraint. The unstressed second (and third, if there is any) syllables have no distinctive prosodic structure, all they have is segmental structure.

Why syllabic quantity, why not the structure of the whole foot?

1. The feet in Q1 and Q2 must consist of two syllables, but may consist of three, and adding a third syllable does not influence the quantity of the first syllable at all: *kalale*, *kaalutleb*. A recent paper by Ilse Lehiste does not confirm the importance of the foot structure as a whole in durational patterns: the duration of the three-syllable foot in Finnish folk songs is approximately 40% longer than that of the two-syllable foot. There is almost no tendency to accommodate the duration of a foot to some timing measure of the foot (Lehiste 1997c). The third syllable of the foot does not influence the quantity of the first syllable. But what about the second syllable?

2. You may alter the structure of the second syllable, and this does not influence the quantity of the first syllable either: the first syllable in *kalà* — *kalàs* — *kalast* — *kalaks* or *kaalù* — *kaalün* — *kaaluks* are in Q1 or Q2 irrespective of the structure of the second syllable. And if the duration of the open second syllable is predictable from the quantity of the first syllable, this is exactly what a phonologist regards

as dependent features. In conclusion: the structure of the first stressed syllable determines the phonotactical *musts* and *maybes* of the following syllable(s), not *vice versa*.

3. You may have monosyllabic Q3 feet (*Sprechtakte*), which are both phonetically and phonologically parallel with disyllabic Q3 feet: `raks — `raksu — `raksus — `raksuks (non-standard pronunciation) are all in Q3. You may have monosyllabic Q3 feet in succession in connected speech (`kehr `kõhn `poiss `läks `kepp `käes; `tõu `suur `selts `kond `likkus; `rõht `palk `sein, `jalg `pall, `välk `matt) or followed by two-syllable feet (`kunst `likkus, `mäes `tikke, `kont `serte). The assertion by A. Eek and E. Meister (1997 : 93, 95) that a stress foot must be at least disyllabic proceeds from the foot theory, and not from the fact that a syllable in Q3 may make up a foot.

4. The phonological rules for the description of the production of well-formed Estonian word forms do not need any reference to the ratio of durations of the first and second syllables. The unstressed syllable, whether open or closed, is fully describable as a chain of segmental phonemes only. It is not plausible that the phonological theories of production and perception are different and make use of different phonological concepts. The description of Estonian cannot proceed from the conviction that in Estonian everything may be fundamentally different from all the other languages (as it does in the theory of ternary quantity oppositions of vowels and consonants).

2. Why not the foot?

The ratio theory has a half a century long history. Not fully believing in the theoretical possibility of ternary oppositions and searching for binary solutions, already Lauri Posti (1950) proposed a binary explanation for Estonian quantity contrasts.

L. Posti proceeded from the binary oppositions both in the first and the second syllables: short and long contrasting in the first syllable (Ist and non-Ist quantity degree), and a half-long vowel contrasting with a short vowel in the second syllable (differentiating the II and III degrees of quantity in a two-syllable sequence). In this explanation the phonetically half-long vowel of the second syllable must be considered phonologically long (as L. Posti does), or it has to be regarded as an independent degree of phonological length (one more phonological quantity degree in Estonian!). Either solution is impossible for many reasons, including the predictability of this half-length and the inconsistency of its occurrence. Paavo Ravila (1961) analyzed L. Posti's theory and considered the whole structure of the two-syllable sequence to be relevant for quantity distinctions, but he did not say how to interpret the relations within this two-syllable unit phonologically.

Georg Liiv published many reliable experimental data about the duration relations of vowels in the first and second syllables ($V_1 : V_2$) in words of different degrees of quantity (e.g. Liiv 1961; 1962).

The concept of the phonological word or speech tact (synonymous with stress group, *Sprechtakt*, foot) in Estonian was elaborated at the end of 1960s in different works by M. Hint (Hint 1968; 1973; cf. Lehiste 1965). The phonological word was considered as the domain of prosodic patterns: stress and quantity patterns manifest themselves and are repeated within the boundaries of the phonological word.

But the views about what is phonologically relevant and what is phonologically redundant (dependent) within the boundaries of this unit for determining the quantity degrees are not unanimous.

The author of this paper has advocated a phonological interpretation according to which the domain of prosodic patterns is the speech tact (phonological word, stress group, *Sprechtakt*, foot), but the segmental and prosodic composition of the first stressed syllable alone bears on the quantity degree (Hint 1997a; 1997b). The length of the vowel of the second syllable is redundant, dependent, and predictable; the unstressed nature of the second syllable following the first syllable in Q1 or Q2 is predictable as well.

In the 1980–90s the concept of the two-syllable sequence as the domain of Estonian quantity patterns was again advocated in many papers by Kalevi Wiik, Arvo Eek, Einar Meister, Ilse Lehiste (most recently, e.g., Lehiste 1997a : 27 ff.; Eek, Meister 1997 : 75, 83 ff.; Wiik 1997¹ : 323–324).

The new things in these publications are the more detailed experimental data and an innovated terminology pertaining to the foot or stress group.

But the main phonological problems remain unsolved: how to interpret ratios of syllable durations phonologically, how to explain monosyllabic Q3 feet, how to phonologize segments in the second syllable of the foot, how to harmonize the theories of speech perception and speech production for Estonian, how to avoid *ad hoc* phonological theories for Estonian.

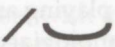
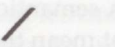
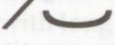


The theory of ternary oppositions of Estonian vowels and consonants is a perfect example of an *ad hoc* phonological theory, which leads towards a chain of assertions beginning with the words "unlike any other language, in Estonian there is/are ..." If the ratio theory cannot solve the aforementioned problems, it will turn into just another *ad hoc* theory which heavily relies upon the absolute exceptionality of the Estonian language.

3. Why syllabic quantity?

My argumentation in favour of feet as the carriers, or domains, of prosodic structure, and the stressed syllable as the only bearer of quantity is supported by parallels of stress patterns: stress and weak stress are manifested in a chain of syllables, but stress is present or absent in any concrete syllable (not in a foot as a whole); although stress is perceived as contrast between stressed and unstressed syllables, there are phonetic parametres within stressed syllables which allow to identify them as stressed; in the same way the quantity degree is dependent only upon the structure of the stressed syllable, not upon the structure of the two- or three-syllable sequence.

This argumentation is phonological, but recent papers by the phoneticians Ilse Lehiste, Arvo Eek and Einar Meister are taken into account. Contrary to Ilse Lehiste, I do not consider the third degree of quantity an exception in respect of the number of syllables in the foot (Lehiste 1997a : 11): the length of the foot in the case of Q1 and Q2 is two or three syllables and in the case of Q3 one syllable (*kehv*, *kaal*) or two (*raske*) or (?) three (*kaalusin*) syllables. In any case, if Q3 is an exception, the phonological theory of Estonian cannot put this exception aside, because almost all the problems of quantity in Estonian phonology are connected with syllables and feet in Q3.

¹ In this review of Hint 1997a, K. Wiik commits an absolutely unbelievable mistake: he asserts that according to M. Hint the suprasegmental feature (prosodic phoneme) differentiating between Q2 and Q3 is stress — a syllable in Q3 is stressed but there is no stress in a syllable in Q2 (Wiik 1997 : 323). This is quite erroneous: I have always said that the opposition of Q2 and Q3 is possible only in the stressed syllables, stress being the prerequisite for any Q2 : Q3 opposition. This is repeatedly discussed in the book K. Wiik reviews, and even on the jacket of the book there is a scheme which illustrates the same idea.

Feet before Q3 emerged	Feet in contemporary Estonian
 <i>tere, jalga</i>	 <i>ˈkehv, ˈkõhn, ˈpoiss, ˈjalg</i>
 <i>orava, metsaste</i>	 <i>tere, ora, ˈjalga</i>
	 <i>orava, metsale, ˈmetsade</i>

When considering syllabic quantity the question is: is the syllabic Q3 the sum of segmental quantities, of which at least one has to be in Q3, or are the syllabic Q2 and Q3 but prosodic counterparts having the same segmental structure, Q3 being interpreted as a prosodic transformation of a syllable in Q2?

The first conception is classical in Estonian linguistics; however, it avoids dealing with syllables where diphthongs are in the position of syllable nuclei and consonant clusters at the boundary of the first and the second syllables (*ˈlaulu, ˈmetsa, ˈkonksu, ˈausta*): it is not possible, without contradictions, to define the phonological segments in such syllable types as belonging to Q1, Q2, or Q3.

Even as late as 1997 Ilse Lehiste repeats her ternary explication of Estonian quantity in word series *sada — saada — ˈsaada* and *taba — tapa — ˈtappa*, without asking how quantity works in more complex syllable types (Lehiste 1997a; cf. Lehiste 1965). In these series it is easy to arrive at a typically phonetic theory of ternary oppositions.

Happily enough there is some progress in this respect: the paper by A. Eek and E. Meister (1997 : 83–84) proceeds from the parallelism of syllables with long vowels and diphthongs, on the one hand (*saada* and *ˈsaada*, *ˈlauda* and *ˈlauda*), and geminated consonants and clusters, on the other hand (*samma* and *tahma*, *ˈsamma* and *ˈtahma*). This turning from segments towards the structure of long syllables is a landmark which manifests the failure of the segmental approach.

Revealing is the wording by I. Lehiste (1997b : 160): "Segmental durations alone do not necessarily reveal the quantity degree of the word in which they appear. For example, /t/ in C₁ position of type 11, *vaatate*, has the same duration (156 msec) as /p/ in C₁ position of type 5, *kepiga* (154 msec); but *vaatate* is in Q3 and *kepiga* is in Q2. V₁ of the Q2 word *vaadata* is 170 msec, while V₁ of the Q3 word *vaatate* is 164 msec. Of course, the contrastive prosodic word types that share a segmental duration in a given position differ in other respects — structure of the entire metric foot of which the segments constitute a part, position of F0 peak in V₁, value of F0 at the end of V₁ etc.: the point is that all these features have to be specified in order to assign the word to its prosodic type."

It is clear that assigning quantity degrees to segments (and not to syllables) is an inadequate solution. The syllable types of the first syllables in *vaatate* and *kepiga* are totally different. It is not possible to deduce the phonological quantity degrees of syllables from the quantities of segments, while it is possible to identify the quantity degree of the whole syllable. Describing all the phonetic parameters in the disyllabic sequence cannot be the end point of analysis — it is necessary to differentiate between the relevant, independent features, and the redundant, dependent features. I assume that for quantity the relevant features are located in the stressed syllable.

4. The second and the third syllables of the foot

The same problems are essential in respect of non-first syllables. Up to now the role of the second syllable in the quantity patterns has been considered mainly from the point of view of the identification of the quantity degree of the word (or foot, or phonological word, or stress group). No doubt, the second syllable and the word structure have a role in the perception of quantity. In a real situation of

speech perception the identification of quantity involves constant guessing on different linguistic levels, of which semantics and sentence structure are playing an important role. But this does not mean that these factors should be phonologized as a part of phonological theory.

The same pertains to the role of the second syllable in perceiving the quantity degree of the first stressed syllable. Really, in many cases the half-long vowel of the second syllable may be an additional clue in determining Q1 and Q2. The word form is perceived as a whole, as *gestalt*. But there are independent and dependent features in this *gestalt*. The half-length of the second syllable cannot be used at all times, because the half-length of V₂ fully depends 1) on the structure of the first syllable (it cannot be overlong), and, 2) on the structure of the second syllable (it cannot be followed by a long consonant or a voiceless consonant cluster, including geminates). In this way, the half-length is a dependent feature and it is not possible to phonologize half-length as an independent phonological quantity degree or an independent prosodic feature.

A. Eek and E. Meister (1997 : 89) claim that the information about V₂ is important in perceiving quantity of the first syllable. Probably this is not the information about the properties of V₂ which is important, but the fact that short and long (Q1 and Q2) syllable cannot exist without a following unstressed syllable. The structure of this syllable may be very different and even the ratio of the duration of the first and second syllables may not remain constant: *jana, jamal, jamalt, jamaks; jaama, jaamas, jaamast, jaamalt, jaamaks*. Neither the half-length nor the ratio of the durations of the first and the second syllables cannot be a reliable constant cue for quantity degree identification.

The other side of this problem is production. How is a phonologically well-formed Estonian word produced? What is the phonotactics of this process? Is there a specific set of half-long vowel phonemes to be introduced into the second syllable after the first syllable in Q1 (and Q2??)? This seems to be impossible. And how to describe phonologically (and phonotactically) the production of syllable duration ratios?

These are questions which should be answered if one wants to give phonological plausibility to the theory of ratios.

The problem of long obstruent phonemes (particularly stops) after V₂ is likewise intricate. How to interpret phonologically the phonetic geminates at the boundary of the second and third syllables in cases like *kadaka, sinepi, valeta*?

Ilse Lehiste prefers to speak about long consonants (in a more detailed terminology *ambiguously long*, that is, neither Q2 nor Q3; cf. Lehiste 1997b : 160) which contrasts with a short consonant in this position. The possibility to contrast these different degrees of length at the end of a word adds to the plausibility of an interpretation of these contrasts as different quantity degrees of obstruents (cf. Hint 1973 : 73–76):

Short	Long = Geminate
/t/ : /tt/ : <i>palad, piigad, palade, piigade</i>	— <i>palat, piigat, palati, niidate</i>
/p/ : /pp/ : <i>paneb, hiilib</i>	— <i>kanep. siirup, kanepi, siirupi</i>
/k/ : /kk/ : <i>tulega, viiruga</i>	— <i>tulek, viiruk, tuleku, viiruki</i>
/s/ : /ss/ : <i>tulus, kaunis, tulusa, villase</i>	— <i>tahusse, lillasse</i>

Anyway, the short-long interpretation is possible only in this small subset of word forms. In the larger vocabulary it becomes evident that the word forms with a short stop after V₂ are parallel with any word form with any short consonant in this position: *palad* : *palade*, *paneb*, *piigad* : *piigade*, *hiilib*, *tulus* : *tulusa*, *parem* : *parema*, *sadul* : *sadula* etc.

Long stops and geminates in this position are parallel with voiceless consonant clusters in this position: *palat* : *palati*, *siirup* : *siirupi*, *tulek* : *tuleku*, *vanasse* belong together with *kalast*, *alasti*, *vilets* : *viletsa*, *oleks* : *oleksin*, *karask* : *karaski*, *biitseps* : *biitsepsi* etc.

Voiceless consonants and consonant clusters in this position form a well-defined set with long obstruents occurring in complementary distribution with consonant clusters. This complementarity and structural parallelism between word forms with long consonants and consonant clusters directs towards phonemicizing long obstruents as phonological geminates in both positions (that is, between vowels as well as at the end of word):

/pp/ - - /ps/: /kanep/ /kanepi/ /piitsepi/
 - /tt/ - /ts/: /palatt/ /palatti/ /vilets/ /viletsa/
 - - /kk/ /ks/: /tulekk/ /tulekku/ /tuleks/ /tuleksin/
 - /st/ /sk/ /ss/: /valesti/ /karask/ /vanasse/ /kuusesse/

This means that the classical scheme by I. Lehiste (1965; repeated in Lehiste 1997a: 16) which allows two degrees of quantity in positions after unstressed syllables has to be supplemented with solutions which take into account the whole vocabulary, all word forms, including the words with consonant clusters.

When this is done, there is no need any more for quantity degrees in unstressed syllables. All we need is the phonotactic rules which produce segmentally different syllables in the unstressed position.

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