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Comments on Lehiste, I. & Pajusalu, K.'s paper "Experimental study of prosody in Finno-Ugric languages"

The past decade has seen an increased interest in studying the prosodic systems of Finno-Ugric languages. Research in this area has produced significant results contributing not only to our knowledge of the prosody in the languages examined but also to linguistic theory. A major project targeting the lesser known Finno-Ugric languages – Erzya, Meadow Mari and Livonian – has resulted in a number of important publications: Lehiste *et al.* 2001a, Lehiste *et al.* 2001b, Lehiste *et al.* 2003, Lehiste *et al.* 2005, Lehiste *et al.* 2008, Lehiste, 2010. Details of the Finno-Ugric prosody project were reported in Lehiste (2007). In the study presented here (Lehiste & Pajusalu, 2010), in addition to providing an overview of the findings relating to the prosody of these languages, the authors provide a summary of the current state of research in the three best studies languages: Estonian, Hungarian and Finnish.

The objectives of this discussion paper are to highlight some of the recent findings concerning the prosody of those languages studied by the authors, and to provide comments focusing on two aspects of the current research on Finno-Ugric prosody: (i) the significance of experimental studies in Finno-Ugric linguistics, and (ii) the implications of the findings to linguistic theory.

1. The significance of experimental studies in Finno-Ugric linguistics

There has been a growing trend in Finno-Ugric linguistics to conduct experimental analyses aimed at clarifying questions relating to the sound systems at both the segmental

and suprasegmental levels of the languages examined. There is an impressive number of publications on the prosodic structure of Estonian, Finnish and Hungarian; still, as the authors note “new questions continue to be asked in each case” (Lehiste & Pajusalu, 2010, p.1). The concise summaries they give about the recent state of research on the prosody of these three languages intend to identify the complexities of the respective prosodic systems. In the comments that follow reference will be given to those areas of research that need to be further pursued in order to resolve some of the hitherto unclear issues relating to the prosody of Estonian, Finnish, Hungarian, and the three lesser-known Finno-Ugric languages: Erzya, Meadow Mari and Livonian.

1.1. Estonian

Estonian prosody has been experimentally studied for some fifty years. The three areas of research relating to the prosodic structure of Estonian are: (i) the number of contrasting quantities, (ii) the domain of quantity, and (iii) the configuration of suprasegmentals in the realization of the quantity degrees.

As far as the number of contrastive quantities is concerned, it has been widely accepted for some time that the language has three distinctive quantities, dismissing earlier claims of the existence of four quantity degrees (for a survey and discussion of the three vs. four degrees theories, see Lehiste 1980, 1989). The acceptance of the ternary quantity contrast however, continues to be a challenge to phonological theories working with binary distinctions. Although there have been numerous attempts to incorporate the evident three-way contrast into existing frameworks, no satisfactory solution is available as yet. The non-linear approach by several phonologists, such as Prince (1980) and Hayes (1989, 1995), among others, has offered important insights as to the characteristics

and interpreting ternary distinctions in metrical or moraic phonological analyses. Ogden (1995) provides a detailed account of the theoretical issues involved, emphasizing the importance of understanding the relationship between phonetic and phonological representations. He also pointed out the intriguing fact of the rare occurrence of ternary distinctions, a phenomenon that also occurs in Skolt Saami (McRobbie-Utasi, 1999, 2007) and in Dinka (a Nilo-Saharan language, spoken in Southern Sudan), as recently reported by Remijsen & Gilley (2008), referred to by the authors of this presentation.

The second aspect relevant to phonological quantity in Estonian relates to the domain of quantity. Estonian is one of those languages where the domain of contrastive prosodics extends beyond the segment to the syllable and the foot. A model of prosodic levels in the evident phonological hierarchy of segment, syllable, disyllabic foot, and word had been proposed already in an earlier article, “The function of quantity in Finnish and Estonian” (Lehiste, 1965). It has been developed in subsequent studies and reiterated in the classic summary of research on Estonian quantity (Lehiste, 1997). According to this model, quantity alternations can only be described by referring to units larger than the segment: that is, segmental quantity must be described by considering the syllable it occurs in and its position within the word. It does not imply, however, that segmental quantity is not relevant: the same quantity degree of the syllable can be associated with different segmental quantities that are contrastive. It has to be understood, though, that segmental quantity is not predictable on the basis of syllabic quantity (Lehiste, 1997). In connection with the domain of quantity the role of durational ratios in the prosodic foot has to be acknowledged: “disyllabic feet in the short quantity have a ratio of 2:3, those in

the long quantity have a ratio of 3:2, and those in the overlong quantity have a ratio of 2:1”. (Lehiste & Pajusalu, 2010, p.2)

The third area of research relating to Estonian quantity concerns the phonetic correlates of phonological quantity. Experimental phonetic investigations focusing on the acoustic properties of quantity have identified fundamental frequency, in addition to duration, as relevant in the realization of the three-way contrast. In a frequently cited paper “Experiments with synthetic speech concerning quantity in Estonian” (Lehiste, 1975), she reports on her experiment with synthetic stimuli administered for evaluation to a large group of listeners. The results indicate that, although the distinction between the first and the second quantities is made on the basis of durational differences alone, the distinction between the second and third is made primarily on the basis of pitch contour, and, to a far lesser degree on duration in the second syllable – implying the perceptual significance of the fundamental frequency pattern. This finding has been confirmed in subsequent studies, such as those referred to by Lehiste and Pajusalu in this presentation (Lippus *et al.* 2007, 2009). It has to be mentioned, though, that there exist alternative approaches relating to the phonetic realization of quantity distinctions. Research undertaken from a different perspective gives more weight to the role of stress: the hypothesis of the possible realizations of the articulatory energy was experimentally tested giving support to the so called “accent theory” (Eek & Meister, 1997). In two experimental studies aimed at further testing the role of fundamental frequency in distinguishing between Q2 and Q3 (Fox & Lehiste, 1987, 1989), the relevance of pitch movement was confirmed. However, there were also certain doubts raised: it was suggested that in the course of the experiment ...”the addition of the falling contour to

the first syllable of an actual word failed to provide the necessary cue for identification at a level better than chance” (Fox & Lehiste 1989, p. 85). They do not exclude the possibility that the additional cue needed in perceiving Q3 may be stress as proposed in Eek & Help (1987). Additional research, such as Krull (1993a,b, 1997, 1998) and Asu & Nolan (1999) acknowledge the role of intonation on pitch contour. Although in a paper by Ross & Lehiste (2001, p. 49) it is stated that pitch contour is ...”quite stable if words are compared when they occur in sentence-medial position in identical context”, it appears that there is no agreement as yet on what exactly constitutes the additional cue -- which, in addition to duration -- signals the distinction between Q2 and Q3.

1.2 Finnish

Finnish has traditionally been referred to as a representative of “pure quantity languages” (Ravila, 1962) -- implying that the segment is the domain of quantity. There are two quantity degrees in the language: short and long. The contrast between the short and long quantity is independent of stress, Finnish having fixed stress in the first syllable. Quantity may be distinctive both in a stressed and an unstressed syllable and it can be assigned to vowels as well as to consonants. In connection with the distribution of short vs. long segments in Finnish, a difference between vowels and consonants in terms of the freedom of the occurrence of the quantity degrees has to be acknowledged. Vowels may occur in short vs. long quantities in any position of the word. With consonants the opposition between short and long quantities is more restricted. Lehiste (1970) regards the contrast between short and long consonants as an opposition between single and geminate consonants, i.e., a “contrast in the placement of syllable boundaries, accompanied by differences in length” (Lehiste, 1970:157). In her view the fact that

oppositions between short and long consonants occur in intervocalic position or, after a short consonant, support the single vs. geminate opposition assumption – the syllable boundary is assumed to be within the consonant.

The authors refer to the phonological analysis by Lehtonen (1970), according to which quantity contrasts in Finnish are associated with the word – i.e., not only with segmental phonemes. He argues for the recognition of moras within the word, identifying groups of moras as the timing units in Finnish. There is a detailed discussion of this approach in Ogden (1995). Extending the domain of quantity from the segment to larger temporal units has been considered by several scholars, among them Lehiste (1970), Ogden (1995), Wiik (1991) and more recently O'Dell *et al.* (2007). They convincingly demonstrate the relevance of phonological units that are larger than the segment in quantity alternations.

As far as the phonetic realization of quantity in Finnish is concerned, recent research – as referred to by the authors of this presentation – have explored the potential role of fundamental frequency both at word and sentence levels (Suomi *et al.*, 2008, Ylitalo, 2009, Järkikivi *et al.*, 2007). By approaching quantity from a different perspective, these studies have succeeded in advancing understanding of the prosody structures in Finnish; further research should provide additional information with regard to the interaction of fundamental frequency manifestations and the realization of the binary quantity contrasts.

1.3. Hungarian

Recent research on the binary quantity contrast of vowels and consonants in Hungarian has identified hitherto little understood issues relating to the interaction of the prosodic structure of the language and the realization of phonological quantities. Lehiste

and Pajusalu in their presentation refer to an experimental study by Mády and Reichel (2007). The study examined a possible correlation between length and vowel quality, concluding that there is a change in progress in the Hungarian vowel system in terms of quality playing an increasing role in certain instances where quantity contrasts used to be the distinguishing factor. Perception test results indicate a transitional state for mid vowels. The study concludes by stating the necessity of production experiments involving more speakers and expanding the scope of perception tests. This latter objective is of particular interest with regard to the preliminary results of the study, i.e., the fact that listeners tend to hear short vowels as long but not vice versa.

With regard to the binary quantity contrast in relation to the prosodic structure of Hungarian, it is in place to refer here to another paper, “The long and short and the final: Phonological vowel length and prosodic timing in Hungarian” White & Mády (2008). This study raises the question of the relationship between the constraints associated with phonological quantity and the prosodic structure of a language. The material of this experimental study consisted of the contrastive mid back vowels in monosyllabic, disyllabic and trisyllabic words, placed in four sentence contexts: utterance-medial focused, utterance-medial non-focused, utterance-final focused and utterance-final non-focused. It was observed that stress was placed by the speakers in the syllable expected, according to the focus structure of the sentence. The results of the study reveal important information with regard to the interaction of quantity and the prosodic structure of Hungarian. One of the conclusions concerns the lack of polysyllabic shortening – a fact attested to Finnish as well (Suomi, 2007). Among the other conclusions one point in particular calls for additional research: it was evident that preboundary lengthening does

occur in Hungarian, despite the contrastive function of duration – a fact that is contrary to expectations and needs be explored further by considering the relevance of another possible cue, in addition to duration, for boundary signaling.

1.4 Erzya, Meadow Mari and Livonian

It is without any doubt that the Finno-Ugric prosody project is one of the major undertakings in recent years. The prosody of the three lesser-known languages examined has resulted in important findings and identified a number of issues for future research.

1.4.1 Erzya

The acoustic analysis of the material points to the recognition that neither fundamental frequency nor duration is distinctive in that language. Although duration may play some role in identifying a stressed syllable, further research is needed to confirm this possibility. The high degree of variation with regard to stress placement excludes the possibility of considering stress distinctive in the language.

In relating the suprasegmental features in Erzya to their possible functions in the prosodic structure, in Lehiste *et al.* (2003) it is stated that although both duration and fundamental frequency are available to signal stress, they do not constitute the cues for it. Instead, the role of vowel reduction was considered as a possible factor in the distinguishing of stressed syllables from unstressed ones. The authors found, however, that “Vowel reduction does not constitute substitution of a stressed vowel by a reduced vowel, but it is a continuum, a process by which vowels can be gradually more or less reduced”... (p. 85)

In terms of the prosodic structure of Erzya two findings in the project need to be researched further. The first finding concerns the existence of syllabic isochrony – i.e., it was observed that syllable nuclei tend to be shorter in closed syllables than in open syllables. The other finding relates to the possible function of stress in constituting higher-level units by dividing four-syllabic words and utterances into disyllabic sequences (Lehiste *et al.* 2003, pp. 84-86).

As indicated by the presenters, the main difficulty in studying prosody in Erzya lies in the considerable dialectal differences. In agreeing with the conclusion stated in Lehiste *et al.* (2003), the prosody project on Erzya should serve as a “basis for systematic comparisons between the various dialects in Erzya”.

1.4.2 Meadow Mari

In Meadow Mari there is no contrastive quantity, duration being the most evident phonetic correlate of stress; it also has the additional function of signaling boundaries of higher-level grammatical units. Fundamental frequency in Meadow Mari is rising in stressed syllables, but it is sentence intonation that governs F_0 contour.

When considering the boundary signaling function of duration, however, the results appear to be inconclusive. The design of the experiment did not make it possible to determine whether the boundary signaling with duration is relevant to words or, higher-level structures. Further, in order to identify levels of prosodic hierarchy, future studies will have to analyze a larger corpus, containing a sufficient number of polysyllabic words.

The analysis of stress in Meadow Mari offers an interesting insight with regard to its role in the prosodic system. First of all, the question whether stress is contrastive needs to

be resolved; the authors refer to one minimal pair where the distinction between the members of the pair is achieved by differing stress placement. Although in the monograph (Lehiste *et al.*, 2005) the identifying function of stress is pointed out – i.e., distinguishing between words and non-words – the exact phonological status of stress in the language needs to be further clarified. Likewise, an explanation of the pattern with regard to stress being placed on different syllables by different speakers, in fact, not infrequently by the same speaker, constitute an intriguing challenge for future research -- as concluded by Lehiste *et al.*, 2005, p. 94).

1.4.3 Livonian

With regard to the number of contrastive quantities in Livonian, the traditional two-way quantity opposition view was challenged and a ternary quantity distinction was proposed at the level of metric feet, by taking into consideration the role of durational ratios within the disyllabic foot. It was also observed that there is a tendency toward foot isochrony (see Table 1 in Lehiste & Pajusalu, 2010, p. 6). Further, the role of contrastive tone in Livonian was examined, resulting in the recognition that falling vs. rising fundamental frequencies indeed play a role in distinguishing two types of Livonian words. As the authors pointed out, when a word has a long first syllable, it may be followed either by a half-long or a short second syllable. Since the duration of the long syllable in both word types can be considered identical, the differences in F_0 is essential in the realization of contrast – making the opposition less dependant on segmental differences. In a follow-up study (Lehiste, 2010) this observation was supplemented by stating that pitch differences associated with the two word types – i.e., rising F_0 contour on the long stressed vowel when the second syllable is half-long and falling contour when

the second syllable is short -- are not sufficient in achieving the contrast, for ...”sentence intonation can override word-level fundamental frequency patterns”. (pp. 37-38)

One of the most intriguing questions concerns the presence in Livonian of the glottal feature, *stød*. While the experiment by the authors was not designed to examine the systematic behaviour associated with the expected consequences of the occurrence of *stød* in long first syllables – i.e., the eliminating of F₀ contour differences -- Lehiste (2010) reports that that the research team did not find any patterns in pitch contour differences between long syllable nuclei where *stød* was expected and those long syllable nuclei when *stød* was not expected to occur. Because *stød* appears to be disappearing in the speech of younger speakers, there is an urgency for follow-up research to clarify this aspect of Livonian prosody (Lehiste 2010:38).

2. Implications to linguistic theory

In addition to providing valuable new information on the prosody of the languages reviewed, the Finno-Ugric prosody project has contributed significantly to the better understanding of several theoretical issues. Here I shall refer only to two areas of theoretical importance – being aware that the brief discussion that follows is incomplete.

2.1. Implications to comparative prosody in Finno-Ugric linguistics

It is safe to state that Finno-Ugric linguists have been in agreement as to the existence of quantity contrasts in the Proto-language. However, opinions differ in terms of the manifestation of the contrasts; here I refer to the still ongoing discussion on the two classic approaches – the theories by E. Itkonen (1946) and Steinitz (1944). Lehiste *et al.* (2003, p. 18)) cite the by now classic question posited by Raun (1974, p. 304): ... “As

for Proto-Finno-Ugric, the question is one of how to reconstruct, from present day languages, prosodic features which could have been relevant ca. 4000 years ago”. While the difficulty of this task has to be acknowledged, the experimental studies of the prosodic systems of present day Finno-Ugric languages give a new perspective to comparative analyses. In evaluating the findings of the Finno-Ugric prosody project, one of the striking features to be noted is the empirical evidence for a high degree of diversity associated with the prosody of the languages examined so far. It may also be observed that this diversity is systematic to a degree – it clusters languages in geographical areas where the influence of contact languages containing tone must be taken into account. Here I only refer to Estonian and Livonian where the role of fundamental frequency in the realization of quantity contrast has been a generally accepted fact.

Together with the diversity in the realization of quantity contrasts in the languages under review, some important similarities have become evident in the outcome of the Finno-Ugric prosody project. It appears that the prosodic structure in some of the languages analyzed (Estonian, Finnish, Livonian, Erzya and perhaps Meadow Mari) contain a hierarchical organization of prosodic constituents, and the disyllabic foot plays an important role in the realization of quantity contrasts. The presence of a certain degree of foot isochrony is also relevant within the disyllabic feet – a fact recognized also in Skolt Saami (McRobbie-Utasi 1999, 2007).

Although regarding the six languages examined, there remain several questions to be further studied, and there is a number of other Finno-Ugric languages in need to be researched by employing a similar experimental approach, it is evident that if we want to understand developments of prosodic systems from the Proto-language, it is an absolute

first step to have a clear understanding of the prosodic systems of present day Finno-Ugric languages. In this sense the prosody project has to be considered an essential contribution to Finno-Ugric comparative prosody.

2.2 Implications to general linguistic theory

Two aspects of the implications of research on Finno-Ugric prosody to linguistic theory will be referred to here. First, the issue of language change will be addressed. The diversity of the prosodic systems, as emphasized above, may be approached by identifying the type of language change relevant to the languages examined. In connection with languages such as Estonian and Livonian where pitch contour plays a role in quantity contrasts the language change is externally conditioned – i.e., the changes may be attributed to language contacts. In two frequently cited studies by Ilse Lehiste, “Polytonicity in the area surrounding the Baltic Sea” (Lehiste, 1978) and “Prosodic change in progress: Evidence from Estonian” (Lehiste, 1983), she concluded that in Estonian tonal patterns are formed, in place of quantity degree alternations, attesting to a prosodic change in progress. She has reached this conclusion by a series of acoustic analyses of quantity in Estonian, thereby confirming Jakobson’s theory (1931) concerning the inclusion of Estonian in the Baltic polytonicity-Sprachbund. The occurrence of *stød* in Livonian may also be considered an externally conditioned language change.

The other type of language change – referred to as internally conditioned change -- is related to the structure of the grammar or, to universal principles. The changes reported on the Hungarian vowel system in terms of predicting that quantity distinctions may become less prominent because of changes involving vowel quality, is a case in point.

Identifying the type of changes in the prosodic systems in Erzya and Meadow Mari at this stage of research is less clear.

The final point relating to the theoretical implications of the paper concerns the relationship between contrastive quantity and the prosodic system in the languages reviewed. In particular, the function of duration in boundary signaling is being questioned, for segmental quantity tends to put a constraint on the degree of durational increase in boundary positions. Consequently, in languages where duration does not have a grammatical function, preboundary lengthening is expected to co-occur with greater durational increase. What remains to be clarified by future research is (i) determining the degree of constraint on the increase of duration in relation to the prosodic system of languages with contrastive duration, (ii) exploring the possibility of predicting the characteristics of suprasegmentals compensating for the durational increase, again, in relation to the prosodic system, and (iii) identifying the temporal pattern differences between the two types of languages.

3. Conclusion

The decade-long project of experimental research on the prosody of the lesser-known Finno-Ugric languages is to be considered a pioneering one. The employment of large-scale experimental phonetic methods has resulted in important findings in all languages involved in the project. The inclusion in the present paper of the up-to-date state of research on the prosody of the three most thoroughly researched Finno-Ugric languages provides insight as to the recognition of the diversity of prosodic systems in the Finno-Ugric language family. It is this diversity that has to be further explored to the benefit of Finno-Ugric comparative studies and to the benefit of linguistic theories relating to the

still numerous unresolved issues of suprasegmental research. It is hoped that the project will continue by (i) further studying the questions raised in connection with Erzya, Meadow Mari and Livonian prosody, and (ii) extending it to other Finno-Ugric languages.

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