



**POETIC METRE, PROMINENCE, AND THE PERCEPTION OF PROSODY:
A CASE OF INTERSECTION OF ART AND SCIENCE OF SPOKEN LANGUAGE**

**Ilse Lehiste
The Ohio State University
Columbus, Ohio 43210-1298, USA**

ABSTRACT

The paper explores ways in which the prosody of a language can be investigated by studying the prosody of poetry created in that language. Certain poetic metres (such as the trochaic or dactylic metre) are perceived as being 'the same' in essential ways, regardless of the language in the poetry of which these metres are employed. Acoustic analysis of realizations of these metres, produced orally by native speakers of the different languages, reveals distinctive differences that in turn shed light on the prosodic structure of the languages themselves.

Languages reported on in this paper include Japanese, Finnish, Faroese, Estonian, Latvian, Lithuanian, and Swedish.

INTRODUCTION

In this paper, I will try to bring together the three topics listed in the title: poetic metre, prominence, and the perception of prosody. For the past several years, I have been engaged in research in each of these areas. Even though these studies have progressed in parallel, there is a logical connection between them, and I believe them to be aspects of the same topic. I shall now try to make explicit how they relate to each other, and describe some of my recent work that I believe to support my view.

I believe it is not necessary any more to emphasize the importance of prosody in the processing of spoken language, both by a listener and by a speech recognition device. A great deal of effort has been given to the study of prosody, using various traditional techniques. What seemed necessary as well as challenging was to find new ways to study prosody - to look at traditional concepts from new aspects. I have explored some of these aspects during the past few years [7, 11], and what I would like to present today is a brief overview of this work.

POETIC METRE

I started from the assumption that there is a special relationship between the prosodic structure of a language and the prosody of poetry created in that language. Spoken language involves a great deal of variability that has to be accommodated when a special characteristic of the language is to be studied. A considerable amount of that variability is eliminated in poetry created in traditional forms. I am not saying that it is not interesting to study the variability, but I am interested in the essence beyond that variability. Poetic form distils the essential from the ephemeral.

The connection between the prosody of a language and that of folk poetry is especially strong. I have sometimes used the metaphor of crystallization: the prosody of a language is crystallized in the metre of poetry created in that language.

There are, at the same time, poetic traditions that transcend language borders and reflect cultural cohesion. In Europe, this is largely the classical tradition deriving from Greek and Latin. The poetic metres used in classical poetry have been adopted - and adapted - to most European languages; this makes it possible to compare the manifestation of the same metres in different languages, and relate the differences in the manifestations to the prosodic structure of the languages under study.

In cultures with a long recorded history, it is possible to use the study of poetic metre for historical purposes. Folk poetry in particular tends to be conservative and to preserve earlier forms when contemporary spoken language has already gone through various kinds of changes. If, for example, the metre requires ten syllables per line, and an originally disyllabic word has become monosyllabic in spoken language through loss of an unstressed final vowel, the

word may remain disyllabic in that line to preserve the syllable count.

Languages in contact may borrow poetic metres from each other, sometimes adapting them to the prosody of the borrowing language; the process of adaptation may reveal a great deal about the prosodic structure of both languages.

My primary interest has been comparative. I am engaged in a rather extensive project studying and comparing ten languages, relating the phonetic realization of poetic metre to the prosodic structure of the languages, and comparing the ways in which similar metres are manifested in languages with differing prosody.

DESCRIPTION OF THE PROJECT

I selected the area around the Baltic Sea for investigation. This area constitutes a "Sprachbund", a language contact area that contains related and unrelated languages with a variety of prosodic structures. I had worked with materials from this area before and am familiar with the languages - and have personal contacts with colleagues whom I could ask for help in assembling the materials.

The languages involved are the following. Swedish - both Stockholm Swedish, recorded in Stockholm, and Finland-Swedish, recorded in Turku. It is known that Swedish is a tonal language, while Finland-Swedish either has lost tone or never developed it; influence of neighboring Finnish is considered a possible reason. I also included Finnish, known to be a quantity language with long-short oppositions in both stressed and unstressed vowels, and an opposition between short and long consonants in intervocalic position.

Then I included Estonian, with its three-way quantity patterns distributed over disyllabic sequences; Latvian, with both tone and quantity contrasts; Lithuanian, with inherited Indo-European tone; two relatively isolated Germanic languages - Faroese and Icelandic, to contrast them with both tonal Swedish and non-tonal Finland-Swedish; and Hungarian and Serbocroatian, which are geographically more remote (although in contact with each other) - Hungarian for its quantity system, and Serbocroatian for its tonal system.

In each language, I selected - with the help of local colleagues - a set of two poems in the trochaic metre, two poems in the dactylic metre, two poems in free verse, and some materials from the folklore tradition. These texts were read and recorded in the various countries; in most cases I had five speakers, but in Faroese I had just one speaker - the lecturer in Faroese at the University of Copenhagen.

The corpus is being analyzed acoustically, and the results are being published in separate articles. I will offer here some sample results, illustrating the way in which differences in the prosodic structure of languages are revealed by analysis of orally produced poetry.

Faroese-Finnish.

The first example illustrates the difference in the realization of the trochaic and the dactylic metre by speakers of Faroese and Finnish [6]. Data for a single representative speaker are presented for each language; more details are available elsewhere [11, 12].

Table 1: Finnish-Faroese metric feet (in msec)

	Finnish		Faroese	
	X	s.d.	X	s.d.
Troch.2-s.	471	110.1	411	71.3
Troch.3-s.			458	78.2
Dact. 2-s.	480	88.9	400	71.5
Dact. 3-s.	660	155.6	459	85.4

Table 1 presents average durations, in milliseconds, of non-final metric feet in two Finnish and two Faroese poems, one trochaic, the other dactylic, each read by a representative speaker. Figure 1 offers the same information graphically. The terms "trochaic" and "dactylic" are used here to refer to metric feet consisting of two and three syllables respectively, bearing metrical stress or ictus on the first syllable of the metric foot.

It so happens that the Faroese trochaic poem also contained some trisyllabic metric feet, and both the Finnish and the Faroese dactylic poems contained disyllabic metric feet. In Faroese, the difference in duration between disyllabic and trisyllabic feet

is only 53 msec, about 13% of the average; in Finnish, the difference of 184 msec is close to the duration of an added syllable (the average duration of a syllable in disyllabic metric feet was 238 msec). Faroese thus shows a tendency to equalize the duration of metric feet, whereas this tendency is hardly noticeable in Finnish. The North Germanic language, Faroese, could be considered a stress-timed language like other Germanic languages, whereas Finnish is a prototypical quantity language. The regular rhythm of the trochaic lines has practically neutralized the durational difference between disyllabic and trisyllabic metric feet in Faroese, but Finnish has resisted this influence, even though the metric pattern of the poetic form was the same.

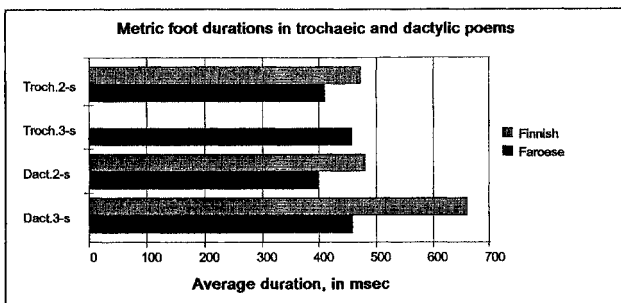


Figure 1. Average durations of disyllabic and trisyllabic metric feet in Finnish and Faroese trochaic and dactylic poems.

Another difference between the two languages appears in the measures of variability (cf. Table 1): in Finnish, the standard deviations were larger in every case. One might just assume that this is due to one speaker using greater differences in tempo, but the actual reason is the fact that Finnish has four kinds of disyllabic trochaic metric feet, and if they are averaged together, greater variability is the natural result. In a disyllabic word, each syllable can be contrastively long or short, resulting in four possible word (and metric foot) types: short-short, short-long, long-short, and long-long.

Figure 2 presents the average durations of metric feet in a considerable corpus of Finnish trochaic poems, read by six speakers [11]. These values were 323 msec for Short-short metric feet, 405 msec for Short-long metric feet, 409 msec for Long-short metric feet, and 511 msec for Long-long metric feet. The larger corpus makes it possible to smooth out the individual differences between speakers, and

reveals the underlying system. Obviously it is irrelevant whether the extra length is added to the first or the second syllable. The metric feet are stressed on the first syllable, but stress seems to play no role in the manifestation of the durational structure: a metric foot with a stressed short first syllable and an unstressed long second syllable has the same duration as a metric foot with a stressed long first syllable and an unstressed short second syllable. In the Long-long case both syllables receive the extra increment.

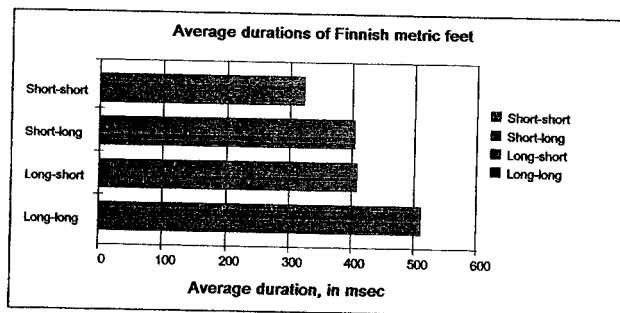


Figure 2. Average durations of four types of metric feet in Finnish trochaic poems.

Finnish-Latvian.

The superposition of the trochaic metrical pattern had no effect on the word-level durational structure of Finnish, but this need not be the case in all languages. A comparison of Finnish with Latvian is instructive in this regard [14]. Table 2 and Figure 3 offer comparative data - average durations of metric feet in Finnish and Latvian trochaic poems.

Table 2: Finnish-Latvian trochaic metric feet (in msec)

	S-S	S-L	L-S	L-L
Finnish	380	524	479	606
Latvian	515	469	513	562

Latvian, too, has contrastive duration in all syllables, and has metric feet of the same kind as Finnish. Like Finnish, Latvian words are stressed on the first syllable. The graph shows average durations from comparable materials in the two languages, produced by two speakers. (The Finnish speaker is the same as in the comparison involving Finnish and Faroese.)

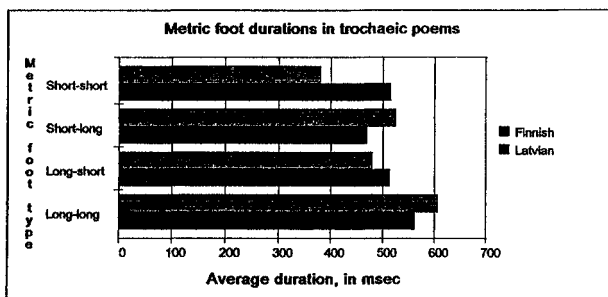


Figure 3. Average durations of four types of metric feet in Finnish and Latvian trochaic poems.

Here the superimposed metrical structure has had a levelling effect on the Latvian reader's performance. The durations of Short-short and Long-short metric feet are practically identical; Short-long metric feet are the shortest of all, and the Long-long metric feet are only 48 msec longer than the Short-short metric feet. In Finnish, that difference is 226 msec. Thus regardless of similarity of the systems, the quantity structure of Finnish appears much more firmly anchored than that of Latvian; in fact, Latvian behaves as if it were a stress-timed language.

Finnish, Estonian, and Japanese

The study of orally produced poetry makes it possible to elucidate many other prosodic differences between languages. As a further examples, I would like to offer some results from a comparison of Finnish, Estonian and Japanese haikus.

It is a generally accepted fact that the temporal structure of Japanese is describable in terms of morae - abstract isochronous units of timing. Beckman [1] has shown that such isochrony does not exist at the segmental level; in an earlier study, Port et al. [16] had suggested that moraic structure is a property of higher-level units, such as words. Regularities within still larger rhythmic units have been reported by Homma [4].

To test the applicability of the mora concept to the analysis of other quantity languages, I carried through a comparison of productions of poems in the haiku form in Japanese, Finnish and Estonian [8]. The classical haiku consists of three lines of five, seven, and five morae. I treated the line as the larger unit Port had suggested as the unit in which morae would be

manifested. For my Japanese materials, I recorded and analyzed 19 classical haikus, spoken by a member of our Department of East Asian Languages and Literatures. For the Finnish materials, I recorded Finnish translations of 37 haikus by Basho, read by the same speaker whose productions of trochaic and dactylic poetry I compared with Faroese. The Estonian materials consisted of readings of 19 haikus composed by an Estonian poet, read by an actress, included on a record produced in Tallinn. In both Estonian and Finnish haikus, what is being counted is syllables rather than morae, so that the poems consist of three lines of five, seven, and five syllables each.

Following the description of a mora as an abstract isochronous unit not necessarily associated with a segment, but rather with a higher-level unit such as a word or phrase, I established the durations of the morae by dividing the duration of the line by five or seven respectively.

To anticipate the results, Japanese and Finnish behaved like mora-counting languages, while Estonian did not.

Table 3 shows the average durations of five-mora and seven-mora lines of Japanese haikus and five-syllable and seven-syllable lines in Finnish and Estonian. The average duration of a mora/syllable is also given, as well as standard deviations.

	Line		Mora/syll.	
	X	s.d.	X	s.d.
5-unit lines				
Japanese	932	97.8	186	19.5
Finnish	928	165.9	186	31.1
Estonian	1260	251.2	252	50.3
7-unit lines				
Japanese	1208	184.7	172	26.4
Finnish	1320	217.0	189	31.0
Estonian	1687	445.8	241	63.6

Several regularities and similarities may be observed here. The seven-mora and seven-syllable lines are longer by approximately the duration of two additional morae or syllables. The Japanese and Finnish data show great regularity in production; the Estonian productions were much more variable. But some of the regularity is misleading, as is shown by a closer study of the internal structure of Finnish and Estonian syllables.

In Finnish, each syllable can be contrastively short or long [15], and in moraic analysis, any syllable could thus be assigned a value of one or two morae. A line of five syllables could therefore, in principle, contain from five to ten morae. If a mora is an isochronous unit of timing, the duration of morae should remain constant, and the duration of a line should increase in parallel with the increase of the number of morae in the line. The variability in the durations of syllables and lines is at least partly explained by the fact that syllables of one and two morae have been averaged together.

In Estonian, the problem of assigning morae to syllables is much more complicated. The basic unit of the Estonian quantity system is not a syllable, but a disyllabic metric foot [5]. There are three contrastive metric foot types - short, long, and overlong - and the contrast is manifested as a ratio between the durations of the first and second syllable. In addition, the second syllable of short and long metric feet can have a two-way quantity opposition - short, and ambiguously long -, while the second syllable of overlong metric feet can have a three-way quantity opposition, yielding a total of seven basic metric foot types.

Several attempts have been made to express the Estonian quantity system in moraic terms. One attempt (by Hint [3] and Prince [17]) assigns two morae to overlong syllables, and treats all other syllables as containing one mora (in other words, ignores the opposition between short and long quantity). The second attempt (by Hayes [2]) follows the three-way distinction found in the first syllable of metric feet and assigns one, two or three morae to these syllables; unfortunately it does not specify how morae should be assigned to non-first syllables, where only two contrastive quantities are found in short and long metric feet.

Averaging durations over syllables ignores all these factors, resulting in the large standard deviations observed in the table.

A five-mora line is possible in Estonian, provided that all words are in the short quantity and all second syllables are likewise contrastively short. Any addition of length should result in lengthening of the line.

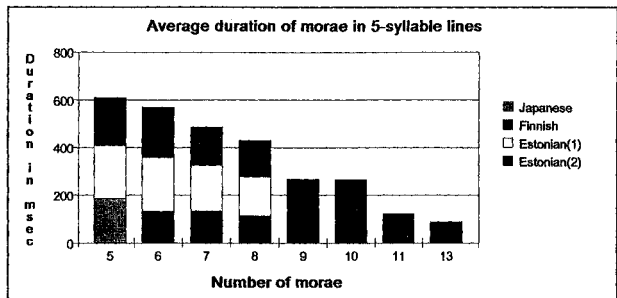


Figure 4. Average duration of morae in Finnish and Estonian five-syllable lines.

Figure 4 shows the average duration of morae in 5-syllable lines. The Japanese value is included. The Finnish material happened not to contain any 5-mora lines, but within six-to-ten mora lines, the average duration of a mora remained more or less constant. The Estonian data are presented twice, calculated according to the two methods (one - assigning two morae only to syllables in Q3, and one mora to all other syllables, and two - attempting to differentiate between the three quantity oppositions, at least in the first syllable of a word).

Contrary to what was found for Finnish, the Estonian data demonstrate that the duration of a mora decreases as their number in a line increases.

If the mora is a unit of timing, one would expect that a line containing, for example, seven morae, should be longer than a line containing five morae - longer by the approximate average duration of two morae. This was found to be true for Japanese and Finnish. The durations of the Japanese 5-mora line and 7-mora line were 932 and 1208 msec respectively. In Finnish, the duration of a five-syllable line increased with the addition of each mora from 784 msec for a 6-mora line to 1314 msec for a 10-mora line (which happens to be practically the same as the duration of a seven-syllable line, 1320 msec). In Estonian, on the other hand, it is the duration of the line that tends to be constant, while the duration of each component decreases (according to the first moraicization, the 6-mora five-syllable line had a duration of 1360 msec, that of the 8-mora line - 1323 msec).

One of the concepts I have been using in my work is that of the domain of suprasegmental patterns. In many languages - probably most languages - there exists a hierarchy of domains. One possible hierarchy is from segment to syllable to metric foot to sentence to paragraph to discourse. In the study just described, the domain for the manifestation of moraic structure in Japanese was assumed to be the haiku line. In Finnish, the syllable could be considered to serve the same function. In Estonian, the temporal regularity was primarily associated with the line. I have found similar regularities in other languages whose prosodic structure I have investigated. But it is important to state that all languages do not behave in the same way.

Lithuanian and Swedish

An illustration is provided by the manifestation of the relationship between line duration and following pause in Lithuanian and Swedish trochaic poems [9, 13].

The next figure (Figure 5) shows the average durations of lines and pauses between lines of productions of a trochaic poem by six Lithuanian speakers. In the poem, 4-foot lines alternate with lines in which the last foot is monosyllabic; thus the lines contain either eight or seven syllables. As can be seen from the figure, shorter lines are followed by longer pauses, which tends to equalize the duration of line + pause and results in a higher-level rhythmic regularity: lines tend to start at equal intervals. Here the variability of pause duration is clearly a function of line duration; in relevant literature, one frequently finds the notion of "silent feet" that are presumably used to provide rhythmic regularity.

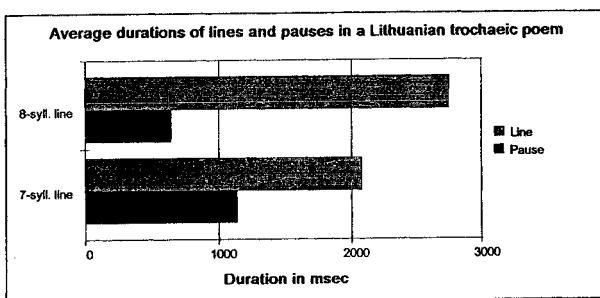


Figure 5. Average duration of lines and pauses at the end of the lines in a trochaic Lithuanian poem.

The following figure (Figure 6) illustrates a case where the variability of the line-final pause appears to have a very different origin. The figure shows the duration of pauses at the end of five-foot lines in a Swedish trochaic poem. Here every line contained ten syllables, the average duration of the line was 2275.15 msec, with a standard deviation of 322.65 msec. The average duration of pauses was considerably greater, and correlated with the punctuation marks found at the end of the lines.

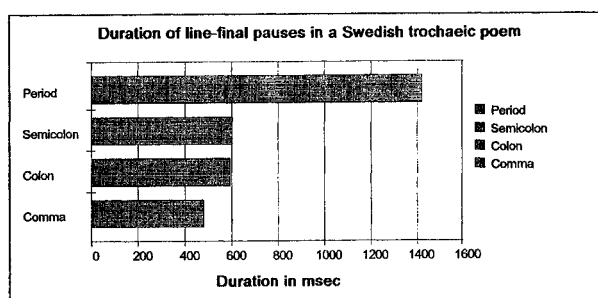


Figure 6. Average durations of lines and pauses at the end of the lines in a Swedish trochaic poem.

This result is somewhat peculiar on the surface, but on second thoughts it is not improbable. Punctuation marks evolved to indicate boundaries between syntactic units; the boundaries are part of spoken language, and are frequently manifested by pauses. This is a long narrative poem ("Bonden Paavo" by J.L. Runeberg), consisting of 61 lines. The readers were reading the poem as if they were telling the story, and telling the story required the indication of its syntactic structure. I should add here that when the sentence continued from one line to the next, there was no pause at all. In this particular situation, then, the pauses were not employed in the manner they had been used in the Lithuanian case - to maintain a higher-level rhythm.

Apart from that, the Swedish readers maintained great regularity in the duration of the metric feet. The average duration of 1525 metric feet (5 metric feet in a line, 61 lines, 5 speakers) was 499 msec, with a standard deviation of 86.4.

CONCLUSION

The examples presented above demonstrate that speakers of different languages behave in very different ways when they produce poetic metres that bear the same label and thus may be considered similar (if not identical), and that the differences in their productions are related to the prosodic structure of the languages. Study of the phonetic realization of poetic metres opens another window through which one can get a clearer view of the prosodic structure of the languages.

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