

Zita McRobbie-Utasi: *Quantity in the Skolt (Lappish) Saami Language: An Acoustic Analysis*

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The volume presents the results of ten years of research into the phonetic and phonological structure of Skolt Saami, an Eastern Saami dialect spoken by about 400 speakers in North-East Finland. It is based on extensive fieldwork and laboratory analysis. The material analyzed consists of over 3000 Skolt Saami disyllabic words, produced by two speakers under laboratory conditions. The results of the analysis are interpreted in various ways to solve some basic problems in Saami phonology.

The main issue is the phonetic manifestation of the three-way quantity opposition observed in the various Saami languages/dialects by earlier researchers. The author finds that since these earlier analyses had been based primarily on subjective observation, and since new instruments and methods for acoustic analysis have become available in recent years, a new look at the phonetic facts is justified.

The volume consists of an introduction, seven chapters, two appendices, a list of references, and an index. The documentation is presented in the form of 143 tables and 85 figures. In the first two chapters, the author reviews previous research into Saami phonology, comparing it with analyses of Estonian - another Fenno-Ugric language with a three-way quantity opposition. She makes the point that in the Saami language, just as in Estonian, quantity relationships involve not only duration, but other prosodic dimensions as well, namely pitch and stress. Previous descriptions of the quantity opposition have claimed that the relevant contrasts are found in the vowel of the first syllable and the following consonant(s). The domain of the contrastive patterns is a disyllabic unit, referred to as the 'disyllabic' in the current study. According to these earlier descriptions, the syllable as such plays no part in Saami phonology. In the course of the study, the author demonstrates that the syllable is indeed a relevant unit in the Saami phonetic/phonological hierarchy.

Most of the words in the language are subject to a process called grade alternation: the consonants following the first vowel can be in either the weak or the strong grade. Consonants participating in grade alternation have traditionally been grouped into three series: the x-series, xx-series, and xy-series. Members of the x-series contain a single consonant in the weak grade, and these alternate with short geminates in the strong grade. Members of the xx-series have a short geminate in the weak grade and a long geminate in the strong grade. Members of the xy-series contain a short consonant cluster in the weak grade that alternates with a long consonant cluster in the strong grade. The overlong grade, which developed independently of weak and strong grades, is historically a more recent phenomenon. When consonants of the x-series appear in the strong grade, with quantity similar to that of the strong grade of the xx-series, their quantity is referred to as the overlong.

grade (Grade III). The relationship between the strong grade of consonants of the x-series and the xx-series may be summarized as follows (p. 29):

	Weak Grade	Strong Grade
x-series	C	CC
	C	C:C
xx-series	CC	C:C

McRobbie classifies the Skolt Saami disyllabics into six structural types on the basis of the consonants following the first vowel. In Type 1, the consonants are long geminates. In Type 2, there is a long consonant cluster. Type 3 has a short intervocalic consonant. In Type 4, the intervocalic consonant is a short geminate - in Type 4a, it is either a liquid, nasal, or voiced fricative, and in Type 4b - a plosive, affricate, or a voiceless fricative. In Type 5, there is a short consonant cluster. Type 6a has geminates, Type 6b a consonant cluster. Type 6a has two subgroups - 6a1, where the consonants are liquids, nasals, or non-sibilant fricatives, and Type 6a2, where the consonants are plosives, affricates, or sibilant fricatives. The difference between Types 6b and 2 is based on the nature of the second syllable vowel, which will be described later.

Duration measurements taken from the *over 3000* disyllabics yield the following overall averages, in milliseconds (reproduced from Table 2.30, page 67):

Disyllabic type V1		Intervocalic Consonant(s)		V2
Type 1	175		248	85
Type 2	152		366	84
Type 3	299		87	88
Type 4	238	(a) 163	(b) 197	93
Type 5	225		174	90
Type 6a	148	(a1) 249	(a2) 355	85
Type 6b	161		323	90

On the basis of these results, the author observes that there are two contrastive durations for vowels: half-long (between 148 and 175 msec) in Types 1, 2, and 6, and long (between 225 and 299 msec) in Types 3, 4, and 5. The consonant(s) following the first vowel occur in three contrastive durations: short (Type 3), half-long (Types 1, 4, 5, and 6a), and long (Type 6b). The second vowel is uniformly short, with an average duration of 87 msec. The author observes a complementation between V1 and intervocalic consonant durations - when the vowel is shorter, the consonant is longer, and, vice versa.

The two different durations of the first syllabic vowel, and the three different durations of the consonant(s) following it, seem not to be affected by the duration of the second syllabic vowel, which remains constant for all structural types. McRobbie claims that this constitutes evidence for the importance of syllables: "The implications of this are twofold: (i) contrary to earlier research, second syllabic duration seems to be irrelevant in the distribution of duration in the first syllabic vowel and the consonant(s) following it; (ii) this being so the claim hitherto made, that the syllable has no status whatsoever within the disyllabic rhythmic unit, has to be reconsidered." (p. 100)

Looking at the measured averages quoted above, certain differences between the Saami and Estonian three-way quantity contrasts become obvious. As far as vowels are concerned only two contrastive durations occur in the relevant position, namely as first vowel of the disyllabic stress-group. From an Estonian point of view, the Saami vowels would be long and overlong; there is no phonetically short vowel in the contrastive position, even though such vowels are found in the second vowel position in the disyllabic. The consonant durations would correspond to Estonian short, long, and overlong degrees. Overlength in Estonian is usually described to have arisen as a result of compensatory lengthening after syncope and/or apocope of a vowel in the following syllable.

In addition to three phonological quantities, Estonian also has a two-way system of morphologically determined strong and weak grades. The two systems - quantity and gradation - are basically independent of each other; thus a word in the strong grade can be in the short or overlong quantity, a word in the weak grade can be in the long or overlong quantity, or - in the case of qualitative alternation - both the strong and the weak grade of a word can be in the same short quantity. (Examples: *tugi* 'support', nom.sg., strong grade, is in Q1. *toele* 'support', allat.sg., is in the weak grade, but in Q3; *kate* 'cover', nom.sg., is in the weak grade, and in Q2, *katte* 'cover', gen.sg., is in the strong grade, and in Q3; *sada* 'hundred', nom.sg., is in the strong grade, and in Q1, while *saja* 'hundred', gen.sg., is in the weak grade, and likewise in Q1). A considerable number of words do not participate in grade alternation, but all words occur in one of the three phonological quantities.

In Saami the overlength of consonants is part of the phenomenon of consonant gradation. Consonants may occur in three different grades: the weak grade (Grade I), the strong grade (Grade II), and the overlong grade (Grade III). As the phonetic conditioning factors for the application of gradation rules have disappeared, consonant gradation has become completely morphologized. According to McRobbie, disyllabics in Skolt Saami can be classified according to two principles, the first being the system of disyllabic stress group types established on the basis of durational patterns, and the second being consonant gradation. Since there are many words in the language that do not undergo consonant gradation, and since durational differences in the vowels do not seem to be determined by the quantity degree of the consonants, she claims that classification according to consonant gradation should be subordinated to classification according to structural type.

The relationship between structural types and consonant gradation is presented in Table 3.25 (p. 102). Unfortunately this table seems to contain a crucial error: the numbers signifying the structural types appear to be misaligned, so that there are no entries under Structural Type I, and there is a final column of entries that has no type number. The problem appears solvable by shifting the sequence of structural type numbers one step toward the right. The summary given below is based on the adjustment that I found necessary for interpreting the data.

The table classifies disyllabics according to three principles: the series to which the intervocalic consonantism belongs (x, xx, xy), degree of consonant gradation (I, II, and III, or

Weak, Strong, and Overlong), and Structural Type. The classifications overlap to a considerable extent. Thus Grade I has two x-series, an xx-series, and an xy-series (Structural Types 3, 4a, 4b, and 5); Grade II has two x-series (types 1 and 4a), three xx-series (types 1, 6a1, and 6a2), and two xy-series (types 2 and 6b); Grade III has two x-series (types 6a1 and 6a2). Looking at the relationships from the point of view of structural types, Type 1 is associated with Grade II, Type 2 with Grade II, Type 3 with Grade I, Type 4a with Grades I and II, Type 4b with Grade I, Type 5 with Grade I, Type 6a1 with Grades II and III, Type 6a2 with Grades II and III, and Type 6b with Grade II.

From the point of view of comparison between Saami and Estonian three-way quantity oppositions, the durational relationships between the weak and strong degree of disyllabics of the x-series are of special interest. Table 2.30 shows that the average duration of the intervocalic consonant in Grade I (Type 3) is 87 msec. Grade II of the x-series (Type 4a) has an intervocalic consonant duration of 163 msec. Grade III of the x-series has an average consonant duration of 249 msec. This regular increase in consonant duration is paralleled by a comparable decrease in the duration of the first vowel, from 299 to 238 to 148 msec. The total duration of the vowel-consonant sequence is almost equal in the three grades: 386, 401, and 397 msec for Grades I, II, and III respectively. The duration of the second vowel remains constant. In Estonian, on the other hand, the compensatory relationship is between the two syllables. Words in the short quantity (Q1) have a short first syllable and a half-long second syllable, with a duration ratio of approximately 2:3; words in the long quantity (Q2) have a long first syllable and a somewhat shorter second syllable, with a duration ratio of 3:2, and words in the overlong quantity (Q3) have a longer first syllable and a still shorter second syllable, with a ratio of 2:1.

McRobbie interprets the patterns found in Saami likewise in terms of ratios. It is the relationship between the durations of the first syllable vowel and the succeeding consonantism that remains constant. There is a phonological rule operating in Skolt Saami (described on p. 111) that produces compensatory lengthening in both the vowel and the consonant, but the increase in absolute duration does not change the ratios that characterize the structural types and alternating grades in question (p. 122).

In addition to differences in duration, the Saami phonological system has also been claimed to involve differences in fundamental frequency and stress. Chapters 5 and 6 are devoted to elucidation of these questions. Chapter 5 offers a detailed analysis of fundamental frequency patterns as manifested within the disyllabic stress-group; Chapter 6 presents intensity data.

Fundamental frequency measurements show that there is no difference between the six structural types with regard to the first syllable, but as far as the second syllable is concerned, there is a difference between types 1-5 on the one hand, and type 6 on the other hand. Basically, there is a step-down *F<sub>0</sub>* pattern on the two syllables. There is a slight downward movement on the first syllable. The second syllable starts lower than the termination of the first syllable, and remains level for most of the duration of the second syllable in Types 6a and 6b; there is a slight downward movement (averaging 26 Hz) at about 85 msec of duration in the second syllables of disyllabics in Types 1-5 (p. 1666). This

difference was found to be statistically significant. The author leaves open the question whether this difference is also significant linguistically. It might be recalled here that the distinction between structural types 2 and 6b is based on the characteristics of the second syllable.

It had been hypothesized by earlier researchers that stress differences might play a significant role in distinguishing between quantity degrees in Skolt Saami. To test the hypothesis, McRobble carried out three types of measurement on the data using the RMS amplitude envelope. Measurements were made of the amplitude peak (the maximum amplitude within a syllable nucleus). The "total amplitude" value - an approximation of the intensity integral - was established by measuring amplitudes at every 10 msec and adding up these values. Finally, the "average amplitude" was calculated by dividing the total amplitude by the duration and then multiplying by ten (p. 175). The point in time at which peak amplitude was reached was also established. The measurement results showed again a difference between structural Types 1-5 and Type 6: second syllabic vowels in type 6 reach their amplitude peak earlier and maintain it longer, and both peak amplitude values and average amplitudes are higher than in types 1-5.

Together with the earlier finding regarding fundamental frequency, the amplitude measurements suggest that the second syllable of disyllabics of Type 6 has special status. These vowels are the result of a historic coalescence process; also called contracted vowels, they are assumed to have been originally longer. In Skolt Saami, all contracted vowels are short; they follow intervocalic consonants that are in the overlong grade. The question is now whether all prosodic oppositions in Skolt Saami can be described on the basis of duration - whether the special status of the second vowel can be predicted from the overlength of the preceding consonant, *or* whether the different status of the second syllable vowel should be recognized in the phonological system - in which case the overlength of the preceding consonant would be predicted from the occurrence of this type of second-syllable vowel. McRobbie treats this question in the final chapter.

Chapter 7 (pp. 201-230) discusses the prosodic components of quantity in Skolt Saami disyllabics as revealed in the acoustic-phonetic analyses presented in the preceding six chapters. The first three sections offer a summary and evaluation of the results of the analysis of the three acoustic parameters - duration, fundamental frequency, and intensity - as manifested in the disyllabic stress-group. The fourth section presents prosodic templates for disyllabics according to structural type. The purpose of the templates is to summarize the tendencies that are apparent on the basis of the results of the acoustic analysis of duration, fundamental frequency, and intensity. The concluding section discusses the implications of the current study with regard to the analysis of phonological quantity.

Three issues need to be examined in order to obtain a clear understanding as to how quantity may function in a language. The first is the question of whether the distinctions are based on duration only, *or* whether other factors (such as pitch and/or stress) are simultaneously involved. The second issue concerns the domain of quantity - whether it is the segment, syllable, *or* a still larger unit (as, for example, a disyllabic sequence or a metric foot), finally. It is necessary to establish the number of contrastive quantity degrees.

All these issues have been studied extensively and intensively in Estonian. The current study has established certain similarities and differences between Estonian and Skolt Saami. In both languages, other prosodic factors besides duration have to be taken into consideration in establishing quantity degrees. There is also a three-way system of oppositions in both languages. The main difference is in the domain of the quantity patterns: in Estonian, it is a disyllabic sequence, whereas in Skolt Saami it is the first vowel and the following consonant(s) of the disyllabic unit. There are also differences in the phonetic realization of the contrastive patterns.

The author summarizes her contributions to the study of Saami prosody on pp. 225-230. They will be quoted in part below.

1. The acoustic analysis of duration has confirmed the significance of the disyllabic stress group as the basic domain of quantity. On the basis of the manifestation of duration in connection with compensatory lengthening, the analysis has provided evidence for the role of durational ratios between the first syllabic vowel and the following consonant(s). The syllable is shown to constitute a distinctive constituent of the disyllabic stress group.
2. The analysis of fundamental frequency has established the characteristic step-down pattern between the two syllables of the stress group, and has shown that the fundamental frequency pattern of the second syllable provides a criterion for distinguishing structural types 1-5 from type 6. At the same time, this fact serves as a strong argument for including a fundamental frequency component in the description of Skolt Saami prosody.
3. The acoustic analysis of intensity showed that disyllabics form two distinct groups with regard to the intensity of the second syllable: disyllabics of type 6 have a second syllable with a distinctive fundamental frequency and intensity pattern that supports earlier suggestions that in type 6 disyllabics the second syllable is stressed.

McRobbie concludes the report of her very thorough and extensive research with the modest statement that "the present study should be viewed as a necessary first step towards an analysis of Skolt Saami quantity, one aimed at providing a detailed account of the prosodic properties of disyllabics associated with the three issues relevant to quantity: (i) the domain of quantity, (ii) the configuration of prosodic factors in the realization of quantity, and (iii) the issue of three-way quantity distinction. The interpretation of the results presented here may contribute to a better understanding of some of the complex issues of quantity, shedding light not only on problems associated with Skolt Saami quantity but also on quantity-related issues in languages in which they are relevant" (p. 230). One can only hope that future investigations will match the achievement offered in the present monograph.

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