

DURATION PATTERNS IN FINNMARK NORTH SÁMI QUANTITY

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ABSTRACT

We investigate the phonetic realization of a rare ternary quantity contrast in an endangered Finno-Ugric language, Finnmark North Sámi, and its Western and Eastern dialects. Its speakers frequently use majority language, Finnish or Norwegian.

The three-way quantity contrast is assumed to be realized by a progressive lengthening of a consonant and a compensatory shortening of the previous vowel. We evaluate this assumption and compare the durational patterns between the two dialects, as well as possible influences of the majority languages.

We analyze durational patterns in material spoken by 10 native North Sámi speakers, varying in both dialectal and majority language background. The contrast between the short and the two longer quantities was realized regardless of the dialect and majority language influences. However, the durational differences between the two longer quantities are significantly greater for the Eastern dialect and the speakers from Finland compared to the Western dialect and the Norwegians.

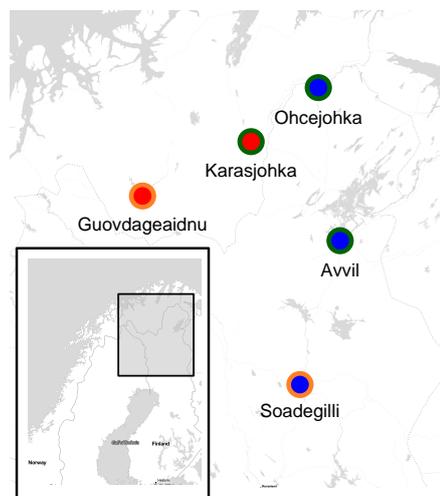
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1. INTRODUCTION

North Sámi is an indigenous minority language belonging to the Finno-Ugric language family. With approximately 25,000 speakers, it is the biggest of the nine Sámi languages. We focus on one of its three documented varieties, Finnmark North Sámi, spoken in the northern parts of Norway and Finland [1], see Fig. 1. The Finnmark North Sámi is traditionally subdivided to the Western and Eastern dialects with various phonetic and phonological differences including the realization of the quantity contrasts analyzed in this paper (see [13] for an overview of the Sámi languages and dialects).

All Finnmark North Sámi speakers are at least bilingual and are often educated primarily in the majority state language, Finnish or Norwegian. These majority languages can thus be expected to exert additional influences on the phonetic characteristics of

Figure 1: Map of the Finnmark North Sámi speaking area. The circles indicate the places of origin of the speakers. Color codes: blue – Finland, red – Norway, green – Eastern dialect and orange – Western dialect.



Finnmark North Sámi.

We investigate the influence of dialect and majority language on realization of phonological quantity contrast in Finnmark North Sámi. Like several other Sámi languages [4] as well some other Finnic languages (e.g., Estonian [9]), North Sámi has a three-way consonant quantity opposition, cross-linguistically an extremely rare typological feature [6, 10]. We refer to the three quantity degrees as Q1 (short), Q2 (long) and Q3 (overlong).

In North Sámi, the ternary contrast centered in the intervocalic consonant is manifested in bisyllabic word roots formed by a first stressed syllable and a following unstressed one. These oppositions have important grammatical functions, for example marking the difference between singular nominative and singular genitive. It is important to note that the quantity oppositions in North Sámi are almost always Q1 vs Q2 and Q2 vs Q3, see Table 1 for examples of contrasts used in this work.

It has been reported, that in North Sámi the duration of the consonant in various quantity degrees is inversely related to the duration of preceding (first

Table 1: Ternary length contrast in NS consonants

Q1 short	Q2 long	Q3 overlong
<i>nama</i> 'name' GEN.SG	<i>namma</i> 'name' NOM.SG	
	<i>homma</i> 'task' GEN.SG	<i>hom'ma</i> 'task' NOM.SG
<i>gili</i> 'village' GEN.SG	<i>gilli</i> 'village' NOM.SG	
	<i>golli</i> 'gold' GEN.SG	<i>gol'li</i> 'gold' NOM.SG

syllable) vowel in a compensatory manner [8]. Thus, quantity oppositions in North Sámi is co-signalled by the alternating duration ratios between the segments in the first two syllables rather than from the intervocalic consonant centre alone.

We hypothesize that the majority language has an influence on the production of quantity in Finnmark North Sámi. The Sámi speakers from Norway might be distinguishing the three quantity degrees less robustly (in terms of durational differences) compared to the Finnish Sámi speakers, because of the typological differences between Norwegian and Finnish.

In Finnish, the (2-way) quantity contrast is used to distinguish lexical meanings but also grammatical categories, for example *kukka* 'flower' NOM.SG vs. *kukan* 'flower' GEN.SG (see, e.g., [5]). In Norwegian, length oppositions of vowels and consonants mainly distinguish lexical meanings, as for *pen* /pe:n/, 'pretty' vs. *penn* /pen:/, 'pen', but are not used to differentiate between morphological categories like in Finnish and North Sámi. As these examples also show, the consecutive segment durations often alternate in Norwegian: long consonant is preceded by a short vowel and vice versa [11]; this phenomenon may also interact with the realization of the complementary shortening in North Sámi.

There are some phonological and morphological differences between the Western and Eastern dialects of Finnmark North Sámi affecting segmental durations. For example, the vowel lengthening patterns where in the Eastern dialects the **first** syllable short vowel is lengthened [12, 13]. Also it has been stated that "[t]he Western dialects have retained the phonological opposition between long and short geminates, but the Eastern ones have transferred the opposition to the vowels" [13].

This paper presents the results of a phonetic investigation on Finnmark North Sámi quantity and its areal variation, focusing on a description and comparison of durational patterns of quantity in North Sámi spoken in Finland and Norway, as well as in the two dialectal areas.

2. DATA COLLECTION AND METHODS

The data for this experiment was collected from 10 native speakers of North Sámi (age range 24–64, median 32,5). Fig. 1 shows the places of origin of the participants. All speakers are bilingual: 6 of the speakers were Sámi–Norwegian bilinguals, and the other 4 Sámi–Finnish bilinguals. Also 6 of the subjects (5 Norwegians and the Finnish speaker from Soadegilli) represent the Western Finnmark dialect, whereas 4 of them (3 Finnish and the Norwegian speaker from Kárášjohka) had Eastern Finnmark dialectal background.

Four speakers were recorded in a sound treated room at the University of Helsinki, the remaining six in Avvil and Guovdageaidnu data collection sites using a Zoom H2n recorder in quiet sites with good room acoustics.

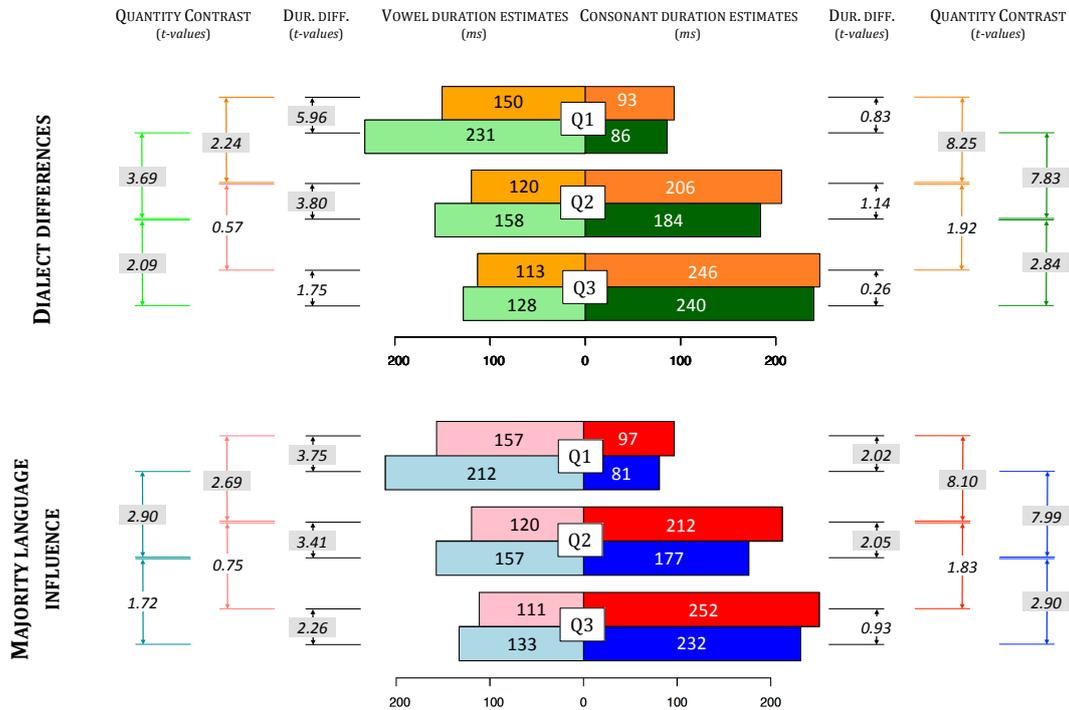
The collected data consisted of 37 different, mostly disyllabic target words, with the following structure: (C1)V1C2V2(C3). C2 was one of the consonants *đ, l, m, n, ŋ, s, v* in one of the three quantity degrees. As North Sámi orthography does not distinguish between Q2 and Q3 (short or long geminates), the target words in Q3 were in their noninflected form and the quantity was marked using an apostrophe as in the last column in Table 1. The target words were presented in a randomized order and embedded in a quotation form in phonetically controlled carrier sentences:

Mun dajan "duvvá" dutnje odđasit.
'I say "a dove" to you again.'

The recordings were annotated using Praat [3] and the durations of the relevant segments – V1 and C2 in the present study – were extracted.

We evaluate the influence of quantity degree, speaker's dialect and the majority language of the duration of the consonant C2, the previous vowel and the ratio between these durations, C2:V1. For each of these three measures, two mixed effect models were fitted, both with the logarithm of the measure as dependent variable. In one model, the independent variables were factors QUANTITY (Q1, Q2, Q3) and DIALECT (Eastern, Western), in the second one variables were QUANTITY and MAJORITY LANGUAGE (Finnish, Norwegian), in both case with interactions. To address the possible differences between speaker and segmental material, speaker and target word were treated as random factors. Some of the estimates reported below were obtained by re-ordering the levels of the independent factors in the models. R package lme4 was used to fit the models [2].

Figure 2: V1 and C2 duration estimates and t-values from the linear mixed model comparisons in Western (Orange) vs Eastern (Green) and Norwegian (Red) vs Finnish (Blue) North Sámi varieties. Both duration estimates as well as quantity oppositions (Q1 vs Q2 and Q2 vs Q3) were compared between the areal varieties. t-values over 2.00 are statistically significant differences and are highlighted with a grey rectangle.



3. RESULTS

3.1. Consonant duration

Fig. 2 presents the estimates of consonant and vowel durations (recalculated to milliseconds from the logarithmic scale) obtained from two fitted models with DIALECT and MAJORITY LANGUAGE, respectively, as independent factors.

The intervocalic consonant duration estimates are plotted at the right hand side of the boxplots in Fig. 2. Consonants were produced little over twice as long in Q2 compared to Q1; the ratios vary from 2.14 for Eastern dialect to 2.20 for Western dialect.

The differences among consonant durations of the same quantity degree were not significant between the dialects (all $t < 2$), however, Q1 and Q2 consonants were produced significantly longer by the Norwegians than by the Finns ($t > 2$). The duration differences between Q1 and Q2 was significant for both models ($t = 8.25$ for West, $t = 7.83$ for East, $t = 8.10$ for Norwegians and $t = 7.99$ for Finns) for DIALECT and MAJORITY LANGUAGE models, respectively.

The Eastern dialect speakers and the Finns pro-

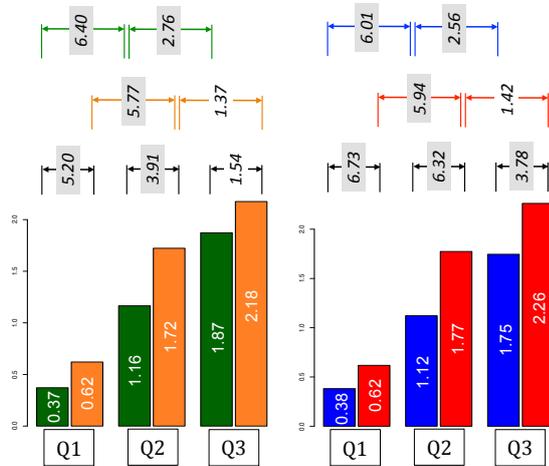
duced consonants significantly longer in Q3 quantity than in Q2 ($t = 2.84, 2.90$, respectively), but for the Western dialect and Norwegian speakers this difference was not significant ($t < 2$). Importantly, the interaction between Q2 vs Q3 contrast and DIALECT / MAJORITY LANGUAGE was significant in both models ($t = 3.77$ and $t = 4.34$, respectively). This shows that the difference between durations of Q2 and Q3 consonants was significantly greater for Eastern dialect than for the Western dialect speakers, and for the Finns compared to the Norwegians.

3.2. Vowel duration

The estimates of the durations of the vowel preceding the consonant (see the left hand side of Fig. 2) demonstrate the compensatory shortening associated with quantity. The duration of the vowels in Q2 is approximately three thirds of the duration of vowels preceding Q1 consonant (ratios between 0.68 for Eastern dialect and 0.79 for the Western dialect). The shortening for Q3 is more varied; it is most prominent for Eastern dialect speakers and least prominent for Westerners (0.55 and 0.75 of duration Q1, respectively).

4. DISCUSSION

Figure 3: C2:V1 ratios estimates and t-values from the linear mixed model comparisons in Western (Orange) vs Eastern (Green) and Norwegian (Red) vs Finnish (Blue) North Sámi varieties.



As these observations suggest, durations of vowels in the same quantity context were significantly greater for Finns than for Norwegians, and with the exception of the Q3 degree ($t = 1.72$), for Eastern than for the Western dialect. For all studied groups, the vowels were significantly shorter before Q2 and Q3 consonants than before Q1. The duration difference between Q2 and Q3 context was, however, significant only for Eastern dialect group ($t = 2.09$). Similarly as for the consonants, the difference between Q2 and Q3 context was significantly greater for Eastern than for the Western dialect speakers ($t = 5.14$) and for the Finnish than for the Norwegian bilinguals ($t = 3.07$).

3.3. Consonant:vowel ratios

Predictably, lengthening of the consonants and simultaneous shortening of the preceding vowel leads to the gradual increase of consonant:vowel duration ratios. Fig. 3 shows the estimates of the ratios obtained from the models with the (logarithm of) ratio as a dependent variable. For the same quantity, the ratios are significantly higher for the Norwegians than for the Finns, and, with the exception of Q3, for the Eastern than for Western dialect group. The ratios are significantly different between Q1 and the longer quantity degrees for all groups. However, the contrast between Q2 and Q3 is only significant for Eastern dialect speakers and for the Finns. Again, the difference between the ratios in these two long quantities is significantly greater for Finns than for Norwegians ($t = 4.75$), and for the Eastern dialect group than for the Western dialect one ($t = 5.97$).

Our data show that the Q2–Q3 contrast in terms of duration is significantly more robust for Finnish and Eastern dialect speakers compared to the Western dialect and Norwegian speakers, respectively. This is the case for both consonant and preceding vowel durations as well as for C:V ratio. The compensatory inverse relation between the vowel and consonant durations means that the sum of these durations might be relatively constant. This would be consistent with a foot isochrony hypothesis but confirming this will require analysis of all segments in a foot.

Evaluating the older observations mentioned in Introduction (cf. [13], see also [8]), the Eastern dialect speakers (and the Finns) co-signal the 3-way quantity opposition by significant compensatory shortening of the preceding vowel but they also realize the contrast by consonant duration differences (rather than shifting it towards vowel). In fact, the Western dialect speakers, expected to “retain” the opposition between long and short geminates, actually realize this contrast to a measurably smaller degree. It is possible that this could be explained by greater variability between speakers or other circumstances such as the issues with the orthography, which does not differentiate between long and short geminates. Importantly, the C2 durations in the three quantity degrees were not significantly different between the dialects, which could indicate that the dialectal differences are not as prominent as for the V1 durations.

These results might indicate an increasing instability of the ternary length contrast (see, e.g., [10]) in North Sámi potentially leading to language change. The source of instability may be the effect of majority language. While we cannot directly investigate this effect due to the unbalanced corpus (only one speaker in a Western dialect Finnish as well as Eastern dialect Norwegian groups), our results are compatible with this possibility. Comparing the estimates from the pairs of statistical models, the majority language influence on the contrast between Q2 and Q3 durations is numerically greater than that of the dialect influence.

It is also possible that, given typological properties of the two majority languages, the phonetic realization of the contrast might be shifting toward other means, such as fundamental frequency or intensity (cf. [14, 7]). Adding these characteristics to future analysis could bring new answers to the question of the stability and variety of the ternary length contrasts in North Sámi.

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