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AN UMLAUT PHENOMENON IN THE KARASJOHKA DIALECT OF NORTH SAAMI

1. Introduction

The concept of Umlaut occurs in contexts of the history and inflexion paradigms of the Germanic languages. It means a sound change in the development of the language. The Germanic Umlaut is a vowel change where a [+back] vowel in the first syllable has become influenced by the front vowel /i/ in the second syllable, to the effect that the [+back] vowel in the first syllable has developed into the corresponding [–back] vowel. The existence of the /i/ in the sound continuum also told the speaker/hearer about the evident reason of the sound change; only those [+back] vowels which were followed by an /i/ in the second syllable were subject to the rule of fronting. The [–back] vowel that so emerged was in complementary distribution with the [+back] vowel with no /i/-environment. As long as the presence of /i/ offered the explanation for the [–back] property of the 1st syllable vowel, the two alternative vowel qualities in the first syllable only had roles of an allophone. But a crucial event in the history of Germanic languages took place: the 2nd syllable /i/ disappeared. This caused a phoneme split in the system. For instance, the Old Swedish word [hu:sian] (derived from *hus* 'house') well exemplifies the phenomenon. The word underwent the phases [hu:sian] > [hy:sian] > [hy:sa(n)], resulting in the present day *hysa* 'to house' (Elert 1989 : 150). The stem word *hus* survives with a different vowel phoneme in today's Swedish. We are going to show that a process corresponding to the early phases of the Germanic Umlaut has happened in the Karasjohka dialect of North Saami.

The vowel system of Karasjohka dialect of North Saami has six vowel phonemes, viz. /i/, /e/, /á/, /u/, /o/, and /a/. The vowel in focus in this study is the phoneme /á/, the so called "clear *á*". The quality it represents approaches that of the Swedish [æ:] before /r/, i.e., a low front vowel. It is possible to combine the phoneme /á/ in the second syllable with any vowel phoneme in the first syllable, and vice versa, the phoneme /á/ is used in the first syllable with any vowel phoneme in the second syllable. The "clear", [æ]-like vowel quality of /á/-phoneme is preserved in the former case, but when it occurs in the first syllable, it is auditively felt to be influenced by the second syllable vowel. A native speaker's impression is that the phoneme identity is preserved irrespective of the second syllable impact. A timbre variation is influenced by the environment in the 2nd syllable.

In this paper we want to find evidence for the effect of the second syllable vowel, and also to show what the environment condition is, as well as to reveal the nature of the allophonic variation of the first syllable /á/ in bisyllabics in the Saami Karasjohka dialect. Acoustic phonetic experimental methods are used for the task.

2. Material and informants

Word material of the Karasjohka dialect of North Saami was selected for recording. The dialect is spoken in the municipality of Karasjok/Karasjohka in Norway near the Finnish border. Actually there are two dialects in the area: one is spoken by the nomadic Saami, the other by the Saami who live in houses all year round and have other occupations, e.g. agriculture. All our informants speak the dialect of the permanently settled people. A phonemic distinction between /a/ and /á/ seems to exist in this dialect as a whole.

The recordings were made at Guovdageaidnu, Norway, in the winter and spring 1995 by Tuomas Magga. The test word structure was systematized so as to include a combination of /á/ in the first syllable with all the vowel phonemes of the language in the second syllable, in twenty words of each combination. This totals 120 words, which were recorded from three informants. The number of measured realizations of the phoneme /á/ was 360.

Because it is assumed that the duration of the vowel in the second syllable would not affect the quality of /á/ in the first syllable, it was not taken into account in this study. The quality and "strongness" of the consonant centre was not paid heed to, either, nor to the occurrence and quality of word initial and final consonants.

All the test words (except *rábmot*) have been selected from the listed word-type samples in the doctoral dissertation by T. Magga (1984 : 36—42). The test words were read in the following carrier sentence: *Juogo --- daddjui?* 'Was --- already said?' In the context of this carrier sentence, the test word obtains the sentence stress. By this arrangement, the initial and final sentence prosody is also avoided.

2.1. The informants

Informant 1 (KK), male of 44 years, born at Karasjohka. His parents were farmers. His father was born at Karasjohka, too, but relatives on the father's side come from Guovdageaidnu, which belongs to the western dialects. Some of the relatives on the mother's side come from Anár (Inari), Finland. His mother has lived all her life at Karasjohka. KK left Karasjohka at 21, after which he served at the military and studied at Tromsö, Oslo, and Helsinki. Since 1988 he has lived at Guovdageaidnu. According to his own estimate, he speaks the Karasjohka dialect, but pronounces consonants and diphthongs a little more like in the "general" language.

Informant 2 (JS), male of 41 years, born at Karasjohka. His parents live permanently at the town. He left Karasjohka at 19, first for the military service, and then to study at Tromsø. Now he lives at Guovdageaidnu since 9 years. According to his own estimate, he speaks the standard variety of the dialect of the town of Karasjohka.

Informant 3 (JG), male of 33 years. His parents are farmers, and during his childhood the family used to live 30 kilometres from the town. They moved to the town when he was 11. At 19 he left Karasjohka, first for the military service, and then to study in the south of Norway for three years. After that he lived 3 years at Karasjohka, then moved to Guovdageaidnu, where he has stayed now three years. According to his own estimate, he speaks the standard variety of the dialect of Karasjohka.

3. Acoustic measuments

The formant frequencies of F1 and F2 were measured at the steady states of the realizations of the phoneme /á/. The significance of F3 as a factor of distinctive vowel timbre is considered minimal, because the vowels studied here are low vowels. At the time of the acoustic study, the computer program Signalyze in Macintosh environment was available for the analysis. The formant peak values were registered by means of the LPC-analysis method, which involves the application of an "order"-value, requiring modification of it for different voices, e.g. for male and female voices, separately. Order values 14 to 16 were used in the analysis of the three informants.

The obtained formant frequencies for F1 and F2 were transferred to a two-dimensional field, where the locations of vowel values as coordinates on the plane stand for the acoustic qualities of vowels. The observation of acoustic differences of the vowels is made possible on this plane. The values of F1 and F2 of the /á/ realizations were computed as averages per informant and vowel allophone (i.e., for each context provided by the second syllable vowel).

The acoustic parametres F1 and F2 correspond to perceived phonetic (and, in an indirect manner, articulatory) properties of vowels. The frequency of F1 has a fairly straightforward connection with perceived vowel height: the higher the F1 frequency, the lower vowel it represents. Accordingly, the high vowels [i] and [u] show low F1 frequencies. By the same token, F1 frequencies are high in the low vowels [æ] and [a]. The connection of F2 with phonetic features is somewaht more complex. Fant (1960 : 76—78) has shown that a strong formant-cavity affiliation between F2 and the front cavity exists, i.e., the size/length of the mouth cavity is a strong determinant of the frequency of F2. The front cavity size varies with the phonetic features of vowels according to the following proportion: in front vowels, the tongue mass leaves a smaller mouth cavity space open, and a relatively high F2 frequency results; in back vowels, the mouth cavity space is larger, and the resulting F2 frequencies are low. The mouth orifice area affects the F2 (and F3) frequencies as well. Thus, we realize that F2 derives frequency factors from at least these two articulatory parametres: the dimension [+/–back] and the dimension [+/–round] (see Fant 1960 : 76—78).

4. Results

The acoustic values of the allophones of the vowel /á/ are compared with each other informant by informant. The formant values of the /á/ vowel obtained from informant 1 vary very little for F1; the values vary only in the range from 658 to 698 Hz. None of the allophones is essentially different from others on the vowel height dimension. The variation of the second formant is considerably larger: from 1201 Hz to 1393 Hz. The averages for different allophones seem to cluster with reference to a distributional factor: those with a front vowel in the 2nd syllable have 136 Hz higher F2 values in the mean than those with a back vowel in the 2nd syllable (Table 1 and Figure 1).

Table 1

Frequency values of F1 and F2 (Hz) of realizations of vowel /á/ in contexts with different second syllable vowels. Informant 1

2nd syllable V	F1 (Hz)	F2 (Hz)
i	658	1393
e	673	1335
á	698	1356
u	684	1248
o	682	1201
a	687	1227

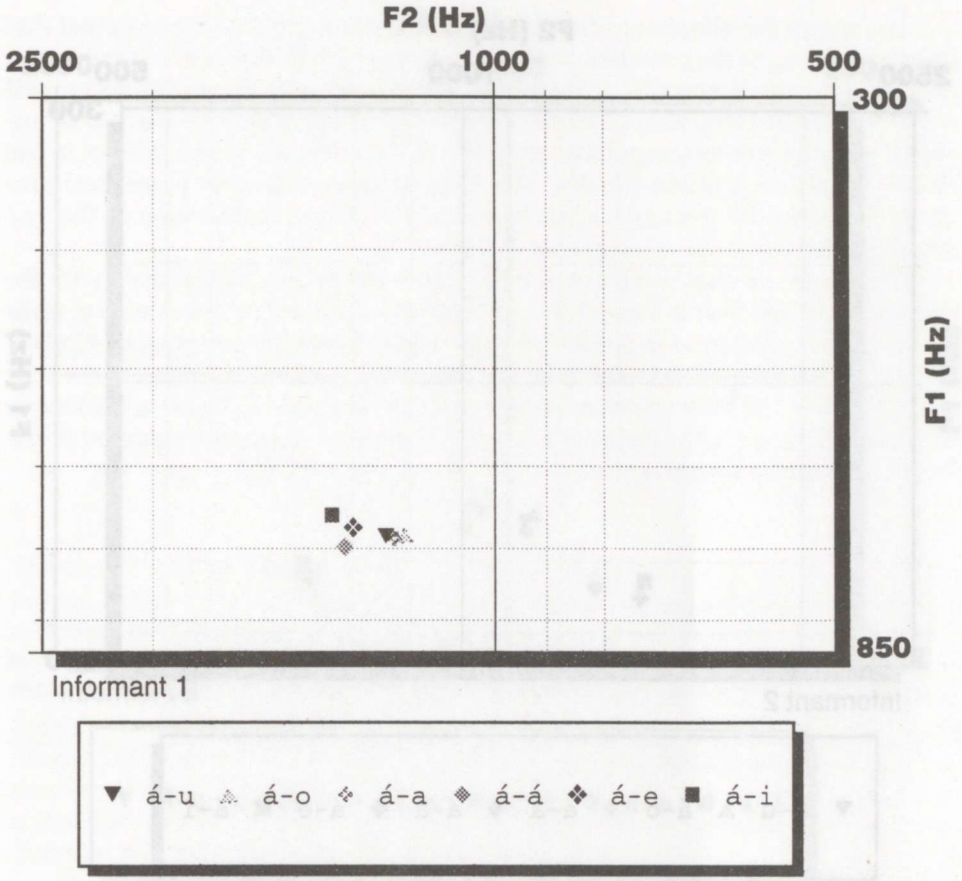

Figure 1. **The formant positions (F1/F2) of vowel /á/ in the first syllable in six second syllable vowel contexts. Informant 1. Legend, see figure.**

Informant 2 produced the /á/ vowel with clearly different values for both F1 and F2 with the two 2nd syllable environments. The range of variation for F1 is 640 to 747 Hz, and for F2 the range is 1137 to 1449 Hz, as computed from the allophonic averages (Table 2). Again the values for F1 and F2 seem to cluster according to the second syllable vowel environment: the F1 and F2 are 735 Hz and 1400 Hz for the allophone with a 2nd syllable front vowel, and 650 Hz and 1143 Hz for the allophones with a back vowel in the 2nd syllable (see Figure 2). The difference is considerably more distinct for informant 2 than for informant 1 (cf. Figures 1 and 2).

Table 2

Frequency values of F1 and F2 (Hz) of realizations of vowel /á/ in contexts with different second syllable vowels. Informant 2

2nd syllable V	F1 (Hz)	F2 (Hz)
i	725	1449
e	747	1437
á	733	1312
u	649	1137
o	640	1154
a	660	1138

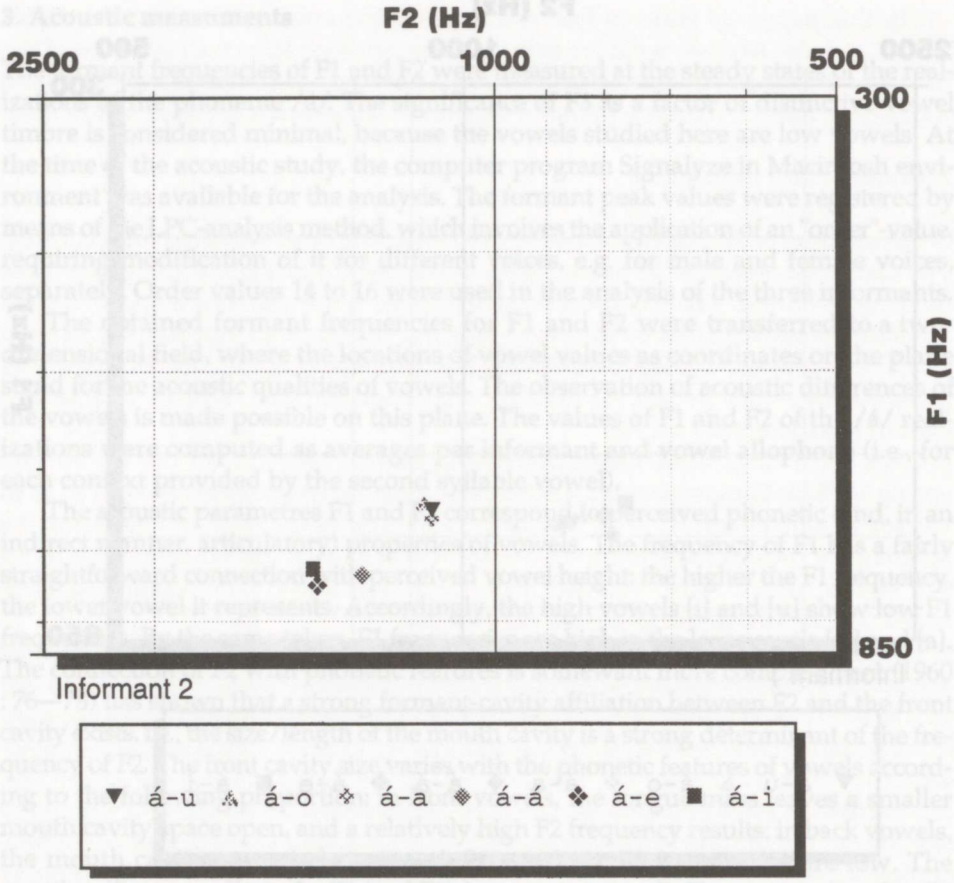

Figure 2. **The formant positions (F1/F2) of vowel /á/ in the first syllable in six second syllable vowel contexts. Informant 2. Legend, see figure.**

Table 3

Frequency values of F1 and F2 (Hz) of realizations of vowel /á/ in contexts with different second syllable vowels. Informant 3

2nd syllable V	F1 (Hz)	F2 (Hz)
i	714	1513
e	734	1496
á	761	1487
u	647	1053
o	634	1083
a	664	1093

Informant 3 shows us a pattern with an even bigger difference between the two allophone series. In the environment with a front vowel in the 2nd syllable, F1 ranges from 714 Hz to 761 Hz (mean: 736 Hz) and F2 from 1487 Hz to 1513 Hz (mean: 1499 Hz). The occurrence of a back vowel in the second syllable causes the following ranges: an F1 range from 634 Hz to 664 Hz (mean: 648 Hz), and an F2 range from 1053 Hz to 1093 Hz (mean: 1076 Hz). The average difference of the F1 values is 88 Hz and that of the F2 values is 424 Hz (Table 3 and Figure 3).

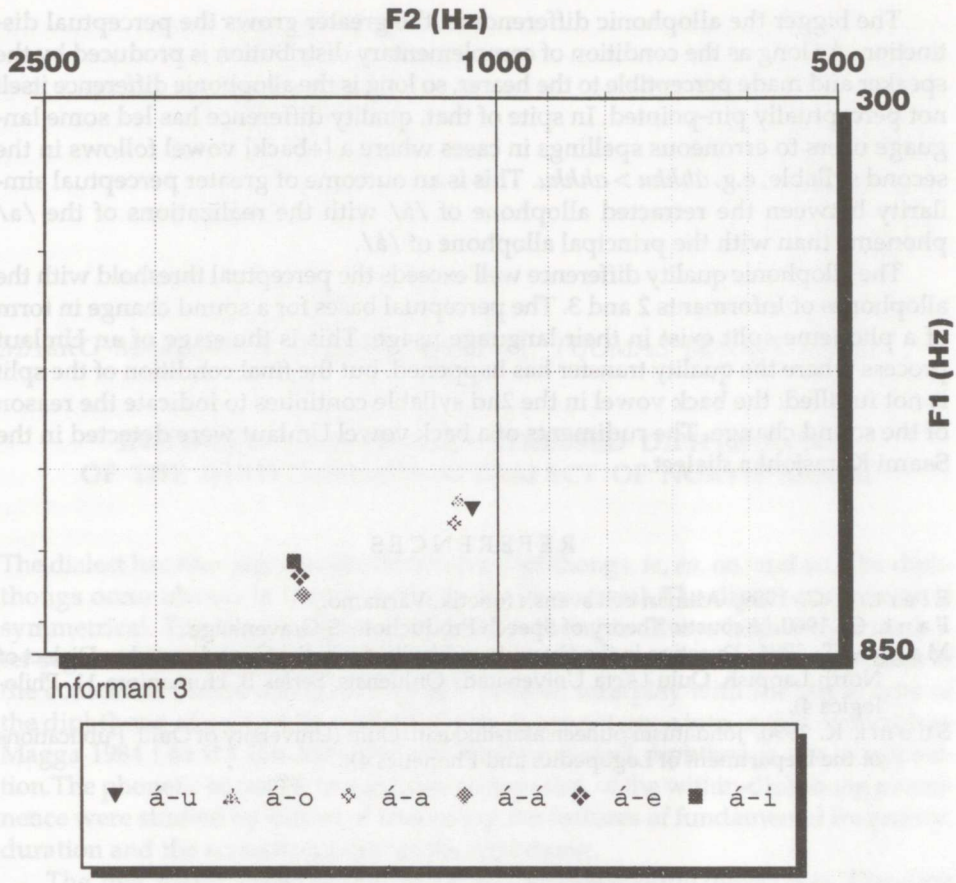

Figure 3. **The formant positions (F1/F2) of vowel /á/ in the first syllable in six second syllable vowel contexts. Informant 3. Legend, see figure.**

5. Conclusions

The results of the formant frequency analysis offer good evidence for how the second syllable vowel plays a role in determining the allophonic quality of the vowel /á/ in the first syllable. There is an evident defect in the study, in not measuring the /á/ vowel quality in monosyllables, and accordingly not obtaining information about an "unaffected" quality of the vowel. The auditive impression of the /á/ quality in monosyllables is, however, that it well corresponds to the allophone with a front vowel in the second syllable. The clear, non-retracted allophone can be considered the principal allophone of the phoneme /á/.

The results strongly support the idea that the quality of a [+back] vowel in the second syllable causes a retracted variety of the /á/ phoneme. The degree of allophonic difference varies individually quite much. As the obtained difference of F2 values is of the order of 140 Hz (Informant 1) to 420 Hz (Informant 3), we can think of the allophonic variation as varying from auditively not very relevant to clearly relevant, if the Bark scale of vowel quality evaluation is taken into account. In the frequency range of about 1000 Hz to 1500 Hz, the values 140 Hz and 420 Hz respectively correspond to about 0.5 Bark and 2.0 Bark (see e.g. Suomi 1990 : 179—185).

The bigger the allophonic difference is, the greater grows the perceptual distinction. As long as the condition of complementary distribution is produced by the speaker and made perceptible to the hearer, so long is the allophonic difference itself not perceptually pin-pointed. In spite of that, quality difference has led some language users to erroneous spellings in cases where a [+back] vowel follows in the second syllable, e.g. *áhkku* > *ahkku*. This is an outcome of greater perceptual similarity between the retracted allophone of /á/ with the realizations of the /a/ phoneme than with the principal allophone of /á/.

The allophonic quality difference well exceeds the perceptual threshold with the allophones of Informants 2 and 3. The perceptual bases for a sound change in form of a phoneme split exist in their language usage. This is the stage of an Umlaut process where the quality transfer has happened, but the final condition of the split is not fulfilled; the back vowel in the 2nd syllable continues to indicate the reason of the sound change. The rudiments of a back vowel Umlaut were detected in the Saami Karasjohka dialect.

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