

ELLEN NIIT (Tartu)

### VOWELS IN WORD-INITIAL SYLLABLES IN MUHU ESTONIAN

**Abstract.** The article provides an overview of the vowel quality in words of different quantity degrees as used in Standard Estonian spoken on the West Estonian Island of Muhu. The findings are based on the formant analysis of the data recorded by male informants of two age groups. The acoustic-phonetic measurements show that the vowel system in word-initial syllables of Muhu Estonian comprises nine vowels, just like that of Standard Estonian. It can be seen that in the older age group, the mid-high vowels /e/, /ö/ and /o/ are raised if they are of long and overlong duration. In the younger age group, only the mid-high front vowel /e/ is slightly raised, and additionally the mid-high vowels /ö/ and /õ/ have become closer in the formant space.

**Keywords:** Insular Estonian, dialectology, vowel system.

#### Introduction

The present paper studies the monophthongs of Standard Estonian as spoken on the Island of Muhu. The aims of the study are to give an acoustic-phonetic description of the quality of the vowels in word-initial syllables of Muhu Estonian, to establish the vowel system of this variety and to compare it to the vowel system of Eastern Saaremaa. The working hypothesis was based on the idea that Standard Estonian spoken in different regions of Estonia could have retained traits of old dialectal pronunciation tradition, and that there are regional differences in spoken Standard Estonian. This phenomenon has been described as a regional accent in speaking Standard Estonian (Niit 2004). It could be assumed that older people have a stronger accent and that the speech of younger language users might not have any regional accent traits at all. The aim was, thus, to see if and to what extent the local dialect has influenced the pronunciation of monophthongs in the modern Standard Estonian of the Muhu Island.

The Muhu dialect is spoken on the Muhu Island, situated between the mainland Estonia and the Island of Saaremaa. It forms a bridge between the Insular and Western dialects, and is therefore characterized as mixed, albeit mainly based on the Insular variety (Saareste 1932 : 36). On the basis of dialect descriptions (Vihma 1957; Lonn, Niit 2002) the word-initial

syllable in the Muhu dialect has nine vowel phonemes similar to Standard Estonian: low vowels /a/ and /ä/, mid-high vowels /e/, /o/, /õ/ and /ö/, and high vowels /i/, /ü/ and /u/. The most significant difference as compared to the vowel inventory of Saaremaa dialect is that the phoneme /õ/ is present in the Muhu dialect. Long vowels are represented in several different ways. Low overlong monophthongs /a/ and /ä/ have been diphthongized: *aa* > *oa* ~ *ua*; *ää* > *eä* ~ *iä* ~ *ia* (*eä* ~ *iä* ~ *ea* when long). Long and overlong mid-high vowels can either be diphthongized or raised. In the former case, the following changes have occurred: *ee* > *ie*, *oo* > *uo*, *öö* > *üö*, *õõ* > *õe* : *õõ*; an overlong diphthong can correspond to a long monophthong (e.g. *kiel* : *keele* 'language, tongue'; *uome* ~ *oome* 'tomorrow'). The mid-high vowel /õ/ is not raised in overlong duration whereas the mid-high vowels /e/, /o/ and /ö/ are raised. The high rounded front vowel /ü/ is, characteristically to Muhu dialect as well as North Estonian dialects, always diphthongized (*üü* > *ii*; in the case of a long diphthong lowering into *üe* may occur as is the case with other diphthongs ending in /i/). There is considerable variation in the language usage of different individuals. Also, diphthongization in modern dialects has been leveled due to the widespread use of standard language.

The same test words were used in an acoustic-phonetic study of the vowels in Saaremaa dialect (Niit 2005 : 113–122). This enables us to compare the findings of the two investigations. Earlier descriptions of the phonetic characteristics of the Muhu dialect are available only in unpublished form and are based on auditory analyses. Both scientific (Lonn, Niit 2002; Pajusalu, Hennoste, Niit, Päll, Viikberg 2002) and more popular overviews of the Muhu dialect (Niit 2002; Rullingo 2001 : 531–537) have been published but an acoustic-phonetic description of the vowels of Standard Estonian as spoken in Muhu is so far lacking.

## Materials and Method

The material of the present study consists of a word list containing words of one to five syllables. The test was designed to include vowels of varying durations in the word-initial syllable. Traditionally, Estonian is described to have three different quantity degrees: short (Q1), long (Q2) and overlong (Q3). It has to be noted that the focus of the present article is not the study of the quantity degrees but the comparison of the vowel quality in word-initial syllables of different quantities carrying the main stress (e.g. *kolid* ('to move' 2<sup>nd</sup> pers sg, Q1), *koolid* ('schools', Q2), *kooli* ('school' part sg, Q3)).

The materials were recorded by five male informants during different recording sessions using different equipment. The informants form two age groups: three are older than 70, and two younger than 40. Two older informants were recorded in the early 1990s using an Uher tape recorder. This material was analyzed acoustically at the Phonetics Laboratory of the University of Turku using the sonograph Kay Elemetrics Corp. Model 5500. The speech data was entered into the sonograph at 8 kHz. Spectrograms were made using a 300 Hz filter with the time constant of 50 ms. One older and two younger informants were recorded in 2005 using a DAT recorder Sony TCD-D 100 and an AKG D40S microphone. This material was analyzed using Praat.

The recordings were made outdoors. The informants were given an opportunity to familiarize themselves with the word list after which they were asked to read it at a normal rate. While the performance of the younger informants was flawless the older informants had to correct and repeat several words. In the analysis, the second repetitions were used if necessary. The words with the long and overlong /*ü*/ and overlong /*e*/ were pronounced as diphthongs by the two older informants recorded in the 1990s. One of these informants pronounced the overlong monophthong /*a*/ as a diphthong /*ua*/. There were no realizations of /*ö*/ in Q3 in the older informant's speech recorded in 2005. Diphthongs were not analyzed. All in all, 467 vowels were measured: 203 in the older age group and 264 in the younger.

The present study focuses on the formant values of the vowels in word-initial syllables. Formant values of the first three formants (F1, F2 and F3) were measured.

## Results

Tables 1 and 2 present the average values of formant frequencies with standard deviations in Hz and in Bark. Table 1 includes the formant values of the vowels of the older speakers, and Table 2 of the younger speakers. The two figures represent the location of the vowels in the formant space (F1/F2): Figure 1 presents the data for the older age group, and Figure 2 for the younger group. In the following, the data of the two age groups will be described separately.

### The older age group

There are some similarities in the occurrence of the high front vowels /*i*/ and /*ü*/. Namely, in neither case does the location of the short vowels overlap with the location of the respective long and overlong vowels in the F1/F2 space because the short vowels are more centralized. The unrounded short front vowel /*i*/ has moved closer to the long and overlong rounded front vowel /*ü*/ in the F1/F2 space, whereas the F3 value of the /*i*/ is higher than that of the /*ü*/ (it is over 1 Bark in all the quantities). In all quantity degrees, the quality of the high back vowel /*u*/ does not vary much.

The front vowel /*ä*/ is low in all three quantities, but is higher as compared to the low back vowel /*a*/ in the F1/F2 space. In its quality, /*a*/ is a low vowel that in all the quantity degrees is stable and always in the same frequency range.

In the case of the mid-high front vowel /*e*/, the location of its short and long variants differs in the F1/F2 space. There is a noticeable distance between the F1 of the short and overlong /*e*/ (114 Hz; the distance between the F1 of the /*e*/ in Q1 and in Q3 on the psycho-acoustic scale is 1.13 Barks, which could cause a qualitative distinction of these two vowels). The same tendency also characterizes the mid-high back vowel /*o*/, as the short /*o*/ is further away from the long and overlong /*o*/ in the formant space (the distance between the F1 of the /*o*/ in Q1 and in Q3 is 90 Hz or 0.82 Barks).

Table 1

Formant values and standard deviations (SD) of vowels in the speech of older male informants from Muhu in Hertz, and formant values in Barks

Vowels		Q1 words			Q2 words			Q3 words		
		F1	F2	F3	F1	F2	F3	F1	F2	F3
<i>a</i> (26/6/5)*	Hz	646	1214	2326	643	1160	2271	648	1097	2192
	SD	111	49	152	83	53	341	159	32	45
	Bark	6.12	9.72	14.02	6.09	9.44	13.86	6.13	9.09	13.62
<i>o</i> (5/6/10)	Hz	489	888	2184	401	814	2260	399	794	2208
	SD	54	92	185	38	169	171	36	115	221
	Bark	4.82	7.83	13.60	4.03	7.34	13.83	4.00	7.20	13.67
<i>u</i> (10/7/5)	Hz	330	779	2124	303	753	2193	313	745	2288
	SD	44	140	246	16	65	202	12	151	110
	Bark	3.34	7.10	13.41	3.06	6.91	13.63	3.16	6.85	13.91
<i>ö</i> (3/4/3)	Hz	477	1507	2191	438	1467	2177	350	1500	2140
	SD	45	139	181	44	23	154	42	28	311
	Bark	4.71	11.12	13.62	4.36	10.95	13.38	3.53	11.09	13.46
<i>õ</i> (19/5/4)	Hz	455	1324	2314	392	1243	2219	404	1261	2431
	SD	44	98	291	10	96	209	34	209	392
	Bark	4.52	10.28	13.99	3.94	9.87	13.70	4.05	9.97	14.31
<i>ä</i> (13/5/5)	Hz	588	1523	2422	608	1573	2398	576	1588	2613
	SD	137	35	94	116	81	145	90	48	259
	Bark	5.66	11.19	14.29	5.81	11.41	14.22	5.56	11.47	14.79
<i>e</i> (10/3/2)	Hz	509	1782	2558	418	1903	2557	385	1858	2595
	SD	80	70	177	55	56	143			
	Bark	5.00	12.24	14.65	4.19	12.68	14.65	3.87	12.52	14.74
<i>i</i> (19/7/8)	Hz	296	2006	3108	274	2185	3107	257	2196	3138
	SD	32	50	273	31	162	247	16	171	168
	Bark	2.99	13.03	15.91	2.76	13.60	15.91	2.58	13.63	15.97
<i>ü</i> (9/3/1)	Hz	286	1631	2278	317	1863	2371	275	1868	2252
	SD	30	107	190						
	Bark	2.88	11.65	13.88	3.20	12.54	14.15	2.77	12.55	13.80

The rounded mid-high front vowel /*ö*/ behaves differently from the other mid-high vowels in that the long and overlong vowels are not in the same frequency range. Instead the long vowel is closer to the short vowel. The same general tendency is apparent: the distance between the short and overlong vowels is considerable (127 Hz; the distance between the F1 values of the /*ö*/ in Q1 and in Q3 is 1.17 Barks, which is a perceptually salient difference).

The mid-high vowel /*õ*/, as compared to /*ö*/, is further back. The realizations of the long and overlong /*õ*/ are close to each other and higher than the short vowel (F1 values: Q1 — 455 Hz, Q2 — 392 Hz, Q3 — 404 Hz). The difference between the F1 of the /*õ*/ in Q1 and Q3 is still smaller

\* In the tables, the figures under each vowel show the number of measured short, long, and overlong vowels.

than that of the other mid-high vowels (51 Hz). The distance between the F1 in Q1 and Q2 in the case of /õ/ is 0.58 Barks, and between the F1 in Q1 and Q3 0.47 Barks, which is perceptually not salient. The difference between the F2 of the vowels /ö/ and /õ/ in Q2 and Q3 could be perceptible (the distance in the case of Q2 and Q3 exceeds 1 Bark: 1.08 and 1.12 respectively).

### The younger age group

The high front vowel /i/ is maximally fronted. The long and overlong /i/ are close to each other in the F1/F2 space. The short /i/, however, is more lower and closer to /e/ in its quality. The distance between the F1 of the overlong and short /i/ is 110 Hz or 1.12 Barks, which could be a perceptually salient difference (Q1 — 364 Hz, Q3 — 254 Hz).

Table 2

**Formant values and standard deviations (SD) of vowels in the speech of younger male informants from Muhu in Hertz, and formant values in Barks**

Vowels		Q1 words			Q2 words			Q3 words		
		F1	F2	F3	F1	F2	F3	F1	F2	F3
<i>a</i> (33/8/8)	Hz	560	1058	2517	547	983	2441	569	1036	2504
	SD	105	34	430	60	28	393	53	32	410
	Bark	5.43	8.87	14.54	5.32	8.42	14.34	5.51	8.74	14.51
<i>o</i> (10/5/17)	Hz	372	844	2368	357	745	2430	376	797	2351
	SD	35	24	399	20	27	459	35	44	349
	Bark	3.75	7.54	14.14	3.60	6.86	14.31	3.79	7.22	14.09
<i>u</i> (19/7/8)	Hz	306	824	2329	296	664	2303	298	712	2368
	SD	5	39	229	12	16	194	20	99	269
	Bark	3.09	7.41	14.03	2.99	6.26	13.95	3.00	6.61	14.14
<i>ö</i> (2/2/2)	Hz	386	1316	2278	388	1422	2346	410	1335	2241
	SD	25	4	141	4	112	117	16	76	1
	Bark	3.88	10.24	13.88	3.90	10.74	14.08	4.10	10.33	13.77
<i>õ</i> (27/7/7)	Hz	388	1280	2454	352	1134	2376	346	1197	2442
	SD	34	83	300	22	100	468	8	100	484
	Bark	3.90	10.06	14.37	3.56	9.30	14.16	3.49	9.63	14.34
<i>ä</i> (19/3/4)	Hz	596	1501	2643	595	1529	2683	644	1541	2662
	SD	33	2	192	51	11	189	2	22	199
	Bark	5.72	11.10	14.86	5.72	11.22	14.96	6.10	11.27	14.91
<i>e</i> (13/5/5)	Hz	451	1770	2592	383	1856	2779	375	1994	2736
	SD	79	88	156	19	161	214	13	41	120
	Bark	4.49	12.19	14.74	3.85	12.51	15.19	3.78	12.99	15.09
<i>i</i> (22/7/10)	Hz	364	2227	2911	245	2301	3020	254	2273	3039
	SD	105	52	111	9	124	16	14	156	48
	Bark	3.67	13.73	15.49	2.45	13.95	15.73	2.55	13.87	15.77
<i>ü</i> (6/5/3)	Hz	274	1709	2239	268	1772	2187	268	1693	2190
	SD	24	13	89	0	23	136	8	111	120
	Bark	2.76	11.96	13.77	2.70	12.20	13.61	2.69	11.90	13.62

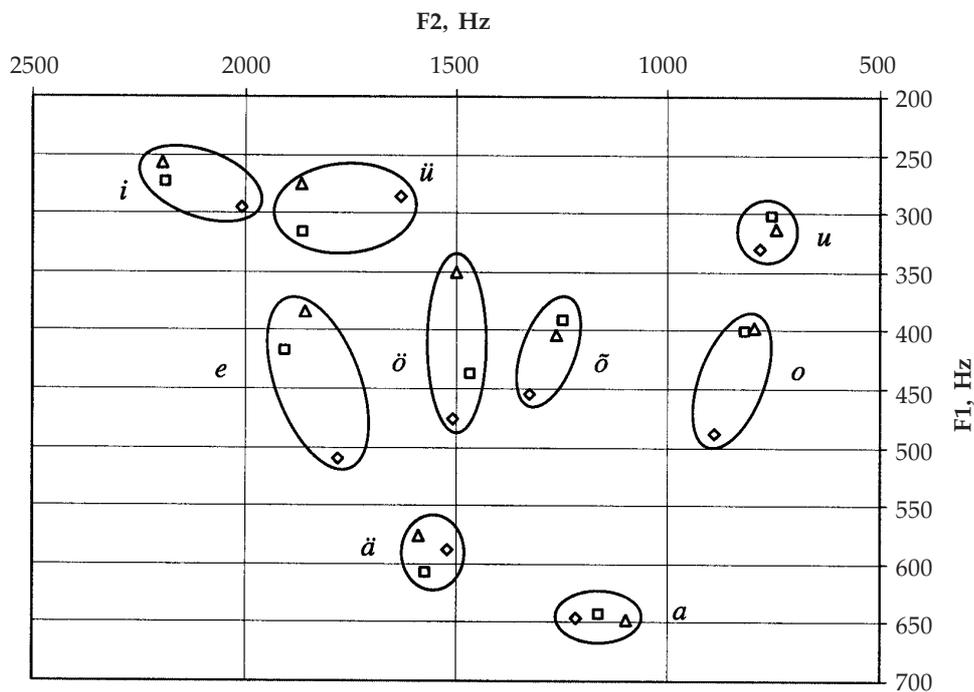


Figure 1. Vowels of the older age group in the formant space:  
 (◇ – Q1, □ – Q2, △ – Q3).

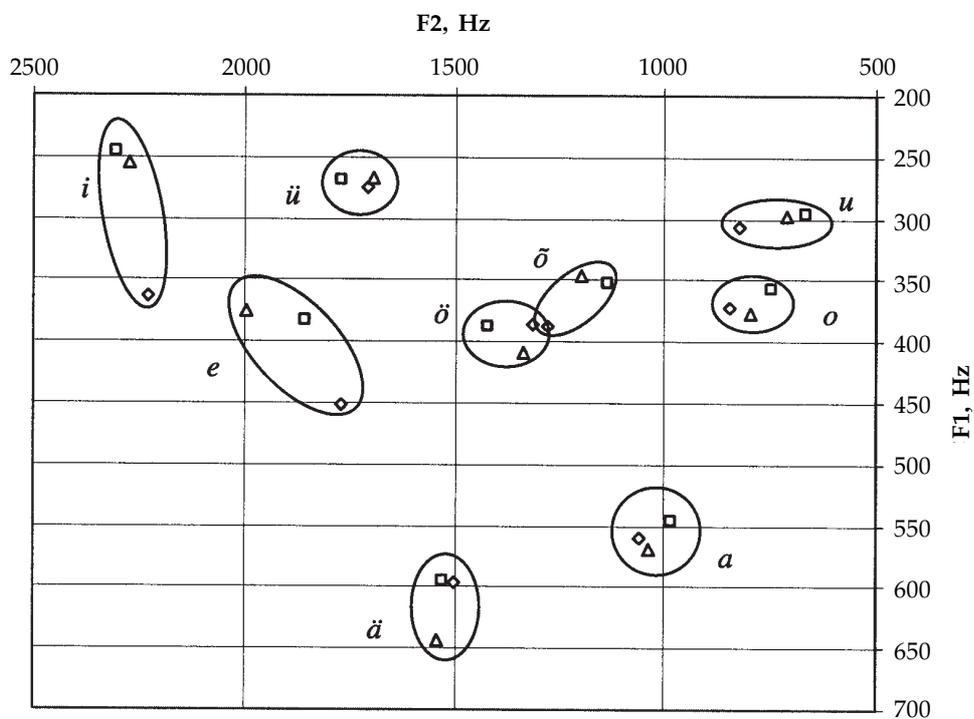


Figure 2. Vowels of the younger age group in the formant space:  
 (◇ – Q1, □ – Q2, △ – Q3).

In all quantity degrees, the rounded front vowel /*ü*/ is close to, but still easily differentiable from the unrounded vowel /*i*/ in the F1/F2 space. The rounded back vowel /*u*/ is a high vowel. Short /*u*/, in the speech of the younger speakers, has moved slightly towards the center of the vowel space.

The low back vowel /*a*/ has a similar location in all three quantity degrees in the F1/F2 space. The same can be said about the low front vowel /*ä*/. The overlong /*ä*/ is maximally low. It can be noted that as compared to /*ä*/, /*a*/ has shifted slightly higher.

The mid-high front vowel /*e*/ in Q2 and Q3 is higher than in Q1 (the difference in F1 between the short and overlong vowels is 76 Hz (0.71 Barks) which is perceptually not salient). The short /*e*/ is more centralized than the long and overlong variants. The mid-high back vowel /*o*/ has a relatively similar frequency range in all the quantity degrees. The mid-high front vowel /*ö*/ is realized in a similar way in all three quantities, moving slightly towards the back vowels. The long and overlong quantity degrees of the mid-high vowel /*õ*/ are close to each other in the F1/F2 space, but the short /*õ*/ is more centralized approaching the formant space of the short front vowel /*ö*/. The differences between the F1 values of the vowels /*õ*/ and /*ö*/ in Barks are minimal in all quantity degrees, but the distance between the F2 of Q2 and Q3 could still be perceivable (1.44 and 0.7 Barks respectively).

## Discussion

The acoustic analysis confirmed the earlier descriptions made on the basis of auditory impressions — the vowel inventory of the Estonian spoken on the Muhu Island consists of nine vowels: /*a, o, u, ä, e, ö, i, ü, õ*/. Almost all of these vowels are realized in different quantity degrees.

The main difference as compared to the vowels of Saaremaa Estonian is that the vowel /*õ*/ is present in Muhu Estonian. As compared to the vowels of the Eastern Saaremaa variety, which is closest to the variety spoken in Muhu (Niit 2005 : 115–116), the main difference seems to be that in the formant analysis of the vowels of Muhu, nine vowels were clearly distinguishable (except in the date of two older informants). The data from Eastern Saaremaa did not contain any long and overlong realizations of /*ü*/ due to diphthongization. This is not the case in Muhu Estonian. The formant values of the mid-high vowels /*ö*/ and /*õ*/ were similar in the material of Eastern Saaremaa, but on the basis of the analysis of Muhu Estonian, it can be stated that /*ö*/ and /*õ*/ are different vowels because there is no overlap of the F2 values.

The following qualitative differences due to the quantity differences in the case of the mid-high vowels of Muhu Estonian were noted. The long and overlong /*e*/ were higher and more front than the short /*e*/ in both age groups, although in the younger age group, the raising is not as noticeable as in the older group. The mid-high back vowel /*o*/ is relatively high in all quantity degrees in the speech of the younger age group, being closer to the formant space of /*u*/. The long and overlong /*o*/ of the older age group is raised as compared to the short vowel.

In the younger age group, the location of /*ö*/ in all quantity degrees is closer to the formant space of /*õ*/. This could be due to the shift of the

*/õ/* towards the front vowels. In any case, the mid-high vowels */õ/* and */ö/* are close to each other in the formant space. It could also be stated, with certain reservations, that in the case of Q1 */õ/* and */ö/* are almost the same vowel in the F1/F2 space (cf. the more front location of the */ö/* in the older age group, Figure 1). The calculation of the formant values in Barks shows no difference. The difference between them can be seen in the words with long or overlong vowels and is based on the value of F2. This could have several possible reasons. One of these could be the fact that for the inhabitants of Saaremaa and Muhu who speak the Insular dialect, */õ/* is a foreign sound, as stated by P. Ariste (1953 : 63): "While trying to pronounce *õ* they can learn to position their tongue correctly, but while doing this they still use lip-rounding as in forming the vowel *ö*. The outcome is a vowel that is acoustically somewhere between *õ* and *ö*". The same might be the case in the pronunciation of younger speakers of Muhu Estonian.

In both age groups, the high/low vowels of different quantity degrees are on the periphery of the F1/F2 space. The long vowels */i, ü, u, ä, a/* are (mostly) close to the respective overlong vowels in the formant space. Comparing the long and overlong vowels to the short ones it can be seen that the */i/* and */ü/* have shifted maximally high and to the front. The location of the short */i/* in both age groups and the short */ü/* of the older age group in the F1/F2 space is different from the respective long vowel. The */u/* in all the quantity degrees is maximally high and back in the speech of both younger and older speakers. The */a/* of both age groups is a back vowel, and in the older age group, it is maximally low. The location of */ä/* in relation to */a/* is reversed in the pronunciation of younger and older speakers: in the realization of the younger age group, */ä/* is lower than */a/*.

When comparing the pronunciation of the informants of different ages it appears that the vowels of the older age group reveal a tendency typical to the West-Estonian region where the mid-high vowels */e/, /õ/* and */o/* are raised in the overlong (but also long) quantity degrees. This phenomenon is absent in the speech of the younger age group, with the exception of a slight raise in the case of the front vowel */e/*.

As to the mutual location of the vowels in the formant space on the scale of high/low it can be observed that there exists a three-level distribution. The vowels in the speech of the older age group form a quadrilateral which is characteristic to other Finnic languages, whereas in the case of the younger speakers we can observe a tendency typical to this region: the back vowel */a/* has shifted towards the */o/* (raised), which in its turn has resulted in the shift of the mid-high */o/* towards the close vowel */u/*.

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Address:  
Ellen Niit  
University of Tartu  
E-mail: ellen.niit@ut.ee  
Phone: +372 7376124

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ЭЛЛЕН НИИТ (Тарту)

ГЛАСНЫЕ ПЕРВОГО СЛОГА  
В МУХУСКОМ ГОВОРЕ ЭСТОНСКОГО ЯЗЫКА

В статье описывается качество гласных первого слога в словах мухуского говора с разными квантитативными ступенями. В основу описания легли данные формантного анализа. Акустико-фонетические измерения позволили установить вокальную систему первого слога мухуского говора, в которую входит девять гласных, как и в эстонском литературном языке. Для эксперимента были записаны мужчины-информанты разного возраста. Результаты измерений дают возможность сделать вывод, что у представителей старшей возрастной группы средневысокие гласные *e*, *ö* и *o* повышаются в словах с долгой и сверхдолгой степенями длительности. В младшей возрастной группе в меньшей мере повышается только переднерядный гласный *e*. У младшей группы сблизилась расположения в формантном пространстве средневысоких гласных *ö* и *õ*.