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GLOTTAL STOP IN VÕRO SOUTH ESTONIAN*

Abstract. One of the most striking characteristics of Võro South Estonian is the glottal stop ʔ that occurs as a peculiar consonant phoneme. The present article investigates the occurrence, quality, and duration of the glottal stop, and the F0 contour of the words with the glottal stop, in controlled and spontaneous speech from the East-Võro area. The acoustic analyses have been carried out with the program PRAAT. The results show that the Võro glottal stop occurs always as a word-final stop whose duration is similar to that of word-final semi-long consonants. The glottal stop is pronounced more frequently in certain word and sentence structures and often gets assimilated with the initial consonant of the following word. The Võro glottal stop has characteristics triggering both phonemic and morpho-phonological processes as well as intonational characteristics. The Võro glottal stop is a phoneme that has certain prosodic features that are above all used for highlighting grammatical and communicational meanings.

Keywords: Võro South Estonian, phonetics, glottal stop.

1. Introduction

One of the most striking characteristics of Võro South Estonian as compared to its neighboring languages is the occurrence of the glottal stop or laryngeal closure. In a phonetic transcription, the glottal stop is transcribed as ʔ, and in the spelling of Võro marked with the letter *q* or an apostrophe (Iva 2000 : 97; 2002 : 15). In the Finnic languages, it can be found also in Finnish, not as an independent phoneme but as a possible realization of a complicated morpho-phonological process which is perceived as a word-initial aspiration rather than laryngeal stop (Karlsson, Lehtonen 1977). In Livonian, there occurs word-internal laryngealization which is to a certain extent similar to the glottal stop. It is worth noting that in the South Estonian subdialect of Leivu, the occurrence of both word-final glottal stop as well as word-internal laryngealization has been observed (Niilus 1936). It is possible that the glottal stop was once also widespread in the North Estonian dialect area (Saareste 1952 : 75–79), but in present-day (North) Estonian, this sound can only be heard in the colloquial negative particle *əʔə*.

In Võro the glottal stop occurs as an independent consonant phoneme, and is often the only differentiator of meaning in the Nominative plural,

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e.g. singular *kala* 'fish', plural *kalaq* [*kalaʔ*]. At the same time it is obvious that the ʔ phoneme in Võro is not a completely usual phoneme as regards its specific conditions of occurrence:

a) ʔ occurs only word-finally after a vowel or a voiced consonant. In the Vahtsõliina dialect texts of the corpus of Estonian dialects, ʔ on the whole is not a very frequent sound (1.9%), but becomes more frequent if only the word-final positions are counted (7.6%), see Table 1; b) ʔ does not palatalize; c) there is no length opposition in the pronunciation of ʔ.

Table 1

The occurrence of ʔ and *k* in the Võro language on the basis of the Vahtsõliina dialect texts

Sounds	Total		Word final position	
ʔ	952	1.9%	947	7.6%
<i>k</i>	2609	5.2%	144	1.2%

S. Nigol (1994 : 69—73), H. Keem (1997 : 5—6), H. Keem and I. Käsi (2002 : 31) present a thorough analysis of the positions of occurrence of the Võro glottal stop. It appears that as a rule ʔ occurs as a grammatical marker whereas it rarely acts as a differentiator of lexical meaning. The fact that the glottal stop does not change the main meaning of the word is evidenced by its (variable) occurrence in forms where it is historically secondary, and mainly concentrates the form in the information structure of the sentence, e.g. pronouns *ma(ʔ)*, *sa(ʔ)*; particles *no(ʔ)*, *küil(ʔ)*. Particularly productive is the usage of particles containing ʔ in the archaic dialect texts of Vahtsõliina — up to a quarter of all the forms, see Table 2.

Table 2

Words ending in ʔ in the archaic dialect texts of Vahtsõliina

Form	Number	%
Particle	56	23.5
Pronoun	18	7.6
Plural marker	24	10.1
<i>nuʔ</i> -infinitive	27	11.3
Negative form	21	8.8
Other	92	38.7
TOTAL	238	100

According to the observations of H. Keem, ʔ is clearly pronounced in the speech stream above all at the end of the utterance, or utterance-internally before a pause or at the end of a stressed word. If the glottal stop is followed by a word that starts with a consonant, the glottal stop usually gets assimilated with that word-initial consonant and a geminate is formed at the word boundary as in e.g. *tulɛʔ s̄ijäʔ* > *tulɛs̄s̄ijäʔ* 'come here'. A similar phenomenon is also common in the pronunciation of Finnish (Karlsson, Lehtonen 1977). According to H. Keem, the glottal stop is not pronounced before a vowel (1997 : 6).

It has been observed that the glottal stop often disappears in trisyllabic words and words with more than three syllables (Keem 2002 : 32),

as well as in disyllabic words in the third quantity (Q3) (Jüvä, Kasak, Help 1995 : 10). This tendency has laid the basis for the claim that the glottal stop does not occur in trisyllabic and Q3 disyllabic words (Jüvä, Kasak, Help 1995 : 10). This claim, however, is not supported by recent observations by the present author.

In some idiolects of the newer colloquial speech of Võro, ʔ is pronounced at the end of forms where it should not occur according to the rules e.g. *tulõmaq* [*tulẽmaʔ*] 'to come', *inemineq* [*inemineʔ*] 'human being'. Such uncertainties occur above all in the pronunciation of suprasegmental phenomena, in vowel harmony, etc (Iva 2002).

Earlier phonetic studies of the Võro glottal stop have been carried out by P. Ariste (1938) and the present author whose recent results (Iva 2003) form to a large extent the basis of this article.

2. Materials and method

The aim of the present study is to clarify the acoustic properties of the Võro glottal stop, its place in the sound system, and the conditions and frequency of its pronunciation. To this aim, the occurrence, quality, and duration of the glottal stop were studied. Additionally, the fundamental frequency (F0) of the words with the glottal stop was measured. The analysis was carried out with the speech analysis program PRAAT.

In order to study the quality of the glottal stop, formant values of the vowels preceding the ʔ were measured in words pronounced in isolation recorded by the present author (a 35 year old man from Navi in the Põlva parish). Also the duration of the isolated glottal stops was measured.

The occurrence and duration of the glottal stops was studied on the basis of recordings of spontaneous speech. The subjects were from the villages of Sutõ and Loosi who speak the Vahtsõliina sub-dialect: women aged 73, 72 and 50, and men aged 78, 62 and 56, recorded in 2002, and a man aged 28 from Sutõ, recorded in 2003 (for texts see Iva 2003 : 86–87, 149–150).

In order to study the intonation of words containing glottal stops, their F0 was measured in the spontaneous speech of a 68 year old man from Puspuri village in the Vastsõliina sub-dialect area recorded in 1974 (EMH 2634).

3. Analysis and results

3.1. Quality of the glottal stop

To study the quality of the glottal stop the formant values of the overlong vowel *a* preceding the word-final consonant were measured in ten isolated words ending in ʔ and ten words ending in *k*. The following test words were used: *paaq* [*pâʔ*], *jaaq* [*jâʔ*], *paak* [*pãk̚*], *Jaak* [*jãk̚*]. Averaged results are presented in Table 3.

As can be seen, an acoustic characteristic of the glottal stop is the stability of the formants in the preceding vowel, which is natural because in the case of the laryngeal stop the closure is formed not in the oral cavity but in the larynx. Differently from other stops, the beginning and end

values of F1, F2 and F3 of the vowel preceding the glottal stop are virtually the same. In the case of *k*, however, there are noticeable differences, particularly in F1 that is 200 Hz lower at the end of the vowel than at its beginning.

In most of the words used in this experiment, in the end portion of the vowel preceding the glottal stop laryngealization was observed.

Table 3

Average formant values (Hz) at the beginning and end of the over-long vowel *a* preceding the word-final stops *ʔ* and *k*

Word structure	F1		F2		F3	
	Beginning	End	Beginning	End	Beginning	End
<i>Caaʔ</i>	655	680	1020	1020	2770	2760
<i>Caak</i>	605	405	1030	1060	2630	2470

As can be seen, an acoustic characteristic of the glottal stop is the stability of the formants in the preceding vowel, which is natural because in the case of the laryngeal stop the closure is formed not in the oral cavity but in the larynx. Differently from other stops, the beginning and end values of F1, F2 and F3 of the vowel preceding the glottal stop are virtually the same. In the case of *k*, however, there are noticeable differences, particularly in F1 that is 200 Hz lower at the end of the vowel than at its beginning.

In most of the words used in this experiment, in the end portion of the vowel preceding the glottal stop laryngealization was observed.

3.2. Duration of the glottal stop

3.2.1. Absolute duration of the glottal stop in words pronounced in isolation

The duration of the *ʔ* in the ten test words presented in the previous section was stable over 200 ms, with an average duration of 217 ms (SD 14), which is somewhat shorter than in the case of *k* with an average duration of 260 ms (SD 18).

3.2.2. Duration of the glottal stop in different word structures

In this section, the duration of *ʔ* in read connected speech is compared to the duration of *k* and *h*, the closest stops with respect to the place of articulation, in different word structures. The results are presented in Table 4 and Figure 1.

Unlike the Võro *p*, *t*, *k* and *s* series the word-final *ʔ* and *h* do not have short equivalents. This is reflected by the single column in the first part of the histogram in Figure 1. It can be concluded that the duration of the Võro *ʔ* is independent of the word structure similar to the duration of the word-final semi-long stops. Unlike other stops and like *h* the glottal stop does not have a distinct overlong or short equivalent. Like the Finnish glottal stop (Karlsson, Lehtonen 1977 : 61) the Võro *ʔ* is a general glottal stop the duration of which varies to some extent.

Table 4

**Duration (ms) of word-final consonants *k*, *ʔ* and *h*
in words with different structure**

Word structure	<i>k</i>	Duration	<i>ʔ</i>	Duration	<i>h</i>	Duration
1 s, -VVČ	<i>tsuug</i>	103	–	–	–	–
1 s, -VVC	<i>luuk</i>	200	<i>luuq</i>	200	<i>suuh</i>	275
1 s, -VCC	<i>lukk</i>	285	<i>muq</i>	203	<i>koh</i>	208
2 s, -VC	<i>kasuk</i>	171	<i>kasuq</i>	135	<i>taloh</i>	182
2 s, -VC (Q3)	<i>aastak</i>	170	<i>aastaq</i>	150	<i>aastah</i>	144
3 s, -VC	<i>lepistik</i>	195	<i>varastiq</i>	178	<i>Kanepih</i>	232

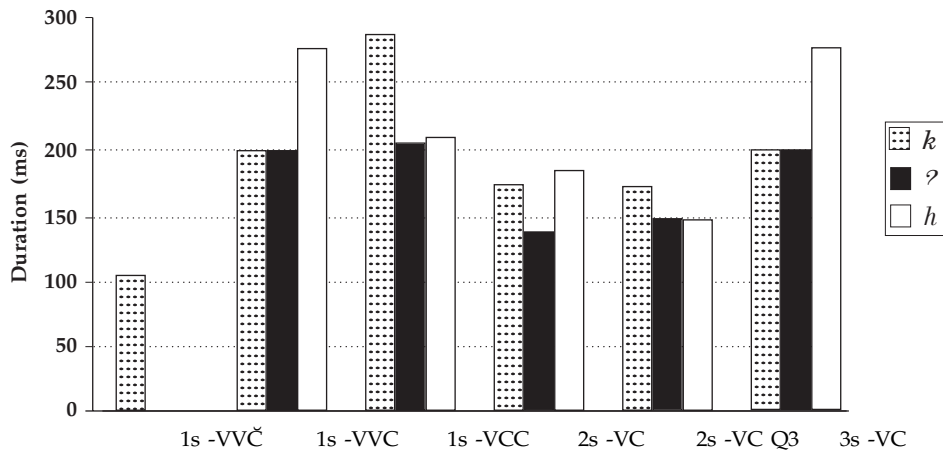


Figure 1. Duration of word-final consonants *k*, *ʔ* and *h* in words with different structure: 1s -VVČ (*tsuug* [tsûC] 'leather shoe'), 1s -VVC (*luuk* [lûk] 'horse bow', *luuq* [lûʔ] 'bones', *suuh* [sûh] 'in the mouth'), 1s -VCC (*lukk* [luk] 'lock', *muq* [muʔ] 'mine', *koh* [koh] 'where'), 2s -VC (*kasuk* [kazuḱ] 'fur coat', (*ei*) *kasuq* [ei kazuʔ] '(doesn't) grow', *taloh* [taloh] 'in the farm'), 2s -VC Q3 (*aastak* [âstak] 'year', *aastaq* [âstaʔ] 'years', *aastah* [âstah] 'in the year'), 3s -VC (*lepistik* [lep̥istik] 'alder grove', *varastiq* [varastiʔ] '(they) stole', *Kanepih* [kanep̥ih] 'in Kanepi').

The comparison of the duration of vowels in the first and second syllables in disyllabic Q1 words shows also that *ʔ* and *h* are similar to typical word-final semi-long consonants because, as is the case with the word-final semi-long *p*, *t*, *k* and *s*, the preceding vowel in such word-structures is short rather than semi-long (see Figure 2).

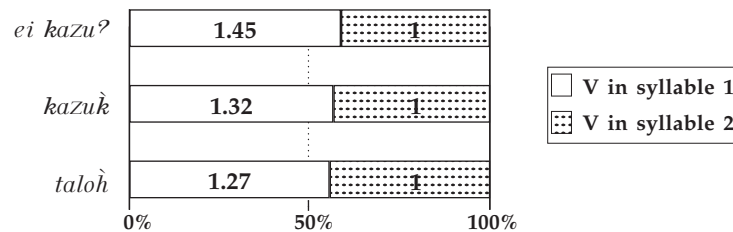


Figure 2. Duration ratios of vowels in the first and second syllables of the words *kasuk* [kazuḱ] 'fur coat', (*ei*) *kasuq* [ei kazuʔ] '(doesn't) grow' and *taloh* [taloh] 'in the farm'.

3.2.3. Duration of the glottal stop as compared to other sounds in the word

The sentences compiled for the purpose of comparison contained ten words in utterance-final stressed position with the (C)VV^ʔ, (C)VVk and (C)VVh structures (e.g. *puuq* [pû^ʔ] 'trees', *luuk* [lû^k] 'horse bow', *maah* [mâ^h] 'on the ground'). Measurements were taken of the duration of the vowel and the duration of the final consonant and its plosion phase. Averaged results are presented in Table 5.

Table 5

Average duration (ms) of word-final consonants ^ʔ, *k* and *h*, their plosion phases and the preceding overlong vowels together with standard deviations (SD)

Consonant	Vowel	SD	Consonant	SD	Plosion	SD
^ʔ	169	12	162	39	18	4
<i>k</i>	167	24	231	37	19	6
<i>h</i>	193	18	225	34	–	–

Average durations of the consonants ^ʔ, *k* and *h*, the preceding overlong vowel and the following plosion are illustrated by Figure 3 where it can be seen that ^ʔ is much shorter than *k* and *h* (by about one third): the average duration of *k* and *h* is over 200 ms, whereas that of ^ʔ is only slightly over 160 ms.

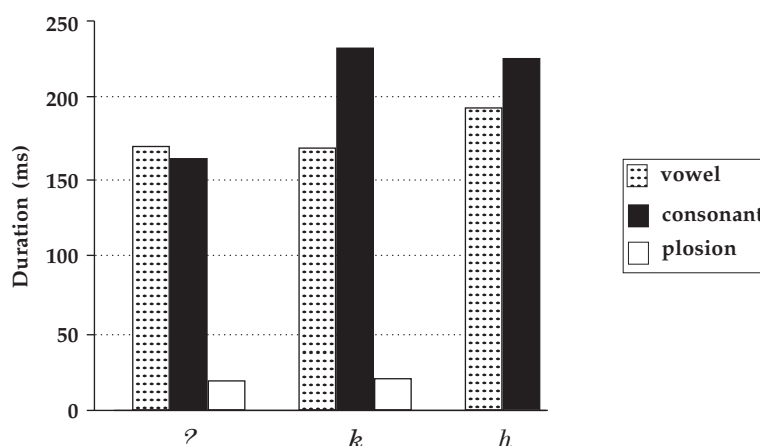


Figure 3. Average duration (ms) of word-final consonants ^ʔ, *k* and *h*, the preceding overlong vowel and the following plosion in utterance-final stressed position.

The glottal stop stands out from *k* and *h* also with respect to the duration ratio of the consonant and the preceding vowel. Namely, in the case of ^ʔ the durations of the vowel and consonant are almost identical, ^ʔ being even slightly shorter than the preceding vowel, whereas *h* and *k* are longer than the preceding vowel (see Figure 4).

The average duration of the plosion was roughly similar in the case of ^ʔ and *k* (see Table 5 and Figure 3). The ^ʔ and *k*, however, seem to differ from each other in the frequency of occurrence of the aspiration. The plosion of ^ʔ was followed by aspiration only once out of ten cases (duration 147 ms), but that of *k* ten times out of ten (average duration 89 ms, SD 41).

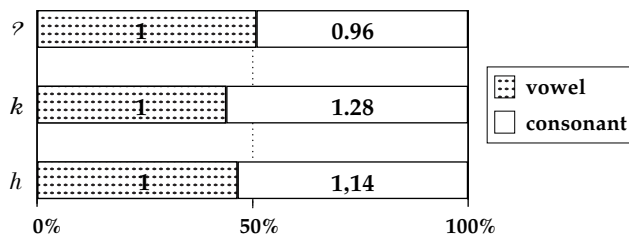


Figure 4. Duration ratio of the word-final consonants ʔ, k and h and the preceding overlong vowel.

3.3. F0 of the words containing the glottal stop in spontaneous speech

Table 6 presents the F0 values of mono- and disyllabic words with a glottal stop occurring in spontaneous speech, measured at the beginning, the highest point and the end of the word, and at the beginning of the next word. Also, the average F0 of the phrase is given.

Table 6

F0 (Hz) of mono- and disyllabic words with a glottal stop from spontaneous speech

Word structure	No.	Phrase average F0	F0 start V1	F0 peak	F0 peak location	V F0 before ʔ	Next word F0
CVVʔ	10	125	134	137	16	119	122
CVC(C)Vʔ	10	132	147	156	12	127	126

We can see that in the case of both mono- and disyllabic words, the words with a glottal stop have a specific F0 contour, the start of which is higher than the average F0 of the phrase, but the end of which falls to the average F0 level or even lower (see Figure 5). Thus, the ʔ gives an abrupt

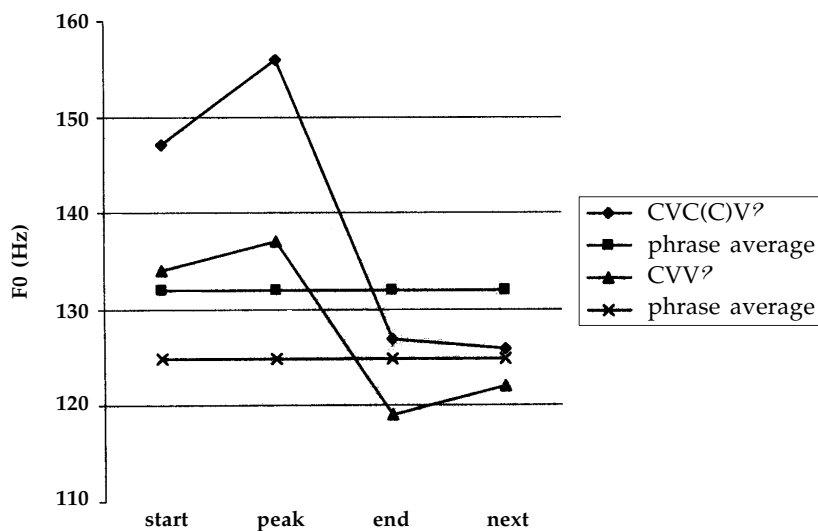


Figure 5. F0 at the beginning, peak and end of mono- and disyllabic words with the glottal stop, and at the beginning of the next word as well as the average F0 of the phrase.

end to the word also with respect to intonation. This seems to be one of the bases of the characteristic Võro intonation.

3.4. The actual occurrence and duration of the glottal stop in read connected speech

In order to clarify the actual occurrence of the glottal stop, all cases of the occurrence of ʔ were identified in the read text recorded by six informants, and the duration of the ʔ measured. Table 7 and Figure 6 present the average durations of the ʔ pronounced in the 34 words ending in ʔ (total 204 words in the speech of six informants) together with the data about the occurrence (i.e. pronunciation) of ʔ. The data has been grouped according to the position of the word in the utterance. The table and figure also show the ratio of the occurrence of pre-consonantal glottal stops and of assimilation with the following consonant. For detailed measurement results see appendixes 1–4 in Iva 2003.

Table 7

Average duration (ms) and standard deviation (SD) of ʔ and the ratio of the occurrence of ʔ and its assimilation

Position of word	Average duration of ʔ	SD	ʔ	Assimilation	ʔ and assimilation
Before pause	83	35	63%	–	–
Before vowel	93	41	55%	–	–
Before consonant	93	39	29%	23%	52%
Total	90	38	49%	8%	57%

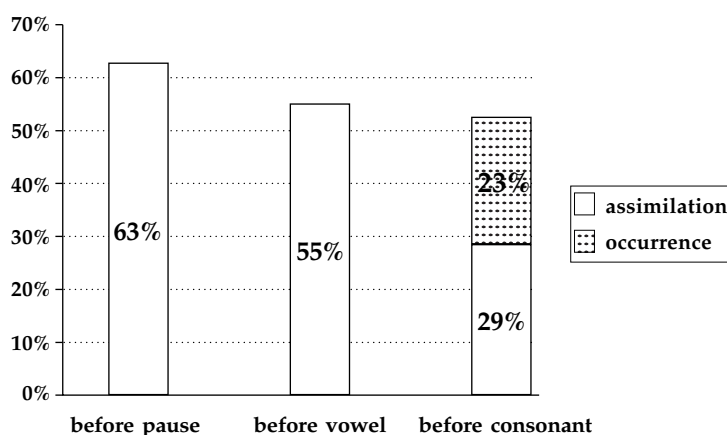


Figure 6. Dependency of the pronunciation of ʔ on position in the word.

As can be seen, ʔ is pronounced most frequently in pre-pausal position, which corroborates the findings of H. Keem (1997), S. Nigol (1994) and J. Rodgers (2000). It is pronounced only a little less frequently in the case of a vowel following without a pause. The occurrence of ʔ before words starting with a consonant is, however, considerably rarer, but together with the cases of assimilation the occurrence of ʔ in this position remains similar to that in other positions. The geminate that forms at the word boundary as a result of the assimilation of ʔ (e.g. in the sentence

es olɛʔ kunaciʔ > *es olɛ^k kunaciʔ* 'there was never') is approximately of the same duration (130 ms) as the word-internal short geminate (e.g. in the word *takah* [*ta^kka^h*] 'behind').

Figure 7 confirms that the most common word-structure for the occurrence of ʔ is the disyllabic word in Q1 or Q2. The high percentage of ʔ pronunciation in tetrasyllabic words can be explained by the fact that if the number of syllables is counted from the secondary stress, tetrasyllabic words have the same structure as disyllabic words.

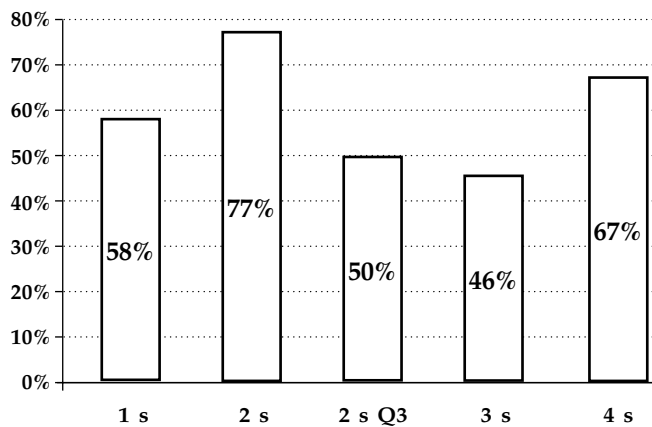


Figure 7. Dependency of the pronunciation of ʔ on word-structure.

It seems that the duration of the glottal stop is not greatly influenced by the position of the word in the utterance; the average duration of ʔ in connected read speech is almost identical (around 90 ms) in all utterance positions (see Table 7). Average durations remain even when the words are grouped by their structure (see Figure 8). Somewhat shorter are only the glottal stops in disyllabic Q3 words.

The longest ʔ measured was 351 ms (in the word *käveq* [*käveʔ*] '(they) went') and the shortest 20 ms (in the word *süvväq* [*süvväʔ*] 'to eat'). There were no large differences in average durations of ʔ in the speech of different informants. It was perhaps somewhat surprising that the youngest informant who pronounced all glottal stops in pre-vocalic and pre-pausal utter-

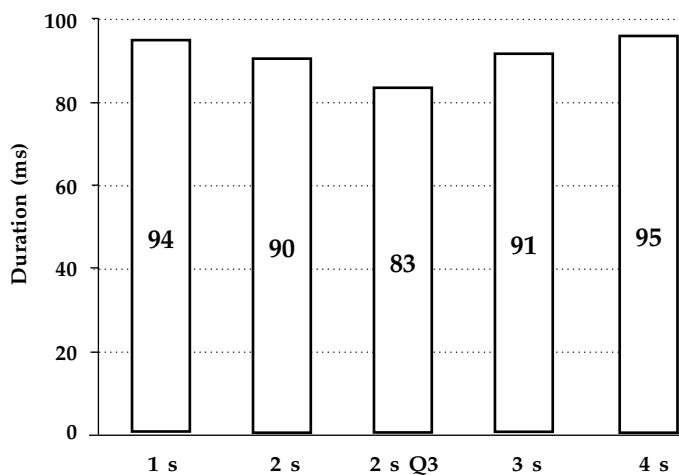


Figure 8. Dependency of the average duration of glottal stop on word-structure.

ance-position clearly stood out with respect to the pronunciation percentage of ʔ. Of all the glottal stops about half were pronounced in the read text (49%; together with assimilation 57%).

4. Conclusion

On the basis of acoustic measurements, comparisons with other sounds and statistical analyses the following can be said about the Võro glottal stop.

An acoustic characteristic of the glottal stop is the stability of the formants of the preceding vowel. Unlike in the case of other stops the start and end values of F1, F2 and F3 of the vowel preceding the glottal stop are practically the same. Often laryngalization can be observed at the end of the vowel preceding the laryngeal stop.

The glottal stop occurs always, independently of the word structure, as a word-final stop the duration of which is similar to other semi-long word-final stops. Unlike other stops and like word-final *h* the glottal stop does not carry a duration opposition.

In words with the glottal stop, the average duration of ʔ and the preceding (overlong) vowel are more or less the same. At the same time, in these conditions, ʔ is about one third shorter than *k* and *h*. The average duration of the plosion of ʔ and *k* is roughly equal but the difference lies in the frequency of the occurrence of aspiration following the plosion.

In spontaneous speech, words with the glottal stop have a specific F0 contour, the beginning of which is higher than the phrase average F0 and the end of which falls to the phrase average level or even lower. Thus, ʔ gives an abrupt end to the word also with respect to intonation.

The average pronunciation percentage of the glottal stop in different word structures varies quite considerably. It is highest (77%) at the end of disyllabic Q1 and Q2 words (e.g. *(ei) olõq* [*ei olõʔ*] 'is (not)', *tetäq* [*tettäʔ*] 'to make/do') and lowest at the end of trisyllabic (46%, e.g. *väsünüq* [*väsünüʔ*] 'tired') and disyllabic Q3 words (50%, e.g. *küttäq* [*küttäʔ*] 'to heat').

The average percentage of pronunciation of the glottal stop is higher than expected before a pause (63%) and only a little lower (55%) in the case of a vowel following without a pause. The pronunciation percentage of ʔ before words starting with a consonant is about half as much (29%) as in other utterance positions, because there the ʔ is assimilated with the following consonant in almost half of the cases (23%). Together with the cases of assimilation the occurrence of ʔ in this position is still more or less the same as in other positions (52%). Of all the glottal stops, about half are pronounced in controlled speech. The figure is slightly higher when the cases of assimilation are added. As a result of the assimilation of ʔ a geminate is formed at the word-boundary the duration of which is approximately the same as that of the word-internal short geminate.

The Võro laryngeal stop has characteristics triggering both phonemic and morpho-phonological processes as well as intonational characteristics. It can be maintained that it is a phoneme that has certain suprasegmental features that are above all used for highlighting grammatical and communicational meanings.

Abbreviations

EMH 2634 — Estonian dialect recording number 2634, recorded by Hella Keem in 1974. — The dialect archive of the Institute of the Estonian Language.

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СУЛЕВ ИВА (Тарту)

ЮЖНОЭСТОНСКИЙ ВЫРУСКИЙ ЛАРИНГАЛЬНЫЙ СМЫЧНЫЙ ЗВУК

Одной из наиболее ярких особенностей вырусского языкового ареала является наличие ларингального смычного звука как самостоятельной фонемы. В статье на основе записей, осуществленных на востоке южноэстонского языкового ареала, рассматриваются частотность (встречаемость), качество и длительность ларингального смычного, а также основной тон слов с этим звуком. Результаты показывают, что вырусский ларингальный смычный всегда выступает в слове как конечный, по длительности он близок полудолгим смычным в конце слова. Вырусский ларингальный смычный чаще всего произносится (встречается) в определенных структурах слов или предложений и нередко ассимилируется начальным согласным следующего слова. Рассматриваемый звук обладает как чертами, оказывающими влияние на фонемные и морфонологические процессы, так и интонационными свойствами. Можно утверждать, что он представляет собой фонему с супrasegmentальными чертами, которая употребляется прежде всего для выделения грамматических и коммуникативных особенностей.