A perceptual study of difficulties met by native speakers of English in the production of the durational patterns of Finnish disyllabic word structures

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Spring 2014

Acknowledgements

I wish to sincerely thank Loris Antonangeli for his invaluable and time-consuming contribution in designing the database for originally arranging the raw material to a usable form for further analysis.

Contents

1 Introduction

This paper presents a perceptual study of difficulties met by native speakers of English in producing the durational patterns of Finnish disyllabic word structures. The primary purpose of the analysis is to investigate how a message changes on the way from text to utterance and further from utterance to perception and then to evaluate how well the informants have managed in their utterances on the basis of the listeners' perceptions. All quantitative deviations from the original word in each syllable pattern and position will be analysed separately.

The emphasis lies in analysing the perceptions written down by native Finns of the utterances of Finnish and similar pseudowords produced by native English speakers. The findings are, when seen necessary, supported by results derived from segmental phonetic measurements. In this way the ultimate goal is to find evidence from the research material which type of quantitative deviations are the most persistent and which kind of words are the hardest to master. The analysis will seek for answers from phonetic regularities, linguistic interference and to some extent also from psycholinguistic factors.

As the analysis is limited to quantitative properties, the focus is on the quantitative aspects of phonetic interference, i.e. lack of pure quantitative opposition in English and word-internal proportional durations between sound segments.

Chapter 2 presents some of the most relevant issues of the theoretical framework pertaining to this study. The research material and setup are described in detail in Chapter 3. The perception analysis is made from two main points of view, focusing on quantitative changes in different syllable types discussed in Chapter 4 and on the individual tendencies of the informants, including some notions of their qualitative characteristics discussed in Chapter 5.

The research material including the recording of the informant's productions and gathering of perception data was originally carried out during spring 1993. Although it seems like a long time ago, this kind of research material loses little of its validity over the years. In fact, phonetic characteristics in the vernacular remain somewhat unchanged while there are more changes taking place in the vocabulary and sentence structures. For more details on the research material and the methods used in the study, see Chapter 3.

In the analysis the quantitative deviations are viewed in all positions of the disyllabic utterances used as the source material. Deviations can represent the perceived shortening or lengthening or diphthongisation of the sound segments in both syllabic positions as well as those taking place at the syllable boundary including the interrelated deviations taking place on both sides of it.

This study is an attempt to provide some answers to the problems met by English speakers in learning to pronounce segmental quantities of Finnish sounds, which can be addressed using the following hypothetical statements:

GENERAL. The interference of the mother tongue may cause problems when a native English speaker pronounces Finnish words and it is difficult for a native Finnish speaker to correctly perceive what she says.

SPECIFIC. The English speaker's pronunciation of Finnish is likely to lead into communication difficulties when one cannot produce the quantitative opposites of sound segments similar to those of native Finnish speakers.

Traces of these tendencies can even be found in the pronunciation of those Englishmen whose command of Finnish is very good. A myriad of contrastive phonetic studies have been made of Finnish speakers' problems in English, and considerably less the other way round, using native English speakers as informants. This study aims at partially filling in that gap.

2 Theoretical background

2.1 General

A major part of this chapter introduces selected ideas that are relevant to the research setup used here in two extensive studies, Vihanta's article (1990) on Finnish as a foreign language from a phonetic point of view (sections 2.2 to 2.4), and an article by Klatt (1976) on linguistic uses of segmental duration in English leaning on acoustical and perceptual evidence (section 2.5).

2.1.1 Differences in sound systems

As Wiik (1965) presents it, in foreign language learning difficulties are found in those items which are not the same in the native language (NL) and the target language (TL). Identical units in two languages do not cause a learning problem. Different types of differences between languages cause different types of learning problems, and each type of difficulty calls for a special kind of exercise. Thus, to be able to devise maximally efficient exercises, it is advantageous to know the types of difficulties that confront a foreign language learner (p. 15).

The differences concerning sound systems can be grouped into four major types (ibid.):

1. *Physical differences:* a physical sound or group of sounds occurs in one language, but not in the other
2. *Relational differences:* two physically similar sounds exist in both the NL and the TL, but the sounds are grouped differently into phonemes
3. *Distributional differences:* similar sounds of phonemes occur in both languages, but in different environments
4. *Segmental differences:* phonetically similar stretches of speech occur in both languages, but the stretches are differently divided into phonemic segments.

2.1.2 Language transfer

With a varying level of knowledge of the target language by the informants this study falls in the framework of language transfer. As Odlin (1989) puts it, pronunciation is the most difficult aspect of a second language to master, as some believe, and the influence of native

language phonetics and phonology will be more pervasive than the influence of other language subsystems (p. 13).

According to Odlin (1989), cross-linguistic similarities and differences can produce positive transfer, negative transfer by means of overproduction, underproduction, production errors and misinterpretation, and differing lengths of acquisition. The scope of this study is in misinterpretation, i.e. where native language structures can influence the interpretation of target language messages, and sometimes that influence leads to learners inferring something very different from what speakers of the target language would infer (p. 38). The most salient consequences of linguistic differences are production errors which result in pronunciation patterns that diverge from those found in the target language (p. 115). Moulton's taxonomy recognizes four types of errors: phonemic, phonetic, allophonic and distributional errors (p. 116).

Lehtonen (1980) states that the most typical pronunciation errors of Finnish students of English have proven to be the following (p. 22):

- faulty rhythm and phrasal stress
- insufficient reduction on the unstressed parts of a clause
- above all: faulty signalling of a word boundary using 1) faulty pauses, 2) faulty stress on the first syllable, 3) unusual if not faulty phonetic boundary signals, such as glottalisation at the beginning of each vowel-initial word

If we turn the situation the other way round, that is native English speakers learning Finnish, the problems they face would not be any easier.

2.2 Finnish as a foreign language

As Vihanta (1990) summarizes it in his article on Finnish as a foreign language from a phonetic point of view, phonetics and pronunciation have maintained their peripheral position in both the practice and theory of Finnish teaching. The interrelationship between the comprehension and comprehensibility of the spoken foreign language has not been sufficiently understood.

According to Bannert (1980, as cited in Vihanta, 1990, p. 204), the role of prosody is crucial in learning to speak another language. The prosodic features are also the most difficult to learn: especially important are rhythm, word stress and phrasal stress, and duration.

The foreign learner of Finnish has to be considered both a listener and a speaker as well as someone to be listened to. It is essential to learn to perceive correctly. There is a general

faulty belief that Finnish pronunciation is easy, but in principle the difficulties are the same as those of other languages − all properties of Finnish are potential difficulties from the point of view of another language.

Lehtonen (1980, as cited in Vihanta, 1990, p. 205) points out that speakers of different languages have learned to identify different kinds of entities, as information in the languages has been packed in different ways − in this respect Finnish significantly deviates from the analytical Indo-European languages. Processing of speech comprehension and production naturally also reflects these differences, having again an impact on processing a foreign language (p. 83).

Vihanta (1990) also refers to Karlsson (1977 and 1982) who has paid attention to the fact that in Finnish a word with all its endings is essential with regard to processing speech comprehension, whereas in Indo-European languages the unit is larger, often a prosodic entity of several words together. One has to be able to identify the important units with regard to meaning in order to be able to analyse it − a foreigner learning Finnish thus has to learn to identify word entities and as a speaker to produce them in a recognizable form. According to Lehtonen & Koponen (1977, as cited in Vihanta, 1990, p. 205) the indicators of word boundaries in Finnish are solid stress on the first syllable and the possible glottalisation at the beginning of a word that begins with a vowel (p. 78−79). The foreign learner should hear where the stress is, and often ends up in difficulty if the manner indicating stress differs between his mother tongue and Finnish.

2.3 Quantitative oppositions in Finnish

As Suomi, Toivanen & Ylitalo (2008) put it, Finnish is a full-fledged quantity language in that both vowel and consonant durations are contrastive, independent of each other, and independent of stress. Thus, contrastively short and long vowels can occur before and after both contrastively short and long consonants, and vice versa, and the contrasts exist in stressed as well as unstressed syllables (p. 39).

Vihanta (1990) finds the short/long opposition the most characteristic of phonetic difficulties in Finnish, as its scope in this respect is exceptionally large. Naturally the difficulties caused by it depend on the learner's mother tongue. The situation is the most difficult when the differences of duration in the mother tongue do not have a phonologically distinctive function. Several languages have this opposition with vowels. In some languages, for example in English, German and Swedish, the quantitative opposition is bound with vowel quality. The

speakers of such languages may find it difficult to hear the difference between the short and long vowels, as in Finnish there is no sufficient qualitative difference connected with it.

In Finnish, Vihanta (1990) continues, the quantitative opposition concerns both vowels and consonants, and it can be produced both in stressed and unstressed position. On top of this there can be several long segments within the same word, for example *taakkaammekaan* '[not] even our burden'. In several other languages the quantitative opposition can only concern vowels and those in stressed syllables only. In addition, the lengthened duration of a sound can mean a stressed syllable. The learner's difficulties cannot then be predicted merely on the basis of Finnish, and also in the mother tongue one must search for equivalence from a much wider area than just by comparing the phonologically distinctive functions.

The quantitative opposition in Finnish is also difficult because the seemingly simple long/short or 1 phoneme / 2 phonemes opposition is realized as such in writing only, thus not it speech. Lehtonen (1970) and Karlsson (1983, p. 72) provide some examples cited by Vihanta (1990, p. 213−214) on this. Diverse compensatory use of durations is characteristic of Finnish, that is proportional durations depending on word structure: half-long vowel in the second syllable, if the first one is short (e.g. *kuka* 'who' vs. *kukka* 'flower'); long consonant is shorter after a long vowel (i.e. the geminate is shorter in the word *taakka* 'burden' than in *takka* 'fireplace'); a consonant is longer before a long vowel (i.e. /k/ is longer in the word *takaa* than in *taka* and /kk/ longer in the word *takkaa* 'fireplace, partitive sg.' than in *takka*); the first consonant of a cluster is shorter in the word *kanssa* 'with' than in *kansa* 'people', and so on.

These are all identification cues that a Finnish speaker−listener uses, but at the same time also features particular to the language. A foreigner cannot use them naturally, and they have proven very difficult to learn. Here also the excellent orthography of Finnish does not help at all. If one cannot use these cues, the whole short/long opposition remains vague.

Vihanta (1990, p. 214) cites Wiik (1988) by noting that the compensation phenomena of Finnish lead us, in fact, back to rhythm: they can be explained to be a result of beat timing, of the tendency to construct rhythm of speech from two or three beats with which the timing of the units takes place.

Vihanta (1990) argues this kind of beat isochrony to mean that the sequence aiming at a constant length is most often a beat consisting of two syllables. If the first syllable of the beat

is short, the second one is lengthened (*muuta* 'something else, partitive sg.' vs. *mutta* 'but') The beat would thus be a kind of basic unit in timing the Finnish speech; one both squeezes up and thins out within it, unlike in French where this kind of a unit is the syllable and in English where it is the stress group which is longer than the beat of Finnish. However, all durational changes that are regularly used and that depend on the word structure, are not compensatory by nature, neither do they necessarily follow the isochronic tendencies of the beat.

Duration in Finnish, Vihanta (1990, p. 214) concludes, is even a more complicated phenomenon than the above allows us to understand. It is much more than just the mere short/long opposition. The durations of sounds are defined by many features: speech rate, phrasal stress, length of utterance, position in the expression, and so on. This means that phonologically long sounds can be shorter than the short ones in some other position. At the same time it is, nevertheless, necessary to keep the long/short phonological opposition. There is no reason to envy the learner of Finnish.

2.4 English learners of Finnish and the Finnish sound system

This section is an overview of known phonetic differences between English and Finnish consonants and vowels.

2.4.1 Consonants

As stated by Vihanta (1990), with its only thirteen phonemes the Finnish consonant system is rather simple in comparison to what most foreign learners of Finnish are accustomed to in their mother tongues. Yet, they may face problems with it, as listed below.

- The Finnish /r/, which most often occurs as a tremulant, is particularly difficult to utter for English speakers.
- English speakers strongly aspirate the voiceless plosives [p^h k^h t^h], but this is merely a rather harmless stigma of one's foreignness, as Finnish does not use it as a distinctive feature.
- As stated in Suomi (1980), /t/-/d/ opposition in Finnish uses different cues from those in English: in Finnish it is primarily based on the front-back articulatory dimension, but there are other cues as well.
- The English /l/ in syllable-final position is too dark for Finnish when surrounded by front vowels, e.g. [kiɬtin].
- A foreigner, who often learns Finnish from literary sources, does not easily learn the final coupling, e.g. *tule tänne* 'come here' pronounced by native Finns as [tulet tæn:e].

2.4.2 Vowels

As Suomi, Toivanen & Ylitalo (2008) present it, Finnish vowel phonemes can occur as single and as double. The single−double vowel opposition is valid in any syllable, stressed or unstressed, word initially, internally and finally (p. 41). Finnish has no restrictions on the occurrence of vowels dependent on stress in the sense that all vowels, both single and double, can occur in any syllable of the word (p. 55).

As opposed to the 20 vowel phonemes in RP English divided to 12 pure vowels (7 short and 5 long) and 8 diphthongs, Finnish has a somewhat different set of them: 8 short vowels, 8 long vowels, 17 diphthongs, and quite a few sequences of two, three or even four vowels. Therefore we cannot start from the assumption that these sounds are easy to learn.

Morris-Wilson (2004) illustrates the differences in vowel spaces between English and Finnish. While English has four degrees of vowel height, Finnish has only three of them, resulting in inevitable mismatch between the vowel qualities. In English changes in vowel duration also change the quality, while in Finnish quantitative changes have no impact on it. Moreover, tongue position plays a much bigger role in English which has 11 tongue positions for vowels while Finnish has only 6.

English does not have close equivalents for the Finnish /y/ and /œ/, rounded front vowels. On the other hand, there are a lot of diphthongs in English and native English speakers who learn Finnish as a second language tend to turn Finnish monophthongs into diphthongs.

2.5 Linguistic uses of segmental duration in English: acoustic and perceptual evidence

According to Klatt (1976) in English, duration often serves as a primary perceptual cue in the distinctions between:

- inherently long versus short vowels
- voiced versus voiceless fricatives
- phrase-final versus non-final syllables
- voiced versus voiceless postvocalic consonants, as indicated by changes to the duration of the preceding vowel in phrase-final positions
- stressed versus unstressed or reduced vowels and
- the presence or absence of emphasis

Gaitenby (1965, as cited by Klatt, 1976, p. 1211) states that the syllable or syllables at the end of a sentence are longer than they would be within an utterance. A word spoken in isolation is about the same duration as it would be at the end of an utterance, and perhaps as much as twice as long as it would be at the beginning of a sentence. Oller (1973) and Klatt (1975) have shown that word-final syllables are somewhat longer in duration, even in non-phrase-final positions.

Klatt (1976) refers to studies made by Oller (1973), Klatt (1974) and Umeda (1975) which show that consonant duration also depends on the position within a word. Consonants are longest in word-initial position, about 10-30 msec shorter in word-final position, and shorter still in medial positions. Word final consonants are longest if they are also phrase-final.

According to Delattre (1962, as cited by Klatt, 1976, p. 1214) there is a tendency in many languages for vowels to be slightly shorter if followed by a voiceless consonant than if followed by a voiced consonant. In English, the durational difference is quite large, about 50-100 msec in a phrase-final syllable.

Klatt (1976, p. 1218−1219) also refers to Fujisaki et al. (1975) who studied the discrimination of changes in segmental duration in Japanese vowels and consonants. The just noticeable difference near a phoneme boundary for a two-syllable word spoken in isolation or placed in a carrier sentence is about 10 msec (of a segment of 100 msec) for vowels, fricatives, plosives and nasals – only changes of about 20% or more may serve as primary perceptual cues.

Fry (1958, as cited in Klatt, 1976, p. 1219) has shown that changes in the relative durations of vowels in a two-syllable word can change the perceived stress pattern for the word.

To conclude, durational cues have the potential for carrying considerable information in connected speech.

2.6 Relevance to the study

The articles by Vihanta (1990) and Klatt (1976) cited above match up the methodological setup of this study described in the following chapter. For example, the quantity oppositions used in the minimal pairs and the use of disyllabic test words can find their justification from the ideas presented here. Klatt's article is, perhaps, more relevant to the phonetic measurements used in this study, when necessary, only to support the findings based on perceptual data, which is what the analysis is based on.

3 Material and method

The research material consists of a list of source words, their written identifications and computer measurements of segmental durations. Most of the word list is based on the quantitative opposites of the phonemes of Finnish. The words were read by nine native English speakers, all of whom had at least some knowledge of Finnish. Their productions were both phonetically measured by computer and the core part played to native Finnish listeners, groups of upper secondary school students, who wrote down their identifications (see section 3.5), forming the raw perception data. The focus in the analysis of this study falls on the latter, i.e. the perception data that shows how Finns understood what they heard.

3.1 Source material requirements and restrictions

When planning the test material and the procedure, several requirements and restrictions had to be accounted for. Reading the words mechanically in isolation with short breaks in between is, admittedly, far from a natural situation, such as full phrases in a conversation. Admittedly, an error occurs only in a practical context, that is to say, in communication.

The material lacks these dimensions and is therefore highly artificial. It could have been possible to use sentences in which there was a certain sequence embedded in a chosen location under survey, but this would have been more beneficial if the data was designed only to be measured. The following, nevertheless, explains why a word list was chosen.

3.2 Words for the perception test

The word list consists of three parts: 1) Finnish words for the perception test, 2) Finnish and 3) English control material as a reference for measurements only. The basic material were the words used for a perception test. It was necessary to limit their amount only to the most relevant cases. Finally, almost half (35) of the total 72 potential and originally Finnish syllable patterns of disyllabic words were included.

On top of these words the informants read both Finnish (14) and English words (12) which were used only for reference as measured data to support or to contradict the data derived from the perception analysis. One word not to be utilized was added at the end of both the Finnish and English material knowing that the final word tends to have prosodic features different from the rest.

For the perception test material, the aim was to find a homogeneous group of disyllabic vowel-initial and consonant-initial words in which the perceptual uncertainties are taken to the minimum. The phonotactic restrictions of Finnish were carefully followed. Two types or words were used: pseudowords and meaningful words with a minimal pair, 35 of both, making it 70 in total.

The word list showing the selected syllable types and predictable minimal pairs is presented in Appendix 2, and the final word list read by the informants and used as a basis of the perception analysis in Appendix 1.

Some syllable patterns are more productive than others, as far as finding minimal pairs due to change of duration is concerned. Finally, the samples used were limited to those for which it was possible to find a minimal pair. In this test material, there are 24 types of syllable patterns the initial segment of which is a consonant. Another 11 structurally identical types with a word-initial vowel were added to lay stress on the more productive syllable types.

One pseudoword (a.k.a. logatome), was designed for each syllable pattern category. This was necessary in the sense that listeners would not try to make sense of what they hear, but would rather write down more precisely their perceptions without any apparent or sensible and thus misleading cues. Also, the pseudowords were chosen so that there would be little danger of mixing them up with some known words resembling them too closely.

For all categories, a Finnish word was selected to form a minimal pair with another word just by changing the quantity of some sound segment within it. In this way, also the potential error produced would lead into the perception of another meaningful word. Two kinds of minimal pairs were used: 1) those where plosives are contrasted within the word list itself with other consonants (10 word pairs, e.g. *ottaa/onnaa*) and 2) those resulting from quantitative vacillation only, such as *varras/varas,* where one is used as a test word and the other is an alternative to be mixed with by the listeners.

On the basis of what is generally known about duration in English, some of these error types were very predictable. Both the informants reading the material and their listeners writing down their perceptions were told in advance that the material includes both nonsensical and meaningful words.

Thus, in the source material there are two words representing each disyllabic pattern. It was chosen that between these two samples, whenever possible, plosives are contrasted with other consonants in medial position at the syllable boundary. In the case of contrasted

geminates, the segmental environment in this kind of a word pair is phonemically identical. This makes it possible to concentrate on seeing more clearly which geminate consonants are harder to identify correctly or to produce than others, because in this case there is only one variable in question.

The syllable patterns used here also make it possible to see whether the word-final plosive /t/ takes up articulatory energy from the preceding sound segment and shortens it, as is the case in English.

The existing Finnish words used here represent only very basic grammatical forms. For nouns, only the singular nominative case or sometimes plural was used; for verbs, only the infinitive form or present tense in third person singular was allowed. Rarer grammatical forms could easily have forced the listener not to believe her ears, and would rather have made her write down any form that is used more frequently. For example, the use of partitive case singular with its lengthening of the final vowel would easily have extended the possibilities for using CVV-structures in the second syllables, but for clarity of interpretation, it was left out.

As the focus of the study is on quantity, no diphthongs nor patterns having subsequent vowels at the syllable boundary (e.g. VV-VC, *auer*) were used in the test material. Accordingly, the most difficult vowel sounds for English speakers, the front rounded Finnish sounds /y/ and /œ/, corresponding to graphemes <y> and <ö>, were not used, as an arduous sound may have made the speaker exaggerate its duration against her knowledge.

The words were listed in random order and the informants were asked to read aloud the material in Finnish as "naturally" as they can, keeping a pause of at least three seconds between each utterance to gain sufficient isolation and ease of perception. The Finnish control material, beginning from *soti* (see Appendix 1) was read immediately after the words targeted for identification. Then, after a short break, followed the English control material.

3.3 Control material

Another 14 Finnish words followed immediately the words targeted for identification. These were designed in particular in comparison to the 12 English words which were used to see how the duration of a vowel sequence changes in different environments. The duration is at its shortest when there is a voiceless plosive right after it, slightly longer if there is a voiced plosive, and longer still, if there is no consonant at all. The English words used here are all

monosyllabic and include pairs and sequences of this type in random order. The Finnish words, again, are both mono- and disyllabic. In these the word-final voiceless plosive /t/ is contrasted with the nasal /n/. At the syllable boundary, the voiceless /t/ and voiced plosive /d/ are contrasted. The purpose of these words is to see how strongly the interference of English is carried over to the productions of the Finnish words.

3.4 Informants

Before the informants read through the word list, they were not told what the specific purpose of this study was.

I chose to use native British English speaking learners of Finnish as my informants, since they were most easily available. Ideally, though, I would have preferred to use informants whose dialectal background is somewhat homogeneous to allow comparison to one another without excessive speculation on unwanted variables in this context. With these speakers this comes true only through their education, the considerable impact of which on their speech is fluctuation towards the neutral model of Received Pronunciation (RP). All informants have a university degree behind them and most of them work in Finland as teachers of English. Admittedly this makes them more aware of the problems here dealt with. Yet, they do represent a variety of levels of spoken language skills in Finnish.

A female Finnish university student of logopedics read through the same material in order to have a Finnish norm for comparison of the phonetic measurements.

A short summary of the background of each informant is given in connection with the analysis of the results in Chapter 5.

3.5 Perception test

For the perception tests all the informants had their own listener groups. I chose to use Finnish second grade upper secondary school students 16 to 18 years of age from the city of Oulu as listeners of the material. In this way I could meet the need to use a group whose members' dialectal background is as homogeneous as possible, as this is known to have an impact on one's perception. Also, these groups of 14 to 32 listeners per informant, in total 205 persons with their individual sets of 70 perceptions, offered a sufficient basis for statistical significance. Out of the total number of 14,350 potential perceptions, ranging from 980 to 2,240 per informant, the failures to write down an identification (marked with “…” in Appendix 3) remained low for all informants, in total 137 cases (1%). A material of this

magnitude required computer-aided analysis. The insertion, sorting and the calculations of the perception data were implemented by using a FoxPro relational database tailored by Loris Antonangeli from the University of Oulu.

The aim of this test procedure was to simulate perception in everyday context. Therefore, the listeners were asked to write down their immediate impressions of each utterance by using normal Finnish spelling where the durational distinctions can be seen just as the listeners process the utterances in their minds – for Finns the sound segments are either short represented by one grapheme or long represented by two graphemes. Luckily the Finnish orthographic system poses little problem with regard to the aims of this study due to its unambiguity and excellent correlation with the phonemic system of the language. Since the focus is to study the errors with regard to natural understanding, it is perhaps justifiable to allow this sort of a layman's perception. The words were played to the listeners only once, without the opportunity to check one's own identification. It is exactly the perceiver's instant idea, the spontaneous reaction, where the danger of misunderstanding lies in everyday communication.

In all, this approach partially follows what Määttä did in his doctoral dissertation (1983). His test arrangement to study the effect of Finnish vowel harmony confusing the Finns' perception of Swedish disyllabic words greatly resembles my procedure. The evaluation scale used here is also similar to that of Määttä.

3.6 Error evaluation

The perceptual responses were computed for analysis of the durational deviations from the original words. Judging the duration of some sequence by writing it as either short or long is, of course, an oversimplification of one's identification, but as the listeners' identifications are divided into these two groups, conclusions can be drawn from the entity they form, and the gravity of the pronunciation problems suggested by the identifications can thus be evaluated.

In principle, a disyllabic word allows six potential deviation types for identification: an originally short sequence can be considered long, and vice versa, the deviation can occur in the vowel durations of both of the two syllables and in the consonant sequence between them at the syllable boundary.

The evaluation scale applied here allows us to draw conclusions on the weight of each quantitative deviation type in the disyllabic word material. The different grades of deviations are highlighted in the tables presented in this study as follows:

Table 1. Evaluation of quantitative deviations.

% range	Evaluation
0-10	Optimal
10-25	Fair
25-40	Diffuse
40-100	Distorted

Responses which show 10 per cent or less of identifications deviating from the original words in terms of their quantitative nature, suggest optimal production by the speaker. A fair level of identification is considered to be manifested between values of 10 and 25%, and the identification is classified as diffuse at values between 25 to 40%, and as distorted with values over 40%.

The perceptions of the informants' utterances are analysed primarily as separate individual entities (in Chapter 5), as the speakers represent different levels of competence in the Finnish language. Those entities also allow to point out the quality and the magnitude of the level of pronunciation difficulties that these learners of Finnish have to struggle with.

3.7 Phonetic measurements and recordings

The informants' utterances were analysed by using ISA (Intelligent Speech Analyser®) computer, a device developed by Raimo Toivonen from Pitchsystems Ltd. The durations of all segments of all the utterances produced by the informants were measured and written down, and then transcribed phonetically using the IPA characters. All of this allows the analysis of the durational features both in the absolute and proportional sense. Under the scope of this perceptual study these results are, when seen necessary to support or to contradict the perception data, referred to in comparison to the corresponding identifications.

The informants' utterances were recorded on DAT tape in a speech laboratory ensuring noiseless quality of the material, which is essential for its reliable segmentation. Later on the original DAT tape material was copied to mp3 file format, one file per each informant, allowing easier handling of the recordings with a computer. The quality of the mp3 recordings is equally noiseless.

4 Quantitative deviations

This chapter discusses the quantitative deviations found in the perception material, the focus being on deviations in different positions and syllable types in the disyllabic words. The analysis starts with introducing the summarised results of the categories used in the analysis:

- Deviations in the 1st syllable
- Deviations in the 2nd syllable
- Deviations at the syllable boundary
- Interrelated simultaneous deviations in both syllables

Table 2 presents all potential types of quantitative deviation, yet the focus of this study is on the most predictable ones which are vowel shortening in the unstressed second syllable and the interrelated simultaneous deviations around the syllable boundary. When necessary, more evidence for the conclusions is given using the measured segmental durations.

The potential quantitative changes in disyllabic words are the following:

Table 2. Quantitative changes in disyllabic words.

Location	Transcription	Description
1st syllable	V > VV	vowel lengthening
1st syllable	V > V_1V_2	diphthongisation
1st syllable	VV > V	vowel shortening
1st syllable	VV > V_1V_2	diphthongisation
2nd syllable	V > VV	vowel lengthening
2nd syllable	V > V_1V_2	diphthongisation
2nd syllable	VV > V	vowel shortening
2nd syllable	VV > V_1V_2	diphthongisation
Syllable boundary	V-C > VC-C	consonant lengthening
Syllable boundary	C_1-C_2 > C_1C_2-C_2	consonant cluster lengthening
Syllable boundary	VC-C > V-C	consonant shortening
Syllable boundary	C_1C_2-C_2 > C_1-C_2	consonant cluster shortening

For details on the deviations in different syllable types by each informant, see Appendix 5. A corresponding summary of deviations in syllable types arranged by frequency is presented in Appendix 4. This is discussed more closely in section 4.6.

4.1 Deviations in the 1st syllable

This section discusses the quantitative changes in the first syllable based on the perceptions of the disyllabic utterances.

4.1.1 1st syllable: V > VV

This type of change was not expected, and the perceptions show that only one informant (6) clearly had this type of tendency to pronounce the vowel in the stressed first syllable slightly too long, causing 22.8 per cent of deviating perceptions.

Table 3. Vowel lengthening in the first syllable.

Informant	Frequency	%	Evaluation
1	2/1091	0.2	optimal
2	2/811	0.3	optimal
3	78/848	9.2	optimal
4	2/684	0.3	optimal
5	8/1098	0.7	optimal
6	139/609	22.8	fair
7	8/1009	0.8	optimal
8	11/1364	0.8	optimal
9	0/1408	0.0	optimal
Σ	250/8922	2.8	

These kinds of deviations were perceived especially from words with closed first syllables, and were at their highest in the somewhat heavy CVC-CV(V)C structures represented by the word pairs *tikkaat* ‘ladders’/*timmaat* with 82.1% of the perceptions, such as <tiikat> and <tiimat> suggesting a double-length vowel in the first syllable, or *varras* ‘spit’/*vannas* in 60.7% of the cases, such as <vaaras> and <vanas>, respectively.

4.1.2 1st syllable: V > V_1V_2

This type of change was not expected either, and the informants' productions showed little trace of diphthongisation of the first syllable. Only in the case of informant 3 were there some traces of this in syllable patterns CVC_1-C_2VV and CVC_1-C_2VVC represented by word pairs *kohtuu* ‘moderate’ (prefix)/*kirvuu* with 57.9% and *vanhuus* ‘old age’/*vorteet* with 40.5% of deviating perceptions.

Table 4. Diphthongisation of the short vowel in the first syllable.

Informant	Frequency	%	Evaluation
1	31/1091	2.8	optimal
2	20/811	2.5	optimal
3	**74/848**	**8.7**	**optimal**
4	26/684	3.8	optimal
5	36/1098	3.3	optimal
6	14/609	2.3	optimal
7	28/1009	2.8	optimal
8	13/1364	1.4	optimal
9	41/1408	2.9	optimal
Σ	283/8922	3.2	

There is an interesting variety of perceptions of the word *kirvuu* by informant 3 resulting from its somewhat hesitant and unclear pronunciation transcribed as [kʰiər fu:]:

Table 5. Perceptions of <kirvuu> from the utterance by informant 3.

Perception	Count	Perception	Count
kirkko	3	kiehuu	1
...	2	kieppuu	1
kierfu	2	kierräpuu	1
kirppu	2	kifu	1
carefull	1	kirffuu	1
hiehku	1	kirkku	1
kareful	1	kliöpuu	1
kieffu	1		

Several listeners (5/20) identified a diphthong in the first syllable. This is, however, an individual occurrence without any proof of a regular tendency to produce such utterances. In the word *olut* uttered by informant 3 most perceptions (16/20) suggest a diphthong /ou/ in this position, but the reason behind this is the dark quality of /l/ rather than a real diphthong.

4.1.3 1st syllable: VV > V

A shorter duration than the long vowel sound in Finnish is understandable, as for English speakers such a duration is unnaturally long even in the stressed position. With three informants this tendency is quite evident, as the overall proportion of deviating perceptions was close to 40 per cent. The half-long duration was often interpreted as short.

Table 6. Shortening of the long vowel in the first syllable.

Informant	Frequency	%	Evaluation
1	16/646	2.5	optimal
2	56/483	11.6	fair
3	204/511	39.9	diffuse/distorted
4	37/405	9.1	optimal
5	284/649	43.8	distorted
6	159/362	43.9	distorted
7	46/597	7.7	optimal
8	104/805	12.9	fair
9	10/832	1.2	optimal
Σ	916/5290	17.3	

By taking a closer look at informant 5, for example, syllable type $CVVC_1$-C_2VV represented by the word pair *kuultaa* 'gleam'/*seestaa* resulted without exception in perceptions like <kulta> (all 25 instances) and <sösta>, <sesta> and similar CVC_1-C_2V interpretations.

4.1.4 1st syllable: VV > V_1V_2

Diphthongisation of the long vowel in the first syllable is suggested to appear to some extent in the perceptions made from informants 1 and 4.

Table 7. Diphthongisation of the long vowel in the first syllable.

Informant	Frequency	%	Evaluation
1	79/646	12.2	fair
2	14/483	2.9	optimal
3	19/511	3.7	optimal
4	46/405	11.4	fair
5	12/649	1.8	optimal
6	7/362	1.9	optimal
7	15/597	2.5	optimal
8	52/805	6.5	optimal
9	3/832	0.4	optimal
Σ	247/5290	4.7	

Of informant 1, for example, there are perceptions like <seista> for *seestaa* (23/25) <veisti> for *veestin* (9/25) or <touku> for *tooku* (16/25). Dark /l/ also results in identifying a /u/-like quality here, hence writing diphthong <au> as the perception in those positions, and in fact we cannot talk about a real diphthongization taking place in cases like <tauke> for *talke* (12/25).

4.2 Deviations in the 2nd syllable

This section discusses the quantitative changes in the second syllable based on the perceptions of the disyllabic utterances.

4.2.1 2nd syllable: V > VV

Lengthening of the vowel in the second syllable is more evident only when a long consonant or a consonant cluster precedes it, thus in syllabic patterns (CV)VC_1-C_2V(C), (CV)VC-CV(C). Following examples from the perceptions illustrate the deviations:

- Informant 4: <taassaa>, <taasaa>, <taasnaa> for *taassa* (14/16); <veentaa> and other variants with a long vowel for *veenta* (14/16), <puuntaa> and other variants with a long vowel for *oonta* (15/16)
- Informant 7: <taasaa> and other variants with a long vowel for *taassa* (23/23); <veentaa> for *veenta* (7/23)

In the case of informants 4 and 7 all of the deviations of this kind were identified from words containing a long vowel in the first syllable. This deviation also occurs together with simultaneous shortening of the preceding consonant (see section 4.4).

Table 8. Vowel lengthening in the second syllable.

Informant	Frequency	%	Evaluation
1	33/940	3.5	optimal
2	32/705	4.5	optimal
3	21/734	2.9	optimal
4	57/589	9.7	optimal/fair
5	16/949	1.7	optimal
6	22/527	4.2	optimal
7	86/871	9.9	optimal/fair
8	30/1177	2.6	optimal
9	7/1216	0.6	optimal
Σ	314/7708	4.1	

4.2.2 2nd syllable: V > V_1V_2 and VV > V_1V_2

On the basis of the perceptions, diphthongisation of the vowel sequence at the end of a disyllabic utterance is random, suggesting only some individual tendencies, such as <kokou> for *koko* (4/14) by informant 6, or <vorteit> for *vorteet* by informant 4. It makes no difference whether the vowel sequence in the second syllable of the test word is short or long.

Table 9. Diphthongisation in the second syllable.

2nd syllable V > V_1V_2				2nd syllable VV > V_1V_2			
Informant	**Frequency**	**%**	**Evaluation**	**Informant**	**Frequency**	**%**	**Evaluation**
1	2/940	0.2	optimal	1	0/797	0.0	optimal
2	1/705	0.1	optimal	2	1/589	0.1	optimal
3	3/734	0.4	optimal	3	3/625	0.5	optimal
4	3/589	0.5	optimal	4	19/500	3.8	optimal
5	4/949	0.4	optimal	5	3/798	0.4	optimal
6	6/527	1.1	optimal	6	0/444	0.0	optimal
7	0/871	0.0	optimal	7	1/735	0.1	optimal
8	1/1177	0.1	optimal	8	3/992	0.3	optimal
9	1/1216	0.1	optimal	9	0/1024	0.0	optimal
Σ	21/7708	0.3		Σ	30/6504	0.5	

4.2.3 2nd syllable: VV > V

According to the perceptions, with an overall percentage of 26.5 shortening of the word-final vowel is the most common type of quantitative deviation in the research material. The deviations are significant in any syllabic pattern, ranging from 14.5% for CVVC-CVV to 40.4% for $CVVC_1$-C_2VV.

Table 10. Shortening of the vowel in the second syllable in different syllable types.

Syllable type	**Total %**	**Word pair**	**Typical deviating perceptions**
$CVVC_1$-C_2VV	40.4	*kuultaa/seestaa*	*<kulta>, <seistä>*
CVC_1-C_2VV	38.0	*kohtuu/kirvuu*	*<kohtu>, <kirvu>*
CVV-CVVC	37.7	*suuruus/kiipuus*	*<suurus>, <kiipus>*
$CVVC_1C_2$-C_2VV	31.1	*karttaa/pankkuu*	*<kartta>, <pankku>*
CV-CVVC	29.2	*pahuus/pakuus*	*<pahus>, <pakus>, <pakkus>*
CVC-CVV	28.7	*hakkuu/hammuu*	*<hakku>, <hammu>*
CV-CVV	27.8	*makuu/posuu*	*<maku>, <possu>*
CVV-CVV	27.8	*kaatuu/saaruu*	*<kaatu>, <saaru>*
V-CVV	25.7	*enää/atoo*	*<enä>, <ato>*
VC_1-C_2VV	25.3	*ehtoo/otsuu*	*<ehto>, <otsu>*
CVC_1-C_2VVC	23.5	*vanhuus/vorteet*	*<vanhus>, <vortit>*
CVVC-CVVC	22.9	*kookkaat/koollaat*	*<kukat>, <kookaat>, <kullat>*
V-CVVC	17.9	*eväät/akeet*	*<evät>, <akit>*
CVC-CVVC	17.4	*tikkaat/timmaat*	*<tikkat>, <timmat>*
VC-CVV	16.4	*ottaa/onnaa*	*<otta>, <onna>*
CVVC-CVV	14.5	*muuttaa/moossaa*	*<muutaa>, <muusaa>*
Total	26.5		

Shortening in the second syllable vowel is the most common in syllable types containing a consonant cluster at the syllable boundary and in CVV-CVVC structures where there is a short consonant between long vowel sequences. Subsequent, evenly long sound segments seem to be easier to master, respectively. Examples are given on the perceptions of the utterances of informant 1 later in this section.

It is evident that this type of deviation is somewhat common among the less advanced learners of Finnish, but no longer a problem at all for those with a good command of the language. These tendencies, discussed more closely in section 4.5, are somewhat similar in the pairs of meaningful and nonsensical test words and the problem remains longer in words requiring higher articulatory energy to produce, i.e. those containing several double-length sound segments.

Table 11. Shortening of the long vowel in the second syllable.

Informant	Frequency	%	Evaluation
1	220/797	27.6	diffuse
2	110/589	19.2	fair
3	438/625	70.1	distorted
4	96/500	19.2	fair
5	446/798	55.9	distorted
6	392/444	88.3	distorted
7	13/735	1.8	optimal
8	4/992	0.4	optimal
9	6/1024	0.6	optimal
Σ	1725/6504	26.5	

Three out of the nine informants had the majority of perceptions suggesting a shortened duration of the vowel sequence in the second syllable. The measured segmental durations indicate the same. Let us look more closely at informant 1, for example, whose production as regards this tendency is closest to the overall average:

Table 12. Shortening of the long vowel in the second syllable by informant one arranged by frequency:

Syllable type	Occurrences/ all	%	Word pair	Deviating perception examples
CVV-CVVC	38/50	76.0	*suuruus/kiipuus*	<suurus< (24/25), <kiipus> (14/25) vs. <kiipuus> (11/25)
CVC-CVV	25/50	50.0	*hakkuu/hammuu*	<hammu>(24/25), <hämmu> (1/25)
CVC1-C2VV	24/49	49.0	*kohtuu/kirvuu*	<kohtu> (1/25), <kirvu> (11/25) and other shortened variants 23/25 in total
V-CVV	24/49	49.0	*enää/atoo*	<enä> (16/25) vs. <enää> (8/25) <atoo> (16/25) vs. <ato> (5/25)
CVVC1-C2VV	23/50	46.0	*kuultaa/seestaa*	<seistä> (23/25)
CVC1-C2VVC	21/50	42.0	*vanhuus/vorteet*	<vanhus> (21/25)
CVC1C2-C2VV	16/50	32.0	*karttaa/pankkuu*	<pankku> (14/25) vs. <pankkuu> (8/25)
CVV-CVV	13/50	26.0	*kaatuu/saaruu*	<kaatuu> (17/25) vs. <kaatu> (7/25) <saaruu> (18/25) vs. <saaru> (3/25)
VC-CVV	12/50	24.0	*ottaa/onnaa*	<onna> (11/25) vs. <onnaa> (11/25)
CV-CVVC	7/50	14.0	*pahuus/pakuus*	<pahuus> (22/25) vs. <pahus> (3/25)
CVVC-CVV	6/50	12.0	*muuttaa/moossaa*	<muutaa> (11/25) and <muuntaa> (6/25) vs. <muuta> (5/25)
CV-CVV	5/50	10.0	*makuu/posuu*	<maku> (1/25), <posuu> (20/25) vs. <possu> (3/25)
VC1-C2VV	3/50	6.0	*ehtoo/otsuu*	<ehto> (1/25), <otso> (1/25), <otsu> (1/25)
CVC-CVVC	12/49	4.0	*tikkaat/timmaat*	<timmaat> (22/25) vs. <timmat> (2/25)
V-CVVC	1/50	2.0	*eväät/akeet*	<evät> (1/25)
CVVC-CVVC	0/50	0.0	*kookkaat/koollaat*	
Total	220/797	27.6		

In the case of informant 1 we can see that learning to produce the short-long opposition sufficiently contrasted for the Finnish ear is well underway. Even in the words with the highest number of deviating perceptions the listeners were hesitant whether to write down short or long duration. The listeners were almost unanimous about a short vowel in the second syllable only in cases like *suuruus* perceived as <suurus> (24/25) and *hammuu* as <hammu> (24/25). Problems occur with words containing both short and long segments, whereas the CVVC-CVVC words containing evenly long word-internal sound segments are no problem at all.

More examples of these deviations are shown in Chapter 5 in which the focus is on selected informants.

4.3 Deviations at the syllable boundary

According to the perception data, durational deviations at the syllable boundary of the disyllabic words are somewhat common, no matter which type of deviation we are talking about. As expected, shortening of a long consonant is the prevalent type of deviation in this position.

4.3.1 Syllable boundary: V-C > VC-C and C_1-C_2 > C_1C_2-C_2

Lengthening of the consonant at the syllable boundary, whether preceded by a consonant or a vowel, seems to be an individual tendency, which is not in direct proportion to the level of Finnish spoken by the informant, or to put it the other way round, speakers with a poorer

command of Finnish do not necessarily have any trace of this tendency. Diffuse or distorted production of the consonant is present in perceptions made from the productions of informants 3, 5 and 6, yet slightly less apparent when preceded by another consonant.

Table 13. Lengthening of a single consonant (V-C > VC-C) at the syllable boundary.

Informant	Frequency	%	Evaluation
1	3/646	0.5	optimal
2	3/481	0.6	optimal
3	212/506	41.9	distorted
4	4/406	1.0	optimal
5	233/649	35.9	diffuse
6	101/364	27.7	diffuse
7	7/596	1.2	optimal
8	26/806	3.2	optimal
9	1/832	0.1	optimal
Σ	590/5286	11.2	

Table 14. Lengthening of the latter consonant in a cluster (C_1-C_2 > C_1C_2- C_2) at the syllable boundary.

Informant	Frequency	%	Evaluation
1	27/443	6.1	optimal
2	8/328	2.4	optimal
3	88/346	25.4	diffuse
4	5/278	1.8	optimal
5	74/449	16.5	fair
6	37/245	15.1	fair
7	13/412	3.2	optimal
8	19/558	3.4	optimal
9	13/576	2.3	optimal
Σ	284/3635	7.8	

In the case of a vowel preceding the consonant at the syllable boundary the pattern CV-CVV seems to generate the most problems. For example:

- Informant 3: <makkuu> for *makuu* (8/20), <ena> for *enää* (7/20)
- Informant 5: <makkuu> or <makku> for *makuu* (21/24)
- Informant 6: <maakku>, <markhu>, <markku> for *makuu* (8/14)

When preceded by a consonant, the pattern like VC_1-C_2V, present in words *arki* and *sanka* is clearly the hardest one for the informants to produce, as illustrated by the following examples:

- Informant 3: <arkki> and other perceptions with <kk> for *arki* (10/20), <sankka> and other perceptions with <kk> for *sanka* (10/20)
- Informant 5: <arkki> and other perceptions with <kk> for *arki* (22/24), <sankka> for *sanka* (9/20)

- Informant 6: <arkki> and other perceptions with <kk> for *arki* (4/14), <sankka> and other perceptions with <kk> for *sanka* (7/14)

Perceptions of a long consonant in the medial position may result from the effort used in their production. Duration measurements speak for half-long duration with aspiration in /k/ in these words as well as for rolled quality of the preceding /r/.

4.3.2 Syllable boundary: VC-C > V-C

Failure to pronounce the long consonants sufficiently long to the native Finnish ear is perhaps the most evident characteristic of the informants with a more basic level of Finnish. Albeit noticeable by duration measurements, this is no longer visible to a disturbing extent in the speech of the most advanced learners of Finnish.

Table 15. Shortening of a single consonant (VC-C > V-C) at the syllable boundary.

Informant	Frequency	%	Evaluation
1	118/548	21.5	fair
2	26/414	6.3	optimal
3	106/430	24.7	fair/diffuse
4	116/346	33.5	diffuse
5	101/549	18.3	fair
6	198/306	64.7	distorted
7	47/506	9.3	optimal
8	12/681	1.8	optimal
9	15/704	2.1	optimal
Σ	739/4484	16.5	

A shorter consonant is heard in a great majority of perceptions (64.7%) of the utterances of Informant 6, such as <aka> for *äkkä* (9/14), <piiros> or <piiras> for *piirros* (10/14), or <piitos> and other variants with a short consonant for *piittos* (14/14).

Table 16.Sample words with perceived consonant shortening at the syllable boundary by informant 6.

ÄLLÄ	Count	ÄKKÄ	Count	PIIRROS	Count	PIITTOS	Count
alla	8	aka	9	piiros	7	piitos	10
ala	4	akka	3	piirros	4	phiitos	2
aala	1	akah	1	piiras	3	kiitos	1
aalla	1	akha	1			pitos	1

As shown in the table above, a similar trend of shortening can also be seen between the word pairs having the same syllable structure.

4.3.3 Syllable boundary: C_1C_2-C_2 > C_1-C_2

In this research material, shortening of the latter segment in a consonant cluster at the syllable boundary is markedly less common than shortening of a single-quality consonant

segment in the same position. Similarly, advanced learners of Finnish show little problems in this respect.

Almost two thirds of the perceptions made from the utterances of informant 4 suggest this kind of deviation, e.g. <kampi> and other shorter variants for *kamppi* (6/16), <panku> and other shorter variants for *pankkuu* (7/12), or <lompo> and other shorter variants in all 16 perceptions.

Table 17. Shortening of the latter consonant in a cluster (C_1C_2- C_2 > C_1-C_2) at the syllable boundary.

Informant	Frequency	%	Evaluation
1	4/100	4.0	optimal
2	9/71	12.7	fair
3	5/77	6.7	optimal
4	37/59	62.7	distorted
5	9/100	9.0	optimal
6	24/56	42.9	distorted
7	2/92	2.2	optimal
8	0/124	0.0	optimal
9	0/128	0.0	optimal
Σ	90/807	11.1	

Deviations at the syllable boundary are typically coupled with simultaneous deviations in other positions within the utterances. This is discussed in the following section.

4.4 Interrelated simultaneous deviations

Interrelated simultaneous quantitative deviations in this research material can be grouped as follows:

- 1st syllable V > VV and 2nd syllable VV > V
- V-C > VC-C and 2nd syllable VV > V
- VC-C > V-C and 2nd syllable VV > V

Note that these results differ from summary tables where quantitative deviations are presented in isolation (see Appendix 5, pages 5 and 6), as here only the words and syllable patterns matching the conditions of simultaneous deviation are compared (see Appendix 6).

In all of these deviation types the informants 3, 5 and 6 face the biggest problems.

4.4.1 1st syllable V > VV and 2nd syllable VV > V

The following table shows a comparison of the syllable types (C)V-CVV(C) having simultaneous lengthening of the 1st syllable and shortening of the 2nd syllable vowel

sequence. Only the informants with notable deviation in this respect are presented. For a full set of results, see Appendix 6, p. 1.

Table 18. Extract from Appendix 6, p. 1: simultaneous lengthening of the 1st syllable and shortening of the 2nd syllable vowel sequence.

		Inf 3		Inf 5		Inf 6		All	1-9
Syllable type	**Source word**	**occ/all**	**%**	**occ/all**	**%**	**occ/all**	**%**	**Σocc/all**	**%**
1st syllable: V > VV									
CV-CVV	makuu	0/20	0.0	0/25	0.0	11/14	78.6	11/205	5.4
CV-CVV	posuu	0/20	0.0	0/25	0.0	0/14	0.0	0/205	0.0
CV-CVVC	pahuus	0/20	0.0	0/25	0.0	9/14	64.3	9/204	4.4
CV-CVVC	pakuus	0/19	0.0	2/25	8.0	4/14	28.6	6/203	3.0
V-CVV	atoo	3/19	15.8	0/25	0.0	9/14	64.3	12/201	6.0
V-CVV	enää	0/19	0.0	0/24	0.0	0/14	0.0	0/203	0.0
V-CVVC	akeet	0/20	0.0	0/25	0.0	0/14	0.0	0/204	0.0
V-CVVC	eväät	2/19	10.5	0/25	0.0	13/14	92.9	15/203	7.4
Σ		5/156	3.2	2/199	1.0	46/112	41.1	53/1628	3.3
2nd syllable: VV > V									
CV-CVV	makuu	5/20	25.0	14/25	56.0	14/14	100.0	55/205	26.8
CV-CVV	posuu	20/20	100.0	18/25	72.0	14/14	100.0	59/203	28.8
CV-CVVC	pahuus	18/20	90.0	20/25	80.0	13/14	92.9	66/204	32.4
CV-CVVC	pakuus	15/19	78.9	21/25	84.0	11/14	78.6	53/203	26.1
V-CVV	atoo	18/19	94.7	19/25	76.0	12/14	85.7	61/201	30.3
V-CVV	enää	10/19	52.6	2/24	8.3	14/14	100.0	43/203	21.2
V-CVVC	akeet	19/20	95.0	18/25	72.0	12/14	85.7	49/204	24.0
V-CVVC	eväät	6/19	31.6	4/25	16.0	13/14	92.9	24/203	11.8
Σ		111/156	71.2	116/199	58.3	103/112	92.0	355/1628	21.8

This phenomenon is clearly visible only in the pronunciation of informant 6 who generally had the most perceptual deviations out of all the informants. The prerequisite for this distortion seems to be that the speaker's second syllable vowel sequence is, as a rule, clearly shortened. Informant 6 produced utterances resulting in perceived vowel shortening in the second syllable in 92% of all cases against 41.1% lengthening in the first syllable. Note that even though informants 3 (71.2%) and 5 (58.3%) in most cases in the second syllable produced an utterance heard as short, they did not, however, have difficulties uttering the first syllable somewhat correctly. Thus, perceptually this phenomenon does not cause tremendous difficulties to correctly segment the first syllable.

Duration measurements do, however, show a slight lengthening here with informants 3, 5, and 6. The lengthening occurred in 3.3% of the above cases, which is almost the same as in all the words with a short vowel in the first syllable. Lengthening in the form of diphthongisation is merely random, 0.4%.

4.4.2 V-C > VC-C and 2nd syllable VV > V

The following table shows a comparison of the syllable types (C)V-CVV(C) having simultaneous lengthening of the consonant sequence at the syllable boundary with the shortening of the vowel sequence in the second syllable. Only the informants with notable deviation in this respect are presented. For a full set of results, see Appendix 6, p. 2.

Table 19. Extract from Appendix 6, p. 2: simultaneous lengthening of the consonant sequence at the syllable boundary with the shortening of the vowel sequence in the 2nd syllable.

		Inf 3		Inf 5		Inf 6		All	1-9
Syllable type	**Source word**	**occ/all**	**%**	**occ/all**	**%**	**occ/all**	**%**	**Σocc/all**	**%**
2nd syllable: VV > V									
CV-CVV	makuu	5/20	25.0	14/25	56.0	14/14	100.0	55/205	26.8
CV-CVV	posuu	20/20	100.0	18/25	72.0	14/14	100.0	59/203	28.8
CV-CVVC	pahuus	18/20	90.0	20/25	80.0	13/14	92.9	66/204	32.4
CV-CVVC	pakuus	15/19	78.9	21/25	84.0	11/14	78.6	53/203	26.1
V-CVV	atoo	18/19	94.7	19/25	76.0	12/14	85.7	61/201	30.3
V-CVV	enää	10/19	52.6	2/24	8.3	14/14	100.0	43/203	21.2
V-CVVC	akeet	19/20	95.0	18/25	72.0	12/14	85.7	49/204	24.0
V-CVVC	evät	6/19	31.6	4/25	16.0	13/14	92.9	24/203	11.8
Σ		**111/156**	**71.2**	**116/199**	**58.3**	**103/112**	**92.0**	**355/1628**	**21.8**
CVV-CVV	kaatuu	5/20	25.0	1/25	4.0	13/14	92.9	41/204	20.1
CVV-CVV	saaruu	19/20	95.0	17/25	68.0	13/14	92.9	72/203	35.5
CVV-CVVC	kiipuus	20/20	100.0	11/25	44.0	13/14	92.9	62/204	30.4
CVV-CVVC	suuruus	15/19	78.9	25/25	100.0	12/14	85.7	92/204	45.1
Total		**59/79**	**74.7**	**54/100**	**54.0**	**51/56**	**91.1**	**267/815**	**32.8**
Syllable boundary: V-C > VC-C									
CV-CVV	makuu	8/20	40.0	22/25	88.0	5/14	35.7	35/205	17.1
CV-CVV	posuu	20/20	100.0	19/25	76.0	14/14	100.0	57/205	27.8
CV-CVVC	pahuus	7/20	35.0	12/25	48.0	0/14	0.0	19/204	9.3
CV-CVVC	pakuus	14/19	73.7	22/25	88.0	7/14	50.0	43/203	21.2
V-CVV	atoo	12/19	63.2	3/25	12.0	9/14	64.3	24/201	11.9
V-CVV	enää	0/19	0.0	3/24	12.5	14/14	100.0	17/203	8.4
V-CVVC	akeet	4/20	20.0	9/25	36.0	2/14	14.3	15/204	7.4
V-CVVC	evät	0/19	0.0	1/25	4.0	0/14	0.0	1/203	0.5
Σ		**65/156**	**41.7**	**91/199**	**45.7**	**51/112**	**45.5**	**211/1628**	**13.0**
CVV-CVV	kaatuu	0/20	0.0	3/25	12.0	4/14	28.6	7/204	3.4
CVV-CVV	saaruu	5/20	25.0	0/25	0.0	0/14	0.0	6/203	3.0
CVV-CVVC	kiipuus	14/20	70.0	14/25	56.0	1/14	7.1	53/204	26.0
CVV-CVVC	suuruus	0/19	0.0	25/25	100.0	0/14	0.0	30/204	14.7
Total		**19/79**	**24.1**	**42/100**	**42.0**	**5/56**	**8.9**	**96/815**	**11.8**

Similarly to the case discussed in the previous section, the very same informants 3, 5 and 6 have the highest amount of lengthening perceived in the consonants at the syllable boundary, while the shortening of the long vowel in the second syllable is considerably more common even among the more advanced learners of Finnish. Only informants 7, 8, and 9, whom we can consider the most advanced in their Finnish skills, have in practice no traces of this shortening remaining in their utterances.

4.4.3 VC-C > V-C and 2nd syllable VV > V

Appendix 6, p. 3 shows a comparison of the syllable types (C)V-CVV(C) having simultaneous shortening of the consonant sequence at the syllable boundary and the vowel sequence of the second syllable.

Table 20. Extract from Appendix 6, p. 3: simultaneous shortening of the consonant sequence at the syllable boundary and the vowel sequence of the second syllable.

		Inf 3		Inf 5		Inf 6		All	1-9
Syllable type	**Source word**	**occ/all**	**%**	**occ/all**	**%**	**occ/all**	**%**	**Σoccc/all**	**%**
2nd syllable: VV > V									
CVC-CVV	hakkuu	10/20	50.0	14/25	56.0	10/14	71.4	46/204	22.5
CVC-CVV	hammuu	18/19	94.7	14/25	56.0	13/14	92.9	71/203	35-0
CVC-CVVC	tikkaat	6/20	30.0	0/25	0.0	12/14	85.7	18/205	8.8
CVC-CVVC	timmaat	11/18	61.1	25/25	100.0	13/14	92.9	53/202	26.2
Σ		**35/77**	**45.5**	**53/100**	**53.0**	**48/56**	**85.7**	**188/814**	**23.1**
CVVC-CVV	moossaa	11/20	55.0	4/25	16.0	14/14	100.0	37/204	18.1
CVVC-CVV	muuttaa	0/20	0.0	10/25	40.0	6/13	46.2	22/204	10.8
CVVC-CVVC	kookkaat	18/20	90.0	0/25	0.0	13/14	92.9	31/205	15.1
CVVC-CVVC	koollaat	20/20	100.0	24/24	100.0	11/14	78.6	62/202	30.7
Σ		**49/80**	**61.2**	**38/99**	**38.4**	**44/55**	**80.0**	**152/815**	**18.7**
VC-CVV	onnaa	7/20	35.0	20/25	80.0	13/14	92.9	55/203	27.1
VC-CVV	ottaa	5/20	25.0	0/25	0.0	7/14	50.0	12/205	5.9
Σ		**12/40**	**30.0**	**20/50**	**40.0**	**20/28**	**71.4**	**67/408**	**16.4**
CVC1C2-C2VV	karttaa	15/20	75.0	11/25	44.0	12/14	85.7	47/205	22.9
CVC1C2-C2VV	pankkuu	16/19	84.2	24/25	96.0	14/14	100.0	78/197	39.6
Σ		31/39	79.5	35/50	70.0	26/28	92.9	125/402	31.1
Σ all		**127/236**	**53.8**	**146/299**	**48.8**	**138/167**	**82.6**	**532/2439**	**21.8**
Syllable boundary: VC-C > V-C									
CVC-CVV	hakkuu	0/20	0.0	0/25	0.0	7/14	50.0	7/204	3.4
CVC-CVV	hammuu	2/19	10.5	5/25	20.0	2/14	14.3	10/203	4.9
CVC-CVVC	tikkaat	1/20	5.0	0/25	0.0	12/14	85.7	13/205	6.3
CVC-CVVC	timmaat	4/18	22.2	0/25	0.0	14/14	100.0	19/202	9.4
Σ		**7/77**	**9.1**	**5/100**	**5.0**	**35/56**	**62.5**	**49/814**	**6.0**
CVVC-CVV	moossaa	3/20	15.0	0/25	0.0	4/14	28.6	59/204	28.9
CVVC-CVV	muuttaa	1/20	5.0	0/25	0.0	6/13	46.2	35/204	17.2
CVVC-CVVC	kookkaat	14/20	70.0	6/25	24.0	12/14	85.7	69/205	33.7
CVVC-CVVC	koollaat	0/20	0.0	0/24	0.0	13/14	92.9	52/202	25.7
Σ		**28/80**	**35.0**	**6/99**	**6.1**	**35/55**	**63.6**	**215/815**	**26.4**
VC-CVV	onnaa	0/20	0.0	0/25	0.0	14/14	100.0	16/203	7.9
VC-CVV	ottaa	0/20	0.0	0/25	0.0	3/14	21.4	3/205	1.5
Σ		**0/40**	**0.0**	**0/50**	**0.0**	**17/28**	**60.7**	**19/408**	**4.7**
CVC1C2-C2VV	karttaa	0/20	0.0	0/25	0.0	7/14	50.0	16/205	7.8
CVC1C2-C2VV	pankkuu	2/19	10.5	5/25	20.0	6/14	42.9	30/197	15.2
Σ		2/39	5.1	5/50	10.0	13/28	46.4	46/402	11.4
Σ all		**37/236**	**15.7**	**16/299**	**5.4**	**100/167**	**59.9**	**329/2439**	**13.5**

While vowel shortening is somewhat evenly presented in the different syllable types, consonant shortening at the syllable boundary together with second syllable vowel shortening is markedly more common with words such as *muuttaa* or *kookkaat* where a long vowel precedes the long consonant at the syllable boundary. For a native English speaker producing the long sequences in all positions is very much against their natural tendency to

shorten the unstressed parts of the utterances, and in cases where they manage to produce the long vowel sequence in the first syllable, there is not enough energy left to produce the subsequent consonant sequences sufficiently long to be perceived as long by native Finnish speakers.

4.5 Word pairs in contrast

Pairs of meaningful and nonsensical words with identical syllable structures were used with the purpose that those who listened to the performances of the informants would not forcibly try to make sense of what they heard. Albeit not in the very core of this analysis, also this aspect of the research material deserves a notion.

By comparing the results of the real and pseudowords we can conclude that a similar overall trend occurs in them in terms of quantitative deviations. In the most common deviation type, shortening of the second syllable vowel, the pseudoword is in general slightly more difficult to perceive correctly. This is an expected result because the familiarity of the word may help the listeners guess the targeted perception of the word instead of only concentrating on writing down what they just heard.

Table 21. Shortening of the second syllable vowel with comparison between word pairs.

Syllable type	Real word	occ/all	%	Pseudoword	occ/all	%
CV-CVV	makuu	55/205	26.8	posuu	59/203	28.8
CV-CVVC	pahuus	66/204	32.4	pakuus	53/204	26.1
CVC1-C2VV	kohtuu	58/205	28.3	kirvuu	95/197	48.2
CVC1-C2VVC	vanhuus	63/202	31.2	vorteet	32/203	15.8
CVC1C2-C2VV	karttaa	47/205	22.9	pankkuu	78/197	39.6
CVC-CVV	hakkuu	46/204	22.5	hammuu	71/203	35.0
CVC-CVVC	tikkaat	18/205	8.8	timmaat	53/202	26.2
CVV-CVV	kaatuu	41/204	20.1	saaruu	72/203	35.5
CVV-CVVC	suuruus	92/204	45.1	kiipuus	62/204	30.4
CVVC1-C2VV	kuultaa	62/205	30.2	seestaa	103/203	50.7
CVVC-CVV	muuttaa	22/204	10.8	moossaa	37/204	18.1
CVVC-CVVC	kookkaat	31/205	15.1	koollaat	62/202	30.7
V-CVV	enää	43/203	21.2	atoo	61/201	30.3
V-CVVC	eväät	24/203	11.8	akeet	49/204	24.0
VC1-C2VV	ehtoo	47/203	23.2	otsuu	56/204	27.5
VC-CVV	ottaa	12/205	5.9	onnaa	55/203	27.1
Subtotal		727/3266	22.3		998/3237	30.8
Total					1725/6503	26.5

The overall trend between the meaningful and nonsensical words is convincingly similar. Or, to put it the other way round, the syllable types follow similar trends irrespective of the word.

4.6 Summary of deviations in syllable types

This section focuses on the total sum of quantitative deviations in different syllable types. The results discussed here are presented in Appendix 4, where the percentages of deviating perceptions in the different syllable patterns are arranged from top to down by frequency.

4.6.1 Deviations in the first syllable

In the first syllable, a notable level of diphthongisation of a short vowel appears in syllable types CVC_1-C_2VV, VC_1-C_2V and CVC_1-C_2V, thus always in patterns where there are different consonants on both sides of the syllable boundary. The absence or presence of the word-initial consonant does not seem to have a notable impact, and the same is true regardless of the duration of the vowel sequence in the second syllable.

Syllable type CVC_1-C_2VV represented by the word pair *kohtuu* ‘moderate’ (prefix) and *kirvuu* (nons.) hit the highest total number of deviations (23.4%). By looking into the individual words we can see that the vowel in the sequence /ir/ in *kirvuu* tends to be perceived as diphthong <ie> with the subsequent /r/ also audible from the utterances of the speakers with weakest command of Finnish.

The most prevalent change in the first syllable, perceived shortening of the vowel, is in common to most syllable types, yet the most common in cases just like above, where there are different consonants on both sides of the syllable boundary. A plausible explanation lies in the greater articulatory effort required for producing such utterances. This type of error is most productive (35%) in syllable type $CVVC_1$-C_2VV represented by test words *seestaa* and *kuultaa.* A notable diphthongisation (21.3%) of the long vowel sequence in the first syllable also appeared with the very same words.

4.6.2 Deviations in the second syllable

In the second syllable there is a notable lengthening of the word-final vowel sequence perceived in syllable types CVV-CV (13.7%), VC-CV (12.7%) and $CVVC_1$-C_2V (12.3%), represented by words *tuuli* ‘wind’/*tooku* (nons.), *ällä* ‘letter l’/*äkkä* (nons.) and *laasti* ‘plaster’/*veenta* (nons.), respectively. This speaks for insufficient distinction between the short and long vowel sequences.

The most prevalent and the most expected tendency to markedly deviate from the expected utterance is shortening of the vowel in the second syllable, which took place in all syllable types having a long vowel sequence in the second syllable. Again, the hardest one to produce seems to be the syllable type $CVVC_1$-C_2VV, which has different consonants as a sequence at the syllable boundary, represented by the test word pair *kuultaa* ‘gleam’/*seestaa* (nons.). Keeping double-length after a long vowel sequence is the factor that goes strongly against the model of the informants’ native tongue.

4.6.3 Deviations at the syllable boundary

Quantitative deviations prove to be somewhat common in all possible change patterns at the syllable boundary, of which shortening of a consonant (VC-C > V-C) is the most prevalent one. Diffuse overall production is met in syllable types CVVC-CVC (33.5%) and CVVC-CVC (29.7%) represented by word pairs *piirros* ‘drawing’/*piittos* (nons.) and *kookkaat* ‘tall’ (plural)/*koollaat* (nons.), respectively. Maintaining double-length successfully in all positions seems to be the challenge here.

5 Informants in focus

This chapter focuses on the production of the utterances of each individual under study. A more in-depth discussion is provided about informants 1, 2, 4, 5 and 7. Their Finnish skills are neither the weakest nor the strongest among the informants, and so give us a representative idea of the difficulties met in the pronunciation of Finnish.

5.1 Informant 1

5.1.1 Background information

Informant 1 has lived in Finland for ten years. Her experience of formal Finnish studies is merely one summer university course of 60 hours she took soon after she first came to the country. She speaks Finnish daily in various situations at home, at work and in shops. She finds her level of spoken Finnish fair, but at the same time states that she faces communication problems daily due to her pronunciation difficulties. Her English is characterized mainly by Northern Irish and Northern English accent. Also, as she speaks Spanish, it might have helped her slightly in learning of Finnish pronunciation. She also mentioned about the occasional lisp in her speech.

5.1.2 Perception analysis

The table below shows a summary of the quantitative deviations in the perceptions made from the utterances of the word list by informant 1.

Table 22. Informant 1: Summary of quantitative deviations in disyllabic words.

Type of quantitative change	Frequency	%	Σ %	Evaluation
1st syllable: V > VV	2/1091	0.2		optimal
1st syllable: V > V_1V_2	31/1091	2.8	3.0	optimal
1st syllable: VV > V	16/646	2.5		optimal
1st syllable: VV > V_1V_2	79/646	12.2	14.7	fair
2nd syllable: V > VV	33/940	3.5		optimal
2nd syllable: V > V_1V_2	2/940	0.2	3.7	optimal
2nd syllable: VV > V	220/797	27.6		diffuse
2nd syllable: VV > V_1V_2	0/797	0.0	27.6	optimal
Syllable boundary: V-C > VC-C	3/646	0.5	0.5	optimal
Syllable boundary: C_1-C_2> C_1C_2-C_2	27/443	6.1	6.1	optimal
Syllable boundary: VC-C > V-C	118/548	21.5	21.5	fair
Syllable boundary: C_1C_2-C_2 > C_1-C_2	4/100	4.0	4.0	optimal
Σ	535/5211	10.3	10.3	

Notable deviations in the perceptions occur only in the following cases:

- 1st syllable: VV > V_1V_2, diphthongisation of the long vowel in the first syllable
- 2nd syllable: VV > V, shortening of the long vowel in the second syllable

The diphthongisation finds its explanation through some written patters in English: <oo> and <ee> were sometimes the troublesome sequences. See words *tooku, veestin, seestaa* and *koollaat* discussed in more detail below.

The peculiar fact here is that of all informants she has the largest number of deviations of this kind, even though in general her pronunciation of Finnish is relatively good. The diphthongisation occurs only in the stressed syllable; in the second syllable the corresponding deviation was next to non-existent. Also, perceiving a diphthong here is far more common than a short vowel. With 6 of the 9 informants this was vice versa.

The shortening of the vowel in the second syllable is, as expected, also the most common one in this material. The source of this is obvious: the English speakers' natural tendency to reduce the sounds of the unstressed syllable.

See Appendix 3, p. 1, for the occurrences of each word by frequency as perceived from the utterances of informant 1. The material supports the following findings:

5.1.2.1 Diphthongisation

In cases like <seista> for *seestaa* (23 cases out of 25) and <touku> and the like for *tooku* (23/25) the listeners somewhat unanimously heard diphthongisation in this position. The long /e:/, non-existent in English, seems to be challenging for not only informant 1, but also for some other native English speakers in this study.

Perceptions <veisti>, <veitsi> or <veeisti> for *veestin* (12/23) and <kou(l)kaat> for *kookkaat* (14/25) refer to diphthongisation in about half of the cases.

Again, <tauke> and similar patterns for talke (19/25) also speak for diphthongisation, yet for another reason: this case shows the Finns' difficulty to perceive /l/, as the corresponding English allophone here is the /u/-like velarised dark [ɬ] which is much darker than the dark /l/ used adjacent to back vowels in Finnish. None of the listeners wrote down the original word.

5.1.2.2 Consonant lengthening

Perceptions like <sankka/o> in two thirds of the instances (14+4/25) for *sanka* suggest a geminate to the Finnish ear; which also is the case according to the measured more than 2:1 duration of the segment in comparison to the adjacent segments.

5.1.2.3 Vowel shortening in the unstressed syllable

Cases like <suurus> for *suuruus* (24/25), <vanhus> for *vanhuus* (21/25) and <kiipus> for *kiipuus* (14/25) show a very clear vowel shortening in the unstressed syllable.

On the other hand, the opposite case of <veentaa> and the like for *veenta* (19/25) show, peculiarly enough, lengthened vowel duration. The segmental measurements show a considerable /h/-like puff of air at the end of the utterance, which is the most likely explanation for this kind of perceptions.

5.1.2.4 Qualitative deviations

The following qualitative deviations were the most notable ones for informant 1:

A considerable number of perceptions suggest that /a/ is too front, i.e. towards the quality of /æ/. Likewise several perceptions indicate too high a tongue position when pronouncing /o/, especially shown by perceptions <kuulaat> for *koollaat* (12/25). Also <muusaa> for *moossaa* shows this, but it makes me doubt that the /u/-quality here could also be a mere spelling mistake. The /u/ in this case was unusually long, which also partly explains why the subsequent consonant sequence was perceived as short. More often though, there was a shift from /o/ towards /u/ in question in these sequences.

Sometimes there is excessive attempt towards clarity by the informant. In some cases the final consonant is very long, e.g. [ss] could have a duration of 400 ms, which is about 4 times the average duration of a short segment in her utterances. This is understandable, as the words were pronounced in isolation. Often also the duration of the long vowel in the first syllable was exaggerated, as e.g. in the words *saaruu* and *maaton*.

5.2 Informant 2

5.2.1 Background information

Informant 2 has lived in Finland for four years, and has never studied Finnish formally. Also, he has little need to speak the language, as his daily environment is characteristically English speaking. He considers his spoken language skills of Finnish passable, but then again states that he seldom faces problems of being understood because of his pronunciation of Finnish. He originally comes from London, but describes his variety of English as educated of no description. He also thinks that his stay in Finland has had some impact on his native English pronunciation.

5.2.2 Perception analysis

The table below shows a summary of the quantitative deviations in the perceptions made from the utterances of the word list by informant 2.

Table 23. Informant 2: Summary of quantitative deviations in disyllabic words.

Type of quantitative change	Frequency	%	Σ %	Evaluation
1st syllable: V > VV	2/811	0.3		optimal
1st syllable: V > V_1V_2	20/811	2.5	2.8	optimal
1st syllable: VV > V	*56/483*	*11.6*		*fair*
1st syllable: VV > V_1V_2	14/483	2.9	14.5	optimal
2nd syllable: V > VV	32/705	4.5		optimal
2nd syllable: V > V_1V_2	1/705	0.1	4.6	optimal
2nd syllable: VV > V	*110/589*	*19.2*		*fair*
2nd syllable: VV > V_1V_2	1/589	0.2	19.4	optimal
Syllable boundary: V-C > VC-C	3/481	0.6	0.6	optimal
Syllable boundary: C_1-C_2> C_1C_2-C_2	8/328	2.4	2.4	optimal
Syllable boundary: VC-C > V-C	26/414	6.3	6.3	optimal
Syllable boundary: C_1C_2-C_2 > C_1-C_2	9/71	12.7	12.7	fair
Σ	282/3882	7.3	7.3	

Notable deviations in the perceptions occur only in the following cases:

- 1st syllable: VV > V, shortening of the long vowel in the first syllable
- 2nd syllable: VV > V, shortening of the long vowel in the second syllable

It is difficult for an English speaker to extend the duration of a sequence long enough to make it a geminate, i.e. matching the Finnish double length. This is possible in English only if no sounds follow. Here we can clearly see that his pronunciation of the vowel sequence is the shorter the longer the following consonant sequence. This feature occurs in most syllable types, but more in the ones containing a geminate or a cluster (see Appendix 5, p. 2).

The latter feature is, as expected, also the most common type of deviation in this material. The source of this is obvious: the English speakers' natural tendency to reduce the sounds of the unstressed syllable. Shortening of the vowel sequence in the second syllable is shown somewhat evenly throughout the perception material, but most evidently in the syllable types including a geminate or a consonant cluster at the syllable boundary, immediately preceding this vowel sequence.

See Appendix 3, p. 2, for the occurrences of each word by frequency as perceived from the utterances of informant 2. The material supports the following findings:

5.2.2.1 Additional syllable

As an individual word *kirvuu* proved rather difficult for most informants, resulting in perceptions far from the original. Many of the perceptions indicated the existence of an additional syllable in the middle (10/19). This is clearly verified by the phonetic transcription [kʰirəvu:], too.

5.2.2.2 Slight vowel shortening in the 1st syllable

In cases <lasti> for *laasti* (5/19), various shortened versions for *veenta* (11/19), <tässa>, and <tässä> for *taassa* (5/19) the listeners are never unanimous on this kind of shortening. Rather, these perceptions remain a minority in each case but still speak for a slight shortening of this vowel sequence in general.

5.2.2.3 Half-long consonants instead of long

<pankuu> and other similar perceptions for *pankkuu* (8/16) show that the listeners hesitate in deciding whether they should spell their perceptions of the consonant short or long. The measured data suggest half-long duration. In general, however, his pronunciation of the doubling was quite good.

5.2.2.4 Qualitative deviations

The following qualitative deviations were the most notable ones by informant 2:

A very common qualitative vacillation throughout the material appears between /ɑ/ and /æ/, often resulting in perceiving <ä> instead of <a>. In some cases the long <e:> in the word *seestaa* is perceived as <ää>, suggesting too open a position. The intended utterance of back vowel /u/ is much too front to the Finnish ear, towards the English /ʊ/. Of consonants, /r/ is not rolled occasionally and /l/ appears in some cases as the dark velarized allophone [ɬ], resulting in perceiving it as <u>, e.g. <tauke> for *talke (5/19).* Plosives are still aspirated in positions where they occur in English.

5.3 Informant 3

5.3.1 Background information

Informant 3 has lived in Finland for a year and a half. He has not participated any Finnish language course. He speaks Finnish very rarely, only with his own children, and describes his level of Finnish as poor, if even that. As he said that he never faces communication

problems due to his pronunciation, it has to do with the rarity of those occasions. In his own opinion he speaks a variety of English which is difficult to place.

5.3.2 Perception analysis

The table below shows a summary of the quantitative deviations in the perceptions made from the utterances of the word list by informant 3.

Table 24. Informant 3: Summary of quantitative deviations in disyllabic words.

Type of quantitative change	Frequency	%	Σ %	Evaluation
1st syllable: V > VV	78/848	9.2		optimal
1st syllable: V > V_1V_2	74/848	8.7	17.9	optimal
1st syllable: VV > V	204/511	39.9		diffuse/distorted
1st syllable: VV > V_1V_2	19/511	3.7	43.6	optimal
2nd syllable: V > VV	21/734	2.9		optimal
2nd syllable: V > V_1V_2	3/734	0.4	3.3	optimal
2nd syllable: VV > V	438/625	70.1		distorted
2nd syllable: VV > V_1V_2	3/625	0.5	70.6	optimal
Syllable boundary: V-C > VC-C	212/506	41.9	41.9	distorted
Syllable boundary: C_1-C_2> C_1C_2-C_2	88/346	25.4	25.4	diffuse/fair
Syllable boundary: VC-C > V-C	106/430	24.7	24.7	fair/diffuse
Syllable boundary: C_1C_2-C_2 > C_1-C_2	5/77	6.5	6.5	optimal
Σ	1251/4077	30.7	30.7	

70.1% of the perceptions made of the utterances of informant 3 speak for his inability to produce word-final long vowels as sufficiently long. The consonant at the syllable boundary is often lengthened, as is also the case with the subsequent word-final vowel. All in all, as there is considerable fluctuation to both unnecessarily short and long utterances in the same positions, his ability to make a proper distinction between short and long segments is still undeveloped. For the occurrences of each word by frequency as perceived from the utterances of informant 3, see Appendix 3, p. 3.

5.4 Informant 4

5.4.1 Background information

Informant 4 has lived in Finland for already 18 years. During his long stay, though, he has not received any formal education in the Finnish language. Nevertheless, he now speaks Finnish every day with his family and also at work. He learnt a lot of his now fluent Finnish in building context. Still, in his opinion, he faces communication problems with Finns daily. He comes originally from Yorkshire, but as a result of education and working circumstances his accent has changed strongly towards RP.

5.4.2 Perception analysis

The table below shows a summary of the quantitative deviations in the perceptions made from the utterances of the word list by informant 4.

Table 25. Informant 4: Summary of quantitative deviations in disyllabic words.

Type of quantitative change	Frequency	%	Σ %	Evaluation
1st syllable: V > VV	2/684	0.3		optimal
1st syllable: V > V_1V_2	26/684	3.8	4.1	optimal
1st syllable: VV > V	37/405	9.1		optimal
1st syllable: VV > V_1V_2	46/405	11.4	20.5	fair
2nd syllable: V > VV	57/589	9.7		optimal/fair
2nd syllable: V > V_1V_2	3/589	0.5	10.2	optimal
2nd syllable: VV > V	96/500	19.2		fair
2nd syllable: VV > V_1V_2	19/500	3.8	22.0	optimal
Syllable boundary: V-C > VC-C	4/406	1.0	1.0	optimal
Syllable boundary: C_1-C_2 > C_1C_2-C_2	5/278	1.8	1.8	optimal
Syllable boundary: VC-C > V-C	116/346	33.5	33.5	diffuse
Syllable boundary: C_1C_2-C_2 > C_1-C_2	37/59	62.7	62.7	distorted
Σ	448/3267	13.7	13.7	

Notable deviations in the perceptions occur with the long vowel in the first syllable as well as the long consonant at the syllable boundary. For all the individual perceptions of the words arranged by their frequency, see Appendix 3, p. 4.

5.4.2.1 Shortening of the long vowel

Considerable changes in long vowels appear in both syllabic positions. In the stressed first syllable diphthongisation is more common than shortening, while in the second syllable it is vice versa.

Deviant perceptions appear mostly in the following syllable patterns:

Table 26. Informant 4: Perceived shortening of the long vowel in the first syllable.

1st syllable: VV > V	**Syllable type**	**Frequency**	**%**	**Examples**
	CVVC1-C2VV	11/32	34.4	*kuultaa* as <kultaa> (8/16)
	CVV-CVC	6/31	19.4	*keelin* as <kelvin> and <kevin> (5/16)
	Σ	17/63	27.0	
1st syllable: VV > V_1V_2	**Syllable type**	**Frequency**	**%**	**Examples**
	CVVC1-C2VV	16/32	50.0	*seestaa* as <seistaan> etc. (16/16)
	CVV-CV	10/31	32.3	*tooku* as <touku> (10/16)
	CVV-CVC	6/31	19.4	*keelin* as <keivin>, <keirin> etc. (6/16)
	CVVC1-C2V	5/30	16.7	*veenta* as <veintaa> and <vientaa> (4/16)
	CVVC1-C2VC	4/29	13.8	*veestin* as <veistin>, veisni>, <fyisti>, <fyisvin> (4/16)
	Σ	41/153	26.8	

A clear vowel shortening appears in the word *kuultaa*, where a short vowel was perceived in 11 cases out of 16.

In the case of *seestaa*, for example, every single perception suggests the diphthong [ei] to replace the long vowel in the first syllable. A similar tendency is visible also in *tooku*, resulting in perceptions <ou> in 10 cases out of 16.

Table 27. Informant 4: Perceived shortening of the long vowel in the second syllable.

2nd syllable: VV > V	**Syllable type**	**Frequency**	**%**	**Examples**
	CVV-CVV	20/31	64.5	*kaatuu* as <kaatu> (13/16), *saaruu* as <saaru>, <saru> (7/15)
	VC1-C2VV	13/31	41.9	*ehtoo* as <ehdo> etc- (4/16), *otsuu* as <otsu>, <opsu> etc. (9/15)
	CVC-CVV	11/31	35.5	*hakkuu* as <häkku>, <äkku>, <akku> etc. (11/16)
	CV-CVV	11/32	34.4	*makuu* as <maku>, <nmaku> etc. (11/16)
	CVV-CVVC	9/32	28.1	*suuruus* as <suurus>, <suullus> etc. (7/16)
	CVC1-C2VV	7/32	21.8	*kohtuu* as <kohtu> (2/16), *kirvuu* as <kiervu>, <kieru> etc. (5/16)
	CVC1C2-C2VV	5/28	17.9	*karttaa* as <kartta> (3/16), *pankkuu* as <panku>, <pänku> (2/16)
	CV-CVVC	5/32	15.6	*pahuus* as <pahus> (4/16), *pakuus* as <pahus> (1/16)
	CVVC1-C2VV	5/32	15.6	*kuultaa* as <kulta> (2/16), *seestaa* as <seiston>, <seistä> (3/16)
	CVVC-CVV	4/32	12.5	*moossaa* as <muusa>, <musa> (4/16)
	CVVC-CVVC	2/31	6.5	*koollaat* as <koolat>, <kovat> (2/16)
	VC-CVV	2/31	6.5	*onnaa* as <oma>, <onna> ((2/16)
	V-CVV	1/31	3.2	*atoo* as <ato> (1/16)
	CVC1-C2VVC	1/31	3.2	*vanhuus* as <vanhus> (1/16)
	V-CVVC	0/32	0.0	*eväät* and *akeet* with no shortening
	CVC-CVVC	0/31	0.0	*tikkaat* and *timmaat* with no shortening
	Σ	96/500	19.2	

In the unstressed second syllable there is clear evidence for vowel shortening, yet not so apparently when the word ends with a consonant.

5.4.2.2 Shortening of the consonant at the syllable boundary

The most distinct quantitative deviation for this informant is the shortening of the vowel sequence at the syllable boundary, irrespective of the syllable pattern. The following table with related words illustrate the deviant, shortened perceptions out of the total number of instances that occurred at the syllable boundary:

Table 28. Informant 4: Perceived shortening of the consonant cluster at the syllable boundary.

Syllable boundary: C_1C_2-C_2 > C_1-C_2	**Syllable type**	**Frequency**	**%**	**Examples**
	CVC1C2-C2V	23/31	74.2	*kamppi* as <kampi> etc. (8/16) *lomppo* as <lompo> etc. (16/16)
	CVC1C2-C2VV	14/28	50.0	*karttaa* as <kartaa>, <kärtaa> (7/16) *pankkuu* as < pänkuu> etc. (7/16)
	Σ	37/59	62.7	
Syllable boundary: VC-C > V-C	**Syllable type**	**Frequency**	**%**	**Examples**
	CVVC-CVC	28/32	87.5	*piirros as <piiros> (11/16)* *piittos* as <piitos>, <kiitos> (16/16)
	CVVC-CVVC	27/31	87.1	*kookkaat* as <kookaat> etc.(15/16) *koollaat* as <koolaat> etc. (14/16)
	VC-CV	16/32	50.0	*ällä* as <älä> (16/16) *äkkä* as <äkkä>, <äkkiä>, <äkkäh> (0/16)
	CVC-CVC	15/31	48.4	*varras* as <varas> etc. (15/16) *vannas* as <vannas> etc. (0/16)
	CVVC-CV	10/32	31.2	*taakka* as <taaka>, <taakaa> (7/16) *taassa* as <<taasaa> (3/16)
	CVVC-CVV	18/32	9.4	*muuttaa* as <muutaa>, <mjuutaa> (11/16)
	VC-CVC	1/31	3.2	*allas* as <alas> (1/16), *appas* with no shortening (0/16)
	VC-CVV	1/31	3.2	*ottaa* as such (0/16), *onnaa* as <oma> (1/16)
	CVC-CV	0/32	0.0	*lakki* and *lanni* with no shortening
	CVC-CVV	0/31	0.0	*hakkuu* and *hammuu* with no shortening
	CVC-CVVC	0/32	0.0	*tikkaat* and *timmaat* with no shortening
	Σ	116/346	33.5	

Consonant clusters requiring the most energy to produce seem to be by far the hardest of all to pronounce, and this is also the case with a long consonant after a long vowel sequence. Syllable types (C)VC-CV(V) with short segments in the first syllable and a double consonant at the syllable boundary do not pose any problem at all.

There is no problem with the production of a long nasal at the syllable boundary in *timmaat* or *hammuu* as opposed to a long /r/ in *varras,* unanimously perceived as short.

5.4.2.3 Qualitative deviations

The somewhat /u/-like dark velarized allophone [ɬ] of the lateral approximant /l/ produced by informant 4 at the end of the first syllable resulted in often perceiving a diphthong in those positions, for example <euku> for *elku*, <keilin> for *keelin* or <tauke> for *talke*.

The word *moossaa* was clearly perceived as <muussaa>, and the segmental measurements indicate the long /u:/ quality in the utterance as well. This is may well be an involuntary slip resulting from a similar written pattern in English such as *moose*, for example.

The phonetic transcription supports the speaker's tendency to produce a vowel quality that is more front than the Finnish /ɑ/, resulting in perceiving it as <ä> in a majority of the cases, such as the examples listed below. Informant 1 also has a similar tendency.

Table 29. Qualitative deviations out of the total of 16 in the vowel of the first syllable by informant 4.

APPAS	Count	KAMPPI	Count	SANKA	Count	PANKKUU	Count	LANNI	Count	HAKKUU	Count
appas	6	kämppi	5	sänky	7	...	4	länni	10	häkku	7
äppas	5	kampi	4	sänki	2	pänkkuu	4	langi	3	äkkuu	3
...	1	kämpi	3	sanka	1	pänkuu	3	lanni	1	äkku	2
atpas	1	kämppy	2	sanky	1	pankkuu	1	längi	1	akku	1
kappas	1	kamppi	1	sänkkö	1	panku	1	ränni	1	häkkuu	1
äbbas	1	kämpy	1	sänko	1	pankuu	1			ähkuu	1
äppäs	1			sänku	1	pänku	1			ähky	1
				sänkä	1	pärnkuu	1				
				sänkö	1						

The word *olut* was uttered by the informant so that the short vowel in the second syllable was not clearly audible, and the quality was not perceived as <u> by any of the listeners.

5.5 Informant 5

5.5.1 Background information

Informant 5 has lived in Finland for a year and a half. She once participated in a Finnish language course, but for less than twenty hours. She hardly ever speaks Finnish, only in absolute circumstances when there is no other possibility. She describes her level of Finnish as very poor, and consequently, because of her own efforts to learn to speak Finnish, she daily faces communication problems with Finns. Her learning of Finnish is aided by the fact that she is bilingual – she speaks fluent Spanish. As she lived in Mexico as a child, her Spanish was stronger than her English until she was 12 years old. On top of this, she has taught English pronunciation, and is therefore well aware of the problems discussed here.

5.5.2 Perception analysis

The table below shows a summary of the quantitative deviations in the perceptions made from the utterances of the word list by informant 5.

Table 30. Informant 5: Summary of quantitative deviations in disyllabic words.

Type of quantitative change	Frequency	%	∑ %	Evaluation
1st syllable: V > VV	8/1098	0.7		optimal
1st syllable: V > V_1V_2	36/1098	3.3	4.0	optimal
1st syllable: VV > V	284/649	43.8		distorted
1st syllable: VV > V_1V_2	12/649	1.8	45.6	optimal
2nd syllable: V > VV	16/949	1.7		optimal
2nd syllable: V > V_1V_2	4/949	0.4	2.1	optimal
2nd syllable: VV > V	446/798	55.9		distorted
2nd syllable: VV > V_1V_2	3/798	0.4	56.3	optimal
Syllable boundary: V-C > VC-C	233/649	35.9	35.9	diffuse
Syllable boundary: C_1-C_2 > C_1C_2-C_2	74/449	16.5	16.5	fair
Syllable boundary: VC-C > V-C	101/549	18.3	18.3	fair
Syllable boundary: C_1C_2-C_2 > C_1-C_2	9/100	9.0	9.0	optimal
∑	1226/5241	23.4	23.4	

Notable deviations in the perceptions occur especially in long vowels and at the syllable boundary. The informant is still close to the initial level of a learner of Finnish where quantitative deviations clearly make it harder for Finns to understand what she attempts to say. For all the individual perceptions from the utterances of informant 5, see Appendix 3, p. 5.

5.5.2.1 Shortening of the long vowel

Informant 5 clearly fails to produce a long enough vowel in any syllabic position to be perceived as long by the Finnish listeners. There are many words in the material with which no-one wrote down the long vowel, as can be seen from the following examples:

Table 31. Examples of deviation in vowel duration by informant 5.

1st syllable VV > V	Syllable type	Frequency	%	Examples
	CVVC1-C2VV	50/50	100.0	*seestaa* as <sösta>, <sesta> etc. (25/25) *kuultaa* as <kulta> (25/25)
	CVVC1-C2V	33/50	66.0	*laasti* as <lasti> etc. (8/25) *veenta* as <venta> etc. (25/25)
	CVVC1-C2VC	49/50	98.0	*suuruus* as <surrus> (24/25) *kiipuus* as <kippuus>, <kippus>, <kipus> etc. (25/25)
	CVV-CV	27/50	54.0	*tuuli* as <tuli> etc. (7/25) *tooku* as <tokku> etc. (20/25)
2nd syllable VV > V	**Syllable type**	**Frequency**	**%**	**Examples**
	CVVC1-C2VV	50/50	100.0	*seestaa* as <sösta>, <sesta> etc. (25/25) *kuultaa* as <kulta> (25/25)
	CVC1-C2VV	43/50	92.0	*kohtuu* as <kohtu>, <kuhtu> etc. (23/25) *kirvuu* as <kirvu> etc. (20/25)
	CV-CVVC	43/50	86.0	*pakuus* as <akkus>, <pakkus> etc. (23/25) *pahuus* as <pahus>, <pahhus> etc. (20/25)
	CVVC1-C2VC	49/50	98.0	*suuruus* as <surrus> (24/25) *kiipuus* as <kippuus>, <kippus>, <kipus> etc. (25/25)
	CVC1C2-C2VV	35/50	70.0	*karttaa* as <kartta>, <kartha> (11/25) *pankkuu* as <pankku>, <bankku>, <panku> etc. (24/25)
	CVVC-CVVC	24/49	49.0	*kookkaat* as <kookaakat> etc. (2/25) – clear stumbling *koollaat* as <kullat> etc. (25/25)

5.5.2.2 Lengthening of the short and shortening of the long consonant at the syllable boundary

The frequent occurrence of both shortening and lengthening in the perceptions suggests that the speaker is not yet capable of making a sufficient distinction between short/long oppositions in Finnish and typically produces a half-long duration in most cases. This makes the Finnish listeners hesitate in deciding whether the utterance is short or long:

Table 32. Samples of deviations in consonant duration at the syllable boundary by informant 5.

Syllable boundary: C_1-C_2 > C_1C_2-C_2	Syllable type	Frequency	%	Examples
	VC1-C2V	45/49	91.8	*arki* as <arkki> etc. (23/25) *elku* as <eikku> (23/25)
	CVC1-C2VVC	18/50	36.0	*vanhuus* as <vanhys>, <vanhus> (12/25) *vorteet as <vortitet> etc. (6/25) – clear stumbling*
Syllable boundary: V-C > VC-C	**Syllable type**	**Frequency**	**%**	**Examples**
	CV-CVV	41/50	82.0	*makuu* as <makkuu>, <makku>, <maknu> (22/25) *posuu* as <possu>, <possuu>, <pussuu> (19/25)
	CVV-CVVC	39/50	78.0	*suuruus* as <surrus> (24/25) *kiipuus* as <kippuus>, <kippus>, etc. (15/25)
	CV-CVVC	34/50	68.0	*pahuus* as <pahhus>, <ahhus>, <pahhuus> etc.(12/25) *pakuus* as <akkus>, <pakkus>, <akkuus> etc. (22/25)
Syllable boundary: VC-C > V-C	**Syllable type**	**Frequency**	**%**	**Examples**
	CVC-CV	38/50	76.0	*lakki* as <laki> (14/25) *lanni* as <lämi>, <lami>, <lani> etc. (24/25)
	CVVC-CVC	25/50	50.0	*piirros* never shortened, but consonant cluster unclear *piittos* as <kiitos>, <iitos>, <viitos>, <piitos> (25/25)
	CVVC-CV	21/50	42.0	*taakka* as <taaka> (20/25) *taassa* as <tasa> (1/25)

5.5.2.3 Qualitative deviations

This informant stumbles with words *akeet, vorteet* and *kookkaat*, making an attempt to correct the pronunciation of the vowel quality from /i:/ to /e:/ in the second syllable on the fly. Words *onnaa, tikkaat* and *hakkuu* have a short pause between the syllables.

In some cases like *äkkä* the quality of /æ/ is so much like the Finnish back vowel /ɑ/ that nobody marked their perception as <ä> in these positions. Most of the perceptions of *vanhuus* (23/25), such as <vanhyys>, suggest a front vowel quality, while in other words in this position there are only a few perceptions like this. The word-final long /o:/ in *ehtoo* is perceived as <u> or <uu> in most cases (23/25).

5.6 Informant 6

5.6.1 Background information

Informant 6 has lived in Finland for 5 years off and on. He has studied Finnish on his own for two months. He speaks Finnish in situations like transport, greetings and farewells, and in restaurants. Yet he reports his level of Finnish as poor and that he faces communication problems in Finnish daily due to his pronunciation. He considers his English to be close to RP, with some slight local intrusions, e.g. from Gloucestershire where he originally comes from.

5.6.2 Perception analysis

The table below shows a summary of the quantitative deviations in the perceptions made from the utterances of the word list by informant 6.

Table 33. Informant 6: Summary of quantitative deviations in disyllabic words.

Type of quantitative change	Frequency	%	Σ %	Evaluation
1st syllable: V > VV	139/609	22.8		fair
1st syllable: V > V_1V_2	14/609	2.3	25.1	optimal
1st syllable: VV > V	159/362	43.9		distorted
1st syllable: VV > V_1V_2	7/362	1.9	45.8	optimal
2nd syllable: V > VV	22/527	4.2		optimal
2nd syllable: V > V_1V_2	6/527	1.1	5.3	optimal
2nd syllable: VV > V	392/444	88.3		distorted
2nd syllable: VV > V_1V_2	0/444	0.0	88.3	optimal
Syllable boundary: V-C > VC-C	101/364	27.7	27.7	diffuse
Syllable boundary: C_1-C_2 > C_1C_2-C_2	37/245	15.0	15.0	fair
Syllable boundary: VC-C > V-C	198/306	64.7	64.7	distorted
Syllable boundary: C_1C_2-C_2 > C_1-C_2	24/56	42.9	42.9	distorted
Σ	1099/2913	37.7	37.7	

With an elementary command of Finnish his problems greatly resemble those of informant 5, the most problems occurring in producing long enough vowels in any position and in consonants at the syllable boundary. For all the individual perceptions of the words, see Appendix 3, p. 6.

5.7 Informant 7

5.7.1 Background information

Informant 7 has lived in Finland for 11 years and a half, three of which, though, in a Swedish-speaking environment. She has participated a Finnish for foreigners course for some 40 to 50 hours in total. She estimates that she speaks Finnish for probably half an hour per week when shopping and with some members of staff. She considers her spoken Finnish passable and thinks that she occasionally ends up in communication difficulties with Finns due to her pronunciation. Her English is characterized by Scottish accent, but she points out that she has lived apart from Scots for a long time, and therefore her accent has somewhat toned down. Also, RP was never a model for her during schooldays. During her stay in Finland she has also learnt Finnish Swedish.

5.7.2 Perception analysis

The table below shows a summary of the quantitative deviations in the perceptions made from the utterances of the word list by informant 7.

Table 34. Informant 7: Summary of quantitative deviations in disyllabic words.

Type of quantitative change	Frequency	%	∑ %	Evaluation
1st syllable: V > VV	8/1009	0.8		optimal
1st syllable: V > V_1V_2	28/1009	2.8	3.6	optimal
1st syllable: VV > V	46/597	7.7		optimal
1st syllable: VV > V_1V_2	15/597	2.5	10.2	optimal
2nd syllable: V > VV	86/871	9.9		optimal/fair
2nd syllable: V > V_1V_2	0/871	0.0	9.9	optimal
2nd syllable: VV > V	13/735	1.8		optimal
2nd syllable: VV > V_1V_2	1/735	0.1	1.9	optimal
Syllable boundary: V-C > VC-C	7/596	1.2	1.2	optimal
Syllable boundary: C_1-C_2 > C_1C_2-C_2	13/412	3.2	3.2	optimal
Syllable boundary: VC-C > V-C	**47/506**	**9.3**	**9.3**	**optimal/fair**
Syllable boundary: C_1C_2-C_2 > C_1-C_2	2/92	2.2	2.2	optimal
∑	266/4818	5.5	5.5	

This informant represents a level where listeners no longer have great difficulties understanding what she says. Although the pronunciation of all syllable types can be evaluated as optimal in terms of their perception, there are still some noteworthy observations to point out.

Some problems still remain in producing the long vowel in the first syllable and the long consonant at the syllable boundary as sufficiently long to make a proper distinction. Phonetic measurements show a half-long duration in segments where deviating perceptions occur.

There are cases where the vowel in the second syllable is too long, resulting in perceptions like <veentaa> and <veentah> for *veenta* (8/23). In this particular case /h/ is audible at the end of the word in the recording.

In some cases the long consonant at the syllable boundary has been perceived as short: <muusaa> for *moossaa* (14/23), <iitos> and other short variants for *piittos* (4/23).

Table 35. Sample words with perceived consonant shortening at the syllable boundary by informant 7.

MUUTTAA	Count	MOOSSAA	Count	PIIRROS	Count	PIITTOS	Count
muuttaa	22	muusaa	14	piirros	15	piittos	13
nuuttaa	1	muussaa	9	pierroos	3	tiittos	3
				pierros	3	iitos	2
				piirroos	1	kiittos	2
				piorröös	1	kiitos	1
						viitos	1
						viittos	1

As all the perceptions are based on what was heard in a single, bypassing and unrepeatable moment, the perceptions of *piittos* serve as a good example of the difficulty in deciding the

quality of the word-initial sound segment. For all the individual perceptions from the utterances of informant 7, see Appendix 3, p. 7.

5.7.2.1 Qualitative deviations

More often than quantitative, for informant 7 the problems or non-native production of utterances have to do with qualitative deviations.

For example, the dark, velarised quality of /l/ occurs especially when the segment is long, such as <aullas> and other variants with <aul> for *allas* (9/23). Some diphthongisation occurs as in <pierros> and other similar variants for *piirros* (7/23). The quality of short word-initial /e/ is towards /æ/ for the Finnish ear, e.g. <änää> for *enää* (9/23), and <äväät> and other variants with short word-initial /æ/ for *eväät* (15/23). Perceptions like <muusaa> (14/23) or <muussaa> (9/23) for *moossaa* (see the table above) may also represent a slip based on the confusing similarity of *moose* in writing in English. Despite being an advanced learner of Finnish, aspiration is still frequently present in the utterances of informant 7 in positions where it is used in English.

5.8 Informant 8

5.8.1 Background information

Informant 8 has lived in Finland for as long as 23 years. She has participated in Finnish for foreigners courses for 2 years in 1970-72. She speaks Finnish everywhere except at home. She describes her Finnish as fluent and that she seldom faces problems when speaking Finnish. Her English is strongly influenced by education – or rather, she was already brought up with expectations to speak "Queen's English". In her own opinion she probably speaks the Oulu dialect of Finnish, since she has lived in the city for so long and because of the numerous friends with whom she speaks the language.

5.8.2 Perception analysis

The table below shows a summary of the quantitative deviations in the perceptions made from the utterances of the word list by informant 8.

Table 36. Informant 8: Summary of quantitative deviations in disyllabic words.

Type of quantitative change	Frequency	%	Σ %	Evaluation
1st syllable: V > VV	11/1364	0.8		optimal
1st syllable: V > V_1V_2	13/1364	1.0	1.8	optimal
1st syllable: VV > V	104/805	12.9		fair
1st syllable: VV > V_1V_2	52/805	6.5	19.4	optimal
2nd syllable: V > VV	30/1177	2.6		optimal
2nd syllable: V > V_1V_2	1/1177	0.1	2.7	optimal
2nd syllable: VV > V	4/992	0.4		optimal
2nd syllable: VV > V_1V_2	3/992	0.3	0.7	optimal
Syllable boundary: V-C > VC-C	26/806	3.2	3.2	optimal
Syllable boundary: C_1-C_2 > C_1C_2-C_2	19/558	3.4	3.4	optimal
Syllable boundary: VC-C > V-C	12/681	1.8	1.8	optimal
Syllable boundary: C_1C_2-C_2 > C_1-C_2	0/124	0.0	0.0	optimal
Σ	275/6507	4.2	4.2	

The informant's own judgment about her ability to get by in Finnish is certainly not an understatement. However, there were some cases where deviating perceptions were clearly present and deserve a notion.

Shortening of the vowel in the first syllable occurs in 12.9% of all the perceptions, for example <onta> for *oonta* almost unanimously (30/31), <irros> and other variants with a short initial vowel for *piirros* (23/31), <kultaa> and <kuntaa> for *kuultaa* (25/31). The measured durations of these vowel segments also show that they are clearly shorter than would be sufficient for resulting in perceiving them as long. These examples represent syllable types that require a lot of production energy, a long vowel followed by a long consonant or a consonant cluster.

The informant does not have similar problems with structures where a short consonant follows the long vowel in the first syllable. There is also a contradictory case with lengthened perceptions of the consonant at the syllable boundary like <kiippuus> for *kiipuus* (24/31), but judging by the phonetic quality of the production those seem to result from a slight hesitant pause between the syllables. For all the individual perceptions from the utterances of informant 8, see Appendix 3, p. 8.

5.8.2.1 Qualitative deviations

Despite the advanced level of her Finnish the utterances still contain some traces of word initial aspiration as well as dark quality of /l/, which only give her speech a flavour foreign accent.

5.9 Informant 9

5.9.1 Background information

Informant 9 has stayed in Finland for 15 years. He has studied Finnish continuously since he arrived, on his own at home with "Finnish for foreigners and Suomen Yleisradio", as he puts it. He finds it difficult to estimate the total hours of study, but presumes it to be hundreds, possibly thousands. He also estimates that he speaks Finnish five days out of seven, mostly in shops, offices, banks, with his neighbours and with acquaintances in his block of flats. He considers his level of spoken Finnish fair and states that he seldom faces communication problems with Finns. He comes originally from East London and states that the impact of education on his English is considerable as always in British sociolinguistic questions. He also speaks French and Spanish. In his case it is worthwhile to point out that as a teacher of English pronunciation to Finnish university students he has had the opportunity of becoming closely acquainted with Finnish phonology on a practical level. Admittedly he is by far the best of these informants, as far as Finnish pronunciation is concerned.

5.9.2 Perception analysis

The table below shows a summary of the quantitative deviations in the perceptions made from the utterances of the word list by informant 9.

Table 37. Informant 9: Summary of quantitative deviations in disyllabic words.

Type of quantitative change	Frequency	%	∑ %	Evaluation
1st syllable: V > VV	0/1408	0.0		optimal
1st syllable: V > V_1V_2	41/1408	2.9	2.9	optimal
1st syllable: VV > V	10/832	1.2		optimal
1st syllable: VV > V_1V_2	3/832	0.4	1.6	optimal
2nd syllable: V > VV	7/1216	0.6		optimal
2nd syllable: V > V_1V_2	1/1216	0.1	0.7	optimal
2nd syllable: VV > V	6/1024	0.6		optimal
2nd syllable: VV > V_1V_2	0/1024	0.0	0.6	optimal
Syllable boundary: V-C > VC-C	1/832	0.1	0.1	optimal
Syllable boundary: C_1-C_2 > C_1C_2-C_2	13/576	2.3	2.3	optimal
Syllable boundary: VC-C > V-C	15/704	2.1	2.1	optimal
Syllable boundary: C_1C_2-C_2 > C_1-C_2	0/128	0.0	0.0	optimal
∑	97/6720	1.4	1.4	

According to the perception data the informant has little problems in his Finnish pronunciation. There are no traces of significant quantitative deviations left in his speech. For all the individual perceptions from the utterances of informant 5, see Appendix 3, p. 5.

5.9.2.1 Qualitative deviations

In the research material of this informant the only traces of foreignness have to do with qualitative properties, occasional word-initial aspiration and a more central than the Finnish quality of /i/ as [ɪ], which also explains perceptions like <arke> or <arkke> for *arki* (4/32) and <tuule> for *tuuli* (2/32).

6 Discussion and conclusion

In this study the perception analysis was based on two main viewpoints, first investigating the changes taking place in individual syllable types, and second, on the individual performance of the informants.

As the research material is somewhat large, we can identify some trends in the difficulties met by the informants. In the table presented below, a summary of quantitative deviations is arranged by frequency, the different potential deviations in syllable types presented on rows starting from those with the most problems at the top, and the informants starting from those with the most problems on the left.

Table 38.Summary of quantitative deviations arranged by frequency.

Type of durational change	Inf6	Inf3	Inf5	Inf4	Inf1	Inf2	Inf7	Inf8	Inf9	Total	Total %
2nd syllable: VV > V	88.3	70.1	55.9	19.2	27.6	19.2	1.8	0.4	0.6	1725/6504	26.5
1st syllable: VV > V	43.9	39.9	43.8	9.1	2.5	11.6	7.7	12.9	1.2	916/5290	17.3
Syllable boundary: VC-C > V-C	64.7	24.7	18.3	33.5	21.5	6.3	9.3	1.8	2.1	739/4484	16.5
Syllable boundary: V-C > VC-C	27.7	41.9	35.9	1.0	0.5	0.6	1.2	3.2	0.1	590/4791	12.3
Syllable boundary: C_1C_2-C_2> C_1-C_2	42.9	6.5	9.0	62.7	4.0	12.7	2.2	0.0	0.0	90/807	11.1
Syllable boundary: C_1-C_2 > C_1C_2-C_2	15.0	25.4	16.5	1.8	6.1	2.4	3.2	3.4	2.3	284/3635	7.8
1st syllable: VV > V_1V_2	1.9	3.7	1.8	11.4	12.2	2.9	2.5	6.5	0.4	247/5290	4.6
2nd syllable: V > VV	4.2	2.9	1.7	9.7	3.5	4.5	9.9	2.6	0.6	314/7708	4.1
1st syllable: V > V_1V_2	2.3	8.7	3.3	3.8	2.8	2.5	2.8	1.0	2.9	283/8922	3.2
1st syllable: V > VV	22.8	9.2	0.7	0.3	0.2	0.3	0.8	0.8	0.0	250/8922	2.8
2nd syllable: VV > V_1V_2	0.0	0.5	0.4	3.8	0.0	0.2	0.1	0.3	0.0	30/6504	0.5
2nd syllable: V > V_1V_2	1.1	0.4	0.4	0.5	0.2	0.1	0.0	0.1	0.1	21/7708	0.3
Total %	37.7	30.7	23.4	13.7	10.3	7.3	5.5	4.2	1.4		

We can look at these results in relative terms only, pointing out the structures where problems are faced most often.

In this material by far the most common and the most persistent deviation type is shortening of the vowel in the second syllable, which is clearly coupled with the reduced vowel quality in unstressed positions in English. Among the syllable types allowing this deviation to occur problems are faced with patterns that contain both short and long sound segments, especially those containing a consonant cluster at the syllable boundary and (C)VVCVV(C) patterns where there is a short consonant between double-length vowels. Words with evenly long, either short or long sound segments are the easiest ones to master.

Shortening of the vowel in the first syllable is the next most common occurrence. Informant 8, despite being an advanced learner of Finnish, has an individual tendency to shorten the vowel in this position.

Durational problems at the syllable boundary, the most common being the double-length consonant perceived as short, are a challenging group altogether. These changes are typically coupled so that on the basis of the perceptions, simultaneous shortening and lengthening of the sound sequences occur on both sides of the syllable boundary, resulting in perceptions that are perhaps furthest away from the target utterance and thus hard to understand.

Diphthongisation of the vowel in the first syllable seems to be more of an individual tendency, as indicated by the overall results of informants 4 and 5.

Shortening of the latter consonant in a cluster at the syllable boundary proved troublesome for some informants (2, 4 and 6), while others had little problem with it.

The research material is limited in the sense that it is based on an artificial set of words produced in isolation. The justification for using it comes from its consistency and adequacy for covering the behaviour of pronunciation with the smallest prosodic unit in Finnish, a disyllabic word consisting of syllables where primary stress in a normal speech context falls on the first syllable and the second syllable is unstressed.

Nine informants were used in order to obtain a sufficient sample of varying skills in Finnish. The beginner's and advanced levels are well represented, but perhaps the intermediate level with some more variation among the informants could have been useful.

The listener groups of upper secondary school students were sufficiently large for statistical evidence (14 to 32 per informant) and homogeneous by age and domicile, representing speakers of the same dialect. The idea of using pseudowords in addition to meaningful test words was well understood by the listeners, because in a vast majority of perceptions they managed to stick to the rule of writing down their instant impressions without forcibly trying to make sense of what they heard.

The large research material used in this study would suffice to be reused even for a doctoral dissertation. The material contains a lot of potential for further research items which are not fully or systematically exploited under the scope of the perceptual study of this magnitude. By putting more emphasis on the phonetic measurements, many new points of view could be introduced:

First, phonetic transcription made of the sound segments of the utterances of all nine informants as well as one person representing the Finnish norm for comparison could be used more as evidence for the findings. Second, out of the minimal pairs embedded in the

test material those where plosives are contrasted within the word list itself with other consonants (10 word pairs, e.g. *ottaa/onnaa*) gain little attention in this study. Minimal pairs based on quantitative differences only, such as *varras/varas,* were covered from the viewpoint of any perceptions where the deviation in question (here *rr* perceived as <r>) was realized, and not by counting the number of expected deviant yet meaningful occurrences. Third, the control material at the end of word list A and in word list B (see Appendix 1) was designed for the needs of phonetic measurements, and thus does not play any role in the perceptual study at hand.

Fourth, unlike in Finnish, where the short-long quantity opposition has no impact on vowel quality, In English the shorter phonemes typically have a more central articulatory position in the vowel space than their longer counterparts. Changes in the vowel quality are clearly present in the perception material, but as it was not in the focus of this study, their handling here is rather superficial and lacking any systematic analysis. The qualitative vacillation that co-occurs with quantitative changes could be investigated more closely using the research material of this study, e.g. what kind of transitions there are and to what extent they occur in different syllable patterns and positions.

The study complements our understanding about the differences between English and Finnish vernaculars, underlining the importance of mastering the quantitative opposition in Finnish from the viewpoint of successful communication. On the basis of the findings of this study, training material for those learning Finnish as a second language could be tailored to better serve the needs of native English speakers.

References

Bannert, R. (1980). *Svårigheter med svenskt uttal: Inventering och prioritering*. Praktisk Lingvistik 5, Institutionen för lingvistik, Lunds universitetet.

Delattre, P. (1962). Some factors of vowel duration and their cross-linguistic validity. *Journal of the Acoustic Society of America, 34*, 582-593.

Fry, D. B. (1958). Experiments in the perception of stress. *Journal of Language, Speech and Hearing Reseach, 1*, 126-152.

Fujisaki, H., Nakamura, K., & Imoto, T. (1975). Auditory perception of duration of speech and non-speech stimuli. In G. Fant, & M. Tatham (Eds.), *Auditory analysis and perception of speech* (pp. 197-220). New York: Academic.

Gaitenby, J. (1965). *The elastic word.* (Status Report on Speech Research SR-2). New York: Haskins Laboratories.

House, A. S., & Fairbanks, G. (1953). The influence of consonantal environment upon the secondary characteristics of vowels. *Journal of the Acoustic Society of America, 35*, 105-113.

Karlsson, F. (1977). Morphotactic structure and word cohesion in Finnish. In K. Sajavaara, & J. Lehtonen (Eds.), *Contrastive papers,* Jyväskylä Contrastive Studies 4, (pp. 59-74)

Karlsson, F. (1982). Kieliteorian relevanssi suomen kielen opetukselle. *Suomi vieraana kielenä* (Karlsson, F. ed., pp. 89-114). Porvoo: WSOY.

Karlsson, F. (1983). *Suomen kielen äänne- ja muotorakenne*. Porvoo: WSOY.

Klatt, D. H. (1974). The duration of [S] in English words. *Journal of Speech Hearing and Language Research, 17*, 51-63.

Klatt, D. H. (1975). Vowel lengthening is syntactically determined in a connected discourse. *Journal of Phonetics, 3*, 129-140.

Klatt, D. H. (1976). Segmental duration in English. *Journal of the Acoustic Society of America, 59*(5), 1208-1221.

Lehtonen, J. (1970). *Aspects of quantity in standard Finnish,* Studia Philologica Jyväskyläensia 6. Jyväskylä: University of Jyväskylä.

Lehtonen, J. (1980). Psykolingvistiska aspekter på en finnes förmåga att förstå skandinaviska språk. In C. Elert (Ed.), *Internordisk språkförståelse,* Acta Universitatis Umensis, Umeå Studies in the Humanities 33*,* (pp. 12-26)

Lehtonen, J., & Koponen, M. (1977). Signalling of morphophonological boundaries by Finnish speakers of English: Preliminary findings. In K. Sajavaara, & J. Lehtonen (Eds.), *Contrastive papers, Jyväskylä Contrastive Studies 4,* (pp. 75-87). Jyväskylä: University of Jyväskylä.

Morris-Wilson, I. (2004). *English Segmental Phonetics for Finns.* Oulu: Oulu University Press.

Määttä, T. (1983). *Hur finskspråkiga uppfattar svenskans vokaler: En studie i kontrastiv fonetik med naturligt och syntetiskt tal.* Umeå universitetet.

Odlin, T. (1989). *Language transfer: Cross-linguistic influence in language learning*. New York: Cambridge University Press.

Suomi, K. (1980). *Voicing in English and Finnish stops.* Publications of the Department of Finnish and General Linguistics of the University of Turku 10, Turku.

Suomi, K., Toivanen, I., & Ylitalo, R. (Eds.). (2008). *Finnish sound structure: Phonetics, phonology, phonotactics and prosody*. Studia Humaniora Ouluensia 9. Oulu: University of Oulu.

Vihanta, V. (1990). Suomi vieraana kielenä foneettiselta kannalta. In J. Tommola (Ed.), *Foreign language comprehension and production,* AFinLA Yearbook 1990, (pp. 199-226). Turku: The Finnish Association for Applied Linguistics.

Wiik, K. (1965). *Finnish and English vowels: A comparison with special reference to the learning problems met by native speakers of Finnish learning English.* University of Turku.

Wiik, K. (1988). Pohjoiseurooppalaisten kielten entinen yhteinen puherytmi. *XV Kielitieteen Päivät Oulussa 13.-14.5.1988,* Acta Universitatis Ouluensis B 14, 277-302. University of Oulu.

Appendix 1: Test word list

Test word list as read top to down by informants. The last 15 words starting from *soti* are used as reference as measured data to support or to contradict the data derived from the perception analysis.

Word list A

Please pronounce the following words in Finnish as "naturally" and clearly as you can. Quite many of the words are nonsensical, so do not try to make sense of each of them, but read them as if they were Finnish. Make a pause of at least 3 seconds between each utterance.

arki	**evät**	**vorteet**	**eesti**
seestaa	**karttaa**	**kookkaat**	**lomppo**
eli	**hammuu**	**atoo**	**aasi**
kirvuu	**sisin**	**veenta**	**timmaat**
laasti	**allas**	**koko**	**soti**
elku	**lanni**	**opa**	**saan**
appas	**moossaa**	**hakkuu**	**vadit**
kaatuu	**ehtoo**	**tuuli**	**jäätä**
enää	**koollaat**	**varras**	**säteen**
kamppi	**otsuu**	**tooku**	**saa**
veestin	**talke**	**pahuus**	**sodi**
sanka	**keelin**	**vannas**	**vatit**
suuruus	**kohtuu**	**maaton**	**jäädä**
iike	**ottaa**	**apus**	**säteet**
pankkuu	**pakuus**	**sune**	**raadin**
muuttaa	**piirros**	**taakka**	**saat**
äkkä	**akeet**	**piittos**	**vadin**
onnaa	**kiipuus**	**makuu**	**raadit**
vokos	**kuultaa**	**puuskat**	**loppu**
lakki	**olut**	**oonta**	
taassa	**tikkaat**	**ällä**	
vanhuus	**posuu**	**saaruu**	

Word list B

Please pronounce the following words in English making a pause of at least 3 seconds between each utterance.

bet	**dock**
league	**leak**
cab	**bed**
sword	**sort**
lee	**dog**
cap	**stop**
soar	

Appendix 2: Distribution of test words by syllable types

Table 1: Distribution of disyllabic vowel-initial Finnish test words by the potential perceptual alternatives to be mixed with.

Syllable type	Word	1st syllable V > VV	1st syllable VV > V	2nd syllable V > VV	2nd syllable VV > V	Syllable boundary C > CC	Syllable boundary CC > C	Pseudo-word
V-CV	eli	eeli				elli		opa
V-CVC	olut					ollut		apus
V-CVV	enää				enä	ennä		atoo
V-CVVC	eväät				evät			akeet
VC-CV	ällä	äälä					älä	äkkä
VC-CVC	allas						alas	appas
VC-CVV	ottaa				otta		ota	onnaa
VC-CVVC								
VC1-C2V	arki					arkki		elku
VC1-C2VC								
VC1-C2VV	ehtoo				ehto			otsuu
VC1-C2VVC								
VC1C2-C2V								
VC1C2-C2VC								
VC1C2-C2VV								
VC1C2-C2VVC								
VC1C2-C3V								
VC1C2-C3VC								
VC1C2-C3VV								
VC1C2-C3VVC								
VV-CV	aasi		asi			assi		iike
VV-CVC								
VV-CVV								
VV-CVVC								
VVC1-C2V								
VVC1-C2VC								
VVC1-C2VV								
VVC1-C2VVC								
VVC1-C2V	eesti		esti					oonta
VVC1-C2VC								
VVC1-C2VV								
VVC1-C2VVC								
VVC1C2-C2V								
VVC1C2-C2VC								
VVC1C2-C2VV								
VVC1C2-C2VVC								

Appendix 2: Distribution of test words by syllable types

Table 2: Distribution of disyllabic consonant-initial Finnish test words by the potential perceptual alternatives to be mixed with.

Syllable type	Word	1st syllable V > VV	1st syllable VV > V	2nd syllable V > VV	2nd syllable VV > V	Syllable boundary C > CC	Syllable boundary CC > C	Pseudo-word
CV-CV	koko	kooko				kokko		sune
CV-CVC	sisin	siisin				sissin		vokos
CV-CVV	makuu	maaku			maku			posuu
CV-CVVC	pahuus				pahus			pakuus
CVC-CV	lakki	laak(k)i					laki	lanni
CVC-CVC	varras						varas	vannas
CVC-CVV	hakkuu				hak(k)u		haku	hammuu
CVC-CVVC	tikkaat				tikat		tikat	timmaat
CVC1-C2V	sanka					sankka		talke
CVC1-C2VC								
CVC1-C2VV	kohtuu				kohtu			kirvuu
CVC1-C2VVC	vanhuus				vanhus			vorteet
CVC1C2-C2V	kamppi						kampi	lomppo
CVC1C2-C2VC								
CVC1C2-C2VV	karttaa				kartta			pankkuu
CVC1C2-C2VVC								
CVC1C2-C3V								
CVC1C2-C3VC								
CVC1C2-C3VV								
CVC1C2-C3VVC								
CVV-CV	tuuli		tuli			tulli		tooku
CVV-CVC	maaton		maton					keelin
CVV-CVV	kaatuu		katu		ka(a)tu			saaruu
CVV-CVVC	suuruus		surus		suurus	suurrus		kiipuus
CVVC-CV	taakka		tak(k)a				taka	taassa
CVVC-CVC	piirros				piiras			piittos
CVVC-CVV	muuttaa		mutta(a)		mutta		muta	moossaa
CVVC-CVVC	kookkaat		kok(ka)at		kok(k)at		kokat	koollaat
CVVC1-C2V	laasti		lasti					veenta
CVVC1-C2VC	puuskat		puskat					veestin
CVVC1-C2VV	kuultaa		kulta					seestaa
CVVC1-C2VVC								
CVVC1C2-C2V								
CVVC1C2-C2VC								
CVVC1C2-C2VV								
CVVC1C2-C2VVC								

1 - ARKI
ark 12
arg 3
argh 3
arki 3
arkki 3
... 1

2 - SEESTAA
seistä 23
seis 1
seist 1

3 - ELI
eli 22
peli 2
heli 1

4 - KIRVUU
kirvu 11
kirbu 6
kirpu 2
... 1
kirju 1
kirku 1
kirkuu 1
kirnu 1
kirppu 1

5 - LAASTI
laasti 20
laaste 2
naasti 2
laast 1

6 - ELKU
elku 10
... 3
enkku 3
elkuu 2
elokuu 2
elbu 1
elkku 1
elkuul 1
elukuu 1
enku 1

7 - APPAS
appas 20
abbas 4
... 1

8 - KAATUU
kaatuu 17
kaatu 7
kaaltu 1

9 - ENÄÄ
enä 16
enää 8
nenä 1

10 - KAMPPI
kamppi 25

11 - VEESTIN
veesti 10
veisti 9
... 2
veeisti 2
veest 1
veitsi 1

12 - SANKA
sankka 14
sankko 4
sanko 4
sanka 2
samka 1

13 - SUURUUS
suurus 24
suuruus 1

14 - IIKE
iik 13
iike 7
kiike 2
... 1
kiire 1
liike 1

15 - PANKKUU
pankku 15
pankkuu 8
panku 1
pankuu 1

16 - MUUTTAA
muutaa 11
muuntaa 6
muuta 5
muuttaa 2
muultaa 1

17 - ÄKKÄ
äkkä 24
äkkiä 1

18 - ONNAA
onna 11
onnaa 11
... 1
ommaa 1
onno 1

19 - VOKOS
vokos 22
... 1
rukous 1
vogos 1

20 - LAKKI
lakki 25

21 - TAASSA
taassa 21
päässä 1
taas 1
tassa 1
tässä 1

22 - VANHUUS
vanhus 21
vanhuus 4

23 - EVÄÄT
evät 24
evät 1

24 - KARTTAA
karttaa 25

25 - HAMMUU
hammu 23
hämmu 2

26 - SISIN
sisi 17
sisin 8

27 - ALLAS
allas 17
aulas 6
au 1
auvas 1

28 - LANNI
lämmi 9
lämmin 5
lammi 4
lanni 4
länni 3

29 - MOOSSAA
muusaa 24
muusa 1

30 - EHTOO
ehtoo 24
ehto 1

31 - KOOLLAAT
kuulaat 12
koolaat 6
koulaat 3
kuullaat 2
koulaak 1
kuulaak 1

32 - OTSUU
otsuu 22
otso 1
otsooni 1
otsu 1

33 - TALKE
tauke 12
talk 2
tälki 2
täuke 2
kauki 1
pauke 1
talki 1
tauk 1
taukki 1
taulk 1
tälke 1

34 - KEELIN
keelin 12
keeli 3
geeli 2
keel 2
... 1
geelin 1
keelim 1
keeling 1
keevin 1
teelin 1

35 - KOHTUU
kohtuu 22
kauhtuu 1
kohtu 1
kohtuus 1

36 - OTTAA
ottaa 25

37 - PAKUUS
pakuus 14
pakus 3
takuus 3
akuus 2
pahuus 1
takus 1
vakuus 1

38 - PIIRROS
piirus 13
piirros 5
piiros 3
piirrus 2
tiiros 1
viirus 1

39 - AKEET
äkeet 24
äkee 1

40 - KIIPUUS
kiipus 14
kiipuus 11

41 - KUULTAA
kuultaa 19
kuutaa 4
kuumtaan 1
kuuntaa 1

42 - OLUT
olut 25

43 - TIKKAAT
tikkaat 24
tikkaa 1

44 - POSUU
posuu 20
possu 3
osuu 1
posum 1

45 - VORTEET
vorteet 9
porteet 6
purteet 2
uurteet 2
vuorteet 2
kurteet 1
murteet 1
orteet 1
urteet 1

46 - KOOKKAAT
koukaat 12
kookaat 8
koulkaat 2
kokaat 1
koolkaat 1
koorkaat 1

47 - ATOO
atoo 16
ato 5
... 1
at 1
atolli 1
auto 1

48 - VEENTA
veentaa 12
veenta 3
ventaa 3
veendaa 2
venda 2
veenda 1
vendaa 1
väntaa 1

49 - KOKO
koko 21
kuku 4

50 - OPA
opa 19
kopa 3
opaa 1
opaat 1
opas 1

51 - HAKKUU
hakkuu 24
hakkuut 1

52 - TUULI
tuuli 24
tuuri 1

53 - VARRAS
parras 15
paras 6
varras 3
varas 1

54 - TOOKU
touku 16
tooku 2
touk 2
touko 2
toug 1
toukokuu 1
toukuu 1

55 - PAHUUS
pahuus 22
pahus 3

56 - VANNAS
pannas 16
kannas 5
kangas 1
pammas 1
pannassa 1
vannas 1

57 - MAATON
maaton 23
maato 1
maatos 1

58 - APUS
apus 22
akus 3

59 - SUNE
sune 20
sume 5

60 - TAAKKA
taakka 25

61 - PIITTOS
piittos 19
tiittos 4
kiittos 1
viittos 1

62 - MAKUU
makuu 23
maku 1
nakuu 1

63 - PUUSKAT
puuskat 15
uuskat 8
puuskot 1
puustat 1

64 - OONTA
oonta 16
onta 3
unta 2
ontaa 1
oomta 1
oonda 1
ounta 1

65 - ÄLLÄ
ällä 24
älla 1

66 - SAARUU
saaruu 18
saaru 3
saaruus 2
saarul 1
saarun 1

67 - EESTI
eesti 25

68 - LOMPPO
nomppo 9
lomppu 4
nomppoo 4
lomppo 3
noppo 2
lamppu 1
nompont 1
nopo 1

69 - AASI
aasi 25

70 - TIMMAAT
timmaat 22
timmat 2
timaat 1

1 - ARKI
arki 13
... 3
amki 1
arkhi 1
arkki 1

2 - SEESTAA
seestö 3
seistä 3
säästö 3
seestä 2
... 1
seeskä 1
seesta 1
seesto 1
seista 1
sester 1
sesto 1
säästä 1

3 - ELI
eli 19

4 - KIRVUU
... 4
kirku 2
gitavo 1
kidutu 1
kidutud 1
kidutus 1
kidörpuul 1
kiokbu 1
kirjoful 1
kirpu 1
kirvu 1
kitavi 1
kitopuu 1
kitrobut 1
pitöful 1

5 - LAASTI
laasti 14
lasti 5

6 - ELKU
elku 14
... 1
alku 1
eukko 1
euku 1
eulku 1

7 - APPAS
appas 13
abbas 4
arppas 1
attas 1

8 - KAATUU
kaatuu 12
taatuu 2
... 1
kaartaa 1
kaatu 1
kaatyy 1
kartoo 1

9 - ENÄÄ
enää 19

10 - KAMPPI
kämppi 7
käppi 7
... 1
kaappi 1
keppi 1
kämpi 1
kärppi 1

11 - VEESTIN
veesti 11
veestin 4
... 1
peesti 1
taysin 1
weesti 1

12 - SANKA
sanka 8
sänka 4
sänkä 4
sanki 1
sanko 1
sänky 1

13 - SUURUUS
suuruus 6
suus 5
suurus 4
suulus 2
syus 1
syylus 1

14 - IIKE
iike 11
ikä 6
iikä 1
liike 1

15 - PANKKUU
pänkuu 4
... 3
tänkuu 2
ankku 1
hankkuu 1
kankku 1
pankku 1
pankkuu 1
panku 1
pankuu 1
pänkku 1
pänkkuu 1
vänkkuu 1

16 - MUUTTAA
muuttaa 18
muta 1

17 - ÄKKÄ
äkkää 14
akka 1
akkaa 1
akkää 1
äkkaa 1
äkkä 1

18 - ONNAA
onnaa 17
omnaa 1
onna 1

19 - VOKOS
hokos 4
okos 4
pokos 4
... 2
lokos 2
kokos 1
kokous 1
nokos 1

20 - LAKKI
lakki 13
läkki 6

21 - TAASSA
tääsä 7
tässä 4
täässä 4
täässä 3
tässa 1

22 - VANHUUS
vanhuus 9
vanhus 3
anhus 2
änhuus 2
lakuus 1
panhuus 1
äntuus 1

23 - EVÄÄT
evät 19

24 - KARTTAA
karttaa 14
kartta 5

25 - HAMMUU
hammuu 14
ammuu 2
hambuu 1
hammu 1
hämmuu 1

26 - SISIN
sisin 14
sisi 5

27 - ALLAS
allas 14
aulas 4
ällas 1

28 - LANNI
lanni 19

29 - MOOSSAA
muussaa 14
muussa 2
... 1
mussaa 1
muusa 1

30 - EHTOO
ehtoo 17
eftoo 1
ehto 1

31 - KOOLLAAT
koollaak 5
koollaat 4
koollaa 3
koolla 2
... 1
kollaad 1
kollaat 1
koollak 1
koollap 1

32 - OTSUU
otsuu 8
otsyy 6
otsu 2
atsuu 1
otsy 1
otsyyn 1

33 - TALKE
talke 7
tauke 5
tanke 2
... 1
pauke 1
tauhke 1
telke 1
tälke 1

34 - KEELIN
keeli 8
kieli 4
geeli 2
keli 2
... 1
keele 1
keelee 1

35 - KOHTUU
kohtuu 9
kohtu 4
koftuu 3
koftyy 1
kostyym 1
köftuu 1

36 - OTTAA
ottaa 16
ohtaa 2
oktaa 1

37 - PAKUUS
pakuus 5
vakuus 4
pahuus 2
takuus 2
... 1
ahuus 1
kaguus 1
prakyys 1
rakumus 1
väkuus 1

38 - PIIRROS
piirros 18
tiebros 1

39 - AKEET
äkeet 14
akeet 2
... 1
lakeet 1
näkee 1

40 - KIIPUUS
kiipuus 8
kiikuus 6
... 1
kiihuus 1
kiikus 1
kiipus 1
piikuus 1

41 - KUULTAA
kuultaa 8
kuutaa 4
kyyltaa 3
kulta 2
huutaa 1
kultaa 1

42 - OLUT
olut 15
olt 2
ollut 1
olot 1

43 - TIKKAAT
tikkaat 18
tikkaa 1

44 - POSUU
osuu 16
osu 1
osuus 1
vosu 1

45 - VORTEET
vorteet 5
murteet 3
vortteet 2
... 1
kurteet 1
nuorteet 1
vaatteet 1
voiteet 1
vortheet 1
voteet 1
vuorteet 1
vuoteet 1

46 - KOOKKAAT
kookkaat 17
kolkkaat 1
kookkaalt 1

47 - ATOO
atoo 16
... 1
lato 1
ätoo 1

48 - VEENTA
entä 3
eentä 2
ojentaa 2
veenta 2
... 1
eetä 1
ejentaa 1
enetä 1
enta 1
entää 1
jeentaa 1
perenta 1
rientää 1
venta 1

49 - KOKO
koko 18
kokot 1

50 - OPA
opa 12
ota 5
... 1
kota 1

51 - HAKKUU
hakkuu 7
häkkuu 6
äkkuu 4
... 1
läkku 1

52 - TUULI
tuuli 17
tuli 1
tyuli 1

53 - VARRAS
varras 5
allas 3
harras 2
... 1
ahdas 1
amras 1
anras 1
arras 1
kankas 1
parras 1
sairas 1
varvas 1

54 - TOOKU
tooku 12
toogu 2
... 1
polku 1
tolku 1
tookuu 1
toolku 1

55 - PAHUUS
pahuus 4
vakuus 4
pahus 3
... 1
ahus 1
akus 1
akuus 1
hakus 1
vähuus 1
ähups 1
ähus 1

56 - VANNAS
vannas 13
mannas 3
lammas 1
vangas 1
vanhus 1

57 - MAATON
maato 12
mato 4
maaton 2
maarto 1

58 - APUS
apus 11
hapus 8

59 - SUNE
sune 13
... 1
sine 1
sone 1
sunee 1
suni 1
sunne 1

60 - TAAKKA
taakka 18
taara 1

61 - PIITTOS
kiitos 7
piittos 6
kiittos 2
tiittos 2
viittos 2

62 - MAKUU
maku 7
makuu 6
mäkuu 2
maky 1
mäku 1
mäkuy 1
näku 1

63 - PUUSKAT
puuskat 13
puuskät 3
kuuskat 2
puusket 1

64 - OONTA
oonta 5
oota 3
alta 2
onta 2
oolta 2
oottaa 2
... 1
oltä 1
ootta 1

65 - ÄLLÄ
alla 18
halla 1

66 - SAARUU
saaruu 9
saaru 7
... 1
sauru 1
sorry 1

67 - EESTI
eesti 16
esti 3

68 - LOMPPO
lomppo 12
loppo 6
... 1

69 - AASI
aasi 19

70 - TIMMAAT
timmaat 8
temmaat 2
timmaa 2
tinnaat 2
temmaak 1
temmark 1
tennaat 1
timmak 1
tinnaa 1

1 - ARKI
arkki 6
arki 4
aakki 3
ahki 2
auki 2
... 1
aaki 1
aakkee 1

2 - SEESTAA
seistä 10
seesta 2
seestaa 2
seista 2
sista 2
siesta 1
siisti 1

3 - ELI
elli 7
älli 7
enni 2
andi 1
endly 1
enli 1
änni 1

4 - KIRVUU
kirkko 3
... 2
kierfu 2
kirppu 2
carefull 1
hiehku 1
kareful 1
kieffu 1
kiehuu 1
kieppuu 1
kierräpuu 1
kifu 1
kirffuu 1
kirkku 1
kliöpuu 1

5 - LAASTI
laasti 17
lasti 2
lavaste 1

6 - ELKU
elkku 11
elkhu 2
enkku 2
... 1
aelkku 1
erkko 1
erku 1
äelkku 1

7 - APPAS
appas 14
abbas 3
... 2
aphas 1

8 - KAATUU
kaatuu 13
taatuu 2
gaatu 1
kalatu 1
kaltano 1
karto 1
katu 1

9 - ENÄÄ
ena 7
enaa 4
enää 3
eno 2
enoo 2
... 1
elna 1

10 - KAMPPI
kämppi 9
... 2
kamppi 2
kämpi 1
kämppy 1
käntty 1
käppi 1
tentti 1
tämppi 1
tärppy 1

11 - VEESTIN
risti 11
visti 4
... 1
twisti 1
vissdu 1
vissti 1
visty 1

12 - SANKA
sanka 8
sankka 8
... 1
saikka 1
sankko 1
sänky 1

13 - SUURUUS
suurus 11
suuruus 4
syyrus 3
... 1
syyrys 1

14 - IIKE
iike 7
liike 4
... 2
yyke 2
ilke 1
kiike 1
niike 1
viike 1
yykke 1

15 - PANKKUU
pankku 9
pankko 3
... 1
bankku 1
palkka 1
pank 1
pankki 1
pankkuu 1
panku 1
pankuu 1

16 - MUUTTAA
muuttaa 17
muttaa 1
muutaa 1
myuttaa 1

17 - ÄKKÄ
aakka 11
aakkaa 4
akka 3
aakaa 1
alkaa 1

18 - ONNAA
onnaa 12
onna 5
omnaa 1
onnea 1
onni 1

19 - VOKOS
vokkos 7
vookkos 5
vuokkos 4
... 2
vokos 1
vuokos 1

20 - LAKKI
lakki 10
laakki 5
laki 3
laaki 2

21 - TAASSA
tasa 4
tasan 4
taasan 3
taassaa 3
taasaa 2
taassa 2
taassaan 1
tasaa 1

22 - VANHUUS
vanhus 4
... 3
vanhuus 3
vanttuut 2
lamphus 1
lamppu 1
lampus 1
lanthus 1
vanhys 1
vankkus 1
varmhus 1
värthus 1

23 - EVÄÄT
evät 6
evaat 5
evat 2
övat 2
... 1
eavart 1
eekvaat 1
evät 1
öövaat 1

24 - KARTTAA
kartta 15
karttaa 4
tarttaa 1

25 - HAMMUU
hammu 5
hammy 3
hannu 3
hämmu 3
... 1
haamu 1
hammuu 1
hämmy 1
hämy 1
hännu 1

26 - SISIN
sissi 14
syssy 2
... 1
syssel 1
syssi 1
zyssi 1

27 - ALLAS
allas 17
alas 1
alvas 1
arlas 1

28 - LANNI
lani 8
... 3
laani 2
landi 2
laanni 1
laanti 1
lanli 1
lanni 1
lääni 1

29 - MOOSSAA
muussa 6
muussaa 6
mussa 4
musaa 1
mussaa 1
muusa 1
muusaa 1

30 - EHTOO
etu 7
ethu 4
ettuu 2
... 1
ehtoo 1
etto 1
ettu 1
etty 1
etuu 1
öty 1

31 - KOOLLAAT
kullat 17
hullat 1
kullant 1
kulmat 1

32 - OTSUU
otsu 8
otsy 4
otso 3
otsa 2
otslup 1
otssu 1
ötsu 1

33 - TALKE
talke 12
tarke 3
talkki 2
... 1
tärkee 1
tärkeä 1

34 - KEELIN
kiille 11
kiilen 2
kiillen 2
eilen 1
kiilin 1
kiilli 1
kiillin 1
kiily 1

35 - KOHTUU
koukku 3
kolttu 2
kouthu 2
kouttu 2
kolttuu 1
koltu 1
koty 1
koultyyr 1
kouthy 1
kouttuu 1
koutty 1
koutuu 1
koytty 1
koytu 1
kulttuuri 1

36 - OTTAA
ottaa 14
otta 4
potta 1
pottaa 1

37 - PAKUUS
pakkus 9
pakus 3
pakhus 2
pakkuus 2
... 1
pakkaus 1
pakos 1
vakkuus 1

38 - PIIRROS
piirros 12
piiros 5
... 1
kierros 1
pieros 1

39 - AKEET
akit 12
akhit 2
akkit 2
arkit 2
akkiit 1
akkith 1

40 - KIIPUUS
kiippus 7
kippus 5
kibbus 1
kiikus 1
kiipus 1
kimpuss 1
kiphus 1
kippis 1
kuopus 1
kyypus 1

41 - KUULTAA
kulta 19
kylta 1

42 - OLUT
oulut 11
koulut 4
olut 3
ollut 1
oulu 1

43 - TIKKAAT
tikkaat 10
tikkat 2
tykkät 2
tykkäät 2
teikkaat 1
tekkaat 1
tikat 1
tykkat 1

44 - POSUU
possu 17
possy 2
posly 1

45 - VORTEET
vuottit 5
vuotit 4
voottit 2
voortit 1
vootit 1
vortit 1
vuoltit 1
vuolttit 1
vuontit 1
vuorttit 1
vuoteet 1
vuottiit 1

46 - KOOKKAAT
kukat 12
kukkat 4
kukkaat 1
kuukalt 1
kuukat 1
kuukkaat 1

47 - ATOO
attu 5
athu 4
atu 3
aattu 2
hattu 2
... 1
aatto 1
akku 1
attuu 1

48 - VEENTA
vilta 6
vinta 5
viitta 2
virta 2
... 1
vihta 1
viltta 1
viltti 1
vinttaa 1

49 - KOKO
koko 17
kokko 3

50 - OPA
opa 14
oppa 4
... 1
opas 1

51 - HAKKUU
hakku 9
hakkuu 9
hakkuy 1
häkku 1

52 - TUULI
tuuli 15
tuuri 3
... 1
tuyli 1

53 - VARRAS
vaaras 11
varas 3
laaras 1
naaras 1
vaanas 1
vaara 1
varvas 1
vääräs 1

54 - TOOKU
tuukku 9
tukku 2
turku 2
tuuku 2
thuukku 1
tukhu 1
tukkyy 1
tuukkuu 1
tuukyy 1

55 - PAHUUS
pahus 8
parhus 3
pahuus 2
ahys 1
akys 1
pahlos 1
pahlus 1
pahmus 1
panhus 1
phahus 1

56 - VANNAS
vanas 6
vannas 6
... 1
annas 1
banas 1
kannas 1
pannas 1
rannas 1
vanhas 1
vanhus 1

57 - MAATON
maaton 11
maatton 4
maatto 3
maattol 1
matto 1

58 - APUS
appus 5
akkus 4
aphus 3
... 2
apus 2
abbus 1
akhus 1
akus 1
appos 1

59 - SUNE
sunne 5
suomi 3
suome 2
sonni 1
sulle 1
summi 1
sune 1
sunmej 1
suomee 1
suomei 1
suoni 1
suonmei 1
suunne 1

60 - TAAKKA
taakka 16
taaka 1
taka 1
takka 1
thaakka 1

61 - PIITTOS
pittos 3
pythos 3
pyttos 3
kiitos 2
fytos 1
kittos 1
phyttos 1
piittos 1
pitos 1
pyttös 1
pyytos 1
pyyttos 1
viittos 1

62 - MAKUU
makkuu 8
makuu 7
maku 5

63 - PUUSKAT
puskat 20

64 - OONTA
unta 11
ulta 3
... 2
ultta 1
ulttaa 1
untta 1
uutta 1

65 - ÄLLÄ
aalla 8
alla 5
aala 4
ala 2
aalna 1

66 - SAARUU
saaru 12
saarru 3
saarry 1
saarua 1
saary 1
saavru 1
sarro 1

67 - EESTI
isti 11
iisti 5
iisisti 1
issti 1
isthi 1
visti 1

68 - LOMPPO
loppu 6
loppo 3
moppo 3
voppo 2
lobbo 1
lompo 1
lomppo 1
lumppu 1
mopo 1
vomppo 1

69 - AASI
aasi 14
aassi 4
aassy 1
ashy 1

70 - TIMMAAT
timmat 6
tymmaat 4
timmaat 3
... 2
atemat 1
temat 1
timat 1
tymat 1
tymmat 1

1 - ARKI
arki 15
aurki 1

2 - SEESTAA
seistaan 6
seistään 4
seiston 2
seisoa 1
seistaun 1
seistä 1
seistää 1

3 - ELI
eli 10
ei 4
evi 2

4 - KIRVUU
kieruu 5
kiehuu 2
kiervu 2
kiekuu 1
kiero 1
kierou 1
kirku 1
kirou 1
kirroo 1
kirvu 1

5 - LAASTI
laasti 6
laaste 4
... 1
huasti 1
laase 1
laasi 1
laasten 1
laastin 1

6 - ELKU
elku 5
euku 3
eukko 2
... 1
elko 1
ellku 1
elpu 1
enkku 1
älko 1

7 - APPAS
appas 6
äppas 5
... 1
atpas 1
kappas 1
äbbas 1
äppäs 1

8 - KAATUU
kaatu 13
kaatua 2
kaatui 1

9 - ENÄÄ
enää 5
enään 5
änää 2
änään 2
enaa 1
nänään 1

10 - KAMPPI
kämppi 5
kampi 4
kämpi 3
kämppy 2
kamppi 1
kämpy 1

11 - VEESTIN
... 3
feestin 2
veesee 2
freesni 1
fyisti 1
fyisvin 1
ritsi 1
töörsti 1
veisni 1
veistin 1
viisni 1
viistin 1

12 - SANKA
sänky 7
sänki 2
sanka 1
sanky 1
sänkkö 1
sänko 1
sänku 1
sänkä 1
sänkö 1

13 - SUURUUS
suuruus 6
suurus 4
suullus 2
sullus 1
suuluus 1
suus 1
suuus 1

14 - IIKE
iike 11
liike 2
iikä 1
ilke 1
ilkeä 1

15 - PANKKUU
... 4
pänkkuu 4
pänkuu 3
pankkuu 1
panku 1
pankuu 1
pänku 1
pärnkuu 1

16 - MUUTTAA
muutaa 10
muuttaa 4
mjuutaa 1
muttaa 1

17 - ÄKKÄ
äkkä 13
äkkiä 2
äkkäh 1

18 - ONNAA
ongaa 7
onnaa 4
omnaa 2
... 1
oma 1
onna 1

19 - VOKOS
vokos 10
vohos 3
... 2
fokos 1

20 - LAKKI
lakki 11
laakki 1
läkki 1
läkkli 1
vaikki 1
väkki 1

21 - TAASSA
taassaa 10
taasaa 3
taasnaa 1
taassa 1
tässä 1

22 - VANHUUS
vanhuus 14
vanhus 1
veanhuus 1

23 - EVÄÄT
evät 11
ävät 2
elät 1
erät 1
evaat 1

24 - KARTTAA
karttaa 6
kartaa 4
kartta 3
kärtaa 3

25 - HAMMUU
hammuu 10
ammuu 4
... 1
hämmuu 1

26 - SISIN
sisin 16

27 - ALLAS
allas 13
alas 1
allos 1
auas 1

28 - LANNI
länni 10
langi 3
lanni 1
längi 1
ränni 1

29 - MOOSSAA
muussaa 8
muusa 3
muusaa 2
mmuussaa 1
musa 1
musaa 1

30 - EHTOO
ehtoo 5
ehdoo 2
ehtua 2
edua 1
ehdo 1
ehdoa 1
ehdot 1
ehtiä 1
ehto 1
hehto 1

31 - KOOLLAAT
koolaat 6
koovaat 2
... 1
kollaat 1
kolvaat 1
koolaad 1
koolaatd 1
koolat 1
koollaat 1
kovat 1

32 - OTSUU
otsuu 5
otsu 4
opsu 3
... 1
opsut 1
opsuu 1
potsu 1

33 - TALKE
talke 5
talte 3
taute 2
daige 1
danke 1
taater 1
talkere 1
talteen 1
tauti 1

34 - KEELIN
kelvin 3
kevin 2
... 1
kee 1
keein 1
keeli 1
keevin 1
kein 1
keirin 1
keivin 1
kelnin 1
keulin 1
keuvin 1

35 - KOHTUU
kohtuu 14
kohtu 2

36 - OTTAA
ottaa 16

37 - PAKUUS
pakuus 12
päkuus 2
pahus 1
vakuus 1

38 - PIIRROS
piiros 11
piirros 4
piiiros 1

39 - AKEET
äkeet 7
äkeed 3
akeet 1
näkee 1
näkeet 1
näkoes 1
äkeeut 1
äköet 1

40 - KIIPUUS
kiipuus 10
kiihuus 2
khiipuus 1
kiipesi 1
kiivuus 1
kivus 1

41 - KUULTAA
kultaa 8
kuultaa 5
kulta 2
gultaa 1

42 - OLUT
lot 5
oot 4
vot 2
... 1
hoot 1
hot 1
od 1
ot 1

43 - TIKKAAT
tikkaat 6
tykkaat 3
tykkäät 3
dikkaat 2
dikkaad 1
dykkäät 1

44 - POSUU
posuu 12
hosuu 3
osuu 1

45 - VORTEET
vorteet 9
vorteit 4
... 1
vorteed 1
vuotteet 1

46 - KOOKKAAT
kookaat 12
kookaad 1
kookaart 1
kookkaat 1
kuokaat 1

47 - ATOO
atoo 11
... 1
ato 1
atoot 1
latuu 1
patoo 1

48 - VEENTA
veentaa 4
veintaa 3
viintaa 3
... 1
veentää 1
ventaa 1
vientaa 1
viintä 1
vintaa 1

49 - KOKO
koko 14
koho 1
kopo 1

50 - OPA
opa 14
mopa 1
opas 1

51 - HAKKUU
häkku 7
äkkuu 3
äkku 2
akku 1
häkkuu 1
ähkuu 1
ähky 1

52 - TUULI
tuuli 8
tuuve 3
tuuvi 2
tulli 1
tulve 1
tuule 1

53 - VARRAS
varas 9
waras 3
vvaras 2
faras 1
varras 1

54 - TOOKU
tookuu 3
touhuu 3
touhu 2
touku 2
toukuu 2
... 1
toku 1
tooku 1
toukokuu 1

55 - PAHUUS
pahuus 12
pahus 4

56 - VANNAS
vannas 12
... 1
vangas 1
vanmas 1
wannas 1

57 - MAATON
maaton 14
maata 1
maatong 1

58 - APUS
ahus 4
apus 4
... 2
akus 2
aphus 1
avus 1
pahus 1
ähus 1

59 - SUNE
sune 11
sume 4
... 1

60 - TAAKKA
taakka 8
taaka 5
taakaa 2
taakkaa 1

61 - PIITTOS
piitos 14
kiitos 2

62 - MAKUU
maku 6
nmaku 2
makuu 1
mmaku 1
mmakuu 1
mnakuu 1
naku 1
nakuu 1
nhmakuu 1
unmaku 1

63 - PUUSKAT
puuskat 10
huuskat 1
kuuska 1
puuska 1
puuskad 1
puuskhat 1
puusta 1

64 - OONTA
puuntaa 5
oontaa 4
uuntaa 3
... 1
kuuntaa 1
ontaa 1
untaa 1

65 - ÄLLÄ
älä 16

66 - SAARUU
saaruu 8
saaru 6
... 1
saru 1

67 - EESTI
eesti 9
eisni 2
... 1
eesi 1
eesni 1
eise 1
eisti 1

68 - LOMPPO
lompo 11
... 1
llompo 1
lomfo 1
lommpo 1
vlompo 1

69 - AASI
aasi 8
aase 2
aazi 2
paase 1
paasi 1
spaasi 1
vaazi 1

70 - TIMMAAT
timmaat 7
temmaat 4
timmaad 2
tymmaat 2
... 1

1 - ARKI
arkki 16
ankki 4
arki 2
aakki 1
aikki 1
akhi 1

2 - SEESTAA
sösta 8
sesta 5
sistö 2
söstä 2
sista 1
siste 1
sistöl 1
sostä 1
syspa 1
syster 1
systä 1
systö 1

3 - ELI
eli 3
elvi 3
emi 3
evi 3
elmi 2
eeli 1
eeppi 1
ehi 1
eili 1
eki 1
elhi 1
elli 1
elm 1
emli 1
enfi 1
öhi 1

4 - KIRVUU
kirvu 6
kirbu 2
kirhu 2
kirku 2
kirnu 2
kirvuu 2
kidhu 1
kiduu 1
kidvu 1
kiihuruu 1
kirdvu 1
kirgu 1
kirja 1
kirkuu 1
kirpu 1

5 - LAASTI
laasti 17
lasti 6
laspi 1
tasti 1

6 - ELKU
eikku 22
... 1
eiku 1
elikku 1

7 - APPAS
appas 16
abbas 3
apas 3
abas 1
auppas 1
saappas 1

8 - KAATUU
kaatuu 21
kaattuu 3
kaatu 1

9 - ENÄÄ
enaa 16
ennaa 2
enoo 2
... 1
emnaa 1
ena 1
enao 1
enää 1

10 - KAMPPI
kamppi 22
kampi 1
kamppii 1
kamti 1

11 - VEESTIN
vestin 15
vesting 9
vesping 1

12 - SANKA
sanka 15
sankka 9
sanga 1

13 - SUURUUS
surrus 24
suurrus 1

14 - IIKE
iike 21
liike 2
ikä 1
jiikeh 1

15 - PANKKUU
pankku 11
ankku 3
bankku 3
panku 3
lankku 1
llanku 1
pambku 1
pankkuu 1
panko 1

16 - MUUTTAA
mutta 9
muttaa 8
muuttaa 7
nuutta 1

17 - ÄKKÄ
akka 20
akkaa 5

18 - ONNAA
onna 19
onnaa 5
omna 1

19 - VOKOS
vokos 22
vogos 2
vokus 1

20 - LAKKI
laki 14
lakki 11

21 - TAASSA
taassa 17
kaassa 3
taassaa 3
paassa 1
tasa 1

22 - VANHUUS
vanhyys 12
vanhys 10
vanhus 2
vankyys 1

23 - EVÄÄT
eväät 11
evaat 8
evät 2
eva 1
evvaat 1
eväat 1
övat 1

24 - KARTTAA
karttaa 14
kartta 9
kartha 2

25 - HAMMUU
hammu 6
hammuu 6
hamu 3
hahuu 1
hambu 1
hambuu 1
hamnuu 1
hampuu 1
hamy 1
handu 1
hanhu 1
hanhuu 1
hannu 1

26 - SISIN
sisin 22
sising 2
sissin 1

27 - ALLAS
allas 24
alas 1

28 - LANNI
lämi 12
lami 6
lani 2
lamin 1
lääni 1
lämin 1
lämmin 1
läni 1

29 - MOOSSAA
muussaa 8
muossaa 6
moossaa 3
muussa 2
nuossaa 2
moossa 1
mossaa 1
muossa 1
mussaa 1

30 - EHTOO
ehtu 9
ehtuu 6
eftu 3
eftuu 2
ehktuu 1
ehtoo 1
ehty 1
enhtuu 1
echtu 1

31 - KOOLLAAT
kullat 18
... 1
gullat 1
hullat 1
kulla 1
kuullat 1
pullat 1
ullat 1

32 - OTSUU
otsuu 10
opsuu 5
opsu 4
otsu 4
obsuu 1
otsy 1

33 - TALKE
talke 10
tarke 9
talske 2
kalke 1
talkke 1
tarket 1
taske 1

34 - KEELIN
kiillin 9
kiilin 6
kiilling 6
kiiling 2
kili 1
killing 1

35 - KOHTUU
kohtu 18
kuhtu 3
kohtuu 2
kohhtu 1
kuchtu 1

36 - OTTAA
ottaa 25

37 - PAKUUS
akkus 12
pakkus 5
akkuus 2
akus 2
paakkus 1
paakkuus 1
pahkuus 1
pakus 1

38 - PIIRROS
pirros 5
virros 4
bilros 1
ilros 1
ilvros 1
irros 1
ivros 1
lindus 1
mirros 1
piirros 1
pilros 1
pirloos 1
piudros 1
vierros 1
vildros 1
vilvros 1
virhros 1
virrous 1

39 - AKEET
akiket 11
akkiket 4
akkikeet 2
akiikeet 1
akikeet 1
akikhet 1
akkiiket 1
akkiikket 1
akkiitket 1
aklikeet 1
äkiket 1

40 - KIIPUUS
kippuus 8
kipus 6
kippus 5
kipuus 3
kiphuus 1
kipluus 1
tippuus 1

41 - KUULTAA
kulta 25

42 - OLUT
olut 13
ollut 8
oulut 4

43 - TIKKAAT
tikkaat 23
kikkaat 2

44 - POSUU
possu 14
possuu 4
posu 3
osuu 1
posuu 1
pussuu 1
vozu 1

45 - VORTEET
vorttiitteet 5
vorttiteet 3
vortiteet 2
vorttiiteet 2
morkitet 1
mortiiteet 1
volttiitteet 1
volttiteet 1
vonttiitteet 1
vortiiteet 1
vortikkeet 1
vortitet 1
vorttiitet 1
vorttiittet 1
vorttitteet 1
vottiteet 1
worttiitteet 1

46 - KOOKKAAT
kookkaat 11
kokkaat 2
kookaakaat 2
kookkaakaat 2
kokaakkaat 1
kokkaakat 1
kookaat 1
kookakaat 1
kookkaakkaat 1
kookkaatkat 1
kootkaatkaat 1
kukakaat 1

47 - ATOO
ato 12
auto 4
atoo 3
atu 3
attoo 2
antoo 1

48 - VEENTA
venta 23
ventta 1
ventä 1

49 - KOKO
kokko 17
koko 5
kokkoo 1
kookko 1
koukku 1

50 - OPA
oppa 11
opa 9
otta 2
opas 1
oppaat 1
otpa 1

51 - HAKKUU
hakku 11
hakkuu 8
hagkoo 1
hakgu 1
hakko 1
hakkouk 1
hakkuup 1
häkku 1

52 - TUULI
tuuli 16
tuli 5
tuling 1
tulli 1
tuulin 1
tuulli 1

53 - VARRAS
varras 23
varas 1
varrvas 1

54 - TOOKU
tokku 15
tookku 4
tohkuu 1
tokkuu 1
toku 1
tolkku 1
tonkku 1
toukku 1

55 - PAHUUS
pahus 12
pahhus 5
ahhus 3
pahhuus 2
pahhuu 1
pahkuus 1
pahuus 1

56 - VANNAS
vannas 23
vamnas 1
vanras 1

57 - MAATON
maaton 20
maatun 4
naatun 1

58 - APUS
apus 23
aphus 1
appus 1

59 - SUNE
sune 20
sunnei 2
sumnee 1
sunee 1
sunei 1

60 - TAAKKA
taaka 20
taakka 5

61 - PIITTOS
kiitos 20
iitos 2
viitos 2
piitos 1

62 - MAKUU
makkuu 11
makku 10
maku 3
maknu 1

63 - PUUSKAT
puuskat 18
kuuskat 6
puuska 1

64 - OONTA
onta 23
onhta 1
onnta 1

65 - ÄLLÄ
alla 25

66 - SAARUU
saaru 13
saaruu 7
saary 3
saarlu 1
saaruy 1

67 - EESTI
eesti 23
esti 2

68 - LOMPPO
lumppu 13
lomppo 5
lomppu 2
lombbo 1
lommo 1
lompo 1
lompu 1
lonkpo 1

69 - AASI
aasi 23
aassi 2

70 - TIMMAAT
timmat 12
tinnat 6
timmät 3
timnat 2
hinnat 1
simmät 1

1 - ARKI
... 3
aki 3
aaki 2
ake 2
aakki 1
ahki 1
akki 1
arkki 1

2 - SEESTAA
sista 11
sisda 2
... 1

3 - ELI
elli 7
älli 5
älle 1
äylli 1

4 - KIRVUU
kierfu 5
... 1
kiefu 1
kierfy 1
kiervu 1
kiirfu 1
kirva 1
kirvu 1
kiuru 1
kiurvu 1

5 - LAASTI
lasti 7
laasti 1
lasse 1
lassi 1
laste 1
lasten 1
lastin 1
vlasti 1

6 - ELKU
älku 5
älkku 3
älkky 2
älky 2
alku 1
arkku 1

7 - APPAS
apas 5
aphas 2
appas 2
... 1
abbas 1
ahas 1
ahpas 1
ampas 1

8 - KAATUU
kaatu 4
kartu 3
karttu 2
ghatu 1
kaarttu 1
kaartu 1
kaathuu 1
kaattu 1

9 - ENÄÄ
enna 5
änna 5
anna 1
ennä 1
änga 1
ännä 1

10 - KAMPPI
kamppi 10
kamppei 2
khamppi 1
khämpe 1

11 - VEESTIN
vistin 5
visten 3
vissin 2
vistn 2
visden 1
visdin 1

12 - SANKA
sanka 6
sankha 2
sankka 2
shanka 2
... 1
sankko 1

13 - SUURUUS
suurus 9
shuurus 1
suuruus 1
suurys 1
suuurs 1
syurus 1

14 - IIKE
iikä 4
ikä 4
iikke 2
ike 2
eikä 1
iikkä 1

15 - PANKKUU
pankku 7
panku 4
pankko 1
pannkhu 1
phamku 1

16 - MUUTTAA
muuttaa 3
... 1
muttaa 1
muuta 1
muuthaa 1
myta 1
myyttaa 1
möuto 1
möytta 1
nuotta 1
nyyta 1
nyytaah 1

17 - ÄKKÄ
aka 9
akka 3
akah 1
akha 1

18 - ONNAA
ona 13
onaa 1

19 - VOKOS
pokos 9
vokos 3
kookos 1
phokos 1

20 - LAKKI
laki 10
lahe 1
lahki 1
lahti 1
lakhi 1

21 - TAASSA
tasa 5
tassa 5
stase 1
thasa 1
tvassa 1
tässä 1

22 - VANHUUS
vanhus 12
vanhuus 2

23 - EVÄÄT
iivat 8
eevat 1
iifat 1
iivaat 1
iivad 1
iivart 1
ivat 1

24 - KARTTAA
kartta 5
karta 3
karttaa 2
kaarta 1
kartha 1
khaarta 1
kharta 1

25 - HAMMUU
hammu 10
hamuu 1
hannu 1
hämy 1
phammu 1

26 - SISIN
sissen 8
sisse 2
siisen 1
siiten 1
sise 1
sisen 1

27 - ALLAS
alas 12
allas 2

28 - LANNI
lanne 12
lanni 2

29 - MOOSSAA
myssa 5
mussa 4
musa 2
musä 1
muusa 1
myssä 1

30 - EHTOO
ättu 4
... 1
artu 1
erttu 1
ethu 1
etu 1
ähtu 1
ärthu 1
ärty 1
äthty 1
ätyy 1

31 - KOOLLAAT
kyylat 4
kuulat 3
kyylät 2
kulad 1
kulat 1
kuulaat 1
kylaat 1
kyylmaat 1

32 - OTSUU
otsu 5
opsu 3
oksu 2
ossu 1
osuu 1
otso 1
otsuu 1

33 - TALKE
talkke 7
talke 3
talkki 2
talkkee 1
tarkhe 1

34 - KEELIN
kiili 4
kiilin 3
kiivi 3
kiiri 2
kieli 1
kiilii 1

35 - KOHTUU
kottu 4
kohtu 2
kotu 2
kolttu 1
koltu 1
koottu 1
korttu 1
kothu 1
kottuu 1

36 - OTTAA
ottaa 6
otta 5
ota 2
othaa 1

37 - PAKUUS
pakus 5
pakkus 3
paakkus 1
paakkuus 1
paakuus 1
pakhus 1
parkkus 1
phaakkuus 1

38 - PIIRROS
piiros 7
piirros 4
piiras 3

39 - AKEET
akit 10
akid 1
akiit 1
akkiit 1
akkit 1

40 - KIIPUUS
kiipus 11
kiippus 1
kiipuus 1
kipus 1

41 - KUULTAA
kulta 11
kultaa 1
kultah 1
kultha 1

42 - OLUT
ollut 5
ollyt 3
olut 3
olyt 2
ölut 1

43 - TIKKAAT
tiikat 6
tikat 3
tikkaat 2
kiikad 1
kiikat 1
tiikhat 1

44 - POSUU
possu 14

45 - VORTEET
vortit 3
voorti 2
voortiit 2
voortit 2
foordit 1
forto 1
portit 1
voordit 1
vortid 1

46 - KOOKKAAT
kukat 4
kuukat 3
kykat 2
kukath 1
kukkat 1
kuukka 1
kyykat 1
kyylkaat 1

47 - ATOO
aattu 5
arttu 3
aatu 2
aattuuh 1
aatuu 1
ahtu 1
artu 1

48 - VEENTA
vinta 11
viinta 1
viintaat 1
vintaa 1

49 - KOKO
koko 8
kokou 4
khookoo 1
kouko 1

50 - OPA
opa 5
olppa 2
oopa 2
ooppaa 2
opaa 1
ottaa 1
oupa 1

51 - HAKKUU
haakuu 2
hakku 2
paku 2
arkku 1
haakku 1
haakkuu 1
haaku 1
haggu 1
hakuu 1
paakku 1
pakhu 1

52 - TUULI
tuuli 7
tyyli 5
thyyli 1
tuyli 1

53 - VARRAS
vaaras 11
varas 2
paaras 1

54 - TOOKU
tuukku 2
thyykyy 1
tukhu 1
tuky 1
turku 1
tuukhy 1
tuukky 1
tykky 1
tyky 1
tykö 1
tylkky 1
tyykky 1
tyykkyy 1

55 - PAHUUS
paahus 8
pahus 3
pahys 1
parhus 1
phäähyys 1

56 - VANNAS
vanas 7
vaanas 3
vaanaas 1
vaanhas 1
vanhas 1
vannas 1

57 - MAATON
maaton 8
maathon 2
maatom 1
maatong 1
mato 1
maton 1

58 - APUS
aapus 8
aagust 1
aapuus 1
ahus 1
akhus 1
apus 1
opus 1

59 - SUNE
syyne 4
syynä 4
syynö 3
sauna 1
suuna 1
svennä 1

60 - TAAKKA
taaka 2
taakka 2
taakkaa 2
taka 2
takha 2
takka 2
tarkka 1
thaaka 1

61 - PIITTOS
piitos 10
phiitos 2
kiitos 1
pitos 1

62 - MAKUU
maakku 4
maaku 4
maakhu 3
maku 2
markku 1

63 - PUUSKAT
puskat 6
hyskaat 1
kuuskat 1
kuustaat 1
kyskat 1
puska 1
puskaat 1
puskad 1
pyrkat 1

64 - OONTA
ynta 5
yynta 2
pyyntaa 1
pyyntää 1
pyyntö 1
unta 1
untha 1
ynthaak 1
yyntta 1

65 - ÄLLÄ
alla 8
ala 4
aala 1
aalla 1

66 - SAARUU
saaru 13
saaruu 1

67 - EESTI
iisti 9
isti 2
eesti 1
isdi 1
kiisti 1

68 - LOMPPO
lompo 9
lamppu 1
lompol 1
lompoo 1
lomppo 1
longpo 1

69 - AASI
aasi 11
aassi 2
aase 1

70 - TIMMAAT
tiimat 9
tiinat 2
teemat 1
thiimaat 1
tiimad 1

1 - ARKI
arki 7
arkki 3
ahki 2
aihki 2
aiki 2
... 1
ahkin 1
ahku 1
aihke 1
aike 1
aikki 1
arkni 1

2 - SEESTAA
seestaa 15
seesta 1
seestaaf 1
seestaah 1
seestaar 1
seestar 1
seistaa 1
sesaa 1
siistaa 1

3 - ELI
eli 22
elii 1

4 - KIRVUU
kirvuu 4
kielipuu 2
kiervuu 2
kirnu 2
kiehvuu 1
kielruu 1
kierhuu 1
kierimuu 1
kierkuu 1
kierruu 1
kieruu 1
kirhlu 1
kirhu 1
kirju 1
kirluu 1
kirnuu 1
kirvu 1

5 - LAASTI
laasti 22
maastii 1

6 - ELKU
helku 4
elku 3
elkuh 3
elkup 2
elpu 2
elhu 1
elhuk 1
elkuk 1
elkuva 1
elmkuh 1
elpuh 1
helkun 1
helkup 1
helkuu 1

7 - APPAS
appas 21
abbas 2

8 - KAATUU
kaatuu 22
kaatuum 1

9 - ENÄÄ
enää 14
änää 9

10 - KAMPPI
kamppi 15
kamppii 5
kamphi 1
kamppiin 1
kanppii 1

11 - VEESTIN
peestin 7
peesvin 3
veestin 3
eesti 2
peesim 2
beestin 1
eestii 1
eestin 1
peesvi 1
veesvin 1
viestin 1

12 - SANKA
sanka 16
sankar 3
sankari 2
sankal 1
sankha 1

13 - SUURUUS
suuruus 23

14 - IIKE
liike 10
iike 7
piike 2
ilikee 1
pilke 1
tiiker 1
viike 1

15 - PANKKUU
pankkuu 18
vankkuu 2
ankkuu 1
pamppu 1
pankkuus 1

16 - MUUTTAA
muuttaa 22
nuuttaa 1

17 - ÄKKÄ
äkkää 21
päkkää 1
äkkär 1

18 - ONNAA
onnaa 22
honnaa 1

19 - VOKOS
pokos 7
vokos 7
hokas 2
bogos 1
hokos 1
okas 1
okos 1
pokas 1
vogas 1
vokas 1

20 - LAKKI
lakki 22
lakkii 1

21 - TAASSA
taasaa 18
paasaa 3
kaasaa 1
taassaa 1

22 - VANHUUS
vanhuus 21
vankuus 2

23 - EVÄÄT
äväät 8
eväät 7
äpäät 3
... 1
hävääd 1
häväät 1
ädäät 1
äpääd 1

24 - KARTTAA
karttaa 9
kalttaa 5
kaattaa 4
kaartaa 1
kaarttaa 1
kaottaa 1
kartaa 1
kavttaa 1

25 - HAMMUU
hammuu 19
hammua 1
hammuuh 1
hammuus 1
hampuu 1

26 - SISIN
sisin 23

27 - ALLAS
allas 11
allaas 3
aulaas 2
aullas 2
aaulas 1
aollas 1
auas 1
aulas 1
aullaas 1

28 - LANNI
lanni 10
langi 6
lammi 5
lannii 1
vanni 1

29 - MOOSSAA
muusaa 14
muussaa 9

30 - EHTOO
ehtoo 23

31 - KOOLLAAT
kollaat 19
kolmaat 1
koulaat 1
koullaat 1
koululaat 1

32 - OTSUU
otsuu 13
otsuun 3
otsuum 2
otsuur 2
opsuu 1
otsoo 1
otsuuf 1

33 - TALKE
talke 16
talkee 2
... 1
palkee 1
taake 1
talkeet 1
taokee 1

34 - KEELIN
keeli 7
keelin 7
keedin 2
keevin 2
... 1
geeli 1
keerin 1
keevi 1
kelim 1

35 - KOHTUU
kohtuu 22
korttuu 1

36 - OTTAA
ottaa 23

37 - PAKUUS
vakuus 12
pakuus 7
akuus 3
vahkuus 1

38 - PIIRROS
piirros 15
pierroos 3
pierros 3
piirroos 1
piorröös 1

39 - AKEET
akeet 21
hakeet 2

40 - KIIPUUS
kiipuus 16
hiipuus 3
iipuus 2
kipuus 1
tiipuus 1

41 - KUULTAA
kuultaa 21
kultaa 2

42 - OLUT
olut 17
ollut 4
olt 2

43 - TIKKAAT
tikkaat 22
tikkalat 1

44 - POSUU
hosuu 9
osuu 9
posuu 3
vosuu 2

45 - VORTEET
vorteet 6
porteet 4
forteet 3
portteet 3
vortteet 2
horteet 1
kortteet 1
orteet 1
voltteet 1
voteet 1

46 - KOOKKAAT
kookkaat 21
kookaat 1
kuekkaat 1

47 - ATOO
atoo 17
atol 3
atool 2
atoov 1

48 - VEENTA
veenta 15
veentaa 7
veentah 1

49 - KOKO
koko 22
kokko 1

50 - OPA
opa 21
jopa 1
opah 1

51 - HAKKUU
hakkuu 22
akkuu 1

52 - TUULI
tuuli 20
tulli 2
thuuli 1

53 - VARRAS
varras 15
vannas 5
varnas 2
varas 1

54 - TOOKU
tooku 12
tooki 4
tolku 2
tuuku 2
toohi 1
tookuu 1
tulku 1

55 - PAHUUS
pahuus 11
akuus 3
ahuus 2
hakuus 2
apuus 1
avuus 1
vahuus 1
vakuus 1
vapuus 1

56 - VANNAS
vannas 23

57 - MAATON
maaton 21
maato 1
maatoon 1

58 - APUS
apus 11
akus 6
ahus 5
avus 1

59 - SUNE
sune 17
sume 5
sunen 1

60 - TAAKKA
taakka 16
talkka 5
palkka 1
taatka 1

61 - PIITTOS
piittos 13
tiittos 3
iitos 2
kiittos 2
kiitos 1
viitos 1
viittos 1

62 - MAKUU
makuu 22
makuul 1

63 - PUUSKAT
puuskat 21
pulskat 2

64 - OONTA
oonta 9
onta 3
lunta 2
ounta 2
koonta 1
loonta 1
lumta 1
olonta 1
puunta 1
unta 1
voonta 1

65 - ÄLLÄ
ällah 6
ällä 6
älla 4
älläh 3
alla 1
hällä 1
pällaa 1
ällää 1

66 - SAARUU
saaruu 14
tsaaruu 4
saadun 1
saaduu 1
saajuu 1
tsaaduu 1
tsaajuu 1

67 - EESTI
eesti 23

68 - LOMPPO
lomppo 20
lomppah 2
lomppu 1

69 - AASI
aasi 23

70 - TIMMAAT
timmaat 23

1 - ARKI
arki 12
arkki 9
aakki 2
aanki 2
anki 2
aaki 1
aarkki 1
alki 1
ankki 1

2 - SEESTAA
seistaa 21
seisdaa 3
seisaa 2
seesaa 1
seestaa 1
seestaal 1
seistaal 1
seistal 1

3 - ELI
eli 21
ei 5
eji 2
eeli 1
hei 1
peli 1

4 - KIRVUU
kirhuu 7
kirvuu 6
kiervuu 4
kierhuu 2
kervuu 1
kiehuu 1
kiirhuur 1
kiirvuu 1
kirbur 1
kirbuur 1
kirguu 1
kirhuur 1
kirjhjuu 1
kiruu 1
kirvu 1
kirvuo 1

5 - LAASTI
laasti 23
naasti 5
lhaasti 1
naasdi 1
naashi 1

6 - ELKU
elku 22
helku 3
elhu 1
elkku 1
elphu 1
euku 1
helpu 1
herkku 1

7 - APPAS
appaas 25
abbaas 5
abbaus 1

8 - KAATUU
kaatuu 28
katuuh 2
kaakluu 1

9 - ENÄÄ
enää 28
enääh 1
enään 1
henää 1

10 - KAMPPI
kamppi 29
kaappi 1
kramppi 1

11 - VEESTIN
veestin 22
veistin 7
kveistin 1
tveestin 1

12 - SANKA
sanka 30
sankar 1

13 - SUURUUS
suuruus 29
suulruus 1
suurruus 1

14 - IIKE
iike 28
liike 2
piike 1

15 - PANKKUU
pankkuu 28
ankkuu 1
lankkuu 1
tankkuu 1

16 - MUUTTAA
muuttaa 29
muttaa 1
muuttaah 1

17 - ÄKKÄ
äkkä 30
akka 1

18 - ONNAA
onnaa 24
omnaa 2
honnaa 1
konnaa 1
onaa 1
onnaah 1
onnea 1

19 - VOKOS
vokos 21
bokos 5
bogos 1
bokosh 1
pokos 1
vogos 1
vopos 1

20 - LAKKI
lakki 31

21 - TAASSA
taassa 26
paassa 2
... 1
laassa 1
maassa 1

22 - VANHUUS
vanhuus 27
vanpuus 2
kvampuus 1
vankuus 1

23 - EVÄÄT
evät 18
eläät 6
erät 4
enäät 2
herät 1

24 - KARTTAA
karttaa 31

25 - HAMMUU
hammuu 30
hammuud 1

26 - SISIN
sisin 31

27 - ALLAS
allas 31

28 - LANNI
lanni 17
lammi 13
lamni 1

29 - MOOSSAA
moossaa 24
muossaa 4
moosaa 3

30 - EHTOO
ehtoo 31

31 - KOOLLAAT
koollaat 14
koollaap 5
kollaat 3
koollaad 2
kollaa 1
kollaad 1
kolnaad 1
koollaag 1
koollaut 1
koolnaad 1
koullaap 1

32 - OTSUU
otsuu 28
opsuu 1
otsoo 1
potsuu 1

33 - TALKE
talke 20
tauke 3
kalkeh 1
kauke 1
taake 1
talge 1
talkeh 1
talki 1
tanke 1
taukke 1

34 - KEELIN
keelin 24
geelin 2
keevin 2
keedin 1
keenin 1
kevin 1

35 - KOHTUU
kohtuu 31

36 - OTTAA
ottaa 30
ottaah 1

37 - PAKUUS
pakuus 19
vakuus 10
akuus 1
pahuus 1

38 - PIIRROS
irros 15
piirros 4
pirros 3
irrs 2
hirros 1
ierros 1
iirros 1
kierros 1
kirros 1
pirras 1
virros 1

39 - AKEET
akeet 27
akeed 3
akee 1

40 - KIIPUUS
kiippuus 14
tiippuus 4
kiipuus 3
kipuus 3
piippuus 3
kiikkuus 2
kimpuus 1
tippuus 1

41 - KUULTAA
kultaa 24
kuultaa 5
kuntaa 1
kuutaa 1

42 - OLUT
olut 30
kolut 1

43 - TIKKAAT
tikkaat 31

44 - POSUU
osuu 19
posuu 12

45 - VORTEET
vorteet 22
vorteek 2
vorteep 2
porkteek 1
porteet 1
volteet 1
vorkteet 1
vorteed 1

46 - KOOKKAAT
kookkaat 28
bookkaat 1
kokkaat 1
ookkaat 1

47 - ATOO
atoo 31

48 - VEENTA
veenta 18
veinta 6
venta 4
veeinta 1
veenda 1
veita 1

49 - KOKO
koko 31

50 - OPA
opa 20
kopa 5
oka 3
kova 1
ovat 1
topa 1

51 - HAKKUU
hakkuu 31

52 - TUULI
tuuli 31

53 - VARRAS
varras 28
varvas 2
varrvas 1

54 - TOOKU
tooku 30
toopu 1

55 - PAHUUS
pahuus 30
vakuus 1

56 - VANNAS
vannas 30
vangas 1

57 - MAATON
maaton 30
maatan 1

58 - APUS
apus 24
akus 5
abus 1
atus 1

59 - SUNE
sune 31

60 - TAAKKA
taakka 30
taatta 1

61 - PIITTOS
piittos 23
piitos 8

62 - MAKUU
makuu 30
makuuuu 1

63 - PUUSKAT
puuskat 30
puuskas 1

64 - OONTA
onta 30
honta 1

65 - ÄLLÄ
ällä 31

66 - SAARUU
taaruu 16
saaruu 2
taalruu 2
tsaaruu 2
saapuu 1
saarluu 1
saoruu 1
staaruu 1
stsaaruu 1
taaluu 1
taru 1
taruu 1
taruuuu 1

67 - EESTI
eesti 20
eetti 3
eehti 2
eepi 2
eelti 1
eeti 1
efekti 1
pelti 1

68 - LOMPPO
lomppo 31

69 - AASI
aasi 31

70 - TIMMAAT
timmaat 22
timmaa 4
timmaad 4
timmaap 1

1 - ARKI
arki 16
arkki 12
arke 3
arkke 1

2 - SEESTAA
seestaa 32

3 - ELI
eli 27
eri 3
heli 2

4 - KIRVUU
kierbuu 4
kierhuu 4
kierkuu 4
kieropuu 4
kierpuu 4
kiervuu 3
kierobuu 2
kirkuu 2
hierbuu 1
hierhuu 1
hierpuu 1
kierbuuu 1
kieruu 1

5 - LAASTI
laasti 31
laast 1

6 - ELKU
elku 13
elpu 10
elpuu 3
elkuu 2
elbu 1
elokuu 1
elpyy 1
elu 1

7 - APPAS
appas 22
kappas 4
abbas 2
pappas 2
happas 1
pakkas 1

8 - KAATUU
kaatuu 27
kaapuu 4
kaakuu 1

9 - ENÄÄ
enää 30
emää 1
enään 1

10 - KAMPPI
kamppi 31
kamppe 1

11 - VEESTIN
veestin 26
beestin 4
peestin 1
veistin 1

12 - SANKA
sanka 32

13 - SUURUUS
suuruus 30
suurus 2

14 - IIKE
iikä 18
iike 8
ikä 5
iige 1

15 - PANKKUU
pankkuu 16
kankkuu 10
vankkuu 4
ankkuu 2

16 - MUUTTAA
muuttaa 30
muttaa 1
uuttaa 1

17 - ÄKKÄ
äkkä 26
nähdä 1
tähkä 1
äggä 1
ähkä 1
äkkiä 1
ättä 1

18 - ONNAA
onnaa 31
ongaa 1

19 - VOKOS
vokos 14
bokos 13
bopos 2
pokos 2
popos 1

20 - LAKKI
lakki 31
lakk 1

21 - TAASSA
taassa 31
daassa 1

22 - VANHUUS
vanhuus 28
vankuus 3
vanghuu 1

23 - EVÄÄT
evät 31
ebäät 1

24 - KARTTAA
karttaa 31
kartta 1

25 - HAMMUU
hammuu 11
hanguu 11
ammuu 6
anguu 1
haluu 1
hamluu 1
hampuu 1

26 - SISIN
sisin 26
sisil 4
sisi 2

27 - ALLAS
allas 31
hallas 1

28 - LANNI
lanne 23
lanni 8
langi 1

29 - MOOSSAA
moossaa 26
voossaa 3
moosaa 2
moorsaa 1

30 - EHTOO
ehtoo 21
ehdoo 11

31 - KOOLLAAT
koollaat 21
koollaa 4
koolaat 3
hoollaa 1
hoollaad 1
hoollaat 1
koolla 1

32 - OTSUU
opsuu 17
otsuu 8
oksuu 3
osuu 2
kopsuu 1
opsu 1

33 - TALKE
talke 22
tauke 7
pauke 1
talpe 1
talve 1

34 - KEELIN
keelin 16
keevin 4
keerin 3
geeli 1
geelil 1
keedin 1
keelen 1
keelyn 1
keeren 1
kehrin 1
kerim 1
kerin 1

35 - KOHTUU
kohtuu 25
hohtuu 3
kohduu 2
hohhuu 1
kohluu 1

36 - OTTAA
ottaa 32

37 - PAKUUS
pakuus 17
vakuus 8
pahuus 7

38 - PIIRROS
piirros 25
piiros 4
piiras 2
tiiros 1

39 - AKEET
akeet 26
hakee 3
takeet 2
haheet 1

40 - KIIPUUS
kiipuus 29
kiikuus 2
kiivuus 1

41 - KUULTAA
kuultaa 24
kuurtaa 6
huultaa 1
huurtaa 1

42 - OLUT
olut 29
polut 2
olu 1

43 - TIKKAAT
tikkaat 31
tekkaat 1

44 - POSUU
posuu 23
hosuu 5
osuu 2
bosuu 1
possu 1

45 - VORTEET
vorteet 22
vortee 5
vuorteet 3
korteet 2

46 - KOOKKAAT
kookkaat 32

47 - ATOO
atoo 29
adoo 1
akloot 1
aploo 1

48 - VEENTA
veenta 28
veanta 1
vemta 1
veänta 1
väänta 1

49 - KOKO
koko 32

50 - OPA
opa 32

51 - HAKKUU
hakkuu 29
akkuu 1
appuu 1
kakkuu 1

52 - TUULI
tuuli 26
duuli 4
tuule 2

53 - VARRAS
parras 20
varras 11
barras 1

54 - TOOKU
tooku 26
dooku 4
toloku 2

55 - PAHUUS
pahuus 32

56 - VANNAS
vannas 30
vangas 2

57 - MAATON
maaton 28
naaton 3
maapon 1

58 - APUS
apus 29
akus 2
hapus 1

59 - SUNE
sune 32

60 - TAAKKA
taakka 32

61 - PIITTOS
piittos 20
piihdos 3
tiittos 3
piiddos 2
piitos 2
piitdos 1
tiiddos 1

62 - MAKUU
makuu 32

63 - PUUSKAT
puuska 23
puuskat 8
puuskaht 1

64 - OONTA
oonta 32

65 - ÄLLÄ
ällä 31
allä 1

66 - SAARUU
saaruu 32

67 - EESTI
eesti 32

68 - LOMPPO
lomppo 29
blomppo 1
lonppo 1
lumppo 1

69 - AASI
aasi 31
aasik 1

70 - TIMMAAT
timmaat 17
timmaa 12

Appendix 4: Quantitative deviations in syllable patterns by frequency

1st syllable: V > VV			1st syllable: V > V_1V_2			1st syllable: VV > V			1st syllable: VV >		
	All	1-9		All	1-9		All	1-9		All	1-9
syllable type	* f	* %	syllable type	* f	* %	syllable type	* f	* %	syllable type	* f	* %
CVC-CVC	33/407	8.1	CVC1-C2VV	94/402	23.4	CVVC1-C2VV	143/408	35.0	CVVC1-C2VV	87/408	21.3
VC-CV	31/410	7.6	VC1-C2V	45/394	11.4	VVC1-C2V	124/405	30.6	CVV-CV	37/407	9.1
CVC-CVVC	23/407	5.7	CVC1-C2V	45/405	11.1	CVVC-CVVC	110/407	27.0	CVVC1-C2VC	27/403	6.7
VC1-C2V	15/394	3.8	CVC1-C2VVC	26/405	6.4	CVVC1-C2V	108/406	26.6	CVVC-CVVC	24/407	5.9
CV-CV	15/408	3.7	VC-CVC	22/405	5.4	CVVC1-C2VC	93/403	23	CVVC-CVV	17/408	4.2
CV-CVVC	15/407	3.7	V-CVC	20/405	4.9	CVV-CVVC	67/408	16	CVVC1-C2V	16/406	3.9
CVC1-C2VVC	15/405	3.7	CV-CV	12/408	2.9	CVVC-CVC	61/409	15	CVVC-CVC	14/409	3.4
V-CVVC	15/407	3.7	CV-CVC	5/402	1.2	CVV-CV	51/407	13	CVV-CVC	12/406	3
CVC-CV	13/407	3.2	V-CVV	5/404	1.2	CVVC-CVV	48/408	12	VVC1-C2V	7/405	1.7
V-CVV	12/404	3	V-CV	3/408	0.7	CVVC-CV	47/409	12	CVV-CVVC	3/408	0.7
CV-CVV	11/410	2.7	CVC-CV	2/407	0.5	VV-CV	23/407	5.7	CVV-CVV	2/407	0.5
V-CVC	10/405	2.5	CVC1C2-C2VV	1/402	0.2	CVV-CVC	22/406	5.4	VV-CV	1/407	0.2
CV-CVC	8/402	2	CVC-CVC	1/407	0.2	CVV-CVV	19/407	4.7	CVVC-CV	0/409	0
CVC1C2-C2VV	8/402	2	CVC-CVVC	1/407	0.2	*	916/5290	17.3	*	247/5290	4.7
CVC-CVV	7/407	1.7	V-CVVC	1/407	0.2						
V-CV	7/408	1.7	CV-CVV	0/410	0						
CVC1-C2VV	5/402	1.2	CV-CVVC	0/407	0						
CVC1-C2V	3/405	0.7	CVC1C2-C2V	0/405	0						
CVC1C2-C2V	2/405	0.5	CVC-CVV	0/407	0						
VC-CVC	2/405	0.5	VC1-C2VV	0/407	0						
VC1-C2VV	0/407	0	VC-CV	0/410	0						
VC-CVV	0/408	0	VC-CVV	0/408	0						
*	250/8922	2.8	*	283/8922	3.2						

2nd syllable: V > VV			2nd syllable: V > V_1V_2			2nd syllable: VV > V			2nd syllable: VV >		
	All	1-9		All	1-9		All	1-9		All	1-9
syllable type	* f	* %	syllable type	* f	* %	syllable type	* f	* %	syllable type	* f	* %
CVVC-CV	56/409	13.7	CV-CV	9/408	2.2	CVVC1-C2VV	165/408	40.4	CVV-CVV	5/407	1.2
VC-CV	52/410	12.7	VC-CV	4/410	1	CVC1-C2VV	153/402	38.0	VC1-C2VV	5/407	1.2
CVVC1-C2V	50/406	12.3	CV-CVC	2/402	0.5	CVV-CVVC	154/408	37.7	CVC1-C2VVC	4/405	1
VC-CVC	36/405	8.9	CVC1C2-C2V	2/405	0.5	CVC1C2-C2VV	125/402	31.1	V-CVVC	4/407	1
VVC1-C2V	22/405	5.4	CVC1-C2V	1/405	0.2	CV-CVVC	119/407	29.2	CVC1-C2VV	3/402	0.7
CVV-CV	18/407	4.4	CVVC-CVC	1/409	0.2	CVC-CVV	117/407	28.7	CVC-CVV	3/407	0.7
VC1-C2V	15/394	3.8	VC-CVC	1/405	0.2	CV-CVV	114/410	27.8	CVVC1-C2VV	2/408	0.5
CVC1C2-C2V	13/405	3.2	VV-CV	1/407	0.2	CVV-CVV	113/407	27.8	CV-CVV	1/410	0.2
CVC1-C2V	8/405	2	CVC-CV	0/407	0	V-CVV	104/404	25.7	CV-CVVC	1/407	0.2
V-CV	8/408	2	CVC-CVC	0/407	0	VC1-C2VV	103/407	25.3	CVVC-CVVC	1/407	0.2
CV-CV	6/408	1.5	CVV-CV	0/407	0	CVC1-C2VVC	95/405	23.5	VC-CVV	1/408	0.2
CVVC1-C2VC	6/403	1.5	CVV-CVC	0/406	0	CVVC-CVVC	93/407	22.9	CVC1C2-C2VV	0/402	0
CVVC-CVC	6/409	1.5	CVVC1-C2V	0/406	0	V-CVVC	73/407	17.9	CVC-CVVC	0/407	0
CVV-CVC	3/406	0.7	CVVC1-C2VC	0/403	0	CVC-CVVC	71/407	17.4	CVV-CVVC	0/408	0
CVC-CV	2/407	0.5	CVVC-CV	0/409	0	VC-CVV	67/408	16.4	CVVC-CVV	0/408	0
CVC-CVC	1/407	0.2	V-CV	0/408	0	CVVC-CVV	59/408	14.5	V-CVV	0/404	0
V-CVC	1/405	0.2	V-CVC	0/405	0	*	1725/6504	26.5	*	30/6504	0.5
VV-CV	1/407	0.2	VC1-C2V	0/394	0						
CV-CVC	0/402	0	VVC1-C2V	0/405	0						
*	304/7708	3.9	*	21/7708	0.3						

Syllable boundary: C_1-C_2 > C_1C_2-C_2			Syllable boundary: C_1-C_2 > C_1C_2-C_2			Syllable boundary: VC-C > V-C			Syllable boundary: C_1C_2-C_2 > C_1-C_2		
	All	1-9		All	1-9		All	1-9		All	1-9
syllable type	* f	* %	syllable type	* f	* %	syllable type	* f	* %	syllable type	* f	* %
CV-CVV	92/410	22.4	VC1-C2V	125/394	31.7	CVVC-CVC	137/409	33.5	CVC1C2-C2V	45/405	11.1
CVV-CVVC	83/408	20.3	CVC1-C2V	56/405	13.8	CVVC-CVVC	121/407	29.7	CVC1C2-C2VV	45/402	11.1
V-CV	68/408	16.7	CVC1-C2VVC	43/405	10.6	CVVC-CV	95/409	23.2	*	91/807	11.3
CV-CVVC	62/407	15.2	CVC1-C2VV	31/402	7.7	CVVC-CVV	94/408	23.0			
CVV-CV	49/407	12.0	VC1-C2VV	12/407	2.9	CVC-CVC	76/407	18.7			
CV-CVC	46/402	11.4	VVC1-C2V	11/405	2.7	CVC-CV	66/407	16.2			
CV-CV	39/408	9.6	CVVC1-C2V	6/406	1.5	VC-CVC	43/405	10.6			
CVV-CVC	39/406	9.6	CVVC1-C2VC	0/403	0	VC-CV	39/410	9.5			
V-CVV	41/404	8.9	CVVC1-C2VV	0/408	0	CVC-CVVC	32/407	7.9			
V-CVC	34/405	8.4	*	284/3635	7.8	VC-CVV	19/408	4.7			
V-CVVC	16/407	3.9				CVC-CVV	17/407	4.2			
CVV-CVV	13/407	3.2				*	739/4484	16.5			
VV-CV	13/407	3.2									
*	595/5286	11.3									

1st syllable: V > VV

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CV-CV	0/50	0.0	0/37	0.0	1/40	2.5	0/31	0.0	1/50	2.0	13/28	46.4	0/46	0.0	0/62	0.0	0/64	0.0	15/408	3.7
CV-CVC	0/49	0.0	0/36	0.0	5/37	13.5	0/30	0.0	0/50	0.0	3/28	10.7	0/46	0.0	0/62	0.0	0/64	0.0	8/402	2.0
CV-CVV	0/50	0.0	0/38	0.0	0/40	0.0	0/32	0.0	0/50	0.0	11/28	39.3	0/46	0.0	0/62	0.0	0/64	0.0	11/410	2.7
CV-CVVC	0/50	0.0	0/36	0.0	0/39	0.0	0/32	0.0	2/50	4.0	13/28	46.4	0/46	0.0	0/62	0.0	0/64	0.0	15/407	3.7
CVC1-C2V	0/50	0.0	0/37	0.0	0/38	0.0	1/32	3.1	0/50	0.0	0/27	0.0	1/45	2.2	1/62	1.6	0/64	0.0	3/405	0.7
CVC1-C2VV	0/49	0.0	0/34	0.0	0/38	0.0	0/32	0.0	1/50	2.0	2/27	7.4	0/46	0.0	2/62	3.2	0/64	0.0	5/402	1.2
CVC1-C2VVC	2/50	4.0	1/37	2.7	4/37	10.8	0/31	0.0	0/50	0.0	8/28	28.6	0/46	0.0	0/62	0.0	0/64	0.0	15/405	3.7
CVC1C2-C2V	0/50	0.0	1/36	2.8	0/38	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	1/62	1.6	0/64	0.0	2/405	0.5
CVC1C2-C2VV	0/50	0.0	0/35	0.0	0/39	0.0	0/28	0.0	0/50	0.0	2/28	7.1	6/46	13.0	0/62	0.0	0/64	0.0	8/402	2.0
CVC-CV	0/50	0.0	0/38	0.0	12/37	32.4	1/32	3.1	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	13/407	3.2
CVC-CVC	0/50	0.0	0/37	0.0	16/39	41.0	0/31	0.0	0/50	0.0	17/28	60.7	0/46	0.0	0/62	0.0	0/64	0.0	33/407	8.1
CVC-CVV	0/50	0.0	0/37	0.0	1/39	2.6	0/31	0.0	0/50	0.0	6/28	21.4	0/46	0.0	0/62	0.0	0/64	0.0	7/407	1.7
CVC-CVVC	0/50	0.0	0/38	0.0	0/38	0.0	0/31	0.0	0/50	0.0	23/28	82.1	0/46	0.0	0/62	0.0	0/64	0.0	23/407	5.7
V-CV	0/50	0.0	0/37	0.0	0/39	0.0	0/32	0.0	2/50	4.0	4/28	14.3	0/46	0.0	1/62	1.6	0/64	0.0	7/408	1.7
V-CVC	0/50	0.0	0/38	0.0	0/38	0.0	0/29	0.0	0/50	0.0	10/28	35.7	0/46	0.0	0/62	0.0	0/64	0.0	10/405	2.5
V-CVV	0/49	0.0	0/37	0.0	3/38	7.9	0/31	0.0	0/49	0.0	9/28	32.1	0/46	0.0	0/62	0.0	0/64	0.0	12/404	3.0
V-CVVC	0/50	0.0	0/37	0.0	2/39	5.1	0/32	0.0	0/50	0.0	13/28	46.4	0/45	0.0	0/62	0.0	0/64	0.0	15/407	3.7
VC1-C2V	0/46	0.0	0/34	0.0	5/38	13.2	0/31	0.0	1/49	2.0	3/25	12.0	0/45	0.0	6/62	9.7	0/64	0.0	15/394	3.8
VC1-C2VV	0/50	0.0	0/38	0.0	0/39	0.0	0/31	0.0	0/50	0.0	0/27	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/407	0.0
VC-CV	0/50	0.0	0/38	0.0	29/40	72.5	0/32	0.0	0/50	0.0	2/28	7.1	0/46	0.0	0/62	0.0	0/64	0.0	31/410	7.6
VC-CVC	0/49	0.0	0/38	0.0	0/38	0.0	0/31	0.0	1/50	2.0	0/27	0.0	1/46	2.2	0/62	0.0	0/64	0.0	2/405	0.5
VC-CVV	0/49	0.0	0/38	0.0	0/40	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/408	0.0
Σ	**2/1091**	**0.2**	**2/811**	**0.3**	**78/848**	**9.2**	**2/684**	**0.3**	**8/1098**	**0.7**	**139/609**	**22.8**	**8/1009**	**0.8**	**11/1364**	**0.8**	**0/1408**	**0.0**	**250/8922**	**2.8**

1st syllable: V > V_1V_2

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CV-CV	0/50	0.0	0/37	0.0	9/40	22.5	0/31	0.0	1/50	2.0	2/28	7.1	0/46	0.0	0/62	0.0	0/64	0.0	12/408	2.9
CV-CVC	0/49	0.0	0/36	0.0	5/37	13.5	0/30	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	5/402	1.2
CV-CVV	0/50	0.0	0/38	0.0	0/40	0.0	0/32	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/410	0.0
CV-CVVC	0/50	0.0	0/36	0.0	0/39	0.0	0/32	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/407	0.0
CVC1-C2V	19/50	38.0	7/37	18.9	1/38	2.6	4/32	12.5	0/50	0.0	0/27	0.0	1/45	2.2	5/62	8.1	8/64	12.5	45/405	11.1
CVC1-C2VV	1/49	2.0	1/34	2.9	22/38	57.9	12/32	37.5	0/50	0.0	10/27	37.0	11/46	23.9	7/62	11.3	30/64	46.9	94/402	23.4
CVC1-C2VVC	2/50	4.0	4/37	10.8	15/37	40.5	2/31	6.5	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	3/64	4.7	26/405	6.4
CVC1C2-C2V	0/50	0.0	0/36	0.0	0/38	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/405	0.0
CVC1C2-C2VV	0/50	0.0	0/35	0.0	0/39	0.0	0/28	0.0	0/50	0.0	0/28	0.0	1/46	2.2	0/62	0.0	0/64	0.0	1/402	0.2
CVC-CV	0/50	0.0	0/38	0.0	0/37	0.0	1/32	3.1	1/50	2.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	2/407	0.5
CVC-CVC	0/50	0.0	1/37	2.7	0/39	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	1/407	0.2
CVC-CVV	0/50	0.0	0/37	0.0	0/39	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/407	0.0
CVC-CVVC	0/50	0.0	0/38	0.0	1/38	2.6	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	1/407	0.2
V-CV	0/50	0.0	0/37	0.0	0/39	0.0	0/32	0.0	1/50	2.0	2/28	7.1	0/46	0.0	0/62	0.0	0/64	0.0	3/408	0.7
V-CVC	0/50	0.0	0/38	0.0	16/38	42.1	0/29	0.0	4/50	8.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	20/405	4.9
V-CVV	1/49	2.0	0/37	0.0	0/38	0.0	0/31	0.0	4/49	8.2	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	5/404	1.2
V-CVVC	0/50	0.0	0/37	0.0	1/39	2.6	0/32	0.0	0/50	0.0	0/28	0.0	0/45	0.0	0/62	0.0	0/64	0.0	1/407	0.2
VC1-C2V	0/46	0.0	3/34	8.8	4/38	10.5	6/31	19.4	24/49	49.0	0/25	0.0	7/45	15.6	1/62	1.6	0/64	0.0	45/394	11.4
VC1-C2VV	0/50	0.0	0/38	0.0	0/39	0.0	0/31	0.0	0/50	0.0	0/27	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/407	0.0
VC-CV	0/50	0.0	0/38	0.0	0/40	0.0	0/32	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/410	0.0
VC-CVC	8/49	16.3	4/38	10.5	0/38	0.0	1/31	3.2	1/50	2.0	0/27	0.0	8/46	17.4	0/62	0.0	0/64	0.0	22/405	5.4
VC-CVV	0/49	0.0	0/38	0.0	0/40	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/408	0.0
Σ	**31/1091**	**2.8**	**20/811**	**2.5**	**74/848**	**8.7**	**26/684**	**3.8**	**36/1098**	**3.3**	**14/609**	**2.3**	**28/1009**	**2.8**	**13/1364**	**1.0**	**41/1408**	**2.9**	**283/8922**	**3.2**

1st syllable: VV > V

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CVV-CV	0/50	0.0	3/37	8.1	6/39	15.4	3/31	9.7	27/50	54.0	7/28	25.0	5/46	10.9	0/62	0.0	0/64	0.0	51/407	12.5
CVV-CVC	0/49	0.0	6/37	16.2	1/40	2.5	6/31	19.4	2/50	4.0	2/28	7.1	1/45	2.2	1/62	1.6	3/64	4.7	22/406	5.4
CVV-CVV	0/50	0.0	2/36	5.6	5/40	12.5	1/31	3.2	0/50	0.0	6/28	21.4	0/46	0.0	5/62	8.1	0/64	0.0	19/407	4.7
CVV-CVVC	0/50	0.0	0/37	0.0	9/39	23.1	2/32	6.3	49/50	98.0	1/28	3.6	1/46	2.2	5/62	8.1	0/64	0.0	67/408	16.4
CVVC1-C2V	7/50	14.0	16/37	43.2	20/39	51.3	2/30	6.7	33/50	66.0	25/28	89.3	0/46	0.0	4/62	6.5	1/64	1.6	108/406	26.6
CVVC1-C2VC	0/48	0.0	0/37	0.0	39/39	100.0	1/29	3.4	25/50	50.0	26/28	92.9	2/46	4.3	0/62	0.0	0/64	0.0	93/403	23.1
CVVC1-C2VV	0/50	0.0	5/37	13.5	22/40	55.0	11/32	34.4	50/50	100.0	27/27	100.0	3/46	6.5	25/62	40.3	0/64	0.0	143/408	35.0
CVVC-CV	2/50	4.0	5/38	13.2	11/40	27.5	1/32	3.1	1/50	2.0	21/28	75.0	6/46	13.0	0/61	0.0	0/64	0.0	47/409	11.5
CVVC-CVC	0/50	0.0	0/38	0.0	14/39	35.9	0/32	0.0	22/50	48.0	1/28	3.6	0/46	0.0	24/62	38.7	0/64	0.0	61/409	15.4
CVVC-CVV	0/50	0.0	2/37	5.4	7/40	17.5	3/32	9.4	19/50	38.0	15/27	55.6	0/46	0.0	1/62	1.6	1/64	1.6	48/408	11.8
CVVC-CVVC	1/50	2.0	3/37	8.1	37/40	92.5	3/31	9.7	28/49	57.1	11/28	39.3	20/46	43.5	7/62	0.0	0/64	0.0	110/407	27.0
VV-CV	0/49	0.0	6/38	15.8	2/38	5.3	2/32	6.3	1/50	2.0	6/28	21.4	1/46	2.2	0/62	0.0	5/64	7.8	23/407	5.7
VVC1-C2V	6/50	12.0	8/37	21.6	31/38	81.6	2/30	6.7	27/50	54.0	11/28	39.3	7/46	21.7	32/62	51.6	0/64	0.0	124/405	30.6
Σ	**16/646**	**2.5**	**56/483**	**11.6**	**204/511**	**39.9**	**37/405**	**9.1**	**284/649**	**43.8**	**159/362**	**43.9**	**46/597**	**7.7**	**104/805**	**12.9**	**10/832**	**1.2**	**916/5290**	**17.3**

1st syllable: VV > V_1V_2

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CVV-CV	23/50	46.0	1/37	2.7	1/39	2.6	10/31	32.3	1/50	2.0	1/28	3.6	0/46	0.0	0/62	0.0	0/64	0.0	37/407	9.1
CVV-CVC	0/49	0.0	4/37	10.8	1/40	2.5	6/31	19.4	0/50	0.0	1/28	3.6	0/45	0.0	0/62	0.0	0/64	0.0	12/406	3.0
CVV-CVV	0/50	0.0	1/36	2.8	0/40	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	1/62	1.6	0/64	0.0	2/407	0.5
CVV-CVVC	0/50	0.0	1/37	2.7	1/39	2.6	0/32	0.0	0/50	0.0	1/28	3.6	0/46	0.0	0/62	0.0	0/64	0.0	3/408	0.7
CVVC1-C2V	0/50	0.0	1/37	2.7	0/39	0.0	5/30	16.7	0/50	0.0	0/28	0.0	0/46	0.0	8/62	12.9	2/64	3.1	16/406	3.9
CVVC1-C2VC	12/48	25.0	1/37	2.7	0/39	0.0	4/29	13.8	0/50	0.0	0/28	0.0	1/46	2.2	8/62	12.9	1/64	1.6	27/403	6.7
CVVC1-C2VV	25/50	50.0	4/37	10.8	13/40	32.5	16/32	50.0	0/50	0.0	0/27	0.0	1/46	2.2	28/62	45.2	0/64	0.0	87/408	21.3
CVVC-CV	0/50	0.0	0/38	0.0	0/40	0.0	0/32	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/61	0.0	0/64	0.0	0/409	0.0
CVVC-CVC	0/50	0.0	1/38	2.6	2/39	5.1	0/32	0.0	2/50	4.0	0/28	0.0	7/46	15.2	2/62	3.2	0/64	0.0	14/409	3.4
CVVC-CVV	0/50	0.0	0/37	0.0	1/40	2.5	0/32	0.0	9/50	18.0	3/27	11.1	0/46	0.0	4/62	6.5	0/64	0.0	17/408	4.2
CVVC-CVVC	18/50	36.0	0/37	0.0	0/40	0.0	1/31	3.2	0/49	0.0	0/28	0.0	4/46	8.7	1/62	1.6	0/64	0.0	24/407	5.9
VV-CV	0/49	0.0	0/38	0.0	0/38	0.0	0/32	0.0	0/50	0.0	1/28	3.6	0/46	0.0	0/62	0.0	0/64	0.0	1/407	0.2
VVC1-C2V	1/50	2.0	0/37	0.0	0/38	0.0	4/30	13.3	0/50	0.0	0/28	0.0	2/46	4.4	0/62	0.0	0/64	0.0	7/405	1.7
Σ	**79/646**	**12.2**	**14/483**	**2.9**	**19/511**	**3.7**	**46/405**	**11.4**	**12/649**	**1.8**	**7/362**	**1.9**	**15/597**	**2.5**	**52/805**	**6.5**	**3/832**	**0.4**	**247/5290**	**4.7**

2nd syllable: V > VV

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CV-CV	0/50	0.0	1/37	2.7	1/40	2.5	0/31	0.0	3/50	6.0	1/28	3.6	0/46	0.0	0/62	0.0	0/64	0.0	6/408	1.5
CV-CVC	0/49	0.0	0/36	0.0	0/37	0.0	0/30	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/402	0.0
CVC1-C2V	0/50	0.0	0/37	0.0	1/38	2.6	1/32	3.1	0/50	0.0	1/27	3.7	5/45	11.1	0/62	0.0	0/64	0.0	8/405	2.0
CVC1C2-C2V	4/50	8.0	0/36	0.0	0/38	0.0	0/31	0.0	1/50	2.0	1/28	3.6	7/46	15.2	0/62	0.0	0/64	0.0	13/405	3.2
CVC-CV	0/50	0.0	0/38	0.0	0/37	0.0	0/32	0.0	0/50	0.0	0/28	0.0	2/46	4.4	0/62	0.0	0/64	0.0	2/407	0.5
CVC-CVC	0/50	0.0	0/37	0.0	0/39	0.0	0/31	0.0	0/50	0.0	1/28	3.6	0/46	0.0	0/62	0.0	0/64	0.0	1/407	0.2
CVV-CV	1/50	2.0	1/37	2.7	3/39	7.7	8/31	25.8	2/50	4.0	2/28	7.1	1/46	2.2	0/62	0.0	0/64	0.0	18/407	4.4
CVV-CVC	0/49	0.0	1/37	2.7	0/40	0.0	0/31	0.0	0/50	0.0	1/28	3.6	1/45	2.2	0/62	0.0	0/64	0.0	3/406	0.7
CVVC1-C2V	19/50	38.0	6/37	16.2	1/39	2.6	14/30	46.7	0/50	0.0	2/28	7.1	8/46	17.4	0/62	0.0	0/64	0.0	50/406	12.3
CVVC1-C2VC	0/48	0.0	0/37	0.0	0/39	0.0	2/29	6.9	0/50	0.0	3/28	10.7	1/46	2.2	0/62	0.0	0/64	0.0	6/403	1.5
CVVC-CV	0/50	0.0	4/38	10.5	7/40	17.5	17/32	53.1	3/50	6.0	2/28	7.1	23/46	50.0	0/61	0.0	0/64	0.0	56/409	13.7
CVVC-CVC	0/50	0.0	0/38	0.0	0/39	0.0	0/32	0.0	1/50	2.0	0/28	0.0	5/46	10.9	0/62	0.0	0/64	0.0	6/409	1.5
V-CV	2/50	4.0	0/37	0.0	0/39	0.0	0/32	0.0	1/50	2.0	4/28	14.3	1/46	2.2	0/62	0.0	0/64	0.0	8/408	2.0
V-CVC	0/50	0.0	0/38	0.0	0/38	0.0	0/29	0.0	0/50	0.0	1/28	3.6	0/46	0.0	0/62	0.0	0/64	0.0	1/405	0.2
VC1-C2V	6/46	13.0	0/34	0.0	1/38	2.6	0/31	0.0	0/49	0.0	0/25	0.0	1/45	2.2	0/62	0.0	7/64	10.9	15/394	3.8
VC-CV	0/50	0.0	17/38	44.7	6/40	15.0	0/32	0.0	5/50	10.0	0/28	0.0	24/46	52.2	0/62	0.0	0/64	0.0	52/410	12.7
VC-CVC	0/49	0.0	0/38	0.0	0/38	0.0	0/31	0.0	0/50	0.0	0/27	0.0	6/46	13.0	30/62	48.4	0/64	0.0	36/405	8.9
VV-CV	0/49	0.0	0/38	0.0	0/38	0.0	0/32	0.0	0/50	0.0	0/28	0.0	1/46	2.2	0/62	0.0	0/64	0.0	1/407	0.2
VVC1-C2V	1/50	2.0	2/37	5.4	1/38	2.6	15/30	50.0	0/50	0.0	3/28	10.7	0/46	0.0	0/62	0.0	0/64	0.0	22/405	5.4
Σ	**33/940**	**3.5**	**32/705**	**4.5**	**21/734**	**2.9**	**57/589**	**9.7**	**16/949**	**1.7**	**22/527**	**4.2**	**86/871**	**9.9**	**30/1177**	**2.6**	**7/1216**	**0.6**	**304/7708**	**3.9**

2nd syllable: V > V_1V_2

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CV-CV	0/50	0.0	0/37	0.0	2/40	5.0	0/31	0.0	3/50	6.0	4/28	14.3	0/46	0.0	0/62	0.0	0/64	0.0	9/408	2.2
CV-CVC	1/49	2.0	1/36	2.8	0/37	0.0	0/30	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	2/402	0.5
CVC1-C2V	0/50	0.0	0/37	0.0	1/38	2.6	0/32	0.0	0/50	0.0	0/27	0.0	0/45	0.0	0/62	0.0	0/64	0.0	1/405	0.2
CVC1C2-C2V	0/50	0.0	0/36	0.0	0/38	0.0	0/31	0.0	0/50	0.0	2/28	7.1	0/46	0.0	0/62	0.0	0/64	0.0	2/405	0.5
CVC-CV	0/50	0.0	0/38	0.0	0/37	0.0	0/32	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/407	0.0
CVC-CVC	0/50	0.0	0/37	0.0	0/39	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/407	0.0
CVV-CV	0/50	0.0	0/37	0.0	0/39	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/407	0.0
CVV-CVC	0/49	0.0	0/37	0.0	0/40	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/45	0.0	0/62	0.0	0/64	0.0	0/406	0.0
CVVC1-C2V	0/50	0.0	0/37	0.0	0/39	0.0	0/30	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/406	0.0
CVVC1-C2VC	0/48	0.0	0/37	0.0	0/39	0.0	0/29	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/403	0.0
CVVC-CV	0/50	0.0	0/38	0.0	0/40	0.0	0/32	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/61	0.0	0/64	0.0	0/409	0.0
CVVC-CVC	0/50	0.0	0/38	0.0	0/39	0.0	0/32	0.0	1/50	2.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	1/409	0.2
V-CV	0/50	0.0	0/37	0.0	0/39	0.0	0/32	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/408	0.0
V-CVC	0/50	0.0	0/38	0.0	0/38	0.0	0/29	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/405	0.0
VC1-C2V	0/46	0.0	0/34	0.0	0/38	0.0	0/31	0.0	0/49	0.0	0/25	0.0	0/45	0.0	0/62	0.0	0/64	0.0	0/394	0.0
VC-CV	1/50	2.0	0/38	0.0	0/40	0.0	2/32	6.3	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	1/64	1.6	4/410	1.0
VC-CVC	0/49	0.0	0/38	0.0	0/38	0.0	0/31	0.0	0/50	0.0	0/27	0.0	0/46	0.0	1/62	1.6	0/64	0.0	1/405	0.2
VV-CV	0/49	0.0	0/38	0.0	0/38	0.0	1/32	3.1	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	1/407	0.2
VVC1-C2V	0/50	0.0	0/37	0.0	0/38	0.0	0/30	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/405	0.0
Σ	**2/940**	**0.2**	**1/705**	**0.1**	**3/734**	**0.4**	**3/589**	**0.5**	**4/949**	**0.4**	**6/527**	**1.1**	**0/871**	**0.0**	**1/1177**	**0.1**	**1/1216**	**0.1**	**21/7708**	**0.3**

2nd syllable: VV > V

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CV-CVV	5/50	10.0	12/38	31.6	25/40	62.5	11/32	34.4	32/50	64.0	28/28	100.0	0/46	0.0	0/62	0.0	1/64	1.6	114/410	27.8
CV-CVVC	7/50	14.0	9/36	25.0	33/39	84.6	5/32	15.6	41/50	82.0	24/28	85.7	0/46	0.0	0/62	0.0	0/64	0.0	119/407	29.2
CVC1-C2VV	24/49	49.0	17/34	50.0	28/38	73.7	7/32	28.1	43/50	86.0	26/27	96.3	6/46	13.0	2/62	3.2	0/64	0.0	153/402	38.0
CVC1-C2VVC	21/50	42.0	5/37	13.5	30/37	81.1	1/31	3.2	14/50	28.0	24/28	85.7	0/46	0.0	0/62	0.0	0/64	0.0	95/405	23.5
CVC1C2-C2VV	16/50	32.0	10/35	28.6	31/39	79.5	5/28	17.9	35/50	70.0	26/28	92.9	1/46	2.2	0/62	0.0	1/64	1.6	125/402	31.1
CVC-CVV	25/50	50.0	2/37	5.4	28/39	71.8	11/31	35.5	28/50	56.0	23/28	82.1	0/46	0.0	0/62	0.0	0/64	0.0	117/407	28.7
CVC-CVVC	2/50	4.0	2/38	5.3	17/38	44.7	0/31	0.0	25/50	50.0	25/28	89.3	0/46	0.0	0/62	0.0	0/64	0.0	71/407	17.4
CVV-CVV	13/50	26.0	10/36	27.8	24/40	60.0	20/31	64.5	18/50	36.0	26/28	92.9	1/46	2.2	1/62	1.6	0/64	0.0	113/407	27.8
CVV-CVVC	38/50	76.0	9/37	24.3	35/39	89.7	9/32	28.1	36/50	72.0	25/28	89.3	0/46	0.0	0/62	0.0	2/64	3.1	154/408	37.7
CVVC1-C2VV	23/50	46.0	20/37	54.1	38/40	95.0	5/32	15.6	50/50	100.0	26/27	96.3	2/46	4.4	1/62	1.6	0/64	0.0	165/408	40.4
CVVC-CVV	6/50	12.0	4/37	10.8	11/40	27.5	4/32	12.5	14/50	28.0	20/27	74.1	0/46	0.0	0/62	0.0	0/64	0.0	59/408	14.5
CVVC-CVVC	0/50	0.0	4/37	10.8	38/40	95.0	2/31	6.5	24/49	49.0	24/28	85.7	0/46	0.0	0/62	0.0	1/64	1.6	93/407	22.9
V-CVV	24/49	49.0	1/37	2.7	28/38	73.7	1/31	3.2	21/49	42.9	26/28	92.9	3/46	6.5	0/62	0.0	0/64	0.0	104/404	25.7
V-CVVC	1/50	2.0	0/37	0.0	25/39	64.1	0/32	0.0	22/50	44.0	25/28	89.3	0/45	0.0	0/62	0.0	0/64	0.0	73/407	17.9
VC1-C2VV	3/50	6.0	4/38	10.5	35/39	89.7	13/31	41.9	23/50	46.0	24/27	88.9	0/46	0.0	0/62	0.0	1/64	1.6	103/407	25.3
VC-CVV	12/49	24.5	1/38	2.6	12/40	30.0	2/31	6.5	20/50	40.0	20/28	71.4	0/46	0.0	0/62	0.0	0/64	0.0	67/408	16.4
Σ	**220/797**	**27.6**	**110/589**	**18.7**	**438/625**	**70.1**	**96/500**	**19.2**	**446/798**	**55.9**	**392/444**	**88.3**	**13/735**	**1.8**	**4/992**	**0.4**	**6/1024**	**0.6**	**1725/6504**	**26.5**

2nd syllable: VV > V_1V_2

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CV-CVV	0/50	0.0	1/38	2.6	0/40	0.0	0/32	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	1/410	0.2
CV-CVVC	0/50	0.0	0/36	0.0	1/39	2.6	0/32	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	1/407	0.2
CVC1-C2VV	0/49	0.0	0/34	0.0	0/38	0.0	2/32	6.3	0/50	0.0	0/27	0.0	0/46	0.0	1/62	1.6	0/64	0.0	3/402	0.7
CVC1-C2VVC	0/50	0.0	0/37	0.0	0/37	0.0	4/31	12.9	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	4/405	1.0
CVC1C2-C2VV	0/50	0.0	0/35	0.0	0/39	0.0	0/28	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/402	0.0
CVC-CVV	0/50	0.0	0/37	0.0	1/39	2.6	0/31	0.0	1/50	2.0	0/28	0.0	1/46	0.0	0/62	0.0	0/64	0.0	3/407	0.7
CVC-CVVC	0/50	0.0	0/38	0.0	0/38	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/407	0.0
CVV-CVV	0/50	0.0	0/36	0.0	1/40	2.5	3/31	9.7	1/50	2.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	5/407	1.2
CVV-CVVC	0/50	0.0	0/37	0.0	0/39	0.0	0/32	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/408	0.0
CVVC1-C2VV	0/50	0.0	0/37	0.0	0/40	0.0	2/32	6.3	0/50	0.0	0/27	0.0	0/46	0.0	0/62	0.0	0/64	0.0	2/408	0.5
CVVC-CVV	0/50	0.0	0/37	0.0	0/40	0.0	0/32	0.0	0/50	0.0	0/27	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/408	0.0
CVVC-CVVC	0/50	0.0	0/37	0.0	0/40	0.0	0/31	0.0	0/49	0.0	0/28	0.0	0/46	0.0	1/62	1.6	0/64	0.0	1/407	0.2
V-CVV	0/49	0.0	0/37	0.0	0/38	0.0	0/31	0.0	0/49	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/404	0.0
V-CVVC	0/50	0.0	0/37	0.0	0/39	0.0	3/32	9.4	1/50	2.0	0/28	0.0	0/45	0.0	0/62	0.0	0/64	0.0	4/407	1.0
VC1-C2VV	0/50	0.0	0/38	0.0	0/39	0.0	5/31	16.1	0/50	0.0	0/27	0.0	0/46	0.0	0/62	0.0	0/64	0.0	5/407	1.2
VC-CVV	0/49	0.0	0/38	0.0	0/40	0.0	0/31	0.0	0/50	0.0	0/28	0.0	0/46	0.0	1/62	1.6	0/64	0.0	1/408	0.2
Σ	**0/797**	**0.0**	**1/589**	**0.2**	**3/625**	**0.5**	**19/500**	**3.8**	**3/798**	**0.4**	**0/444**	**0.0**	**1/735**	**0.1**	**3/992**	**0.3**	**0/1024**	**0.0**	**30/6504**	**0.5**

Syllable boundary: V-C > VC-C

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CV-CV	0/50	0.0	1/37	2.7	13/40	32.5	0/31	0.0	23/50	46.0	1/28	3.6	1/46	2.2	0/62	0.0	0/64	0.0	39/408	9.6
CV-CVC	0/49	0.0	0/36	0.0	35/37	94.6	0/30	0.0	1/50	2.0	10/28	35.7	0/46	0.0	0/62	0.0	0/64	0.0	46/402	11.4
CV-CVV	3/50	6.0	0/38	0.0	28/40	70.0	0/32	0.0	41/50	82.0	19/28	67.9	0/46	0.0	0/62	0.0	1/64	1.6	92/410	22.4
CV-CVVC	0/50	0.0	0/36	0.0	21/39	53.8	0/32	0.0	34/50	68.0	7/28	25.0	0/46	0.0	0/62	0.0	0/64	0.0	62/407	15.2
CVV-CV	0/50	0.0	0/37	0.0	14/39	35.9	1/31	3.2	25/50	50.0	7/28	25.0	2/46	4.3	0/62	0.0	0/64	0.0	49/407	12.0
CVV-CVC	0/49	0.0	0/37	0.0	24/40	60.0	0/31	0.0	15/50	30.0	0/28	0.0	0/45	0.0	0/62	0.0	0/64	0.0	39/406	9.6
CVV-CVV	0/50	0.0	1/36	2.8	5/40	12.5	0/31	0.0	3/50	6.0	4/28	14.3	0/46	0.0	0/62	0.0	0/64	0.0	13/407	3.2
CVV-CVVC	0/50	0.0	0/37	0.0	14/39	35.9	3/32	9.4	39/50	78.0	1/28	3.6	0/46	0.0	26/62	41.9	0/64	0.0	83/408	20.3
V-CV	0/50	0.0	0/37	0.0	24/39	61.5	0/32	0.0	25/50	50.0	19/28	67.9	0/46	0.0	0/62	0.0	0/64	0.0	68/408	16.7
V-CVC	0/50	0.0	1/38	2.6	12/38	31.6	0/29	0.0	9/50	18.0	8/28	28.6	4/46	8.7	0/62	0.0	0/64	0.0	34/405	8.4
V-CVV	0/49	0.0	0/37	0.0	12/38	31.6	0/31	0.0	6/49	12.2	23/28	82.1	0/46	0.0	0/62	0.0	0/64	0.0	41/404	8.9
V-CVVC	0/50	0.0	0/37	0.0	4/39	10.3	0/32	0.0	10/50	20.0	2/28	7.1	0/45	0.0	0/62	0.0	0/64	0.0	16/407	3.9
VV-CV	0/49	0.0	0/38	0.0	6/38	15.8	0/32	0.0	2/50	4.0	5/28	17.9	0/46	0.0	0/62	0.0	0/64	0.0	13/407	3.2
Σ	**3/646**	**0.5**	**3/481**	**0.6**	**212/506**	**41.9**	**4/406**	**1.0**	**233/649**	**35.9**	**106/364**	**29.1**	**7/596**	**1.2**	**26/806**	**3.2**	**1/832**	**0.1**	**595/5286**	**11.3**

Syllable boundary: C_1-C_2 > C_1C_2-C_2

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CVC1-C2V	19/50	38.0	0/37	0.0	12/38	31.6	1/32	3.1	10/50	20.0	13/27	48.1	0/45	0.0	1/62	1.6	0/64	0.0	56/405	13.8
CVC1-C2VV	1/49	2.0	0/34	0.0	21/38	55.3	0/32	0.0	0/50	0.0	8/27	29.6	1/46	2.2	0/62	0.0	0/64	0.0	31/402	7.7
CVC1-C2VVC	0/50	0.0	3/37	8.1	14/37	37.8	1/31	3.2	18/50	36.0	0/28	0.0	7/46	15.2	0/62	0.0	0/64	0.0	43/405	10.6
CVVC1-C2V	0/50	0.0	0/37	0.0	5/39	12.8	0/30	0.0	1/50	2.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	6/406	1.5
CVVC1-C2VC	0/48	0.0	0/37	0.0	0/39	0.0	0/29	0.0	0/50	0.0	0/28	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/403	0.0
CVVC1-C2VV	0/50	0.0	0/37	0.0	0/40	0.0	0/32	0.0	0/50	0.0	0/27	0.0	0/46	0.0	0/62	0.0	0/64	0.0	0/408	0.0
VC1-C2V	7/46	15.2	2/34	5.9	26/38	68.4	3/31	9.7	45/49	91.8	9/25	36.0	5/45	11.1	15/62	24.2	13/64	20.3	125/394	31.7
VC1-C2VV	0/50	0.0	0/38	0.0	6/39	15.4	0/31	0.0	0/50	0.0	6/27	22.2	0/46	0.0	0/62	0.0	0/64	0.0	12/407	2.9
VVC1-C2V	0/50	0.0	3/37	8.1	4/38	10.5	0/30	0.0	0/50	0.0	1/28	3.6	0/46	0.0	3/62	4.8	0/64	0.0	11/405	2.7
Σ	**27/443**	**6.1**	**8/328**	**2.4**	**88/346**	**25.4**	**5/278**	**1.8**	**74/449**	**16.5**	**37/245**	**15.1**	**13/412**	**3.2**	**19/558**	**3.4**	**13/576**	**2.3**	**284/3635**	**7.8**

Syllable boundary: VC-C > V-C

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CVC-CV	0/50	0.0	0/38	0.0	16/37	43.2	0/32	0.0	38/50	76.0	12/28	42.9	0/46	0.0	0/62	0.0	0/64	0.0	66/407	16.2
CVC-CVC	7/50	14.0	1/37	2.7	26/39	66.7	15/31	48.4	1/50	2.0	25/28	89.3	1/46	2.2	0/62	0.0	0/64	0.0	76/407	18.7
CVC-CVV	0/50	0.0	0/37	0.0	2/39	5.1	0/31	0.0	5/50	10.0	9/28	32.1	0/46	0.0	0/62	0.0	1/64	1.6	17/407	4.2
CVC-CVVC	1/50	2.0	0/38	0.0	5/38	13.2	0/31	0.0	0/50	0.0	26/28	92.9	0/46	0.0	0/62	0.0	0/64	0.0	32/407	7.9
CVVC-CV	0/50	0.0	12/38	31.6	16/40	40.0	10/32	31.2	21/50	42.0	14/28	50.0	22/46	47.8	0/61	0.0	0/64	0.0	95/409	23.2
CVVC-CVC	18/50	36.0	7/38	18.4	14/39	35.9	28/32	87.5	25/50	50.0	24/28	85.7	4/46	8.7	8/62	12.9	9/64	14.1	137/409	33.5
CVVC-CVV	41/50	82.0	2/37	5.4	4/40	10.0	18/32	9.4	0/50	0.0	10/27	37.0	14/46	30.4	3/62	4.8	2/64	0.0	94/408	23.0
CVVC-CVVC	44/50	88.0	0/37	0.0	14/40	35.0	27/31	87.1	6/49	12.2	25/28	89.3	2/46	4.3	0/62	0.0	3/64	4.7	121/407	29.7
VC-CV	0/50	0.0	0/38	0.0	7/40	17.5	16/32	50.0	0/50	0.0	16/28	57.1	0/46	0.0	0/62	0.0	0/64	0.0	39/410	9.5
VC-CVC	7/49	14.3	4/38	10.5	2/38	5.3	1/31	3.2	5/50	10.0	20/27	74.1	4/46	8.7	0/62	0.0	0/64	0.0	43/405	10.6
VC-CVV	0/49	0.0	0/38	0.0	0/40	0.0	1/31	3.2	0/50	0.0	17/28	60.7	0/46	0.0	1/62	1.6	0/64	0.0	19/408	4.7
Σ	**118/548**	**21.5**	**26/414**	**6.3**	**106/430**	**24.7**	**116/346**	**33.5**	**101/549**	**18.3**	**198/306**	**64.7**	**47/506**	**9.3**	**12/681**	**1.8**	**15/704**	**2.1**	**739/4484**	**16.5**

Syllable boundary: C_1C_2-C_2 > C_1-C_2

	Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σ f	Σ %
CVC1C2-C2V	2/50	4.0	1/36	2.8	3/38	7.9	23/31	74.2	4/50	8.0	12/28	42.9	0/46	0.0	0/62	0.0	0/64	0.0	45/405	11.1
CVC1C2-C2VV	2/50	4.0	8/35	22.9	2/39	5.1	14/28	50.0	5/50	10.0	13/28	46.4	2/46	4.3	0/62	0.0	0/64	0.0	45/402	11.1
Σ	**4/100**	**4.0**	**9/71**	**12.7**	**5/77**	**6.5**	**37/59**	**62.7**	**9/100**	**9.0**	**25/56**	**44.6**	**2/92**	**2.2**	**0/124**	**0.0**	**0/128**	**0.0**	**91/807**	**11.3**

Simultaneous lengthening of the vowel in the 1st syllable vs. shortening of the vowel in the 2nd syllable

1st syllable: V > VV

		Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	source word	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σocc/all	Σ%
CV-CVV	makuu	0/25	0.0	0/19	0.0	0/20	0.0	0/16	0.0	0/25	0.0	**11/14**	78.6	0/23	0.0	0/31	0.0	0/32	0.0	11/205	5.4
CV-CVV	posuu	0/25	0.0	0/19	0.0	0/20	0.0	0/16	0.0	0/25	0.0	**0/14**	0.0	0/23	0.0	0/31	0.0	0/32	0.0	0/205	0.0
CV-CVVC	pahuus	0/25	0.0	0/18	0.0	0/20	0.0	0/16	0.0	0/25	0.0	**9/14**	64.3	0/23	0.0	0/31	0.0	0/32	0.0	9/204	4.4
CV-CVVC	pakuus	0/25	0.0	0/18	0.0	0/19	0.0	0/16	0.0	2/25	8.0	**4/14**	28.6	0/23	0.0	0/31	0.0	0/32	0.0	6/203	3.0
V-CVV	atoo	0/24	0.0	0/18	0.0	3/19	15.8	0/15	0.0	0/25	0.0	**9/14**	64.3	0/23	0.0	0/31	0.0	0/32	0.0	12/201	6.0
V-CVV	enää	0/25	0.0	0/19	0.0	0/19	0.0	0/16	0.0	0/24	0.0	**0/14**	0.0	0/23	0.0	0/31	0.0	0/32	0.0	0/203	0.0
V-CVVC	akeet	0/25	0.0	0/18	0.0	0/20	0.0	0/16	0.0	0/25	0.0	**0/14**	0.0	0/23	0.0	0/31	0.0	0/32	0.0	0/204	0.0
V-CVVC	eväät	0/25	0.0	0/19	0.0	2/19	10.5	0/16	0.0	0/25	0.0	**13/14**	92.9	0/22	0.0	0/31	0.0	0/32	0.0	15/203	7.4
Σ		**0/199**	**0.0**	**0/148**	**0.0**	**5/156**	**3.2**	**0/127**	**0.0**	**2/199**	**1.0**	**46/112**	**41.1**	**0/183**	**0.0**	**0/248**	**0.0**	**0/256**	**0.0**	**53/1628**	**3.3**

1st syllable: V > V_1V_2

		Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	source word	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σocc/all	Σ%
CV-CVV	makuu	0/25	0.0	0/19	0.0	0/20	0.0	0/16	0.0	0/25	0.0	0/14	0.0	0/23	0.0	0/31	0.0	0/32	0.0	0/205	0.0
CV-CVV	posuu	0/25	0.0	0/19	0.0	0/20	0.0	0/16	0.0	0/25	0.0	0/14	0.0	0/23	0.0	0/31	0.0	0/32	0.0	0/205	0.0
CV-CVVC	pahuus	0/25	0.0	0/18	0.0	0/20	0.0	0/16	0.0	0/25	0.0	0/14	0.0	0/23	0.0	0/31	0.0	0/32	0.0	0/204	0.0
CV-CVVC	pakuus	0/25	0.0	0/18	0.0	0/19	0.0	0/16	0.0	0/25	0.0	0/14	0.0	0/23	0.0	0/31	0.0	0/32	0.0	0/203	0.0
V-CVV	atoo	1/24	4.2	0/18	0.0	0/19	0.0	0/15	0.0	4/25	16.0	0/14	0.0	0/23	0.0	0/31	0.0	0/32	0.0	5/201	2.5
V-CVV	enää	0/25	0.0	0/19	0.0	0/19	0.0	0/16	0.0	0/24	0.0	0/14	0.0	0/23	0.0	0/31	0.0	0/32	0.0	0/203	0.0
V-CVVC	akeet	0/25	0.0	0/18	0.0	0/20	0.0	0/16	0.0	0/25	0.0	0/14	0.0	0/23	0.0	0/31	0.0	0/32	0.0	0/204	0.0
V-CVVC	eväät	0/25	0.0	0/19	0.0	1/19	5.3	0/16	0.0	0/25	0.0	0/14	0.0	0/22	0.0	0/31	0.0	0/32	0.0	1/203	0.5
Σ		**1/199**	**1.0**	**0/148**	**0.0**	**1/156**	**0.6**	**0/127**	**0.0**	**4/199**	**2.0**	**0/112**	**0.0**	**0/183**	**0.0**	**0/248**	**0.0**	**0/256**	**0.0**	**6/1628**	**0.4**

2nd syllable: VV > V

		Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	source word	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σocc/all	Σ%
CV-CVV	makuu	1/25	4.0	10/19	52.6	5/20	25.0	11/16	68.8	14/25	56.0	14/14	100.0	0/23	0.0	0/31	0.0	0/32	0.0	55/205	26.8
CV-CVV	posuu	4/25	16.0	2/19	10.5	20/20	100.0	0/16	0.0	18/25	72.0	14/14	100.0	0/23	0.0	0/31	0.0	1/32	3.1	59/203	28.8
CV-CVVC	pahuus	3/25	12.0	8/18	44.4	18/20	90.0	4/16	25.0	20/25	80.0	13/14	92.9	0/23	0.0	0/31	0.0	0/32	0.0	66/204	32.4
CV-CVVC	pakuus	4/25	16.0	1/18	5.6	15/19	78.9	1/16	6.3	21/25	84.0	11/14	78.6	0/23	0.0	0/31	0.0	0/32	0.0	53/203	26.1
V-CVV	atoo	7/24	29.2	1/18	5.6	18/19	94.7	1/15	6.7	19/25	76.0	12/14	85.7	3/23	13.0	0/31	0.0	0/32	0.0	61/201	30.3
V-CVV	enää	17/25	68.0	0/19	0.0	10/19	52.6	0/16	0.0	2/24	8.3	14/14	100.0	0/23	0.0	0/31	0.0	0/32	0.0	43/203	21.2
V-CVVC	akeet	0/25	0.0	0/18	0.0	19/20	95.0	0/16	0.0	18/25	72.0	12/14	85.7	0/23	0.0	0/31	0.0	0/32	0.0	49/204	24.0
V-CVVC	eväät	1/25	4.0	0/19	0.0	6/19	31.6	0/16	0.0	4/25	16.0	13/14	92.9	0/22	0.0	0/31	0.0	0/32	0.0	24/203	11.8
Σ		**37/199**	**18.6**	**22/148**	**14.9**	**111/156**	**71.2**	**17/127**	**13.4**	**116/199**	**58.3**	**103/112**	**92.0**	**3/183**	**1.6**	**0/248**	**0.0**	**1/256**	**0.4**	**355/1628**	**21.8**

Simultaneous lengthening of the consonant at the syllable boundary vs. shortening of the vowel in the 2nd syllable

2nd syllable: VV > V

		Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	source word	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σocc/all	Σ%
CV-CVV	makuu	1/25	4.0	10/19	52.6	5/20	25.0	11/16	68.8	14/25	56.0	14/14	100.0	0/23	0.0	0/31	0.0	0/32	0.0	55/205	26.8
CV-CVV	posuu	4/25	16.0	2/19	10.5	20/20	100.0	0/16	0.0	18/25	72.0	14/14	100.0	0/23	0.0	0/31	0.0	1/32	3.1	59/203	28.8
CV-CVVC	pahuus	3/25	12.0	8/18	44.4	18/20	90.0	4/16	25.0	20/25	80.0	13/14	92.9	0/23	0.0	0/31	0.0	0/32	0.0	66/204	32.4
CV-CVVC	pakuus	4/25	16.0	1/18	5.6	15/19	78.9	1/16	6.3	21/25	84.0	11/14	78.6	0/23	0.0	0/31	0.0	0/32	0.0	53/203	26.1
V-CVV	atoo	7/24	29.2	1/18	5.6	18/19	94.7	1/15	6.7	19/25	76.0	12/14	85.7	3/23	13.0	0/31	0.0	0/32	0.0	61/201	30.3
V-CVV	enää	17/25	68.0	0/19	0.0	10/19	52.6	0/16	0.0	2/24	8.3	14/14	100.0	0/23	0.0	0/31	0.0	0/32	0.0	43/203	21.2
V-CVVC	akeet	0/25	0.0	0/18	0.0	19/20	95.0	0/16	0.0	18/25	72.0	12/14	85.7	0/23	0.0	0/31	0.0	0/32	0.0	49/204	24.0
V-CVVC	eväät	1/25	4.0	0/19	0.0	6/19	31.6	0/16	0.0	4/25	16.0	13/14	92.9	0/22	0.0	0/31	0.0	0/32	0.0	24/203	11.8
Σ		**37/199**	**18.6**	**22/148**	**14.9**	**111/156**	**71.2**	**17/127**	**13.4**	**116/199**	**58.3**	**103/112**	**92.0**	**3/183**	**1.6**	**0/248**	**0.0**	**1/256**	**0.4**	**355/1628**	**21.8**
CVV-CVV	kaatuu	8/25	32.0	1/18	5.6	5/20	25.0	13/16	81.3	1/25	4.0	13/14	92.9	0/23	0.0	0/31	0.0	0/32	0.0	41/204	20.1
CVV-CVV	saaruu	5/25	20.0	9/18	50.0	19/20	95.0	7/15	46.7	17/25	68.0	13/14	92.9	1/23	4.3	1/31	3.2	0/32	0.0	72/203	35.5
CVV-CVVC	kiipuus	14/25	56.0	2/18	11.1	20/20	100.0	2/16	12.5	11/25	44.0	13/14	92.9	0/23	0.0	0/31	0.0	0/32	0.0	62/204	30.4
CVV-CVVC	suuruus	24/25	96.0	7/19	36.8	15/19	78.9	7/16	43.8	25/25	100.0	12/14	85.7	0/23	0.0	0/31	0.0	2/32	6.3	92/204	45.1
Σ		**51/100**	**51.0**	**19/73**	**26.0**	**59/79**	**74.7**	**29/65**	**44.6**	**54/100**	**54.0**	**51/56**	**91.1**	**1/92**	**1.1**	**1/124**	**0.8**	**2/128**	**1.6**	**267/815**	**32.8**

Syllable boundary: V-C > VC-C

		Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	source word	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σocc/all	Σ%
CV-CVV	makuu	0/25	0.0	0/19	0.0	8/20	40.0	0/16	0.0	22/25	88.0	5/14	35.7	0/23	0.0	0/31	0.0	0/32	0.0	35/205	17.1
CV-CVV	posuu	3/25	12.0	0/19	0.0	20/20	100.0	0/16	0.0	19/25	76.0	14/14	100.0	0/23	0.0	0/31	0.0	1/32	3.1	57/205	27.8
CV-CVVC	pahuus	0/25	0.0	0/18	0.0	7/20	35.0	0/16	0.0	12/25	48.0	0/14	0.0	0/23	0.0	0/31	0.0	0/32	0.0	19/204	9.3
CV-CVVC	pakuus	0/25	0.0	0/18	0.0	14/19	73.7	0/16	0.0	22/25	88.0	7/14	50.0	0/23	0.0	0/31	0.0	0/32	0.0	43/203	21.2
V-CVV	atoo	0/24	0.0	0/18	0.0	12/19	63.2	0/15	0.0	3/25	12.0	9/14	64.3	0/23	0.0	0/31	0.0	0/32	0.0	24/201	11.9
V-CVV	enää	0/25	0.0	0/19	0.0	0/19	0.0	0/16	0.0	3/24	12.5	14/14	100.0	0/23	0.0	0/31	0.0	0/32	0.0	17/203	8.4
V-CVVC	akeet	0/25	0.0	0/18	0.0	4/20	20.0	0/16	0.0	9/25	36.0	2/14	14.3	0/23	0.0	0/31	0.0	0/32	0.0	15/204	7.4
V-CVVC	eväät	0/25	0.0	0/19	0.0	0/19	0.0	0/16	0.0	1/25	4.0	0/14	0.0	0/22	0.0	0/31	0.0	0/32	0.0	1/203	0.5
Σ		**3/199**	**1.5**	**0/148**	**0.0**	**65/156**	**41.7**	**0/127**	**0.0**	**91/199**	**45.7**	**51/112**	**45.5**	**0/183**	**0.0**	**0/248**	**0.0**	**1/256**	**0.4**	**211/1628**	**13.0**
CVV-CVV	kaatuu	0/25	0.0	0/18	0.0	0/20	0.0	0/16	0.0	3/25	12.0	4/14	28.6	0/23	0.0	0/31	0.0	0/32	0.0	7/204	3.4
CVV-CVV	saaruu	0/25	0.0	1/18	5.6	5/20	25.0	0/15	0.0	0/25	0.0	0/14	0.0	0/23	0.0	0/31	0.0	0/32	0.0	6/203	3.0
CVV-CVVC	kiipuus	0/25	0.0	0/18	0.0	14/20	70.0	0/16	0.0	14/25	56.0	1/14	7.1	0/23	0.0	24/31	77.4	0/32	0.0	53/204	26.0
CVV-CVVC	suuruus	0/25	0.0	0/19	0.0	0/19	0.0	3/16	18.8	25/25	100.0	0/14	0.0	0/23	0.0	2/31	6.5	0/32	0.0	30/204	14.7
Σ		**0/100**	**0.0**	**1/73**	**1.4**	**19/79**	**24.1**	**3/65**	**4.6**	**42/100**	**42.0**	**5/56**	**8.9**	**0/92**	**0.0**	**26/124**	**20.1**	**0/128**	**0.0**	**96/815**	**11.8**

Simultaneous shortening of the consonant at the syllable boundary and the vowel sequence of the 2nd syllable

2nd syllable: VV > V

		Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	source word	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σocc/all	Σ%
CVC-CVV	hakkuu	0/25	0.0	1/18	5.6	10/20	50.0	11/16	68.8	14/25	56.0	10/14	71.4	0/23	0.0	0/31	0.0	0/32	0.0	46/204	22.5
CVC-CVV	hammuu	25/25	100.0	1/19	5.3	18/19	94.7	0/15	0.0	14/25	56.0	13/14	92.9	0/23	0.0	0/31	0.0	0/32	0.0	71/203	35.0
CVC-CVVC	tikkaat	0/25	0.0	0/19	0.0	6/20	30.0	0/16	0.0	0/25	0.0	12/14	85.7	0/23	0.0	0/31	0.0	0/32	0.0	18/205	8.8
CVC-CVVC	timmaat	2/25	8.0	2/19	10.5	11/18	61.1	0/15	0.0	25/25	100.0	13/14	92.9	0/23	0.0	0/31	0.0	0/32	0.0	53/202	26.2
Σ		**27/100**	**27.0**	**4/75**	**5.3**	**35/77**	**45.5**	**11/62**	**17.7**	**53/100**	**53.0**	**48/56**	**85.7**	**0/92**	**0.0**	**0/124**	**0.0**	**0/128**	**0.0**	**188/814**	**23.1**
CVVC-CVV	moossaa	1/25	4.0	3/18	16.7	11/20	55.0	4/16	25.0	4/25	16.0	14/14	100.0	0/23	0.0	0/31	0.0	0/32	0.0	37/204	18.1
CVVC-CVV	muuttaa	5/25	20.0	1/19	5.3	0/20	0.0	0/16	0.0	10/25	40.0	6/13	46.2	0/23	0.0	0/31	0.0	0/32	0.0	22/204	10.8
CVVC-CVVC	kookkaat	0/25	0.0	0/19	0.0	18/20	90.0	0/16	0.0	0/25	0.0	13/14	92.9	0/23	0.0	0/31	0.0	0/32	0.0	31/205	15.1
CVVC-CVVC	koollaat	0/25	0.0	4/18	22.2	20/20	100.0	2/15	13.3	24/24	100.0	11/14	78.6	0/23	0.0	0/31	0.0	1/32	3.1	62/202	30.7
Σ		**6/100**	**6.0**	**8/74**	**10.8**	**49/80**	**61.2**	**6/63**	**9.5**	**38/99**	**38.4**	**44/55**	**80.0**	**0/92**	**0.0**	**0/124**	**0.0**	**1/128**	**0.8**	**152/815**	**18.7**
VC-CVV	onnaa	12/24	50.0	1/19	5.3	7/20	35.0	2/15	13.3	20/25	80.0	13/14	92.9	0/23	0.0	0/31	0.0	0/32	0.0	55/203	27.1
VC-CVV	ottaa	0/25	0.0	0/19	0.0	5/20	25.0	0/16	0.0	0/25	0.0	7/14	50.0	0/23	0.0	0/31	0.0	0/32	0.0	12/205	5.9
Σ		**12/49**	**24.5**	**1/38**	**2.6**	**12/40**	**30.0**	**2/31**	**6.5**	**20/50**	**40.0**	**20/28**	**71.4**	**0/46**	**0.0**	**0/62**	**0.0**	**0/64**	**0.0**	**67/408**	**16.4**
CVC1C2-C2VV	karttaa	0/25	0.0	5/19	26.3	15/20	75.0	3/16	18.8	11/25	44.0	12/14	85.7	0/23	0.0	0/31	0.0	1/32	3.1	47/205	22.9
CVC1C2-C2VV	pankkuu	16/25	64.0	5/16	31.3	16/19	84.2	2/12	16.7	24/25	96.0	14/14	100.0	1/23	4.3	0/31	0.0	0/32	0.0	78/197	39.6
Σ		**16/50**	**32.0**	**10/35**	**28.6**	**31/39**	**79.5**	**5/28**	**17.9**	**35/50**	**70.0**	**26/28**	**92.9**	**1/46**	**2.2**	**0/62**	**0.0**	**1/64**	**1.6**	**125/402**	**31.1**
Σ all		**61/299**	**20.4**	**23/212**	**10.8**	**127/236**	**53.8**	**24/184**	**13.0**	**146/299**	**48.8**	**138/167**	**82.6**	**1/276**	**0.4**	**0/372**	**0.0**	**2/384**	**0.5**	**532/2439**	**21.8**

Syllable boundary: VC-C > V-C

		Inf	1	Inf	2	Inf	3	Inf	4	Inf	5	Inf	6	Inf	7	Inf	8	Inf	9	All	1-9
syllable type	source word	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	occ/all	%	Σocc/all	Σ%
CVC-CVV	hakkuu	0/25	0.0	0/18	0.0	0/20	0.0	0/16	0.0	0/25	0.0	7/14	50.0	0/23	0.0	0/31	0.0	0/32	0.0	7/204	3.4
CVC-CVV	hammuu	0/25	0.0	0/19	0.0	2/19	10.5	0/15	0.0	5/25	20.0	2/14	14.3	0/23	0.0	0/31	0.0	1/32	3.1	10/203	4.9
CVC-CVVC	tikkaat	0/25	0.0	0/19	0.0	1/20	5.0	0/16	0.0	0/25	0.0	12/14	85.7	0/23	0.0	0/31	0.0	0/32	0.0	13/205	6.3
CVC-CVVC	timmaat	1/25	4.0	0/19	0.0	4/18	22.2	0/15	0.0	0/25	0.0	14/14	100.0	0/23	0.0	0/31	0.0	0/32	0.0	19/202	9.4
Σ		**1/100**	**1.0**	**0/75**	**0.0**	**7/77**	**9.1**	**0/62**	**0.0**	**5/100**	**5.0**	**35/56**	**62.5**	**0/92**	**0.0**	**0/124**	**0.0**	**1/128**	**0.8**	**49/814**	**6.0**
CVVC-CVV	moossaa	25/25	100.0	1/18	5.6	3/20	15.0	7/16	43.8	0/25	0.0	4/14	28.6	14/23	60.9	3/31	9.7	2/32	6.3	59/204	28.9
CVVC-CVV	muuttaa	16/25	64.0	1/19	5.3	1/20	5.0	11/16	68.8	0/25	0.0	6/13	46.2	0/23	0.0	0/31	0.0	0/32	0.0	35/204	17.2
CVVC-CVVC	kookkaat	21/25	84.0	0/19	0.0	14/20	70.0	15/16	93.8	6/25	24.0	12/14	85.7	1/23	4.3	0/31	0.0	0/32	0.0	69/205	33.7
CVVC-CVVC	koollaat	23/25	92.0	0/18	0.0	0/20	0.0	12/15	80.0	0/24	0.0	13/14	92.9	1/23	4.3	0/31	0.0	3/32	9.4	52/202	25.7
Σ		**85/100**	**85.0**	**2/74**	**2.7**	**28/80**	**35.0**	**45/63**	**71.4**	**6/99**	**6.1**	**35/55**	**63.6**	**16/92**	**17.4**	**3/124**	**2.4**	**5/128**	**3.9**	**215/815**	**26.4**
VC-CVV	onnaa	0/24	0.0	0/19	0.0	0/20	0.0	1/15	6.7	0/25	0.0	14/14	100.0	0/23	0.0	1/31	3.2	0/32	0.0	16/203	7.9
VC-CVV	ottaa	0/25	0.0	0/19	0.0	0/20	0.0	0/16	0.0	0/25	0.0	3/14	21.4	0/23	0.0	0/31	0.0	0/32	0.0	3/205	1.5
Σ		**0/49**	**0.0**	**0/38**	**0.0**	**0/40**	**0.0**	**1/31**	**3.2**	**0/50**	**0.0**	**17/28**	**60.7**	**0/46**	**0.0**	**1/62**	**1.6**	**0/64**	**0.0**	**19/408**	**4.7**
CVC1C2-C2VV	karttaa	0/25	0.0	0/19	0.0	0/20	0.0	7/16	43.8	0/25	0.0	7/14	50.0	2/23	8.7	0/31	0.0	0/32	0.0	16/205	7.8
CVC1C2-C2VV	pankkuu	2/25	8.0	8/16	50.0	2/19	10.5	7/12	58.3	5/25	20.0	6/14	42.9	0/23	0.0	0/31	0.0	0/32	0.0	30/197	15.2
Σ		**2/50**	**4.0**	**8/35**	**22.9**	**2/39**	**5.1**	**14/28**	**50.0**	**5/50**	**10.0**	**13/28**	**46.4**	**2/46**	**4.3**	**0/62**	**0.0**	**0/64**	**0.0**	**46/402**	**11.4**
Σ all		**88/299**	**29.4**	**10/212**	**4.7**	**37/236**	**15.7**	**60/184**	**32.6**	**16/299**	**5.4**	**100/167**	**59.9**	**18/276**	**6.5**	**4/372**	**1.1**	**6/384**	**1.6**	**329/2439**	**13.5**