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**PRE-FORTIS CLIPPING BY ESTONIAN LEARNERS
OF ENGLISH: A CASE STUDY**
BA thesis

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ABSTRACT

Many linguists, such as Jenkins (2000) and Celce-Murcia et al (2010) find that EFL learners must be taught pre-fortis clipping to avoid unintelligibility as pre-fortis clipping has proved not to come as naturally to EFL learners as for native speakers. The purpose of this thesis is to discover how Estonian learners of English produce pre-fortis clipping because it has never been studied in Estonian EFL learners before and pre-fortis clipping is not part of the Estonian sound system. A pronunciation test was conducted on three native speakers of English and ten Estonian EFL students. The results of the L1 Estonian students were compared to the ones of the native speakers.

This thesis opens with an introduction which includes the incentive for writing this thesis along with the definitions of the main concepts. The first chapter focuses on the possible reasons pre-fortis clipping exists, the differences of pre-fortis clipping in American English and British English, gives an overview of the Estonian and English sound systems related to pre-fortis clipping, and explores previous studies on the topic. The second chapter presents the nature of the pronunciation test and the methodology along with a results section and a discussion of the results. The thesis ends with a conclusion that summarizes the findings of this present thesis.

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LIST OF ABBREVIATIONS

AmE	American English
BrE	British English
EFL	English as a Foreign Language
L1	first language or the mother tongue of the speaker
L2	second language or a language that is acquired in addition to the first language
NS	native speaker
NNS	non-native speaker
ms	millisecond

INTRODUCTION

Learning a foreign language can be a very intricate and difficult thing to do, especially identifying and grasping language-specific phenomena. For example, it is notoriously complex for foreigners to learn Estonian due to the 14 cases in the language (Argus 2015: para 2). English is currently the *lingua franca* that Maurine (2003: 513) defines as “a vehicular language spoken by people who do not share a native language”. Therefore, L2 speakers of English must obtain a certain level of intelligibility to be able to communicate worldwide. By recognizing pronunciation issues that might cause incomprehensibility in L2 speakers of English, Jenkins (2000: 159) has created a *Lingua Franca Core* where she has identified five categories of possible pronunciation errors. Under the category of vowel sounds, she (2000: 159) emphasizes the importance of the effect that fortis/lenis consonants have on the preceding vowel length as well as maintaining vowel length contrasts in learning English pronunciation.

English vowels tend to be longer before voiced consonants and shorter if followed by a voiceless consonant (Ogden 2009: 65). This phenomenon of vowel duration clipped before a voiceless consonant is known as pre-fortis clipping or pre-fortis shortening (Collins et al 2019: 153). According to Carley and Mees (2020: 12), pre-fortis clipping is mainly associated with vowels but can also affect sonorants or consonants known as nasals and approximants. Since pre-fortis clipping is mostly evident in the free vowels because they are rather long to begin with (Carley and Mees 2020: 131), this study will focus on the effect voiceless consonants have on vowels as opposed to sonorants.

To understand the notion of pre-fortis clipping best, it is important to consider some main terms that will reoccur throughout the paper. First, “a consonant is a speech sound that involves an obstruction of airstream as it passes through the vocal tract” (Carley and Mees 2020: 9). There are three aspects to consider when describing consonants: energy, place, and

manner of articulation (Celce-Murcia et al 2010: 56). Based on energy of articulation or voicing, the way vocal cords act in response to articulating a consonant (Carley and Mees 2020: 9), English consonants are divided into two: voiced and voiceless (Collins et al 2019: 149). According to Collins et al (2019: 149), an alternative term for “voiced” is “lenis” and for “voiceless” is “fortis”. For the purpose of avoiding unnecessary repetition, the author will be using the terms voiced/lenis and voiceless/fortis interchangeably. Contrary to consonants, vowels are units of speech that are created by not obstructing the airstream and letting the air pass without any restraint (Carley and Mees 2020: 122).

Although the lack of pre-fortis clipping might not seem like a fundamental error in constructing English sounds, it is still a source of creating confusion between speakers. Even if a pre-fortis vowel is not shortened and does not resemble another word, thus not resulting in a lexical misunderstanding, it might still confuse the conversation partner by causing unintelligibility. In addition, Jenkins (2000: 141) also upholds that in terms of intelligibility, lack of pre-fortis clipping might cause ambiguity in words. Hence, the receiver might have trouble making use of contextual features and therefore not understand the conversation.

This type of study, specifically focusing on the pre-fortis clipping by Estonian learners of English has not been done before. However, pre-fortis clipping and the way EFL learners produce it has been a topic of interest for many other graduate students and researchers around the world (Hrychová 2015; Chen 1970). The aim of this study is to discover how Estonian learners of English produce pre-fortis clipping. This will be achieved by performing an acoustic analysis of Estonian EFL learners pronouncing word pairs containing the same front vowel but ending in fortis or lenis consonants. Their speech was recorded in the Phonetics Lab at the University of Tartu using Speech Recorder BAS and the audio files were analyzed using the free computer software Praat.

The author of this paper recognizes that the sample size of ten people is too small to draw any large-scale conclusions. Nevertheless, it is still a beneficial step towards further research and contributes to the existing findings regarding the pronunciation of Estonian learners of English. Especially since valid vowel measurements provide valuable information about human language systems, material for comparison of different languages, and the relationships between first and second languages (Yang 2022: 261).

This thesis has two main chapters. The first chapter covers the reasons pre-fortis clipping occurs in English, discusses the differences regarding two major varieties, British English and American English, and gives an overview of similarities and differences concerning English and Estonian consonants, vowels, and prosody. It also explores the findings of previous studies.

The second chapter focuses on the analysis of the speech recordings by Estonian learners of English in comparison with native speakers of English. First, there is an introductory part that presents the results of the questionnaire along with the nature of the experiment. Then, a comprehensive analysis and a comparison of the findings is presented. Lastly, a discussion of what the experiment revealed is provided.

1. VOWEL LENGTH IN ENGLISH AND ESTONIAN WITH EMPHASIS ON PRE-FORTIS CLIPPING

This chapter gives an overview of causes for pre-fortis clipping and why it should be taught to EFL learners along with the differences in American English and British English. In addition, it focuses on the similarities and differences concerning vowels, consonants, and prosody of the two languages. This is followed by an exploration of previous works and findings by other thesis writers along with researchers.

1.1. The Reasons for Pre-fortis Clipping in English and Two of its Varieties

The phenomenon of pre-fortis clipping comes naturally to native speakers of English. Jenkins (2000: 73–74) claims that this linguistic knowledge of different pronunciation elements is often purely subconscious, supporting the assertion with an example of fluent speakers being able to know that the KIT vowel /ɪ/ is clipped before a fortis consonant as opposed to a lenis one, consequently being able to predict which sound should follow the vowel. This idea is supported by Celce-Murcia et al (2010: 79) who stress the importance of teaching the notion of pre-fortis clipping to EFL learners as a clue for predicting the consonant in final position. Jenkins (2000: 141) also emphasizes that learners of English must be guided to make the length reduction before fortis consonants to avoid confusion, i.e. *seat* being pronounced as *sit*. She (2000: 141) suggests that the reason why pre-fortis clipping comes so naturally for proficient speakers but must be taught to learners is because producing a shortened vowel before a fortis consonant takes much less muscular energy and thus, learners might opt for articulatory comfort and be more inclined to choose a closest shortened vowel as opposed to using the necessary long vowel no matter the consonant.

Unfortunately, there is no way to confirm whether this reasoning is correct since the literature on the causes for pre-fortis clipping has not settled on one certain explanation. For instance, Stahlke (2003: 212) has proposed that if we primarily focus on the contrast of fortis

vs lenis consonants, the rule of vowel shortening among other rules may simply be a natural result caused by the phonetic properties of said consonants. Stahlke (2003: 200) agrees with Ladefoged and Maddieson (1996: 96) who have found that regarding articulatory movements, fortis consonants close more rapidly yet have a longer duration. Similarly, Chen (1970: 139) declares that based on his findings, it is probable that one or more articulatory factors must be the reasons vowel duration varies depending on the voicing of the consonant.

This idea of explaining the phenomenon of pre-fortis clipping as a product of “physiological constraints on articulation, phonation, or some combination of both” is challenged by Kluender et al (1988: 153). They (1988: 156) recognize that it is common to regard pre-fortis clipping as a natural and somewhat unavoidable notion that is caused by physics and the physiology of speech production. According to their results, vowel length differences appear to be general tendencies that speakers use “to signal phonological distinctions using an ensemble of mutually enhancing acoustic clues.” (Kluender et al 1988: 166). Although it is not possible to coherently state the reasons why vowel duration tends to vary depending on the consonants, it is clear that literature agrees on the fact that this phenomenon occurs in many languages (Chen 1970), most notably in English (Carley and Mees 2020: 131; Kluender et al 1988: 162).

British English (BrE) and American English (AmE) are two of the widely used varieties of English. A variety is a different form of the same language, distinguishable by pronunciation, grammar, and vocabulary (Collins et al 2019: 45). Collins et al (2019: 52) express that BrE is the type that students in Europe, Africa, India, and much of Asia are taught. Hence, a great part of the world speaks or is taught BrE.

In the United States, a General American accent has developed (Collins et al 2019: 53). This is known as the American pronunciation or the language that is spoken by those who do not have a distinguishable eastern or southern accent (Wells 2000: xiv). Spoken

AmE outside of the United States can be found in the Bahamas, Jamaica, and Suriname among other countries (Schneider 2008: 31). Also, there are ethnic varieties of AmE, such as African American Vernacular English (AAVE), Cajun Vernacular English, and Chicano English (Schneider 2008: 31). In addition, according to Anchimbe (2006: 6), AmE is becoming increasingly popular among L2 speakers of English due to the prestige associated with AmE and because it is vehicled by easily available American culture.

Although the differences between pre-fortis clipping produced by both American speakers of English and British speakers of English have not been thoroughly studied, the literature agrees that there is definitely a distinction between the two regarding this aspect. According to Dr Francis Nolan, an Emeritus Professor of Phonetics at the University of Cambridge, there is a lack of research and materials regarding pre-fortis clipping overall but also about AmE.¹ Thus, much of the materials available could be considered outdated but they are some of the only materials available.

According to Wells (1962), there have been reports that suggest vowels in AmE have a long/short contrast yet are not as distinctive as in BrE. This statement is supported by other research, such as a study by Kumar and Ojamaa (1973: 313) which demonstrates how native American English speakers do not feel or produce vowel length differences. In addition, Jones (1972: 356) has declared that it is common for American speakers of English not to have a consistent relationship with vowel duration since all their vowels may be uniformly long. Interestingly, non-native speakers of American English are sensitive to both vowel duration and quality (Kumar and Ojamaa 1973: 313) indicating that although the long/short contrast in native American English speakers might have a less distinctive vowel quality, non-native speakers of American English demonstrate a clear contrast between vowel lengths, hence they may be more prone to perform pre-fortis clipping.

¹ Personal communication, e-mail: February 15, 2024.

Wells (1962) also demonstrates how vowels /æ/ and /ɒ/ in BrE are short whereas the same vowels in AmE are long and indifferent, illustrating how a difference in the vowel system might be one of the causes for American and British speakers of English contrasting. Schneider (2008: 45) corroborates this by claiming that in Standard AmE pronunciation, the KIT, DRESS, and TRAP vowels may be lengthened by some speakers, although as checked vowels, they should remain invariant. Also, the FLEECE vowel is most likely to be long if followed by lenis consonants and be pronounced without added length if situated pre-fortis (Schneider 2008: 46). Nevertheless, both Wells (1962) and Jones (1972: 356) agree that since in some types of British English the speakers differentiate between short and long vowels, the pre-fortis shortening is much sharper in British English.

1.2. Comparison of Estonian and English Vowels, Consonants, and Prosody

There are many differences between English and Estonian regarding vowels, consonants, and prosody. On the one hand, these differences may cause problems for Estonian learners of English in producing pre-fortis clipping, mainly because this phenomenon does not occur in their L1 Estonian language. On the other hand, the quantity system specific to Estonian might actually be of help to learners of English in sounding more native-like. Although pre-fortis clipping is not an aspect of the Estonian language, Estonian learners of English should be familiar with varying vowel duration as a result of their knowledge of the Estonian degrees of quantity. Consequently, they might have a subconscious skill to recognize vowel length differences.

Jones (1972: 233) divides the English vowels into two based on their length. The vowels /i:/, a:/, ɔ:/, u:/ and /ɜ:/ are considered ‘long’ vowels and the remaining as ‘short’ vowels, such as /ɪ, e, æ, ə, ʊ, ʌ, ə/ (Jones 1972: 235). According to Gonet and Stadnicka (2005: 77), the vowel duration in English can be influenced by either intrinsic or extrinsic variability. This type of ‘short’ and ‘long’ distinction by using the IPA symbol ‘:’ is called

intrinsic variability (Gonet and Stadnicka 2005: 77). Extrinsic variability in vowel duration has been defined by Wells (1995: 136, cited in Gonet and Stadnicka 2005: 78) as the effect of ‘clipping’ that fortis obstruents have on vowels. Therefore, in the case of pre-fortis clipping, the vowel duration is directly influenced by extrinsic variability. Both ‘short’ and ‘long’ vowels are subject to being clipped if followed by a voiceless consonant, even ‘short’ vowels as they tend to be longer in length when followed by a voiceless consonant (Jones 1972: 235).

The ‘long’ and ‘short’ vowels are also known as ‘free’ and ‘checked’ respectively (Carley and Mees 2020: 130). According to Carley and Mees (2020: 130), all checked vowels are monophthongs and free vowels can be both monophthongs and diphthongs. Diphthongs are sounds that undergo a change or a glide in the space of a syllable without a possibility of a break and while performing the movement, also change the tongue shape of a speaker (Collins et al 2019: 206). English diphthongs are /eɪ, aɪ, ɔɪ, aʊ, əʊ, ɪə, ʊə/ (Carley et al 2018: 139). Carley and Mees (2020: 131) hold that English diphthongs can also be clipped but only on the first part, not the glide. Since the shortening of diphthongs is not as distinct, this study focuses on monophthongs for the purpose of getting a clearer understanding of Estonian EFL learners’ pronunciation.

Compared to the vowels of English, Estonian has a total of nine vowels: /i, y, u, e, ø, ɤ, o, æ, ɑ/ (Asu and Teras 2009: 368). The Estonian monophthongs are divided into two with /a, e, i, o, u/ being the primary vowels and the remaining /y, ø, ɤ, æ/ being secondary vowels (Asu et al 2016: 20). This is a division based on the fact that primary vowels occur in both initial and noninitial syllables whereas secondary vowels usually do not occur in noninitial syllables nor as second vowels in diphthongs (Asu et al 2016: 20). Asu et al (2016: 21) assert that in syllables with primary stress, all nine Estonian vowels are subject to occur as short or long monophthongs. In Estonian, monophthongs are long when two short vowels appear

alongside each other (Viitso 1981: 67), like in the case of *ma* (pronoun I) and *Maa* (the Earth). Interestingly, long vowels can only exist in primary stressed syllables (Asu et al 2016: 21). Incidentally, vowels in stressed syllables are nearly never reduced (Asu and Teras 2009: 369) and vowel reduction may only happen in unstressed syllables (Eek and Meister 1998: 232). Thus, compared to English vowels, the clipping of vowels in Estonian is more concerned with sentence level instances such as stress and quantity as opposed to surrounding sounds such as consonants.

Consonants are likewise divided into two in English yet on the basis of voice instead of length. As explained by Ladefoged and Maddieson (1996: 95), there are three main ways to name the consonant categories based on vocal cord vibration, strength, and kinesthetics. These terms are voiced *vs* voiceless, fortis *vs* lenis, and tense *vs* lax, respectively (Ladefoged and Maddieson 1996: 95). To this, Jones (1972: 43) adds that voiceless consonants are also known as breathed consonants. Voiceless consonants in English are /p, t, k, tʃ, f, θ, s, ʃ, h/, which are the consonants that cause pre-fortis clipping (Carley and Mees 2020: 9). Voiced consonants are /b, d, g, dʒ, v, ð, z, ʒ, m, n, ŋ, l, r, j, w/ (Carley and Mees 2020: 9).

In Estonian, the division of voiced and voiceless consonants is generally the same. Regarding plosives, Asu and Teras (2009: 368) acknowledge that Estonian plosives /p, t, k/ are also pronounced as voiceless and their counterparts /b, d, g/ can become partly or fully voiced, however, only in spontaneous speech and in an intervocalic position. Interestingly, voiced consonants /m, n, r, v, l/, which are also regarded as voiced consonants in English, become unvoiced in Estonian if they are positioned word-finally and follow the sounds /t, h, s/ (Asu and Teras 2009: 368). Contrary to native English phoneme inventory, Asu and Teras (2009: 368) argue that the fricatives /f/ and /ʃ/ are foreign to native Estonian inventory. Also, the generally voiced letter ž is pronounced as unvoiced in Estonian (Ariste 1953: 106). Another fascinating distinction regarding fortis and lenis consonants is that when in English

almost every voiceless consonant has a corresponding voiced consonant (Jones 1972: 43), Estonian only has one consonant pair based on voice: voiced /v/ and a voiceless /f/ (Asu et al 2016: 66).

The quantity of phonemes is known as the time that it takes to produce a sound (Ariste 1953: 89). Many languages have degrees of quantity, but the duration of vowels is slightly more complicated in Estonian due to having three degrees of quantity (Asu and Teras 2009: 370). Ariste (1953: 91) concurs that Estonian recognizes three phonological lengths: Q1² (*kalu* ‘fish’ plural), Q2 (*kaalu* ‘weight’s’ in the genitive case) and Q3 (*kaalu* ‘weight’ in the partitive case). However, he (1953: 91) believes that to pronounce Estonian words correctly, one must use five phonetic lengths: short (Q1), long (Q2), overlong (Q3), partly long (the second syllable of *kalu* ‘fish’ plural), and in the middle of long and overlong lengthwise (first syllable of *kooki* ‘cake’ in the partitive case). These quantities are essential to Estonian prosody since the different length vowels mark both lexical meaning and grammatical function (Asu and Teras 2009: 370).

One of the biggest differences between the two languages regarding this topic is the distinction of vowel quality and quantity and to which either language pays more attention. In English, the environment of a vowel occurring before a fortis consonant impacts the duration of the vowel, but Estonian vowel length can vary regardless of the environment due to having a purely phonological quantity system (Ariste 1953: 90). Thus, since English does not have a distinguished quantity system, the primary attention falls on vowel quality. This was demonstrated by Asu et al (2016: 149) by explaining that the main difference in phoneme pairs in English such as /i:/ and /ɪ/ (sheep vs ship) and /ɑ:/ and /ʌ/ (car vs cup) lies in their quality. In Estonian, however, the primary attention is on quantity and therefore, the different length vowels are usually seen as counterparts of one phoneme (Asu et al 2016:

² Q = Quantity

149), which means that long vowels are produced by double vowels (Asu and Teras 2009: 389).

Regarding muscle energy and tension when articulating sounds in English and Estonian, Mutt (1965: 55) describes how laxness or lack of tension is unique to English pronunciation whereas on the contrary, Estonian is characterized by average tenseness. According to Jones (1972: 39), tenseness is a degree of muscular tension where tense sounds need much more muscular tension in the tongue as opposed to lax sounds, especially in regard to vowels. Therefore, according to Mutt (1965: 55), English vowels can be described as somewhat sluggish and slurred and English consonants as dull and dark compared to the generally clearer sounds in Estonian among other languages. This comment of lack of tension is in accordance with the reasoning Jenkins (2000: 141) offers as for why learners of English tend to opt for a lax vowel due to there being less muscular energy needed to produce the sound.

Much of the literature above pointed out differences in both vowel and consonant systems of the two languages as well as the different approaches of vowel quality and quantity. However, based on these elements, Estonian learners of English should be able to make the distinction of shorter vowels before a fortis consonant and longer vowels if they are followed by a lenis consonant due to the intricate quantity system of Estonian. Consequently, they should be used to producing vowels of different length and thus are expected to subconsciously recognize that vowel duration varies in English as well.

1.3. Previous Studies on Pre-Fortis Clipping

The existing previous studies focusing on pre-fortis clipping in EFL learners have been conducted by university students in their MA and BA thesis papers (Taothong 2022; Hrychová 2015). However, this has never been studied in Estonian EFL learners before. Also, there is a lack of material of native speakers of English producing pre-fortis clipping.

Most of the current research has examined pre-fortis clipping in connection to some other circumstance, such as the progress of performing the vowel shortening after having spent some time in an English-speaking environment (Hyrchová 2015; Mitleb 1981) or seeing whether it is a phenomenon that occurs in multiple different languages (Chen 1970).

In a comparison of Czech and native speakers of English, Fejlová (2014: 98) found that the phenomenon of pre-fortis shortening was harder to detect in fluent speech, even in the speech of native speakers but was easily found when comparing cognate pairs in isolation, concluding that it clearly might have been due to many other factors affecting the duration of vowels in fluent speech.

A year later, another study (Hyrchová 2015) was conducted where Czech and native speakers of English were compared by letting the participants read a text which included minimal pairs containing the same vowel but a differently voiced consonant in the final position. The study demonstrated how although the phenomenon occurred in Czech EFL learners' speech, it was not nearly as sharp as in the speech of native speakers of English. In addition, the same study analyzed the speech of two students who had spent an unknown yet longer period in an English-speaking country and compared their speech to other students at the same level (C1) who had never spent time in Canada or the USA. The results showed that the students who had spent time abroad performed a significantly longer vowel before lenis consonants, making the distinction between pre-fortis and pre-lenis vowel length to a greater extent. The study recognized that the sample size was too small but, nevertheless, the author deduced that being exposed to the natural environment of English might have an impact on vowel duration (Hyrchová 2015: 43).

The discovery that people may perform better or more native-like at pre-fortis clipping after spending time abroad was also made by Mitleb (1981). His experiment (1981: 703) looked at the vowels preceding /t/ and /d/ consonants of Arab speakers of English,

Jordanians who had spent time in an English-speaking environment, and native speakers. Mitleb (1981: 703) concluded that the Jordanians who had spent time abroad were situated between Arab speakers of English and native speakers, meaning, their pre-fortis clipping before /t/ and /d/ consonants was more native-like compared to Arab speakers of English.

Chen (1970: 130) conducted a cross-linguistic experiment of vowel duration before voiced and voiceless consonants in languages such as English, French, Russian, and Korean. In the case of English, Chen (1970: 136) considered seven word pairs out of which six contained the TRAP vowel and one the KIT vowel. Only the first three word pairs, lap/lab, fat/fad, and lack/lag can be considered relevant to the present case study as all the other word pairs have a sonorant between the vowel and a final fortis or lenis consonant. Among other results, Chen (1970: 138) describes that voiced codas do influence its preceding vowel to a degree, yet the extent varies depending on the language. Consequently, Chen (1970: 138) emphasizes that compared to other languages used in the study, the vowel length mean difference was largest in English, meaning that the vowel duration in English shows the most drastic range. However, Kluender et al (1988: 163) claim that the evidence cited by Chen (1970) was unbalanced and that the “cross-language variable was virtually always confounded with other variables known to influence the size of the VLE³.”

The findings of Gonet and Stadnicka (2005: 83) demonstrate that out of the durations of the four front vowels, FLEECE, KIT, DRESS, and TRAP, the FLEECE vowel was extensively clipped whereas the remaining three underwent less extensive shortening. Regarding research about Polish EFL learners, Gonet and Pietrón (2003) concluded that the learners had most trouble with preserving the correct intrinsic duration of /i:/-/ɪ/ and /e:/-/æ/ vowels. In addition, Gonet and Stadnicka (2005: 84) have found that FLEECE and TRAP vowels are more susceptible to being clipped.

³ VLE = vowel length effect

Unfortunately, regarding Estonian research, there is not much to draw from. Nevertheless, Ader and Miljan (2015) have conducted a study to examine the external factors of L2 English pronunciation during which they looked at the vowel production among other elements. They did so by recording speech samples of 97 L1 Estonian informants and comparing them to a native speaker of British English (Ader and Miljan 2015: 25). They (2015: 27) noticed that compared to the BBC accent⁴ of English, the Estonian L1 speakers tended to produce L2 English vowel quality similar to their L1 Estonian sounds. Although their English vowels sounded more Estonian than English, Ader and Miljan (2015: 27) claimed that the informants were good at distinguishing quantity over quality due to their L1 Estonian interference.

To conclude, this case study will be examining how Estonian learners of English produce pre-fortis clipping and based on the literature and the previous study by Ader and Miljan (2015), Estonian learners of English should be able to easily distinguish between short and long vowels. Consequently, they should produce pre-fortis clipping well by benefitting from the quantity system of Estonian and their subconscious skill to distinguish different vowel durations.

2. CASE STUDY OF PRE-FORTIS CLIPPING BY ESTONIAN LEARNERS OF ENGLISH

This chapter describes the selection of participants and their responses to the questionnaire they were required to answer before the pronunciation test. It also explains the nature and methodology of the study. Finally, the results of the test are provided along with a discussion of the outcomes.

⁴ Also known as Received Pronunciation (RP) or ‘the Queen’s English’ is a variety of English pronunciation mostly associated with people of privilege and prestige (Collins et al 2019: 46).

2.1. Selection of Participants

There were two groups of participants. The first group of participants were three native speakers (NS) that formed the control group of the study. These three people acquired through formal channels were given the codes N01, N02, and N03 for natives 1–3 to respect their anonymity. The criteria for the NS was that they had to have been born and grown up in an English-speaking environment and that they were over the age of 18. It was also important for there to be more than one person in the control group for a more comprehensive overview of pre-fortis clipping among natives. The mean age of the control group was 46.3 years, ranging from 39 to 51.

The second group consisted of ten non-native speakers (NNS). Five of them were second- or third-year English philology students at the University of Tartu during the time of the study. These participants were given a code letter P for philology and a number from 1 through 5 to ensure their anonymity. The other students were from the Pallas University of Applied Sciences in addition to one psychology student from the University of Tartu. These group members were given a code letter S for student and a number from 1 through 5 for them to remain anonymous. All of the ten participants were acquired through informal channels by a relation to the author. The criteria for the experimental group was for them to be over the age of 18 and to be Estonian learners of English. The mean age of the experimental group was 24.4 years, ranging from 20 to 48.

2.2. Linguistic Background Questionnaires

Both the native speakers and non-native speakers were asked to fill in a questionnaire about their linguistic background as well as their own interpretation of how confident they were in their English skills. The participants answered the questionnaire on paper when they arrived at the Phonetics Lab, before doing the pronunciation test. The questionnaire for the

NS (see *Appendix 1*) contained 11 questions and the one for the NNS (see *Appendix 2*) had 13 questions.

According to the answers of the NS questionnaire, all three natives regarded English as their mother tongue, in addition to Estonian for N03 (Q1). Also, out of the three subjects, two were male and one female (Q3).

Regarding their birthplace (Q4) and countries where they have spent the majority of their lives (Q5), N01 answered the United Kingdom for both. The other two natives had been born in the United States which is where N03 has also spent the majority of their life in addition to the United Kingdom whereas N02 has lived in Germany the longest. Thus, the varieties they use (Q9) are BrE for N01, AmE for N02, and AmE with some BrE influence for N03.

All of the subjects rated their English pronunciation at a level C2 (Q6). Natives N02 and N03 had never been taught English pronunciation at school while N01 was not sure (Q7). Thus, all of the subjects left Q8 unanswered where they were asked to specify the education level in which they were taught pronunciation.

The answers to the last questions revealed that they all speak other languages (Q10). As they were asked to name the languages and CEFR levels⁵ (Q11), all of the subjects noted Estonian, B2 level for N01 and N02, and close to native by N03. Natives N01 and N03 also speak French, with levels of A1 and B2 respectively. In addition, N01 wrote down German (C2), Swedish (C1), and Pite Sami (B1). Participant N03 noted that they speak German, Spanish, and Scots Gaelic with a lower proficiency compared to their Estonian and French levels.

⁵ Common European Framework of Reference for Language (CEFR) levels: A1 (beginner), A2 (elementary), B1 (intermediate), B2 (upper-intermediate), C1 (advanced), C2 (proficiency)

All of the NNS spoke Estonian as their mother tongue (Q1) and were female (Q3). Out of the ten subjects, nine started their English studies in elementary school whereas S04 started in middle school (Q4).

Similarly, nine subjects answered with an affirmative regarding whether they had ever been taught English pronunciation at school (Q8) while S03 answered with a “no”. Those who had been taught English pronunciation were asked to specify the education level (Q9). Students who were not English philology students had been taught pronunciation in elementary school (S01, S02, S05) and middle school (S04). However, all of the English philology students chose “university” as well as high school (P02) and elementary school (P04).

All of the English philology students rated their English skill (Q5) as “very good” whereas the other subjects rated it as “good” (S01, S02, S03, S05) or “satisfying” (S04). In addition, regarding English pronunciation (Q6), philologists ranked themselves at C1 level (P02, P04, P05) and B2 level (P01, P03). Similarly, S03 and S05 rated their pronunciation at C1 level, subjects S01 and S02 at a B2 level, and S04 at level A1.

The choice of variety (Q7) was more specific for English philology students as four (P01, P02, P03, P05) selected BrE and P04 both BrE and AmE as a mix. On the contrary, subjects S02, S03, S04, and S05 chose the option “not sure” while S01 also admitted to speaking a blend of BrE and AmE but felt more inclined towards AmE.

Regarding the context in which the participants use English most (Q10), all of the philologists and S01 except for P03 chose all the options available and even added “at work” (P05) and “at school” (P01, P04). The rest of the subjects chose “watching movies/shows” (S02, S03, S04), “reading books” (P03, S03), “listening to music/podcasts” (S02, S03, S04, S05), and “communicating” (S04).

The majority of the NNS participants do not feel the need to sound native-like (Q11) yet P01, P02, S04, and S05 do. P03 felt that it depended on the situation. Out of all the experimental group participants, only one (P05) has spent considerable time in an English-speaking environment by working in the United States for three months (Q12–13).

2.3. Pronunciation Test

A pronunciation test was conducted to observe and measure pre-fortis clipping by Estonian EFL learners. Since this is a small case study, the pronunciation test concentrated on the pre-fortis clipping of the four front vowels: FLEECE /i:/, KIT /ɪ/, DRESS /e/, and TRAP /æ/. This choice was based on the findings by Gonet and Pietrón (2003) regarding Polish EFL learners. Also, monosyllabic words were chosen because research shows that compared to connected speech, the clipping is much more noticeable in isolated monosyllables (Gonet and Stadnicka 2005: 84; Fejlová 2014: 98).

The test contained 24 monosyllabic words for analysis, represented in Table 1. Each front vowel was represented by six words or three word pairs: three of which ended with a fortis consonant and three with a lenis consonant. In addition, there were 24 filler monosyllabic words to ensure that the participants could not decipher what they were tested on. The test also included two warm-up words. All in all, there were 24 main words, 24 filler words, and two warm-up words, a total of 50 words. Both the main words and filler words were repeated three times in a random sequence.

Table 1. Words used in the pronunciation test according to the vowel.

Vowel	Lengthened	Shortened
FLEECE /i:/	seed /si:d/ bead /bi:d/ leave /li:v/	seat /si:t/ beat /bi:t/ leaf /li:f/
KIT /ɪ/	his /hɪz/ bid /bɪd/ wig /wɪg/	hiss /hɪs/ bit /bɪt/ wick /wɪk/
DRESS /e/	bed /bed/ dead /ded/ said /sed/	bet /bet/ debt /det/ set /set/
TRAP /æ/	rag /ræg/ mad /mæd/ lab /læb/	rack /ræk/ mat /mæt/ lap /læp/

The pronunciation test was first created in a digital document in which the author made sure that the same words never appeared side by side in the set random sequence. Then, the words were transferred over into the free recording software program Speech Recorder BAS⁶ that the Phonetics Lab of the University of Tartu mainly uses for similar production tests. Using Speech Recorder BAS made the process much easier since the presentation section was already in the program and the audio files were automatically saved in .wav format. This made analyzing the files in Praat effortless in the sense of not having to convert any of the audio files to fit into another program.

A pilot test was constructed by the author of the thesis with the help of Anton Malmi, a researcher at the Phonetics Lab after the pronunciation test had been created in the Speech Recorder program. The pilot test was conducted on one person. This test was done to ensure that everything was clear for the participants and whether something had to be changed. The feedback confirmed that the test had been uncomplicated and due to the number of words, it had been almost impossible to focus on decoding the purpose of the test, affirming the

⁶ The acronym BAS stands for Bavarian Archive for Speech Signals which is an institution that created the program at the Ludwig Maximilian University of Munich (Ludwig Maximilian University of Munich 2023).

necessity of the number of filler words. The pilot test also allowed the author to see an estimate of how long one test would take, resulting in approximately 15–20 minutes.

The pronunciation test took place at the Phonetics Lab of the University of Tartu⁷ over two weeks in March 2024. Upon arrival, the participants were first asked to fill out the background questionnaire. Then they were guided to the recording booth where the author explained to them what the test was going to be like and what was expected of them. The participants were instructed to wait for the green light on the traffic light of the Speech Recorder program to start speaking. Also, they were asked to pronounce the words normally, not by exaggerating or slowing down their speech. Since the slides of the words were changed by the author in the control room, the tempo was controlled by the author. To ensure that the instructions were clear, the first two words were warm-up words. Then there was a pause for the author to communicate with the participants to reassure them or to repeat the instructions. After the pause, the participants were informed that the real test would then follow.

2.4. Methodology

The speech samples were analyzed using a version 6.3.18 of the free computer software called Praat. This program was created by Paul Boersma and David Weenink for the purpose of analyzing, synthesizing, and manipulating speech (Boersma and Weenink n.d.). Both acoustic and auditory analysis were applied because the borders of the vowels were created both by listening to the files as well as examining the waveforms and spectrograms. However, only acoustic measurements include duration (Yang 2022: 261) and thus, this methodology focused more on acoustic analysis.

⁷ The Lab is part of the Institute of Estonian and General Linguistics at the University of Tartu (Institute of Estonian and General Linguistics n.d.).

According to Wright and Nichols (2015: 1) it is helpful to identify vowels from consonants by looking at the formants. A formant is “a resonance of the vocal tract” (Titze 2000: 156) meaning that formants represent frequencies created by a human vocal tract (Titze 2000: 153). More specifically, in acoustics, formants constitute the absolute or relative maximums in a spectrogram (Acoustical Society of America 1994, cited in Wolfe n.d.).

Image 1 shows the spectrogram section of the word in the Praat window. The dotted lines indicate the probable formants highlighted by the program on the basis of the slightly darker sections of the spectrogram. Since the counting of formants starts from the bottom, the first line is the first formant or F1 (Ogden 2009: 33) which is what the author of the thesis considered the most.

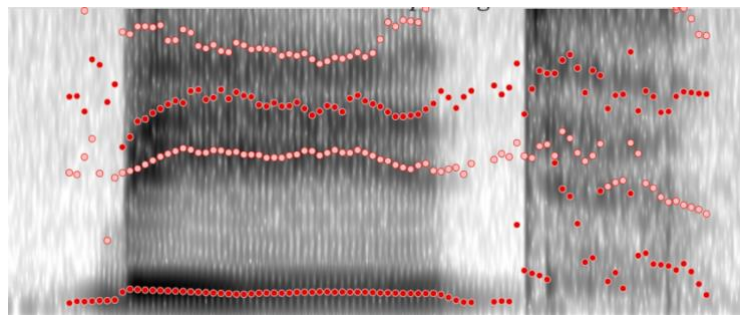


Image 1. Spectrogram of the word *bead*.

After examining the bursts or turbulences of some initial consonants, such as fricatives (Wright and Nichols 2015: 2) and identifying the formant bands in addition to listening to the files, it was possible to establish the approximate borders of a vowel. However, transitions at the beginning and end of a vowel were left out. This is done to get a clear sound of a vowel because in the transitions, the vowels are often merged with surrounding sounds. Thus, the clear vowel duration is not from one border to another, but a percentage is left out at the beginning and the duration ends slightly before F1 ends, as shown in Images 2 and 3.

Image 2 and Image 3 illustrate the pronunciation of the words *bead* and *beat* by N01. The highlighted section with a pink hue and a yellow text background shows the waveform, spectrogram, and formants of the selected vowel. It also signifies the duration of the vowel.

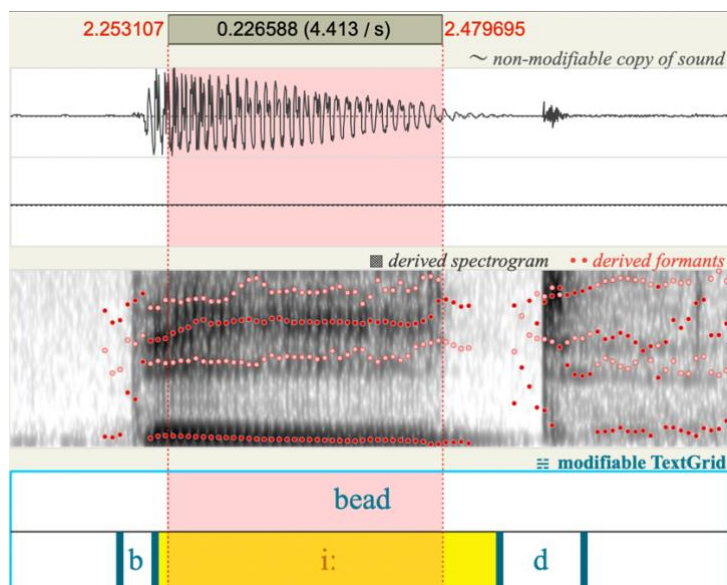


Image 2. Sample of N01's pronunciation of the word *bead*.

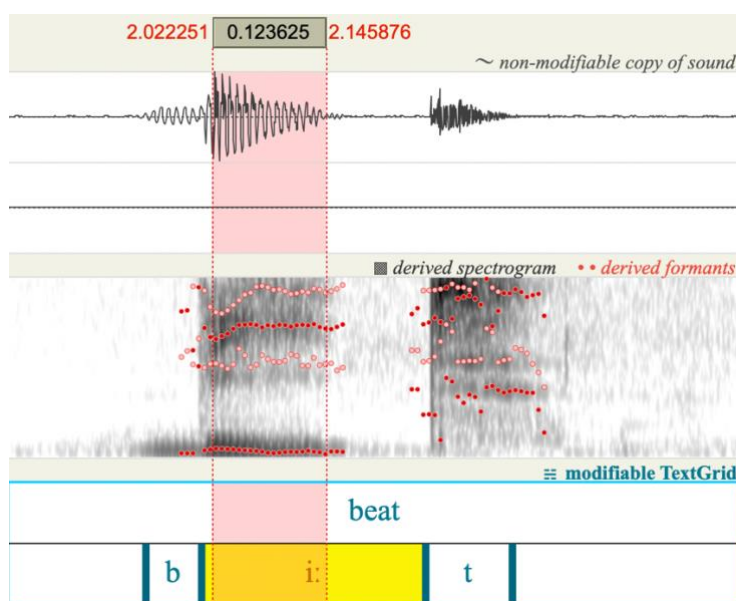


Image 3. Sample of N01's pronunciation of the word *beat*.

2.5. Results of the Case Study

This section begins with an overview of the results of the native speakers (*see Appendix 3*). The mean lengths of each speaker as well as the cumulative means are

represented in Table 2. The vowels FLEECE, KIT, and TRAP were twice as long before voiced consonants as opposed to appearing pre-fortis. The DRESS vowel was 1.5 times shorter when positioned before a voiceless consonant. Thus, the native speakers produced pre-fortis clipping clearly and sharply. The results highlighted in the “native mean” row are the calculations that the results of the non-native speakers were compared to.

Table 2. Mean results (ms) of the native speakers.

Participants	Vowels							
	FLEECE /i:/		KIT /ɪ/		DRESS /e/		TRAP /æ/	
	pre-lenis	pre-fortis	pre-lenis	pre-fortis	pre-lenis	pre-fortis	pre-lenis	pre-fortis
N01	269	118	131	62	171	96	199	89
N02	204	117	121	59	138	98	230	128
N03	248	116	147	70	163	106	274	104
Native mean	240	117	133	64	157	100	234	107

The results of the pronunciation test for the NSs demonstrate that pre-fortis clipping occurs in the speech of both the speakers of BrE and AmE. Since three of the vowels were clipped half in length and the DRESS vowel 1.5 times in length, it can be concluded that the clipping is noticeable and sharp. Although there is no drastic distinction between the durations of the BrE speaker (N01) in comparison with the AmE speakers (N02 and N03), participant N01 produced the shortest TRAP vowel in both pre-lenis and pre-fortis positions. This coincides with Wells (1962) who has claimed that the TRAP vowel is considered short in BrE and long in AmE.

The native N03 acknowledged that due to them spending the majority of their life in both the United States and the United Kingdom, they speak AmE with some BrE influence. This can be considered true as the FLEECE and DRESS durations of N03 are more similar to the results of N01, a BrE speaker. However, their pre-fortis TRAP and KIT vowels were

the longest, a lengthening that the speakers of AmE often do (Wells 1962; Schneider 2008: 45).

Compared to the results of Chen (1970), the lengths of the natives' TRAP vowels are generally shorter. While the mean result of the pre-fortis TRAP vowel illustrated by Chen is 161 ms, none of the natives in this study lengthened the vowel to that extent. Moreover, the mean duration for N01 is almost half of that, below 100 ms. Also, Chen measured the mean length of the pre-lenis TRAP vowel at 321 ms whereas the mean durations of the natives of this case study remain under 300 ms, the result of 274 ms by N03 being the closest to the findings of Chen. Nevertheless, the durations of vowels pre-lenis and pre-fortis presented by Chen differ by 50%. This means that in both studies, the natives clipped the length of the TRAP vowel by half if positioned pre-fortis.

Overall, the results of the natives are according to expectations. The clipping is distinguishable and visible. Also, the mean duration of the KIT vowel is shortest in both pre-lenis and pre-fortis positions while the mean duration of the FLEECE vowel is the longest. The mean duration of the DRESS vowel falls between the durations of the KIT vowel and the TRAP vowel. This shows that the NSs managed to keep the intrinsic variability of the vowels even while the vowels were influenced by extrinsic variability (cf. Gonet and Stadnicka 2005: 78).

In the case of the non-native speakers, it is most productive to first look at the general results according to vowels due to the somewhat large number of participants (*see Appendix 4*). Also, this allows for an easier comparison in the discussion section. The Estonian EFL learners were considered separately since there appeared some minor differences in their results. Thus, they were divided as “non-philologists” for students with the code S and “philologists” for students with the code P. The results are shown in Figures 1–4 in which

the x-axis represents the participants and the y-axis the mean length of a vowel in milliseconds.

It is important to note that in the case of both S02 and S04, the FLEECE vowel in the word *bead* could not be included in the calculations of the mean length due to them producing the DRESS vowel instead. In addition, S04 produced the PALM vowel in place of the TRAP vowel in the words *rag* and *lap*. Since the PALM vowel is a back-central vowel (Carley and Mees 2020: 162), the vowel lengths of the mentioned words were regarded as inadequate and were left out of the calculations because the focus was on front vowels.

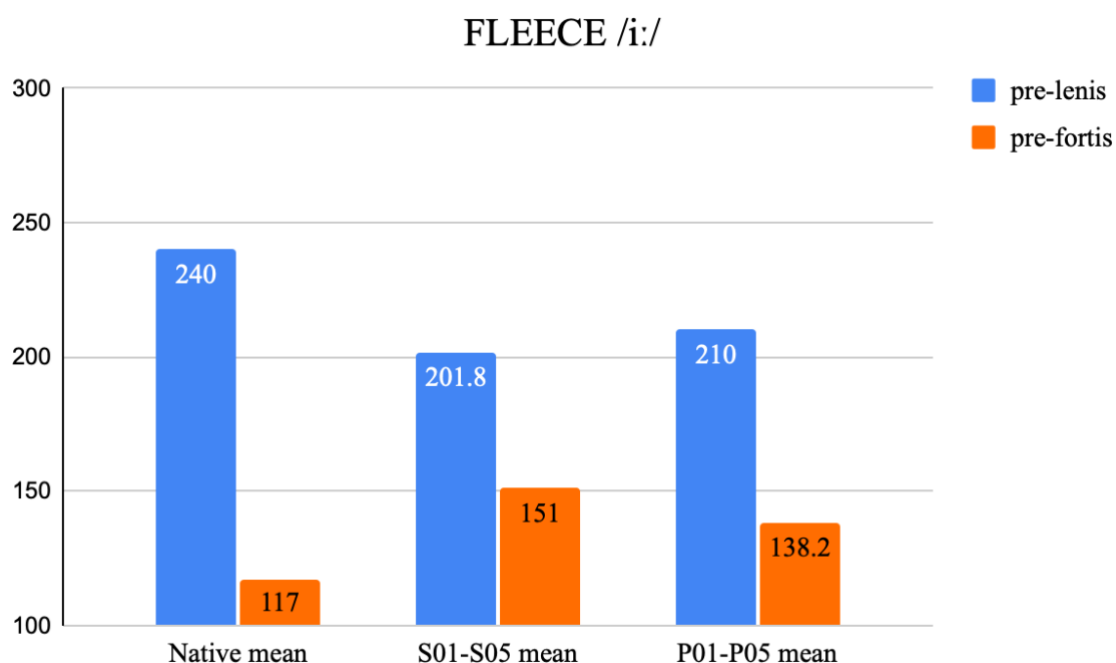


Figure 1. The mean length (ms) of the FLEECE vowel before lenis and fortis consonants in natives, non-philologists, and philologists.

Figure 1 shows that the mean length of the FLEECE vowel before lenis consonants is over 200 ms for all the participants. The pre-lenis vowel duration of Estonian EFL learners is not as long as the natives. While the native mean stands at 240 ms, the mean for non-philologists is 201.8 ms and 210 ms for philologists.

However, there is a clear distinction between vowel duration before a lenis consonant and before a fortis consonant in the results of all the participants. Since the native mean for

the pre-fortis vowel is at 117 ms, the duration is twice as short in comparison with the duration of the pre-lenis vowel. For Estonians, the clipping was not as sharp. While the philologists produced the pre-fortis FLEECE vowel 1.5 times shorter, the non-philologists' vowel was 1.3 times shorter.

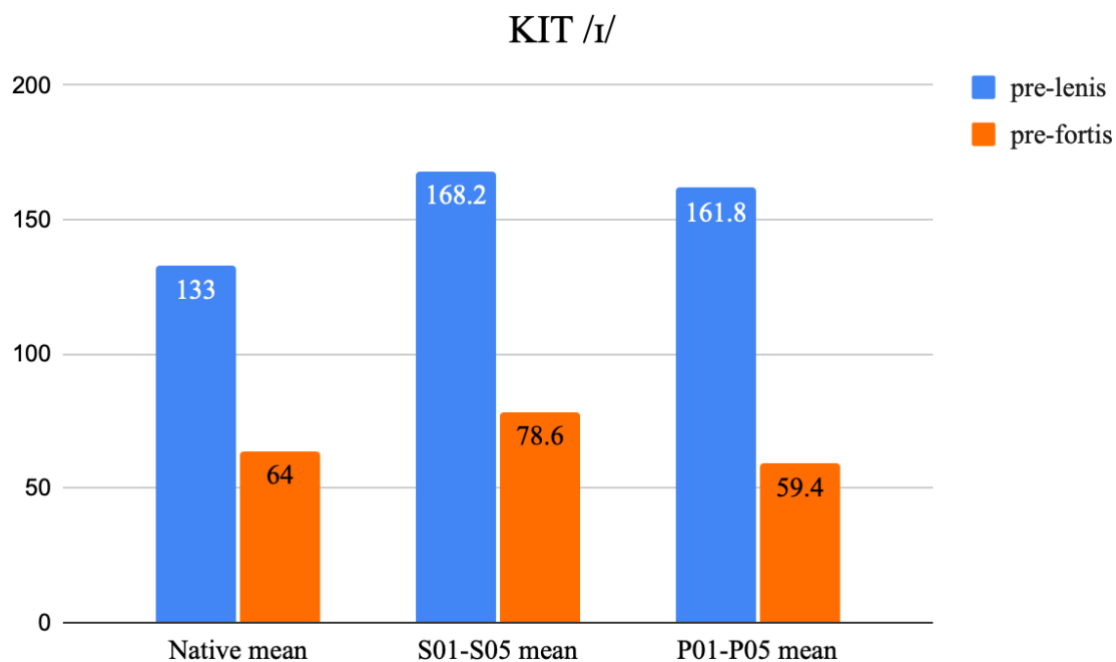


Figure 2. The mean length (ms) of the KIT vowel before lenis and fortis consonants in natives, non-philologists, and philologists.

In the case of the KIT vowel (*see Figure 2*), the vowel length mean preceding lenis consonants for natives is 133 ms and the vowel length pre-fortis stands at 64 ms. Again, the natives shortened the pre-fortis vowel approximately twice in length. Regarding non-philologists, the vowel length before lenis consonants surpasses the length of the native mean by on average 30 ms. Thus, the duration of the pre-lenis KIT vowel of non-philologists and philologists was 168.2 ms and 161.8 ms respectively.

Moreover, the mean length of the KIT vowel before a fortis consonant produced by non-philologists also surpassed the mean duration of the natives but only by 14.6 ms. English philology students clipped the vowel even more sharply than natives, making the mean

length of the pre-fortis KIT vowel 59.4 ms. Nevertheless, all of the participants shortened the duration of the KIT vowel preceding fortis consonants by half.

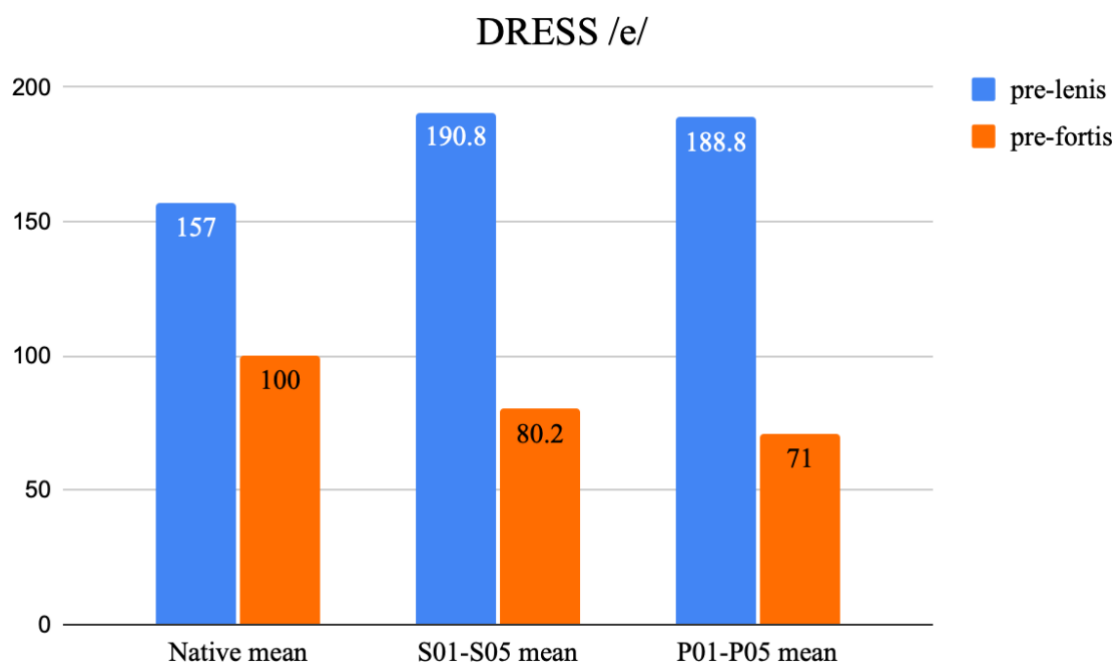


Figure 3. The mean length (ms) of the DRESS vowel before lenis and fortis consonants in natives, non-philologists, and philologists.

The native mean duration of a pre-lenis DRESS vowel is 157 ms (*see Figure 3*). The same duration was greater than 157 ms for both non-philologists as well as philologists. The difference between the durations of the latter two is minimal, only 2 ms. Thus, the non-philologists lengthened the pre-lenis vowel to 190.8 ms while the same vowel duration of the philologists is 188.8 ms.

On the contrary, Estonians performed a much sharper clipping than natives, resulting in a shorter duration if the vowel was followed by a fortis consonant. While the pre-fortis vowel duration remains at exactly 100 ms for the natives, the same vowel duration by non-philologists is 80.2 ms. Moreover, philologists shortened the vowel a further 9.2 ms, resulting in a duration of 71 ms.

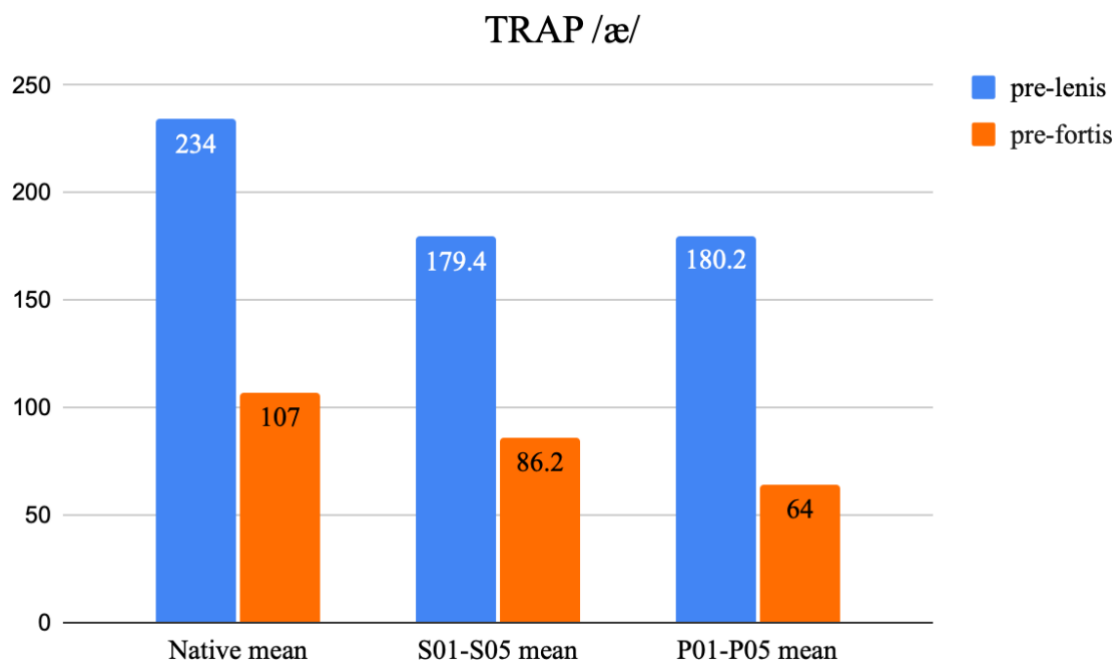


Figure 4. The mean length (ms) of the TRAP vowel before lenis and fortis consonants in natives, non-philologists, and philologists.

Figure 4 illustrates the duration of the TRAP vowel before lenis and fortis consonants. The mean vowel duration before lenis consonants for natives stands at 234 ms. The results of the Estonian non-philologists and English philology students are similar, both around 180 ms. The pre-lenis vowel duration of Estonian EFL students is 179.4 ms while the philologists' result maintains at 180.2 ms.

Similarly to the DRESS vowel, the mean pre-fortis TRAP vowel length produced by natives is 107 ms. Also, the pre-fortis vowel duration for all of the Estonian participants is shorter in comparison with the natives. The duration of the TRAP vowel preceding a fortis consonant is 86.2 ms by non-philologists and 64 ms by English philology students. Thus, both native speakers and non-philologists clipped the vowel duration by half whereas philologists shortened the vowel length by almost three times.

Out of the ten Estonian EFL learners, two participants surpassed the results of the natives more than a few times as illustrated in Table 3. In the case of S04, the durations of the FLEECE and KIT vowels both pre-lenis and pre-fortis are considerably longer than the

durations of the natives. Also, only the pre-fortis DRESS vowels and pre-lenis TRAP vowels are shorter than the results set by the native mean. Since S04 considered herself to have the pronunciation level A1, it could be that she took extra time and caution to pronounce the words as clearly as possible and in turn excessively lengthened the vowels.

The participant P05 also elongated the duration of the FLEECE and KIT vowels in both pre-lenis and pre-fortis positions. Also, her pre-lenis DRESS vowel was noticeably longer than the result of the native mean. In contrast with S04, the results of the TRAP vowel are both shorter than the durations of the natives. It is not clear what the reason for this might have been as she ranked her English pronunciation at a C1 level and uses English for numerous purposes, including at work.

Table 3. Mean results (ms) of S04 and P05 in comparison with the native mean.

Participants	Vowels							
	FLEECE /i:/		KIT /ɪ/		DRESS /e/		TRAP /æ/	
	pre-lenis	pre-fortis	pre-lenis	pre-fortis	pre-lenis	pre-fortis	pre-lenis	pre-fortis
Native mean	240	117	133	64	157	100	234	107
S04	248	182	219	111	249	93	190	117
P05	267	153	204	66	221	71	201	64

Overall, the results of the participants were widely diverse. The only closest accomplishment where both pre-lenis and pre-fortis durations were similar with the native mean was achieved once by P03. As the native mean for the KIT vowel was 133 ms in a pre-lenis position and 64 ms pre-fortis, the mean results of P03 for the same measurements were 134 ms and 67 ms respectively.

In the case of the longest and shortest vowels in general, for both the non-philologists and philologists the mean duration of the FLEECE vowel was the longest and the duration of the KIT vowel the shortest (*see Table 4*). However, contrastingly to the native speakers, the KIT vowel was followed by the mean duration of the TRAP vowel. This could be

explained by the fact that the participants mostly speak BrE whereas out of the three natives, only one speaks BrE. As mentioned before, the TRAP vowel is regarded as short in BrE and long in AmE (Wells 1962). Nevertheless, all of the Estonian EFL students managed to keep the intrinsic variability of the vowels that were simultaneously affected by extrinsic variability.

Table 4. Mean results (ms) of non-philologists, philologists, and both combined.

Participants	Vowels							
	FLEECE /i:/		KIT /ɪ/		DRESS /e/		TRAP /æ/	
	pre-lenis	pre-fortis	pre-lenis	pre-fortis	pre-lenis	pre-fortis	pre-lenis	pre-fortis
S mean	201.8	151	168.2	78.6	190.8	80.2	179.4	86.2
P mean	210	138.2	161.8	59.4	188.8	71	180.2	64
P + S mean	205.9	144.6	165	69	189.8	75.6	179.8	75.1

2.6. Discussion

The results exhibit that Estonian learners of English successfully produce pre-fortis clipping of front vowels, regardless of whether they are students of English philology or not. Also, the pre-fortis vowel length reduction was apparent in the speech of the three native speakers. While Kumar and Ojamaa (1973: 313) and Jones (1972: 356) have claimed that speakers of American English may not feel or produce vowel length differences and thus view all vowels as uniformly long, the AmE speakers (N02 and N03) of the present case study both demonstrated pre-fortis clipping similarly to the BrE speaker (*see Table 2*). Hence, although the pre-fortis vowel shortening was slightly sharper by N01 who speaks BrE, as predicted by Wells (1962) and Jones (1972: 356), on the basis of this case study, it cannot be said that the speakers of AmE do not produce vowel length differences at all. Then again, it is important to note that the native N03 feels like their speech has been influenced by BrE after having spent considerable time in the United Kingdom. Therefore, due to a too

small sample of three natives and ambiguity among them, it is not possible to prove or disprove the claims of Kumar, Ojamaa and Jones.

Regarding the results of the pre-lenis KIT and DRESS vowel durations by the non-native speakers, the durations surpassed the result of the native mean. The same vowels in a pre-fortis position were either longer by some milliseconds, or were lower than the native mean, resulting in a sharper clipping than the natives (*see Figures 2 and 3*). This was also the case with the TRAP vowel (*see Figure 4*). Even though the pre-lenis duration was lower than the native mean, the pre-fortis duration was also lower. As a result, the clipping was still noticeable.

Only the FLEECE vowel was not clipped as sharply by both non-philologists and philologists (*see Figure 1*). It is probable that the cause for this originates from the fact that out of the four front vowels, only the FLEECE vowel is a ‘long’ vowel (Jones 1972: 233). Thus, as its duration is long to begin with, it could be that it was less susceptible to being clipped by Estonian EFL learners in order to retain the vowel’s intrinsic variability.

Gonet and Stadnika (2005: 84) find that the TRAP and FLEECE vowels experience the strongest effect of clipping. This is definitely the case in the results of the native speakers. In the case of the Estonian EFL learners, it is only partly true. Compared to all the other three front vowels, the FLEECE vowel was shortened the least. Nevertheless, the TRAP vowel experienced the most drastic clipping, especially among the philologists who shortened the pre-fortis TRAP vowel nearly three times in duration.

According to Gonet and Pietrón (2003), Polish EFL learners struggled with retaining the intrinsic variability of the four front vowels. Generally, this was not the case with Estonian EFL learners. Even though the sequence of the mean intrinsic duration of the vowels for native speakers was KIT, DRESS, TRAP, FLEECE, and the same order for Estonian EFL learners was KIT, TRAP, DRESS, and FLEECE, the three checked vowels

still precede the free vowel. Therefore, Estonian EFL learners managed to produce pre-fortis clipping without interfering with the intrinsic variability of the vowels.

It is not possible to draw any large-scale conclusions to see whether the findings of Mitleb (1981) and Hyrchová (2015) about the positive effect on pre-fortis clipping after spending considerable time in an English-speaking environment are valid. Nevertheless, one of the philologists (P05) had spent three months working in the United States. Compared to the results of the natives (*see Table 3*), the mean vowel durations of P05 are rather long and none of the measurements are necessarily native-like. Also, compared to the other nine participants, P05 tended to lengthen her vowels much more which is also the reason why her results were so conspicuous. It might be that the results of P05 were not as distinct as the findings of previous research because P05 chose British English as her preferred variety yet spent time in an environment of American English. Even though the result of one person in this limited case study did not show the same results, it would still be an interesting topic for further research to see whether the speech of Estonian EFL learners regarding pre-fortis clipping becomes more native-like or not.

One of the unforeseen drawbacks of this case study was the instance of having to leave out some of the measurements of S02 and S04 due to them not producing the FLEECE vowel in the word *bead*. Moreover, S04 pronounced the PALM vowel in place of the TRAP vowel in the words *rag* and *lap*. The participant S02 graded her English pronunciation at level B2 while S04 felt her pronunciation was at an A1 level. This shortcoming could have been avoided if the author of this thesis had chosen people with a certain CEFR level for her sample. However, the variety of levels allows for a more realistic depiction of the condition of English in the speech of Estonians and could be researched further by comparing pre-fortis clipping produced by Estonians who have different CEFR levels. Moreover, the replacement of vowels by S02 and S04 coincides with the findings of Ader and Miljan (2015:

27) where they conclude that L1 Estonians retain the quality of their L1 vowels while producing L2 English vowels. Thus, it may be that in the case of an unknown word, both S02 and S04 chose to replace the L2 English vowel with one closer to their familiar L1 Estonian vowel.

Overall, the Estonian learners of English succeeded well at pre-fortis clipping English front vowels. Compared to the results of the native speakers, Estonian EFL learners shortened the KIT, DRESS, and TRAP vowels by at least 50% in length, while natives also shortened the KIT and TRAP vowels by 50% and the DRESS vowel by 1.5 times. The FLEECE vowel was also clipped twice in length by native speakers. However, non-philologists and philologists clipped the FLEECE vowel the least, only by 1.3 and 1.5 times respectively.

CONCLUSION

The purpose of this thesis was to observe how Estonian learners of English produced pre-fortis clipping. The incentive for this came from the works of Jenkins (2000) and Celce-Murcia et al (2010) who have emphasized the importance of teaching pre-fortis clipping to EFL learners and guiding them to make the pre-fortis length reduction to intelligibly communicate in their L2 English language. In addition, a study that specifically looks at pre-fortis clipping among Estonian learners of English had never been done before.

Observing the capability at which Estonian EFL learners produced pre-fortis clipping was achieved by creating a pronunciation test and conducting it on three native speakers of English who formed the control group and ten Estonian EFL learners. Two of the natives were speakers of American English and one speaks British English. Five of the Estonian EFL learners were English philology students at the University of Tartu, four were students at the Pallas University of Applied Sciences, and one was a psychology student from the

University of Tartu. The pronunciation test focused on the clipping of four front vowels, FLEECE, KIT, DRESS, and TRAP. There were 12 word pairs or 24 words in total which were repeated three times, creating 216 instances across three natives and 720 instances across ten Estonian EFL learners for analysis. The results of the Estonian EFL learners were divided into two, the results of the five non-philologists and five philologists which were both compared to each other as well as to the results of the three native speakers.

Previous studies on pre-fortis clipping have been conducted by university students in their MA and BA thesis papers (Taothong 2022; Hrychová 2015), by researchers studying the effect of pre-fortis clipping in Polish speakers (Gonet and Pietrón 2003), or in connection with other widely used languages (Chen 1970). However, there is a severe lack of materials regarding the vowel durations of native English speakers and none about Estonian learners of English.

The present case study revealed that all Estonian learners of English successfully clipped the vowels preceding fortis consonants. Both non-philologists and philologists shortened the KIT, DRESS, and TRAP vowels by half in length. The native speakers also clipped the KIT and TRAP vowels by 50% but shortened the DRESS vowel only by 1.5 times. Thus, Estonian learners of English clipped the checked vowels to the same degree or even more in comparison with the native speakers. While the FLEECE vowel was also clipped twice in length by native speakers, non-philologists only shortened it by 1.3 times and philologists by 1.5 times. However, this could be explained by the fact that the FLEECE vowel is a long vowel, and it may be that in order to retain its intrinsic variability, the Estonian EFL learners did not shorten it as sharply.

There is certainly capacity for further research regarding pre-fortis clipping in Estonian learners of English. For one, a larger sample size would allow for larger-scale conclusions. Similarly, a larger number of native speakers would give a better overview and

illustrate possible differences of pre-fortis clipping in the speech of American English and British English speakers. In addition, because this study did not intentionally consider Estonian EFL learners who had spent considerable time in an English-speaking environment, it could be a possible direction for further research. Finally, it would also be interesting to compare students with either high CEFR levels to avoid mispronounced vowels or to compare Estonian EFL learners with different CEFR levels to see whether pre-fortis clipping is a notion that becomes sharper over time or not.

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APPENDICES

Appendix 1 – Questionnaire for the native speakers

Questionnaire for native English speakers taking part in the study

Hello!

My name is K arolin Veerpalu and I am writing my bachelor’s thesis about English pronunciation. This is a questionnaire for native English speakers taking part in the study to gain information about their linguistic background. This questionnaire is completely anonymous and the data gathered will be used only for my thesis.

1. Mother tongue

2. Age

3. Gender

4. Where were you born?

5. Where have you lived the majority of your life?

6. How would you rate your English pronunciation according to the CEFR levels?
 - a. A1 (beginner)
 - b. A2 (elementary)
 - c. B1 (intermediate)
 - d. B2 (upper-intermediate)
 - e. C1 (advanced)
 - f. C2 (proficiency)
7. Have you ever been taught English pronunciation in school?
 - a. Yes
 - b. No
 - c. I am not sure
 - d. Other: _____
8. If yes, in which education level?
 - a. Preschool/Nursery school
 - b. Elementary/primary school (ages 5-10)
 - c. Middle/secondary school (ages 11-13)
 - d. High/secondary school (ages 14-17/18)
9. Which English variety do you use?
 - a. British English
 - b. American English
 - c. Other: _____
10. Do you speak any other languages?
 - a. Yes
 - b. No
11. If yes, which one(s) and at which CEFR level?

Thank you!

Appendix 2 – Questionnaire for the non-native speakers

Küsimustik keelekatses osalejale

Tere!

Olen Kärolin Veerpalu ning uurin enda bakalaureuse töös inglise keele hääldust. Antud küsimustik on täitmiseks kõnekatses osajelatele, et saada taustainfot seoses osalejate eelnevate kogemuste ning inglise keelega seonduvate arvamustega. Küsimustik on anonüümne ning selle vastuseid kasutatakse vaid minu bakalaureusetöös.

1. Emakeel

2. Vanus

3. Sugu

4. Millises kooliastmes alustasite inglise keele õpingutega?
 - a. Lasteaias
 - b. Algklassides (1.– 4. klass)
 - c. Põhikoolis (5.– 9. klass)
 - d. Gümnaasiumis (10.– 11. klass)
5. Kuidas hindate enda inglise keele oskust?
 - a. Mitterahuldav
 - b. Rahuldav
 - c. Hea
 - d. Väga hea
6. Millisele tasemele paigutaksite enda inglise keele häälduse?
 - a. A1 (algtase)
 - b. A2 (elementaartase)
 - c. B1 (madalam kesktase)
 - d. B2 (kõrgem kesktase)
 - e. C1 (vilunud keelekasutaja)
 - f. C2 (keelevaldaja)
7. Millist inglise keele varianti Te kasutate?
 - a. Briti hääldust
 - b. Ameerika hääldust
 - c. Ei ole kindel
 - d. Muu: _____
8. Kas teile on koolis õpetatud kunagi inglise keele hääldamist?
 - a. Jah
 - b. Ei
9. Kui jah, siis millises kooliastmes?
 - a. Lasteaias
 - b. Algklassides (1.– 4. klass)
 - c. Põhikoolis (5.– 9. klass)
 - d. Gümnaasiumis (10.– 12. klass)
 - e. Ülikoolis
10. Kas pöörate teadlikult tähelepanu sellele, et kõlaksite võimalikult sarnaselt inglise keelt emakeelt rääkivale kõneleajale?
 - a. Jah
 - b. Ei
 - c. Muu: _____
11. Kas olete veetnud pikemalt aega inglisekeelses keskkonnas (nt elanud, töötanud, õppinud)?
 - a. Jah
 - b. Ei
12. Kui jah, siis kus ja kui kaua?

Suur tänu!

Appendix 3 – The vowel durations of natives summarized in tables

N01

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.215 s	0.265 s	0.3 s	260 ms	269 ms
bead	0.226 s	0.255 s	0.245 s	242 ms	
leave	0.318 s	0.293 s	0.309 s	307 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.114 s	0.127 s	0.12 s	120 ms	118 ms
beat	0.123 s	0.146 s	0.13 s	133 ms	
leaf	0.102 s	0.097 s	0.107 s	102 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.088 s	0.104 s	0.134 s	109 ms	131 ms
bid	0.11 s	0.131 s	0.173 s	138 ms	
wig	0.18 s	0.148 s	0.117 s	148 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.069 s	0.045 s	0.06 s	58 ms	62 ms
bit	0.086 s	0.077 s	0.083 s	82 ms	
wick	0.042 s	0.044 s	0.051 s	46 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.193 s	0.182 s	0.205 s	193 ms	171 ms
dead	0.212 s	0.157 s	0.181 s	183 ms	
said	0.137 s	0.128 s	0.145 s	137 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.116 s	0.111 s	0.104 s	110 ms	96 ms
debt	0.099 s	0.098 s	0.062 s	86 ms	
set	0.067 s	0.113 s	0.099 s	93 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.148 s	0.195 s	0.237 s	193 ms	199 ms
mad	0.2 s	0.207 s	0.284 s	230 ms	
lab	0.185 s	0.158 s	0.186 s	176 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.105 s	0.08 s	0.057 s	81 ms	89 ms
mat	0.078 s	0.082 s	0.095 s	85 ms	
lap	0.109 s	0.096 s	0.104 s	103 ms	

N02

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.193 s	0.223 s	0.202 s	206 ms	204 ms
bead	0.212 s	0.231 s	0.227 s	223 ms	

leave	0.198 s	0.171 s	0.18 s	183 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.101 s	0.118 s	0.131 s	117 ms	117 ms
beat	0.142 s	0.137 s	0.118 s	132 ms	
leaf	0.102 s	0.1 s	0.102 s	101 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.105 s	0.126 s	0.11 s	114 ms	121 ms
bid	0.096 s	0.081 s	0.164 s	114 ms	
wig	0.131 s	0.14 s	0.14 s	137 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.046 s	0.051 s	0.051 s	49 ms	59 ms
bit	0.078 s	0.086 s	0.075 s	80 ms	
wick	0.045 s	0.05 s	0.048 s	48 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.139 s	0.137 s	0.138 s	138 ms	138 ms
dead	0.127 s	0.145 s	0.142 s	138 ms	
said	0.128 s	0.139 s	0.143 s	137 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.08 s	0.104 s	0.105 s	96 ms	98 ms
debt	0.088 s	0.104 s	0.104 s	99 ms	
set	0.098 s	0.093 s	0.102 s	98 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.225 s	0.244 s	0.238 s	236 ms	230 ms
mad	0.255 s	0.229 s	0.249 s	244 ms	
lab	0.21 s	0.212 s	0.21 s	211 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.136 s	0.125 s	0.121 s	127 ms	128 ms
mat	0.127 s	0.165 s	0.131 s	141 ms	
lap	0.106 s	0.12 s	0.12 s	115 ms	

N03

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.224 s	0.237 s	0.24 s	234 ms	248 ms
bead	0.285 s	0.247 s	0.301 s	278 ms	
leave	0.263 s	0.257 s	0.18 s	233 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.109 s	0.125 s	0.133 s	122 ms	116 ms
beat	0.135 s	0.129 s	0.13 s	131 ms	
leaf	0.088 s	0.105 s	0.088 s	94 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)

his	0.184 s	0.144 s	0.179 s	169 ms	147 ms
bid	0.181 s	0.128 s	0.17 s	160 ms	
wig	0.099 s	0.116 s	0.123 s	113 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.055 s	0.057 s	0.061 s	58 ms	70 ms
bit	0.095 s	0.092 s	0.107 s	98 ms	
wick	0.053 s	0.065 s	0.049 s	56 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.144 s	0.152 s	0.194 s	163 ms	163 ms
dead	0.158 s	0.154 s	0.165 s	159 ms	
said	0.162 s	0.165 s	0.169 s	165 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.09 s	0.117 s	0.066 s	91 ms	106 ms
debt	0.106 s	0.095 s	0.131 s	111 ms	
set	0.113 s	0.134 s	0.103 s	117 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.319 s	0.261 s	0.267 s	282 ms	274 ms
mad	0.289 s	0.261 s	0.365 s	305 ms	
lab	0.2 s	0.269 s	0.236 s	235 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.082 s	0.086 s	0.085 s	84 ms	104 ms
mat	0.132 s	0.161 s	0.118 s	137 ms	
lap	0.091 s	0.078 s	0.107 s	92 ms	

Appendix 4 – Estonian EFL learners' vowel durations summarized in tables

S01

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.201 s	0.263 s	0.214 s	226 ms	209 ms
bead	0.197 s	0.189 s	0.214 s	200 ms	
leave	0.207 s	0.182 s	0.212 s	200 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.138 s	0.159 s	0.159 s	152 ms	159 ms
beat	0.15 s	0.156 s	0.141 s	149 ms	
leaf	0.18 s	0.177 s	0.174 s	177 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.161 s	0.19 s	0.183 s	178 ms	158 ms
bid	0.136 s	0.16 s	0.127 s	141 ms	
wig	0.158 s	0.155 s	0.154 s	156 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.089 s	0.093 s	0.092 s	91 ms	79 ms
bit	0.085 s	0.091 s	0.105 s	94 ms	
wick	0.055 s	0.053 s	0.047 s	52 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.196 s	0.202 s	0.204 s	201 ms	200 ms
dead	0.216 s	0.194s	0.189 s	200 ms	
said	0.188 s	0.202 s	0.208 s	199 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.087 s	0.1 s	0.098 s	95 ms	93 ms
debt	0.103 s	0.097 s	0.094 s	98 ms	
set	0.095 s	0.084 s	0.079 s	86 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.23 s	0.228 s	0.189 s	216 ms	206 ms
mad	0.207 s	0.206 s	0.203 s	205 ms	
lab	0.184 s	0.193 s	0.211 s	196 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.062 s	0.087 s	0.083 s	77 ms	84 ms
mat	0.099 s	0.096 s	0.103 s	99 ms	
lap	0.078 s	0.078 s	0.066 s	74 ms	

S02

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.175 s	0.204 s	0.178 s	186 ms	183 ms
bead	0.162 s	0.17 s	0.158 s	N/A	
leave	0.203 s	0.149 s	0.186 s	179 ms	

	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.115 s	0.112 s	0.115 s	114 ms	121 ms
beat	0.11 s	0.12 s	0.113 s	114 ms	
leaf	0.132 s	0.153 s	0.123 s	136 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.167 s	0.167 s	0.075 s	136 ms	152 ms
bid	0.176 s	0.142 s	0.145 s	154 ms	
wig	0.178 s	0.194 s	0.121 s	164 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.062 s	0.078 s	0.06 s	67 ms	59 ms
bit	0.059 s	0.08 s	0.063 s	67 ms	
wick	0.051 s	0.037 s	0.038 s	42 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.165 s	0.126 s	0.149 s	147 ms	137 ms
dead	0.156 s	0.13 s	0.127 s	138 ms	
said	0.139 s	0.129 s	0.111 s	126 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.071 s	0.07 s	0.075 s	72 ms	65 ms
debt	0.059 s	0.06 s	0.058 s	59 ms	
set	0.055 s	0.064 s	0.071 s	63 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.16 s	0.11 s	0.114 s	128 ms	136 ms
mad	0.165 s	0.17 s	0.144 s	160 ms	
lab	0.113 s	0.132 s	0.116 s	120 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.077 s	0.057 s	0.07 s	68 ms	73 ms
mat	0.087 s	0.056 s	0.092 s	78 ms	
lap	0.069 s	0.062 s	0.088 s	73 ms	

S03

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.155 s	0.13 s	0.187 s	157 ms	160 ms
bead	0.163 s	0.153 s	0.169 s	162 ms	
leave	0.17 s	0.168 s	0.148 s	162 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.152 s	0.131 s	0.131 s	138 ms	148 ms
beat	0.137 s	0.136 s	0.141 s	138 ms	
leaf	0.182 s	0.17 s	0.151 s	168 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.181 s	0.19 s	0.205 s	192 ms	176 ms
bid	0.162 s	0.157 s	0.16 s	160 ms	
wig	0.186 s	0.184 s	0.158 s	176 ms	

	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.113 s	0.102 s	0.118 s	111 ms	92 ms
bit	0.068 s	0.075 s	0.078 s	74 ms	
wick	0.102 s	0.088 s	0.082 s	91 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.186 s	0.182 s	0.186 s	185 ms	187 ms
dead	0.192 s	0.196 s	0.198 s	195 ms	
said	0.181 s	0.19 s	0.175 s	182 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.079 s	0.105 s	0.098 s	94 ms	90 ms
debt	0.096 s	0.1 s	0.096 s	97 ms	
set	0.079 s	0.077 s	0.077 s	78 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.178 s	0.208 s	0.173 s	186 ms	175 ms
mad	0.17 s	0.171 s	0.176 s	172 ms	
lab	0.176 s	0.159 s	0.164 s	166 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.115 s	0.103 s	0.11 s	109 ms	95 ms
mat	0.096 s	0.083 s	0.101 s	93 ms	
lap	0.081 s	0.08 s	0.082 s	81 ms	

S04

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.258 s	0.269 s	0.27 s	N/A	248 ms
bead	0.219 s	0.256 s	0.263 s	N/A	
leave	0.223 s	0.282 s	0.238 s	248 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.139 s	0.129 s	0.144 s	137 ms	182 ms
beat	0.189 s	0.199 s	0.162 s	183 ms	
leaf	0.239 s	0.23 s	0.205 s	225 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.232 s	0.231 s	0.221 s	228 ms	219 ms
bid	0.232 s	0.235 s	0.239 s	235 ms	
wig	0.182 s	0.215 s	0.182 s	193 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.131 s	0.155 s	0.236 s	174 ms	111 ms
bit	0.059 s	0.167 s	0.094 s	77 ms	
wick	0.107 s	0.088 s	0.05 s	82 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.271 s	0.247 s	0.232 s	250 ms	249 ms
dead	0.26 s	0.26 s	0.18 s	233 ms	

said	0.267 s	0.247 s	0.274 s	263 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.085 s	0.086 s	0.097 s	89 ms	93 ms
debt	0.1 s	0.099 s	0.094 s	98 ms	
set	0.092 s	0.09 s	0.094 s	92 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.231 s	0.239 s	0.203 s	N/A	190 ms
mad	0.194 s	0.221 s	0.223 s	213 ms	
lab	0.174 s	0.164 s	0.163 s	167 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.146 s	0.138 s	0.124 s	131 ms	117 ms
mat	0.088 s	0.113 s	0.109 s	103 ms	
lap	0.061 s	0.09 s	0.083 s	N/A	

S05

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.195 s	0.229 s	0.18 s	201 ms	209 ms
bead	0.201 s	0.208 s	0.238 s	216 ms	
leave	0.221 s	0.225 s	0.18 s	209 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.131 s	0.132 s	0.142 s	135 ms	145 ms
beat	0.133 s	0.164 s	0.125 s	141 ms	
leaf	0.157 s	0.158 s	0.164 s	160 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.149 s	0.161 s	0.168 s	159 ms	136 ms
bid	0.124 s	0.169 s	0.153 s	149 ms	
wig	0.073 s	0.11 s	0.118 s	100 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.055 s	0.069 s	0.051 s	58 ms	52 ms
bit	0.047 s	0.067 s	0.067 s	60 ms	
wick	0.034 s	0.05 s	0.029 s	38 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.191 s	0.203 s	0.191 s	195 ms	181 ms
dead	0.185 s	0.15 s	0.143 s	159 ms	
said	0.185 s	0.171 s	0.213 s	190 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.066 s	0.076 s	0.068 s	70 ms	60 ms
debt	0.047 s	0.039 s	0.046 s	44 ms	
set	0.056 s	0.077 s	0.066 s	66 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)

rag	0.218 s	0.196 s	0.215 s	210 ms	190 ms
mad	0.179 s	0.177 s	0.211 s	189 ms	
lab	0.159 s	0.185 s	0.17 s	171 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.053 s	0.063 s	0.071 s	62 ms	62 ms
mat	0.067 s	0.058 s	0.076 s	67 ms	
lap	0.052 s	0.054 s	0.064s	57 ms	

P01

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.173 s	0.198 s	0.21 s	194 ms	202 ms
bead	0.225 s	0.184 s	0.222 s	210 ms	
leave	0.196 s	0.208 s	0.206 s	203 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.126 s	0.138 s	0.116 s	127 ms	129 ms
beat	0.128 s	0.129 s	0.135 s	131 ms	
leaf	0.128 s	0.136 s	0.121 s	128 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.148 s	0.152 s	0.124 s	141 ms	148 ms
bid	0.172 s	0.179 s	0.177 s	176 ms	
wig	0.132 s	0.122 s	0.13 s	128 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.055 s	0.061 s	0.05 s	55 ms	57 ms
bit	0.084 s	0.081 s	0.084 s	83 ms	
wick	0.031 s	0.032 s	0.034 s	32 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.171 s	0.172 s	0.185 s	176 ms	174 ms
dead	0.176 s	0.181 s	0.188 s	182 ms	
said	0.162 s	0.164 s	0.167 s	164 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.073 s	0.08 s	0.073 s	75 ms	74 ms
debt	0.072 s	0.077 s	0.072 s	74 ms	
set	0.071 s	0.071 s	0.073 s	72 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.181 s	0.182 s	0.175 s	179 ms	179 ms
mad	0.189 s	0.163 s	0.193 s	182 ms	
lab	0.152 s	0.189 s	0.19 s	177 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.063 s	0.075 s	0.063 s	67 ms	67 ms
mat	0.064 s	0.069 s	0.073 s	69 ms	
lap	0.067 s	0.064 s	0.061 s	64 ms	

P02

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.224 s	0.219 s	0.211 s	218 ms	251 ms
bead	0.247 s	0.242 s	0.268 s	252 ms	
leave	0.278 s	0.28 s	0.29 s	283 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.083 s	0.137 s	0.138 s	119 ms	150 ms
beat	0.138 s	0.193 s	0.147 s	159 ms	
leaf	0.186 s	0.157 s	0.17 s	171 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.232 s	0.226 s	0.235 s	231 ms	188 ms
bid	0.172 s	0.2 s	0.217 s	196 ms	
wig	0.13 s	0.139 s	0.137 s	135 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.066 s	0.066 s	0.046 s	59 ms	58 ms
bit	0.06 s	0.07 s	0.095 s	75 ms	
wick	0.037 s	0.039 s	0.039 s	38 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.244 s	0.246 s	0.242 s	244 ms	212 ms
dead	0.201 s	0.201 s	0.201 s	201 ms	
said	0.183 s	0.195 s	0.199 s	192 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.086 s	0.08 s	0.109 s	92 ms	83 ms
debt	0.059 s	0.103 s	0.085 s	82 ms	
set	0.081 s	0.07 s	0.072 s	74 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.231 s	0.23 s	0.16 s	207 ms	209 ms
mad	0.244 s	0.163 s	0.244 s	217 ms	
lab	0.203 s	0.169 s	0.234 s	202 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.082 s	0.055 s	0.071 s	69 ms	70 ms
mat	0.077 s	0.069 s	0.056 s	67 ms	
lap	0.065 s	0.073 s	0.085 s	74 ms	

P03

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.136 s	0.15 s	0.127 s	138 ms	155 ms
bead	0.189 s	0.166 s	0.148 s	168 ms	
leave	0.178 s	0.144 s	0.157 s	160 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.145 s	0.135 s	0.108 s	129 ms	135 ms

beat	0.136 s	0.138 s	0.134 s	136 ms	
leaf	0.138 s	0.144 s	0.134 s	139 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.13 s	0.105 s	0.134 s	123 ms	134 ms
bid	0.15 s	0.15 s	0.141 s	147 ms	
wig	0.142 s	0.154 s	0.103 s	133 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.095 s	0.094 s	0.07 s	86 ms	67 ms
bit	0.061 s	0.064 s	0.059 s	61 ms	
wick	0.046 s	0.062 s	0.048 s	52 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.147 s	0.155 s	0.165 s	156 ms	160 ms
dead	0.182 s	0.185 s	0.161 s	176 ms	
said	0.156 s	0.143 s	0.145 s	148 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.065 s	0.061 s	0.058 s	61 ms	63 ms
debt	0.067 s	0.056 s	0.044 s	56 ms	
set	0.076 s	0.073 s	0.065 s	71 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.112 s	0.1 s	0.109 s	107 ms	123 ms
mad	0.118 s	0.157 s	0.121 s	132 ms	
lab	0.12 s	0.154 s	0.112 s	129 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.086 s	0.062 s	0.064 s	71 ms	66 ms
mat	0.062 s	0.073 s	0.068 s	68 ms	
lap	0.058 s	0.055 s	0.065 s	59 ms	

P04

FLEECE					
/i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.228 s	0.158 s	0.155 s	180 ms	175 ms
bead	0.209 s	0.157 s	0.189 s	185 ms	
leave	0.185 s	0.157 s	0.134 s	159 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.107 s	0.117 s	0.097 s	107 ms	124 ms
beat	0.115 s	0.125 s	0.116 s	119 ms	
leaf	0.152 s	0.136 s	0.151 s	146 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.155 s	0.124 s	0.112 s	130 ms	135 ms
bid	0.146 s	0.209 s	0.147 s	167 ms	
wig	0.095 s	0.105 s	0.118 s	106 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.063 s	0.06 s	0.055 s	59 ms	49 ms

bit	0.049 s	0.065 s	0.063 s	59 ms	
wick	0.022 s	0.025 s	0.036 s	28 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.218 s	0.18 s	0.147 s	182 ms	177 ms
dead	0.167 s	0.2 s	0.179 s	182 ms	
said	0.174 s	0.145 s	0.18 s	166 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.065 s	0.074 s	0.07 s	70 ms	64 ms
debt	0.072 s	0.061 s	0.062 s	65 ms	
set	0.053 s	0.065 s	0.053 s	57 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.188 s	0.185 s	0.187 s	187 ms	189 ms
mad	0.184 s	0.208 s	0.229 s	207 ms	
lab	0.185 s	0.194 s	0.142 s	174 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.049 s	0.056 s	0.044 s	50 ms	53 ms
mat	0.06 s	0.05 s	0.047 s	52 ms	
lap	0.071 s	0.052 s	0.047 s	57 ms	

P05

FLEECE /i:/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
seed	0.255 s	0.234 s	0.23 s	240 ms	267 ms
bead	0.29 s	0.269 s	0.303 s	287 ms	
leave	0.274 s	0.236 s	0.31 s	273 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
seat	0.136 s	0.155 s	0.144 s	145 ms	153 ms
beat	0.162 s	0.16 s	0.156 s	159 ms	
leaf	0.161 s	0.156 s	0.145 s	154 ms	
KIT /ɪ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
his	0.272 s	0.165 s	0.235 s	224 ms	204 ms
bid	0.256 s	0.254 s	0.23 s	247 ms	
wig	0.133 s	0.15 s	0.143 s	142 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
hiss	0.062 s	0.085 s	0.081 s	76 ms	66 ms
bit	0.074 s	0.088 s	0.077 s	80 ms	
wick	0.056 s	0.037 s	0.035 s	43 ms	
DRESS /e/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
bed	0.254 s	0.234 s	0.251 s	246 ms	221 ms
dead	0.197 s	0.187 s	0.21 s	198 ms	
said	0.213 s	0.218 s	0.226 s	219 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
bet	0.065 s	0.078 s	0.077 s	73 ms	71 ms

debt	0.052 s	0.08 s	0.064 s	65 ms	
set	0.073 s	0.071 s	0.075 s	73 ms	
TRAP /æ/	Instance 1	Instance 2	Instance 3	Mean	Length mean (lengthened)
rag	0.183 s	0.208 s	0.203 s	198 ms	201 ms
mad	0.251 s	0.204 s	0.216 s	224 ms	
lab	0.173 s	0.21 s	0.159 s	181 ms	
	Instance 1	Instance 2	Instance 3	Mean	Length mean (clipped)
rack	0.047 s	0.045 s	0.055 s	49 ms	64 ms
mat	0.063 s	0.085 s	0.091 s	80 ms	
lap	0.056 s	0.054 s	0.08 s	63 ms	

RESÜMEE

TARTU ÜLIKOOL
ANGLISTIKA OSAKOND

Kärolin Veerpalu

Pre-Fortis Clipping by Estonian Learners of English: A Case Study

Helitutele kaashäälikutele eelnevate täishäälikute lühendamise Eesti inglise keele õppijate seas: juhtumiuuring

Bakalaureusetöö

2024

Lehekülgede arv: 59

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