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WHEN /ˈfeɪθ/ BECOMES /ˈfeɪt/:

Realizations of Dental Fricatives and Plosives in Two Academic Finnish EFL Speaker Groups

Faculty of Information Technology and Communication Sciences
BA Thesis
April 2024

ABSTRACT

Cavén, Assi: When /'feɪθ/ becomes /'feɪt/: Realizations of Dental Fricatives and Plosives in Two Academic Finnish EFL Speaker Groups
BA thesis
Tampere University
Bachelor's Programme in Languages, Specialization in English Language
April 2024

The purpose of this bachelor's thesis is to investigate the voice onset times of the plosives /t/ and /d/ and the production of dental fricatives /ð/ and /θ/ in two different Finnish EFL (English as a Foreign Language) speaker groups in higher education. More specifically, this study aims to examine whether English majors as an advanced learner group would consistently produce more target-like realizations of plosives and fricatives than engineering majors. Another aim is to recognize and understand the uttered substitutions of these sounds.

Research material was collected by recording students from both groups performing a pronunciation test (See Appendix 1) which included the examined sounds in three phonotactic (word-initial, word-medial and word-final) positions as individual words read separately and in read-aloud text. After this, they were asked to fill out a questionnaire of their linguistic background. The analysis of the data, to determine the values of voice onset times (VOT) and voicing as well as possible substitutions for the sounds, was conducted with Praat software.

The results of this study did reveal significant differences between advanced English learners and the comparison group consisting of their peers from technical fields of study. The voiced dental fricative /ð/ was the hardest sound for the participants to pronounce as only 62,5% of its total occurrences were pronounced in a target-like manner, compared to the same value, 77%, of its voiceless counterpart. The substitutions made for both dental fricatives included plosives /t/ and /d/, the former with an aspiration as well as a flap /ɾ̥/. The voiced dental fricative /ð/ was commonly substituted with the voiceless dental fricative /θ/ but not vice versa. Results of the VOT values varied within the groups, the English group being more consistent with voiced plosive /d/ and the engineering majors with the voiceless plosive /t/.

Although a small-scale study, this thesis suggests that Finnish EFL education needs to focus more on the segmental level of pronunciation, individual sounds and minimal pairs. In the future, this study could be carried out on a larger scale together with additions, such as studying the possible effects of experiences of identity, gender and environment in pronouncing EFL sounds.

Key words: VOT, voice onset time, dental fricatives, plosives, second language acquisition, EFL

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TIIVISTELMÄ

Cavén, Assi: When /'feɪθ/ becomes /'feɪt/: Realizations of Dental Fricatives and Plosives in Two Academic Finnish EFL Speaker Groups
Tampereen yliopisto
Kielten kandidaattiohjelma, englannin kielen opintosuunta
Huhtikuu 2024

Tämän kandidaatintyön tavoitteena on tarkastella englannin dentaalifrikatiivien /ð/ ja /θ/ sekä klusiilien /t/ ja /d/ toteutumista kahden suomalaisen ja englantia vieraana kielenä puhuvan, kolmannella asteella opiskelevan ryhmän keskuudessa. Tutkielma keskittyy voice onset time (VOT) -arvoihin, eli soinnin alkamisaikoihin englannin /t/ ja /d/ klusiilien tuottamisessa sekä soinnin, soinnittomuuden ja korvaavien äänteiden havaitsemiseen englannin dentaalifrikatiivien /ð/ ja /θ/ tuottamisessa.

Koska vertailtavien ryhmien taitotasot englannissa ovat erilaiset, tämä tutkimus pyrkii tarkastelemaan, miten englannin pääaineopiskelijoiden ja teknillisten alojen opiskelijoiden tuottamat äänteet eroavat toisistaan sekä tavoitekielen äännejärjestelmän mukaisista klusiili- ja frikatiiviäänteistä. Toinen tavoite on tunnistaa ja ymmärtää kohdeäänteiden tilalla käytettyjä korvaavia äänteitä.

Tutkimusaineisto kerättiin nauhoittamalla molempien opiskelijaryhmien edustajia. Nauhoituksissa osallistujat tekivät ääntämiskokeen (kts. Appendix 1), jossa kohdeäänteet esiintyivät kolmessa fonotaktisessa positiossa (sanan alussa, sanan keskellä, sanan lopussa) niin yksittäin lausuttuina sanoina kuin katkeamattomassa puheessa. Tämän lisäksi osallistujat täyttivät kielellistä taustaansa kartoittavan kyselyn. Klusiiliäänteiden VOT -arvot ja frikatiivien soinnillisuus analysoitiin Praat -ohjelmalla.

Tulokset osoittavat merkittäviä ääntämiseroja englannin pääaineopiskelijoiden sekä teknillisten alojen opiskelijoiden välillä. Tutkituista äänteistä soinnillinen dentaalifrikatiivi /ð/ tuottaa eniten ääntämisvaikeuksia: vain 62,5% kaikista soinnillisista dentaalifrikatiiveista on lausuttu tavoitekielen äännejärjestelmän mukaisesti, kun taas soinnittomien dentaalifrikatiivien sama arvo on 77%. Soinnillinen frikatiivi /ð/ on korvattu useimmiten sen soinnittomalla vastaparilla /θ/ mutta /θ/ -äännettä ei yleensä ole korvattu sen soinnillisella vastineella. Molempia äänteitä on korvattu klusiililla /t/, aspiraatiolla sekä ilman, klusiililla /d/ sekä hipaisuäänteellä /ɾ/. Klusiiliäänteiden VOT -arvot vaihtelevat ryhmien välillä. Englannin pääaineopiskelijat tuottavat /d/ -äänteen johdonmukaisemmin siinä missä teknillisten alojen pääaineopiskelijat /t/ -äänteen.

Vaikka tämä tutkimus on rajallinen, sen tulokset kannustavat kiinnittämään vieraan kielen ääntämisessä enemmän huomiota segmentaaliseen tasoon, yksittäisiin äänteisiin sekä minimipareihin. Tulevaisuudessa tämänkaltainen tutkimus olisi arvokasta tehdä isommalla otannalla keskittyen esimerkiksi identiteetin, sukupuolen tai ympäristön vaikutukseen englannin ääntämisessä.

Avainsanat: VOT, voice onset time, dentaalifrikatiivit, klusiilit, englanti vieraana kielenä

Tämän julkaisun alkuperäisyys on tarkastettu Turnitin Originality Check -ohjelmalla.

CONTENTS

1 INTRODUCTION 1
1.1 English plosives 2
1.2 Voice Onset Time 3
1.3 Fricatives 4
1.4 Aim and hypotheses 6
2 LITERATURE REVIEW 7
2.1 Dental fricatives 8
2.2 Plosives 9
3 METHODOLOGY 10
4 DATA COLLECTION 13
5 RESULTS 14
5.1 Plosives 15
5.2 Dental fricatives 16
6 DISCUSSION 20
7 CONCLUSION 23
8 WORKS CITED 25
9 APPENDICES 26
Appendix 1 26
Appendix 2 26

1 INTRODUCTION

Although oral proficiency is not necessarily important to intelligibility in neither dental fricatives (See, e.g., Jenkins 2000) nor plosives, it does contribute to a first impression of a language user as the listener always more or less consciously evaluates the speaker's entire linguistic competence as either good or bad due to pronunciation. This is presented in Antti Iivonen's "*Fonetiikan merkitys kielenomaksumisessa ja -opetuksessa*" quoted in Lintunen (2004: 1). As Ringbom, quoted in Lintunen (ibid.), points out in "*Near-nativeness and the four language skills: some concluding remarks*," even with advanced learners, pronunciation is where our foreignness is revealed. While it is subjective to ponder whether this is a positive thing or not, a 2013 study shows that although learners do not aim for native-like speech, fluency is a central objective in language learning (Tergujeff 2013b: 81). However, Tergujeff has found that pronunciation teaching was found to be inadequate by most lower and upper secondary students in Finland (ibid.). As one's pronunciation correlates with confidence to communicate, this can have far-reaching impacts in one's future career. In working life, even in "highly specialized fields such as civil and mechanical engineering, employers consistently rank the ability to communicate above technical knowledge when deciding whom to hire and whom to promote" (Lucas and Stob 2023: 5).

Both plosives and fricatives are classified as obstruent sounds in which the airflow is obstructed by the articulators in the mouth. However, Finnish and English plosives differ from one another in both place and manner of articulation while dental fricatives (/θ/ and /ð/) do not exist in Finnish at all. These differences make the voiceless plosive /t/ and dental fricatives /θ/ and /ð/ an especially fruitful subject for further examination in the Finnish-English language pair as they tend to be marked and produced with the next best thing (Lintunen 2004): For example, the voiceless dental fricative /θ/ can easily become a plosive /t/ unintentionally. In both dental fricatives and plosives, voicing, as in the vibration of vocal folds, acts as an important factor in distinguishing sounds.

In their mother tongue, Finnish speakers are used to a “close letter-to-sound correspondence” which leads to learning to produce words correctly often without imitating (Tergujeff 2013a: 19). In addition to the potential obstacle that English has little letter-to-sound correspondence, English dental fricatives do not exist in the Finnish sound system altogether. Therefore, their pronunciation is particularly susceptible to substitutions in the vocal tracts of Finnish EFL speakers as the speaker implements their native pronunciation to the target language. Furthermore, studies show that these sounds are easily either lost altogether (Lintunen 2004: 216) or difficult to separate from one another (ibid., 217). Plosives, in contrast, are occupied in Finnish sound system which would logically make them easier to produce compared to the fricative sounds examined.

While Finnish speakers of English have been studied with respect to plosives and dental fricatives before, this study employs a different perspective from the existing research: along with the quality of dental fricatives, the plosives /t/, /d/ and their voice onset times are analyzed between two comparison groups using the Praat software package.

Of all the sounds, voiced dental fricatives turned out to be the most challenging sounds for the participants to produce. They were the most frequently mispronounced category in the whole data, although there was a significant difference between the two groups as E group had hit significantly more target-like /ð/ sounds than the comparison group. With voiceless dental fricatives, the trend continued the same, although in both groups the target-like voiceless fricative was produced more than its voiced counterpart.

1.1 ENGLISH PLOSIVES

Finnish realizes /t/ in its sound system as a dental phoneme (ibid., 79), where the tip of the tongue either touches the back of the teeth or is placed between the teeth, only occasionally forming a (pre)alveolar allophone when /t/ is preceded with /s/ in words such as kaste, ‘dew’ (Suomi et al. 2008:

27) whereas /d/ is realized as apico-alveolar sound (Lintunen 2004: 79). This makes /t/ more fronted in the mouth than /d/ (ibid.).

The equivalent sounds in English are both alveolar (ibid.). The Finnish voiceless plosives are typically unaspirated (Suomi et al. 2008: 26) in contrast with English, where aspiration is essential to distinguish plosives from one another. Thus, the force behind their phonation is the main feature of distinction between /ptk/ and /bdg/ - fortis and lenis pairs (Lisker and Abramson 1964: 2). Another deviation from English plosives is how the Finnish equivalents, including /t/, have a weak explosive burst (Suomi et al. 2008: 28) and are always released before another consonant except for nasals succeeding a homorganic consonant. (ibid., 26) In English, the plosive preceding a nasal or another plosive is generally unexploded (Ladefoged 1975: 45). According to Lintunen (2004: 77), "Finnish word-initial plosives are closer to English lenis stops." This is because of the correlation between unaspirated Finnish plosives and English plosives that can be devoiced (ibid.).

In addition to examining differences between speakers with differing academic backgrounds and due to the sound differences explained above, the present study aims to observe whether the participants consciously change their places of articulation and aspiration as they would need to in order to achieve target-like pronunciation.

1.2 VOICE ONSET TIME

Voice onset time (VOT) refers to the interval of time between the plosion of a plosive and the onset of voicing that follows (Lisker and Abramson, 1964: 389). VOT can be divided into three subtypes (Gabriel and Thiele 2017: 85) as listed below and further exemplified with Figure 1 (ibid., 86).

(1) long lag – voicing starts markedly late after the release of the plosive (aspiration)
(2) short lag – voicing starts either immediately or shortly after the release of the plosive
(3) lead lag – voicing starts before the release of the plosive

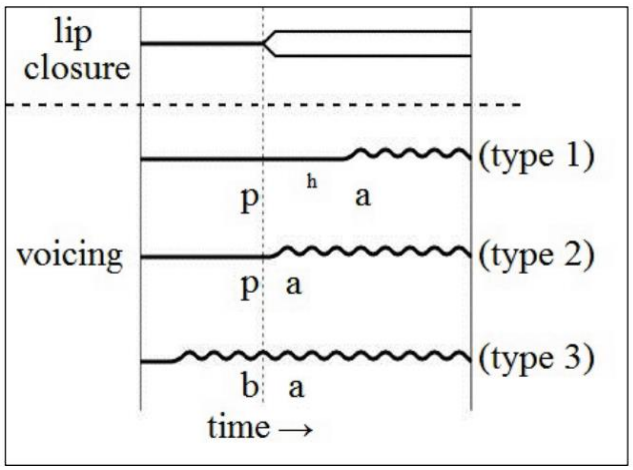

Figure 1: long lag, short lag, lead lag (Gabriel and Thiele 2017)

The present study disregards any prevoicing of voiced plosives /d/ and thus focuses solely on the time values between the release and beginning of voicing. VOT values are not stagnant and they vary along with place of articulation. Some of the previously identified facts include the fact that the further back in the mouth the closure occurs, the longer the VOT is (Cho and Ladefoged 1999: 208). That is, in minimal pairs, such as parrot /ˈpæɹət/ and carrot /ˈkærət/, the latter has an inevitably longer VOT. Other observations have shown that VOT duration also correlates with the extendedness of the contact area (i.e. the more the longer) and the speed of the articulation is shortened (ibid.). It has also been noted that "the longer the occlusion, the shorter the VOT" (Suomi 1980: 74).

Voiced (lenis) plosives are not aspirated whereas voiceless (fortis) plosives are: "each feature [voicing and aspiration] tends to be prominent in spectrograms only where the other is absent" (Lisker and Abramson 1964: 4).

1.3 FRICATIVES

Fricatives are generated in two different ways. One way is by producing a constriction of airflow with two articulators close enough one another to make the passing air turbulent, causing friction noise (McConville and Chui 2017: 120). Another way is to narrow the channel of air to move in contact

with another surface, “such as the back of the teeth or the alveolar ridge,” making the passing airflow turbulent (ibid.). More specifically, the two English dental fricatives /θ/ and /ð/ are produced with the tip of the tongue behind upper front teeth, a light contact with both upper and lower teeth (Broeders et al., n.d.) or tongue tip between the upper and lower teeth, making them interdental in articulation (McConville and Chui 2017: 129).

The dental fricative /ð/ has a voiced phonation which means the vocal cords are vibrating as the sound is articulated whereas with /θ/ the phonation is voiceless, meaning that the vocal cords do not vibrate when the sound is produced. Thus, they are referred to as voiced and voiceless dental fricatives. In acoustic analysis, these sounds can be analyzed with spectrograms that show the intensity of voicing as “regularly spaced vertical striations” (Lisker and Abramson 1964: 389) and the present study aims to identify just that – the quality of voicing in order to determine correct phonemes produced in pronunciation.

This thesis will overlook further sociolinguistic phenomena of th-fronting, alveolarization and stopping as well as inevitable variation in pronunciation of /θ/ and /ð/ sounds between different varieties in English. The main focus is on voicing and the possible substitutes the informants produce instead of the target sounds. As dental fricatives are new sounds for Finnish EFL learners, they are commonly affected by negative transfer, making them the plosives /t, d/ (Lintunen 2004: 78-79). This notion, together with the theme of the plosives /t, d/, further justifies the selected focus.

Whereas previous research in Finnish generally concentrates on the pronunciation of advanced English learners solely, the present study adds a new perspective where two student groups of the same academic level, higher education, are compared. Of course, the other group consists of advanced English learners, which gives them an advantage over the other group. This study aims to shift the perspective from previous research from evaluating advanced EFL speakers alone to evaluating them in relation to their peers of opposing fields, their own perception in the form of self-assessment and

possible substitutions for the sounds. Examples from the gathered data in oscillo- and spectrograms will be included.

1.4 AIM AND HYPOTHESES

The aim of this study was to compare two separate groups of Finnish EFL speakers whose levels of language competence in English differ. More specifically, the objective was to examine whether advanced English students, defined here as English majors in a university, are distinguishable in their speech production as more native-like speakers compared to their peers in technical fields of study.

The purpose of the study is threefold: two defined research questions and one additional entity leading to more specific discussion toward the end of the paper. The two research questions for this research were:

(1) Does having had explicit teaching in phonetics and English language at a university level contribute to a native-like pronunciation of the sounds examined compared to the comparison group (their peers from other fields of study)?

(2) What substitutions to the sounds do the participants make to compose the given words?

The study's intention is to also assess specific features of the differences in VOT cutoffs and factors contributing to them as well as examine the ratio of target-like dental fricatives and their actual realizations in the data. This is done by comparing the collected data to Kari Suomi's study (1980) and results measuring VOTs of English native speakers. The data is thus presented and analyzed within the two groups. Hypotheses are that English majors produce more target-like realizations of the examined plosives and fricatives than the comparison group and that dental fricatives are either mixed with each other or most commonly substituted with a Finnish plosive /t/.

Now, after having presented the study and defined the key constructs, previous literature on the topic is introduced. This is followed by a methodology section where the research methods as well as data collecting procedure are described. Finally, the results will be presented succeeding a discussion

that binds the findings to my research questions, aim and previous research in the field. The study ends with a concluding section followed by works cited and the appendices.

2 LITERATURE REVIEW

Despite English being almost impossible to escape in the modern world and while most people know English at some level, the deeper levels of the language, say, phonetics, remains a mystery to the majority. This is no wonder, as the Common European Framework of Reference for Languages (CERF) has included pronunciation as one of its sections yet still, there is evidence on neglecting both segmental and suprasegmental levels in the Finnish EFL pronunciation teaching (Tergujeff 2012: 599).

Among others, Mäkelä (2005) and Lintunen (2004) have brought up the inadequacy of pronunciation teaching in Finnish EFL teaching. Tergujeff (2013a: 12) suggests that this may be attributable to limited sources in the education system to pay attention to individual problems as "teaching groups are big and time is limited," first introduced by Mildner and Tomic (2007, quoted in Tergujeff 2013a).

However, pronunciation does not go unnoticed among language learners themselves, as it was given a high priority when it came to teaching preferences in a previous study (Macdonald, Yule, Powers 1994, quoted in Lintunen 2004). As mentioned before, similar results [that phonetics teaching is insufficient] have been gathered from surveys conducted among Finnish lower and upper secondary students (Tergujeff 2013b: 81). This lacking shows as an inability to produce target-like sounds: dental fricatives and fully aspirated plosives, among other sounds that do not exist in the Finnish sound system. When these sounds significantly increase the markedness of an EFL learner's speech, they are not taught enough.

James Flege distinguishes *new*, *similar* and *equivalent* sounds between a source language and a target language in his Speech Learning Model in "Production and perception of a novel, second-

language phonetic contrast" (quoted in Wester et al. 2007: 479). It also states that erroneous productions in L2 learner speech more commonly occurs with sounds that are considered similar rather than new (ibid.). This is because when similar sounds in L1 and L2 compete with one another, usually the sound from L1, being the familiar and already a mastered sound, substitutes the L2 target sound (ibid.). According to Flege, it could be expected that in the present study, plosives would cause more challenges in producing target-like realizations than dental fricatives. However, based on contrastive Finnish-English studies, dental fricatives are one of the most difficult sounds for Finnish EFL learners (Tergujeff 2013a: 22).

Furthermore, Lintunen (2004: 216) states in his study how the language skills of a speaker who cannot use all the building blocks of spoken English "do not have a very firm basis." While oral proficiency is often overlooked, it carries weight that affects one's personal and working life as one's pronunciation skills are in straight correlation with one's credibility as a professional and especially academically trained expert in their field. This, however, does not mean an individual should master a foreign language perfectly but to learn to produce target-like phones without mixing minimal pairs or similar sounds, were they interfered with the speaker's native sound system or not.

2.1 DENTAL FRICATIVES

Dental fricatives have been previously studied with EFL speakers at various academic levels. The problems that have been found are varied although the common denominator seems to be the difficulty of producing target-like sounds. As Lintunen (2004: 78) found, dental fricatives appeared to cause pronunciation problems frequently and when a TL "has completely new phonemes [as in dental fricatives], the learners sometimes have difficulties in keeping them separate" (ibid., 217). Furthermore, negative transfer plays a key role in the pronunciation of new sounds like dental fricatives (ibid., 78-79). This usually results in substituting these sounds with plosives /t, d/ (ibid.). Substitutions of dental fricatives in EFL context have been studied before by, for example, Wester,

Gilbers and Rowie in the Netherlands. In their 2007 study, they observed Dutch learners of English and their production of dental fricatives in different situational contexts. The study draws attention to the substitutions Dutch speakers tend to make when producing fricative sounds. They found that very few learners actually produced the target-like realizations (Wester et al. 2007: 478), replacing them most commonly with [s], [z], [t] and [d] (ibid., 485). Alveolar fricatives [s] and [z] occurred mainly in word-final positions while the obstruents [t] and [d] were produced word-initially (ibid.).

2.2 PLOSIVES

The pronunciation of plosives has been studied at different academic levels, from comprehensive school to universities. Paananen's (1998) study of the English obstruents (quoted in Lintunen 2004: 218), as produced by Finnish comprehensive school pupils showed that out of English plosives, alveolar ones were the easiest for the Finnish pupils to produce.

When it comes to measuring VOT times, Suomi (1980: 73) has claimed earlier that the voiced plosives tend to show notably lower values than their voiceless counterparts. In his study of 1980, Suomi listed the VOT values of plosives across five native informants as did Lisker and Abramson with four native speakers of English in 1964. In Lisker and Abramson's study, the voice onset times for the plosive /d/ varied as the speakers were very consistent of either producing negative or positive VOTs. The average voice onset time for /d/ in their study for the speakers that had a positive VOT was 5ms. For the plosive /t/, the value was 70ms. Unlike Suomi, Lisker and Abramson did not include specific information about the positions of the examined plosives. The values from these two studies are where the present study draws its target-like values. Thus, the results in VOT data are compared to Suomi's and Lisker and Abramson's results, making them standard values within this research (see table 1 for Suomi).

	Word-initial	Word-medial
/t/	55	44
/d/	7	10

Table 1: Summary of Suomi's arithmetic VOT means across data of native informants (N=5)

Of course, uttering the word-medial /t/ as a flap /ɾ/, shortens the VOT value significantly. This occurs especially in the AmE variant. As informants have been immersed in the American popular culture and thus it has become the main source of input, this feature was inevitably present in the data.

3 METHODOLOGY

This study included eight participants who all study at the time of data collection in Tampere University and who were split into two groups of four persons, based on their major: first group had participants from technical fields whereas the second group of participants included English students. Each participant was given four sentences, two phrases and twelve individual words to read out loud to a high-quality Zoom H4 Pro recorder and a microphone.

The passage included the plosives /t/ and /d/ and dental fricatives /θ/ and /ð/ in word-initial, word-medial and word-final contexts; all the sounds, two dental fricatives and two plosives, were embedded in the test six times (see Appendix 1). The experimental design followed Suomi's study in which he also had plosives in different positions of the words to get the differing voice onset time values. Participants were informed only afterwards what parts of the test were significant for the study. After the pronunciation test, all participants filled out a questionnaire regarding their background as language learners (see Appendix 2). The scope of this study is too narrow to make generalizations or cover larger Finnish EFL learner groups, but it does give new information about the differences in phonetic competence between language users of different skill levels in English in

an academic environment. To serve the purpose of this study, all chosen participants were native Finnish speakers, students enrolled at an institution of higher education and all of them were young adults (see figure 2).

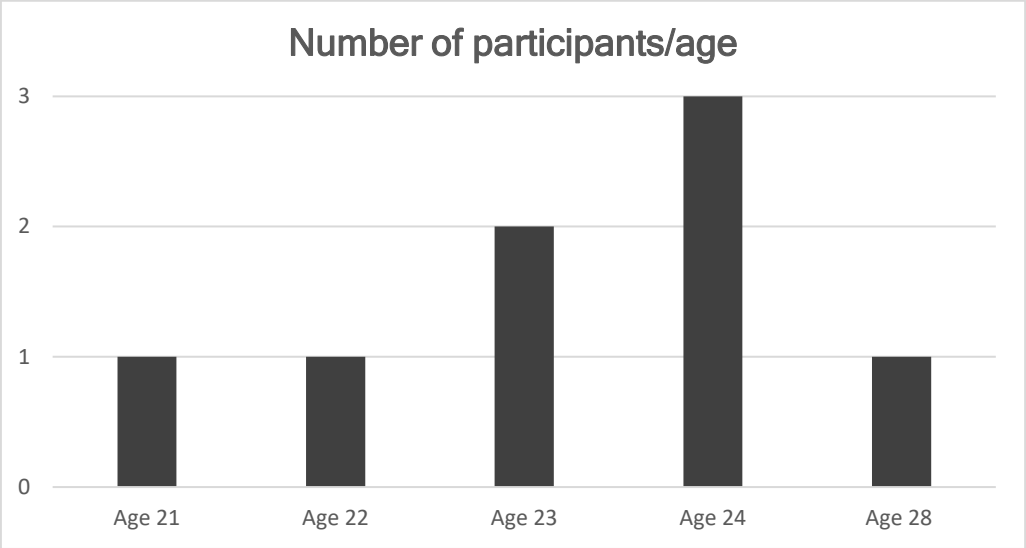

Figure 2: Number and age scale of the informants

The spectrograms and oscillograms that were examined proved to be effective means of determining VOT values as they showed the exact start of the closure as well as the start of the succeeding segment. Checking both were crucial in pointing out the VOTs as this acted as a double confirmation of the segment boundaries even after confusion about them after judging by ear. Drawing clear margins was also challenged by co-articulation which occurred in most cases in the data with prevoicing (see figure 3).

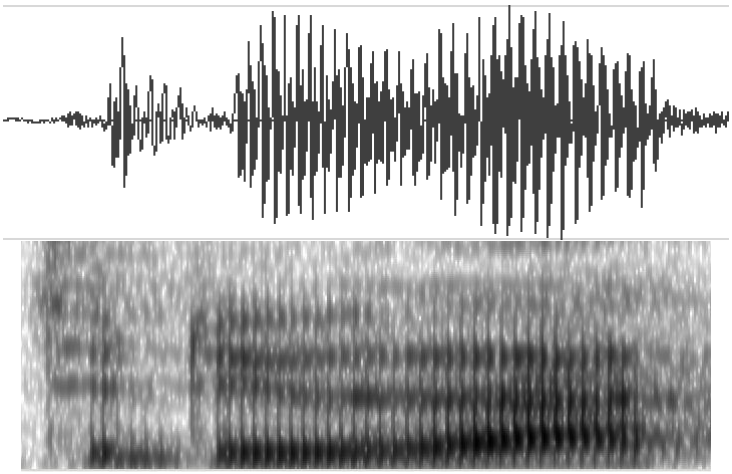

*Figure 3: Prevoicing shown in the word **do***

Analyzing the voicing and possible substitutes for the dental fricatives, spectrograms, together with auditory judgement played a key role in defining the attributes of fricatives. More specifically, the focus in the production of dental fricatives was on the actual realizations and the number of substituting sounds used for the two. While these replacements could be regarded as variation only, within this paper they are analyzed as errors. The uttered sounds would first be listened to and categorized, and subsequently thoroughly examined with their oscillograms to further confirm the first notion of the produced sound.

The actual test had four sentences and 12 individual words. The test was structured in a way that the data would include the segments of interest both individually and in connected speech. All of the sounds, two dental fricatives and two plosives, were embedded to the test six times: two in word-initial, two in word-medial and two in word-final positions. However, plosives in word-final positions were subsequently disregarded in the analysis as they would not precede a voiced segment, therefore making them irrelevant in examining voice onset times. Thus, the final analysis contained six voiceless and voiced fricatives in three phonotactic positions and four voiced and voiceless plosives in two positions, making the total amount of analyzed sounds 20 per participant. The analyzed sounds were distributed as follows: voiced dental fricatives: that/the (word-initial, hereafter WI), father/bother (word-medial, hereafter WM), with/breathe (word-final, hereafter WF); voiceless

dental fricatives: thought/theater (WI), something/author (WM), faith/birth (WF); voiced plosive /d/: dry/dry (WI), indie/candy (WM); voiceless plosive /t/: towel/tide (WI), elated/empty (WM). Before taking the test and filling the questionnaire, all the participants read a privacy notice that was later sent to their emails and signed a consent form regarding the data collection for ongoing as well as a possible future study.

4 DATA COLLECTION

Due to the limitations in time and length of a bachelor's thesis, the sample size was relatively small. The research was taken a part by four students of a technical field and four students of English, making the total participant amount eight. All the participants were studying in Tampere, born in Finland and raised with Finnish as their L1. All English majors stated having had some teaching in English phonetics while three of the engineering majors had not. One engineering major disclosed in the questionnaire that they had been to speech therapy between ages seven and eight but this was disregarded as its focus on Finnish made it irrelevant to the present study.

The data collecting was conducted with a Zoom H4n Pro recorder and the recordings were saved as wav files that were annotated and analyzed with Praat, a computer software for speech analysis. In order to get as clear sound files as possible, the recorder was equipped with an external microphone. Recordings were first analyzed by ear and then as spectrograms and oscillograms. The validity of the research was taken into account. The software used is a widely recognized and used worldwide in phonetic analysis for its in-built features of, for example, synthesizing, manipulating and creating high-quality spectrograms. Praat is especially useful for analyzing the quality of fricatives as well as VOTs by providing detailed pictures of voicing intensity, onset and end. The questions of test and the questionnaire were also designed to answer the research questions.

The recruitment of participants was effortless as all eight are students at Tampere University. The recordings took place in two locations, Hervanta campus and the city center campus. To ensure

the sound quality of recordings, the participants performed the test in closed and silent study rooms on campuses. Recordings were conducted with only the researcher and one participant in the room at a time. The participants were first asked to read the test to themselves and when ready, read the passage out loud to the recorder. After completing this task, the participants were asked to fill out a questionnaire regarding their linguistic background and previous as well as current language knowledge. Additionally, all participants signed a consent form which enables the use of the collected data not only in the present study but also in possible future studies. Next, the recordings were downloaded to a computer, anonymized and annotated to be analyzed with Praat software.

There were multiple relevant dependable variables in this study. They included, for example, the varying acoustic characteristics of the rooms the recordings were conducted in, the participants' levels of nervousness, possible dyslexia and voice soreness or an illness affecting their voice quality. Some surprising variables were present as well, for example, the participants having disclosed information about the test to the next participant in line. Two of the recordings were not as clear (but clear enough to analyze) due to technical problems with the recorder. The independent variables lay mainly in the data analysis. For example, the word-final words of the test were removed from the analysis as they turned out to be pointless to analyze as the initial and medial positions revealed all the relevant data about VOTs. The questionnaire's validity was also an independent variable.

5 RESULTS

In this results section, the two groups are abbreviated the following way: English majors (E) and engineering majors (T). All VOT values in plosives are milliseconds. Tables 2 and 3 present VOTs in word-initial (WI) and word-medial (WM) positions, in both connected speech (con) and as individual words (ind) with intended pauses in between. Dental fricatives had a stricter analysis as the informant either produced the target sound or not, variation excluded.

5.1 PLOSIVES

	WI (con)	WM (con)	WI (ind)	WM (ind)
E group	21-43	7-13	48-84	8-16
T group	17-81	9-26	3-104	15-25
E+T group males	17-81	7-26	3-84	16-18
E+T group females	21-43	9-19	48-104	8-25

Table 2: VOTs (ms) of the voiced plosive /d/ across participants

Word-initial voiced plosives turned out to be more difficult than word-medial plosives for the groups. E group produced more target-like values with both word-initial and word-medial plosives than the comparison group. E group's word-initial values deviated from Suomi (7ms/WI) by mean of 42ms and word-medial (10ms/WM/Suomi) by mean of 3,5ms. The same mean values with T group were 46ms to Suomi's 7ms and 9ms to Suomi's 10ms. Similarly, compared to Lisker and Abramson (5ms), E group had a mean deviation value of 44ms in word-initial and 6ms in word-medial position whereas T group had a mean deviation of 47ms in word-initial and 9ms in word-medial position.

Females had higher values in word-initial plosives compared to the similar value of males. Females' deviation means were 47-49ms, making male participants more target-like with deviation means of 41-42ms. However, females performed better in the word-medial positions with deviation means of 8-10ms to males' 9-11ms.

	WI (con)	*WM (con)	WI (ind)	WM (ind)
E group	64-155	13-55	77-109	30-186
T group	24-82	25-92	37-108	22-180
E+T group males	24-155	25-92	73-109	50-186
E+T group females	42-79	13-79	37-81	22-62

Table 3: VOT:s of the voiceless plosive /t/ across participants

*these values include some /t/ plosives pronounced as flaps /ɾ/

T group performed voiceless plosives in a word-initial position in a more target-like manner than E group. However, E group was closer to the target in producing the sound in a word-medial position. Within E group, word-initial plosive values deviated from Suomi's values (55ms/WI/Suomi) with a 46ms mean while the T group deviated with a mean of only 32ms. Similarly, mean values to Lisker and Abramson (70ms) were 34ms with E group and 32ms with T group. In the word-medial position, the E group produced more target-like values to Suomi (44ms/WM/Suomi) than the T group, deviating from it with a mean value of 49,5ms. The mean deviation from Lisker and Abramson was 57ms. The T group was consistent when compared to both Suomi (44ms) and Lisker and Abramson (70ms), deviating from both with a mean value of 56ms.

These results suggest that the T group performed word-initial plosives in a more target-like manner than the comparison group. The E group deviated slightly less from the target values (44ms/WM/Suomi) in the word-medial position than T group. Compared to the value of Lisker and Abramson, there were no significant differences between the groups. In comparison, females produced values significantly closer to the targets than males with mean deviation values 20ms to 67ms in a word-initial position and 33ms to 47-48ms.

5.2 DENTAL FRICATIVES

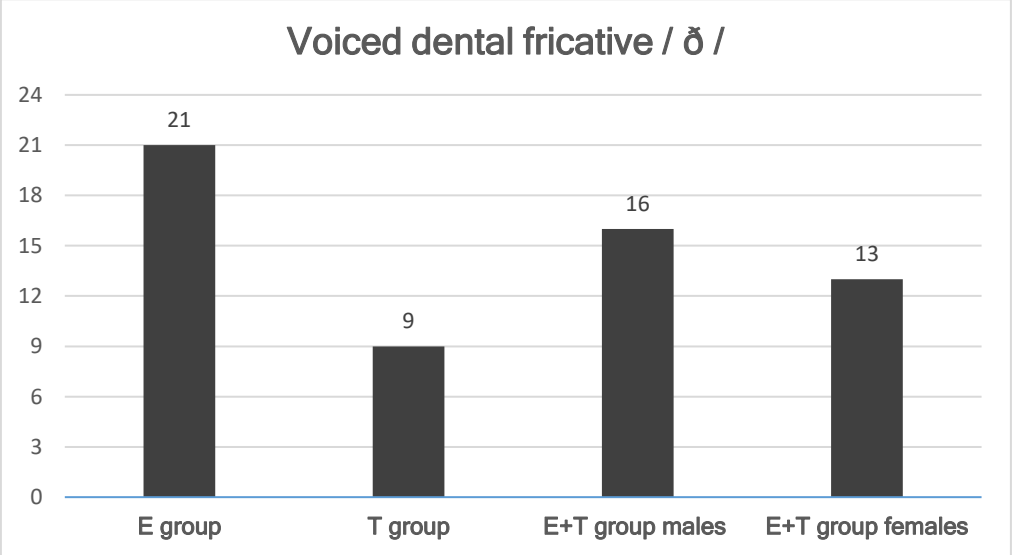

Figure 4: voiced dental fricatives pronounced in a target-like manner across participants

Pronunciation of the voiced dental fricative notably divided the two groups as seen in figure 4. Out of 24 occurrences in both connected speech and individual word testing, E group performed 21 and T group nine fricatives in a target-like manner. Unlike with the academic groups, there were no significant variation between males and females (three digits).

The missing three sounds within the E group were substituted in a word-initial position once with an aspirated plosive /t/ ([t^h]) and in a word-final position two times with a voiceless dental fricative /θ/. Within T group, word-initial fricatives were substituted once with /d/ and a voiceless fricative and twice with /t/.

In a word-medial position, substitutions included one /t/ and /t̪/ as well as two aspirated /t/ sounds ([t^h]) and voiceless dental fricatives (/θ/). Finally, the word-final position had five voiceless dental fricatives in the place of voiced ones.

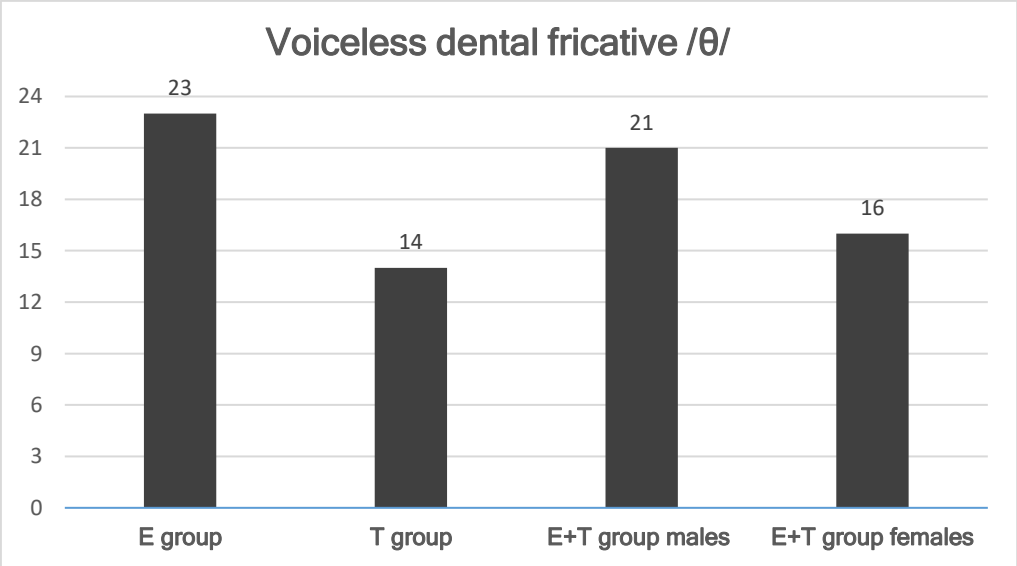

Figure 5: Voiceless dental fricatives pronounced in a target-like manner across participants

Looking at figure 5 above, the voiceless dental fricatives were easier to produce compared to their voiced counterparts as both groups performed better. The E group had one mispronunciation whereas T group had 10. E group's only substitution [t^h] occurred in a word-initial position. Similarly to the results with voiced fricatives, T group performed substituting sounds in all three phonotactic

positions. Utterances within the T group included one aspirated /t/ sound ([t^h]) and four /t/ sounds in a word-initial position, two /t/ sounds and two aspirated /t/ sounds ([t^h]) in a word-medial position and one /t/ sound in a final position. In this category, males performed better than females, surpassing the latter in producing target-like fricatives with five digits.

English majors produced 87,5% of all the voiced dental fricative sounds accurately compared to engineering majors, who pronounced 38% correctly. The trend continued with the voiceless dental fricatives as E group got 96% correct whereas T group 58%. This shows not only the importance of having acquired teaching in phonetics as well as that Finnish speakers in general find voiceless dental fricatives easier to pronounce than the voiced ones. This finding is significant because it shows which dental fricative is in favor in EFL pronunciation with L1 Finnish speakers and it paves a way to further research to find out why that is.

Of the two dental fricative sounds, the voiced one caused significantly more problems than its voiceless counterpart: E group the substituted /ð/ three times and T group 14 times. Similarly, /θ/ was substituted once by E group and 10 times by T group. Thus, it could be said that the voiced dental fricative is more difficult for a Finnish speaker to pronounce than the voiceless dental fricative. The most common substitution for the /ð/ was /θ/ in both groups whereas there were zero instances of /ð/ substituting /θ/ in the data.

Overall, T group made significantly more substitutions to dental fricatives (25) compared to the E group (4). Logically, T group did also have more range in their substitutions as they included voiceless dental fricatives /θ/, voiced and voiceless plosives /d/ and /t/, a flap /t̬/ and an aspirated plosive [t^h]. The E group substituted the voiced fricative /ð/ with the voiceless fricative /θ/ three times, all in word final positions (*breathe*, *with*). Another substitution for the voiced fricative occurred in *that*, pronounced as [t^h]. The voiceless dental fricative was substituted once with an aspirated plosive [t^h] in the word-initial position in *thought*.

Altogether, *breathe*, with a voiced dental fricative /ð/, was the most challenging word in the test as it was mispronounced four times out of eight (See figures 6 and 7 below for differences in the pronunciation of the /ð/ in *breathe*).

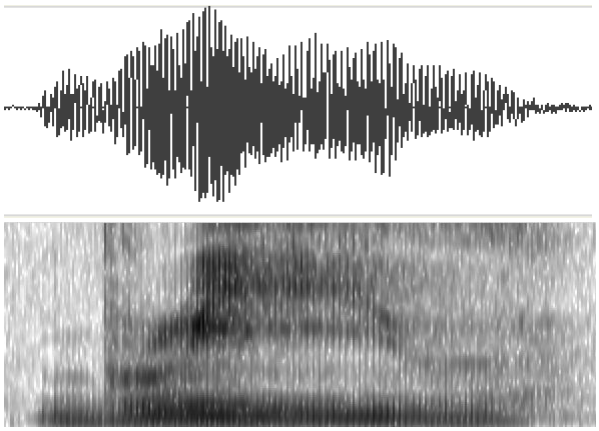

Figure 6: ***breathe*** *where /ð/ pronounced correctly*

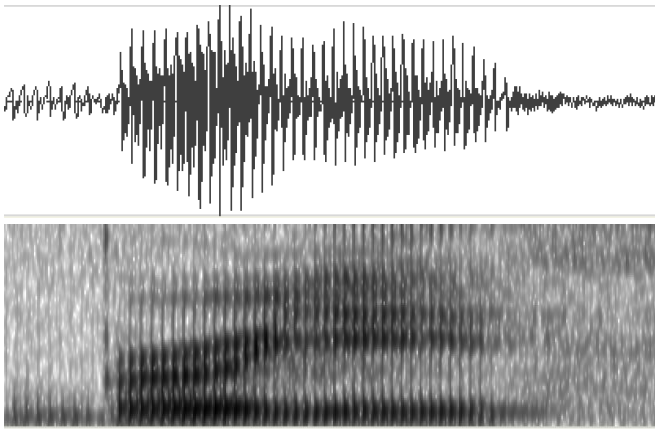

Figure 7: ***breathe*** *where /ð/ replaced with /θ/*

Voiced dental fricative portrayed challenges in other words too and its most common substitution after voiceless dental fricative /θ/ was the voiceless plosive /t/. This occurred in the initial position in the words *that* and *the*. See figures 8 and 9 that compare voicing of the dental fricative /ð/ in pronouncing *the*, first showing the word substituted by the plosive and in the second picture pronounced with the actual fricative.

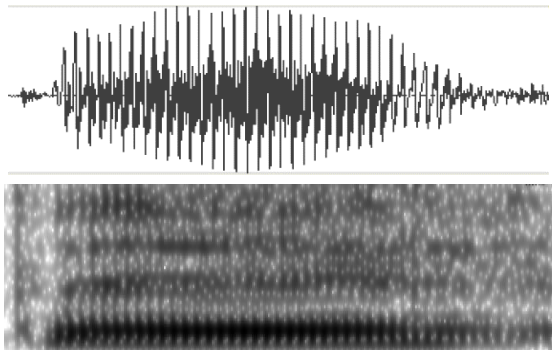

Figure 8: ***the*** *where /ð/ replaced with /t/*

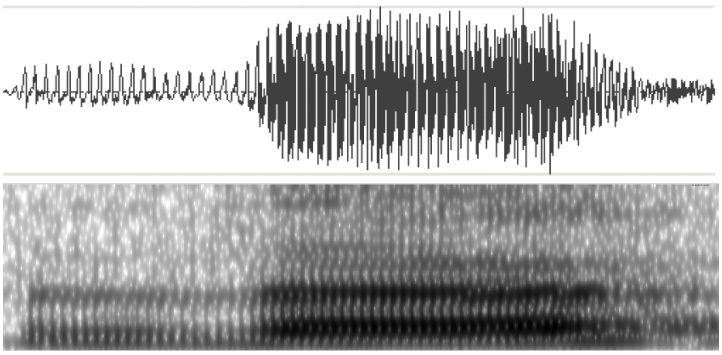

Figure 9: ***the*** *where /ð/ pronounced correctly*

In the questionnaire, all the English majors stated that they had received explicit instruction in phonetics. Thus, they have learned the theory of fricative and plosive sounds and would presumably know how to pronounce these sounds in the test, giving them advantage over their engineering peers.

Before moving to Tampere, the participants had lived in Hämeenlinna, Hattula, Turku, Nokia, Pirkkala, Kajaani, Oulu and Kittilä.

All participants claimed to listen to English daily and all the English majors claimed to speak the language every day. In the T group, one participant said to speak English every day while others once or a few times a week. Another noticeable contrast between the groups had to do with other foreign languages as three out of four in the E group were actively using, either speaking or listening, another language whereas in the T group the similar value was one to four. These languages included Polish, Korean, Spanish and Japanese.

When asked if the participants paid attention to their pronunciation, most common answers were either *often* or *always*, with little deviance between the groups. Only two participants, one from both groups, said *sometimes*. None of the participants had resided in an English-speaking country for more than three months.

6 DISCUSSION

This thesis offers insights on how young people in higher education utilize their phonetic competence in speaking English while studying in vastly different fields. Participants' differing majors and thus interest in language were the most relevant sources of different results as all of them estimated themselves to be very active listeners of English. Furthermore, the current study presents results on both plosives and fricatives as individual words and in continuous speech, not just the other. The aim of this study was to see whether two academic EFL groups would vary in pronunciation based on their majors, background knowledge in linguistics and frequency of input and output. As stated above, the hypotheses of this study were that the participants studying English tend to produce more target-like realizations of the examined sounds compared to their engineering peers and that dental fricatives are either mixed with each other or commonly substituted with a Finnish alveolar plosive /t/.

This study would also ask whether explicit teaching of phonetics leads to better pronunciation and what the substitutions made for the examined sounds were. According to Tergujeff and this study, students of different academic levels do show interest in their pronunciation in a foreign language. In the framing of the present study, however, it could be argued that English majors practice self-selectiveness and thus are more interested in phonetics, paying more attention to their pronunciation than the comparison group.

The most difficult sound to produce turned out to be the voiced dental fricative as only two participants voiced every occurrence of the sound. Both of them were in the E group, which unsurprisingly, was mostly multilingual. This, along with self-selectiveness rooted in interest in English act as one explaining factor to differences between the groups. The T group had only one multilingual student and he had the least erroneous dental fricatives among the T group. This partly explains the result that contrasts with others in the T group while also suggesting further research on whether exposure to multiple languages contributes to a higher language competence.

Previous research on dental fricatives with Finnish speakers of English has showed that while learners are able to produce them, keeping the voiceless and voiced dental fricative sounds separate from one another cause problems (Lintunen 2004: 78, 217). This is especially true with phonemes that the learner's native language does not occupy and thus they are new (ibid.) The perception of dental fricatives as 'difficult' sounds reaches speakers of other languages as well, validating the results of Finnish speakers. The results show that new and sounds similar to one another, like dental fricatives, were mixed with one another which aligns with Lintunen's previous research. However, the more significant finding was that the participants would more often not mix the two sounds but substitute them altogether with a Finnish plosive /t/. This was expected as previous studies show that out of all the plosives, Finns find the alveolar ones the easiest to pronounce (Paananen 1998; quoted in Lintunen 2004: 218). In addition, the Finnish plosive /t/ is the closest equivalent to dental fricatives from the participants' native language and is thus a natural substitution. While this phenomenon could

be disregarded as variation, its effect on intelligibility makes it erroneous. If two words with different meanings become homonyms because of erroneous pronunciation, the meaning changes and thus the recipient is either left perplexed or understanding the speaker by means of other cues, such as context. This happened, for example, with the word *faith* as it became *fate* due to the substitution.

In their 2007 study of Dutch speakers, Wester et al. (485) found that Dutch speakers would substitute most of the English dental fricatives with [s], [z], [t] and [d], with alveolar fricatives [s] and [z] mainly occurring at the word-final positions whereas obstruents [t] and [d] at the onset of a word. Results of the present study show similar results to the Dutch within the T group as both the voiceless and voiced fricative were substituted often with /t/ at the onset of a word. However, alveolar fricatives did not occur in the data which might be because of a different native language.

Both groups, E and T, showed significantly lower values in voiced plosives than in voiceless plosives following Suomi's (1980) results. E group would produce more target-like values with the voiced plosive /d/ than T group. Voiceless plosive /t/ divided the groups to T group performing better in word-initial positions and E group in word-medial positions. As with dental fricatives, the active and self-selective use of language as well as teaching has played a role in distinguishing the two groups. In all data, females produced more target-like values in comparison to males which encourages further studies. As Finnish plosives are unaspirated, their VOT time is lower compared to aspirated English plosives. While it might be expected to see this in the form of negative transfer in the data, most of the results disagree. The data shows how everyone in the E group and most of T group had higher values than the target in VOT. A few participants from T group had lower VOT values. Here Paananen's claim (quoted in Lintunen 2004: 77) that high VOT values sometimes change the alveolar plosives into affricates, for example [th], is likely. Virtually, the aspiration has become /h/ and thus of similar value with the plosive itself, making them equal.

According to James Flege's Speech Learning Model in Production (quoted in Wester et al. 2007: 479), plosives would have presented bigger a challenge for the Finnish speakers than dental

fricatives as most errors in L2 speech are caused by similar, rather than new sounds. In the light of the results of the present study, Flege's claims offer a partial explanation. While the results show notably varying values within VOT times, the plosives were intelligible with only a few exceptions. The substituted dental fricatives, however, would sometimes compromise intelligibility. Therefore, one could argue that dental fricatives, in fact, portray more challenges to the Finnish EFL speakers than plosives.

7 CONCLUSION

Answers to the questionnaire in this study (see Appendix 2) proved what Tergujeff (2013b: 81) has previously stated: Finnish learners take an interest in their own pronunciation, and it is a matter they have to face continuously in their daily lives. However, there were significant differences between the two groups examined: most members of the English group were multilinguals who claimed to speak English every day, whereas their engineering peers used an L2, including English, less frequently. All English students also claimed to have had explicit instruction in phonetics while students of technical fields had not. This, along with self-selectiveness has been presented as the most considerable factor to explain the differences between the comparison groups. Results were also affected by pronunciation transfer as this study focused on not only similar sounds to Finnish but also new ones (dental fricatives).

Overall, the English major group performed in a significantly more target-like manner than their peers in technical fields. This trend was seen throughout the data with voiceless plosives in word-initial position being an exception. Although unsurprising for the reasons mentioned above, we would need to dive deeper into education to find what causes these gaps. Moreover, while social media occupies our free time and teaches us language use, it is worth considering whether these platforms are reliable enough to provide the base to our language competence and whether they are adding to it or leading users astray. The importance of understanding and tackling these differences

ultimately reaches into working life where employers value oral proficiency. Those who show higher language skills do not compromise on intelligibility and are thus more likely to be considered more credible and have more and better opportunities in their careers.

As previous studies as well as this one have stated, language learners do have interest in phonetics. However, with the education system struggling financially, pronunciation challenges are pushed further down in the list of importance. This study, although it being limited, encourages for further examination and teaching of the sounds that are found difficult for a Finnish EFL learner. As there are no resources nor time to focus on the English sound system fully in the curricula, it could focus on these specific phonemes that tend to cause consistent difficulties in target or almost target-like production.

The present study leaves room for future studies to expand on the topic. It would be valuable to examine the cross-linguistic effects on English pronunciation from the other second languages that speakers of one language, say Finnish, speak. This could be tied to the experience of gender, environment, individuality, and culture, for example. Furthermore, accent intelligibility (Tergujeff 2013a: 23) and attitude studies of Finnish-accented English involving native English-speaking judges are few and could be carried out in parallel with fluency studies, where the sounds examined in this thesis and other works could be considered along with intonation, lexicon, and speech rate.

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9 APPENDICES

APPENDIX 1

The pronunciation test: “Read once to yourself and then out loud.”

I tried to dry my indie father’s white teeth with a white towel. To do that, the towel had to be brought to me. After that, I was elated and thought something: Have faith! … what now?
I found happiness where he had left the light.

theater	the	tide	dry
author	bother	empty	candy
birth	breathe	night	bed

APPENDIX 2

The questionnaire: “Fill out as truthfully as you can.”

Kysymykset

Ikä:
Sukupuoli: mies/nainen/jokin muu/en halua vastata
Äidinkieli:
Opiskeluala:

Kuinka usein puhut englantia?
Asteikko: joka päivä, joka toinen päivä, muutama pv viikossa, kerran viikossa, harvemmin

- ➔ Missä kontekstissa? _____ (esim. videopelaaminen, ystävien näkeminen jne.)

Kuinka usein kuuntelet englantia puhuttavan?
Asteikko: joka päivä, joka toinen päivä, muutama pv viikossa, kerran viikossa, harvemmin
➔ Missä kontekstissa? _____ (esim. pelit, videot, televisio, koulu jne.)

Oletko oleskellut englanninkielisessä maassa pitkään (= yli 3kk) yhtäjaksoisesti?
En _____
Kyllä_____; missä, kuinka kauan ja milloin? _____

Jos **et** ole Tampereelta kotoisin, missä olet asunut aikaisemmin? _____
➔ Minkä ikäisenä olet muuttanut? _____

Puhutko tai kuunteletko muita kieliä kuin suomea tai englantia aktiivisesti? _____
➔ Milloin aloitit? _____

Oletko saanut fonetiikan opetusta?
Kyllä_____ En_____

Kiinnitätkö huomiota englannin ääntämiseesi?
Asteikko: Aina Usein Toisinaan Harvoin En koskaan