Adults versus Teenagers: Realisations of the English Voiceless Dental Fricative by Dutch Speakers

Sylvia van Lijssel
4373499

December 2016

LET-TWM400: Master's Thesis
MA English Linguistics

Prof. Dr. Carlos Gussenhoven
Radboud Universiteit Nijmegen

Radboud Universiteit Nijmegen

Table of contents

List of Figures

List of Tables

Abstract

This study investigates the realisations of the English voiceless dental fricative [θ] by Dutch teenage and adult speakers of English. Forty-two Dutch participants were asked to complete a production task containing thirty occurrences of /θ/ equally divided over syllable-initial, medial and syllable-final position. The results indicated that Dutch L2 speakers of English realise /θ/ most often as accurate [θ], inaccurate [t] and [f]. Position of /θ/ matters most for accurate realisation as [θ] in medial position, where non-target realisation [t] is more frequent than [θ]. The number of [d] realisations is highest in medial position, and the number of [f] realisations is highest for syllable-final position. Data reveals that adult participants generally realise /θ/ as [t]. By contrast, teenage participants generally have a higher number of both target [θ] and [f] realisations. This difference between the two age groups is a significant trend for ScoreF ($t_{30.032} = 0.056$). Teenage participants also report more extensive contact with the English language than the adult participants ($t_{40} = -4.701$; $p < 0.001$).

Keywords: second language speech, voiceless dental fricative, realisations, Dutch L2 speakers, production experiment, phonetics, English

Chapter 1. Introduction

Native speakers of Dutch are generally known to have a relatively high proficiency level in English, and most of them tend to switch to English immediately when they hear a foreign accent. Even though native English speakers are very appreciative of these language skills, some English sounds do remain a stumbling block. Dutch learners have particular difficulties with common English dental fricatives /θ, ð/. Dutch does not have dental fricatives, which generally results in Dutch second language (L2) speakers replacing these sounds with others, such as [s, z], [t, d] and [f]. This is also common for speakers of other foreign languages like German, Korean and Japanese, who tend to realise [θ] as [s]. Similarly, Russian, Thai and Hungarian speakers realise [θ] as [t], and Cantonese speakers from Hong Kong realise [θ] as [f] (Rau, Chang & Tarone, 2009).

Previous findings from L2 speech research have confirmed that realisations for /θ/ can be linked to the first language (L1). However, these languages had the same realisation of /θ/ regardless of syllable-initial or syllable-final position. Wester, Gilbert and Lowie (2007) conducted an empirical study in the Netherlands which showed that Dutch L2 speakers tend to realise syllable-initial /θ/ as [t] and syllable-final /θ/ as [f] or [t]. Wester et al. (2007) also reported large "intra-subject variation" among the substituted consonants in their study. In other words, Dutch speakers of English show irregularities in their realisations of the English voiceless dental fricative, and a more detailed analysis of these realisations by Dutch L2 learners may provide valuable insights into L2 speech production processes.

On that account, the present investigation will only focus on the voiceless dental fricative and carries out a quantitative study on the consonantal substitutions by two groups of native Dutch speakers of English, teenagers and adults below the age of 50, and establishes which of the consonants referred to above are used to replace [θ] and whether the answer depends on the position of /θ/ in the word. In addition to the interaction between age, syllable position and the realisation of /θ/, this study also investigates whether there is an association between exposure to the English language and the type of consonant realised by learners of English. First, the remainder of this chapter will explore the characteristics of the English voiceless dental fricative. Then, Section 1.2 and 1.3 will review literature on the pronunciation of [θ] by native English speakers and Dutch L2 speakers. Section 1.4 will discuss previous studies conducted on the voiceless dental fricative /θ/ and lastly it will present the research questions, hypotheses and predictions.

1.1 The voiceless dental fricative

The English phoneme /θ/ belongs to the group of consonants and is a voiceless fricative sound. Its energy is fortis or otherwise known as voiceless, which is why it is pronounced with more tension than the voiced fricative /ð/. The English /θ/ is articulated by holding the tip of the tongue slightly against the back of the upper teeth (Jones, 1975). The active articulators are thus the tongue and the upper teeth. The main part of the tongue is fairly flat during production and the soft palate is raised (Figure 1.1). Air passes from the lungs through the open non-vibrating vocal cords and escapes through the narrow space between the tip of the tongue and the upper teeth.
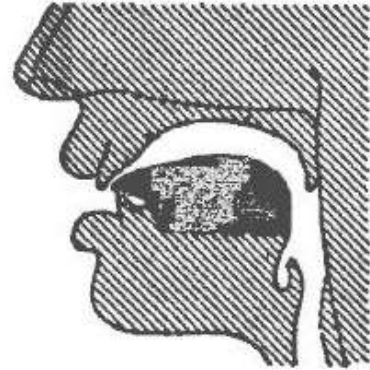
Figure 1.1 Position of the mouth for [θ] (Jones, 1975).

1.1.1 From thorn to theta

The voiceless phoneme /θ/ and voiced /ð/ are both represented by the digraph <th> in written English, e.g. *thin* /θɪn/ and *that* /ðæt/. However, this was not always the case. The <th> in Old English texts (1100-1150) was written with the letter <þ> called thorn. For example, in this line from the *Peterborough Chronicle* 'I ne can ne I ne mai tellen alle þe wunder ne all þe pines ðat he diden wrecce men on þis land', which translates into Modern English as 'I neither can nor may recount all the atrocities nor all the tortures that they did on the wretched men of this land.' The letter <þ> stood for either /θ/ or /ð/. The letter <ð>, called eth, was also used in Old English writing, although the two letters tended to be interchangeable, meaning that <þ> did not "consistently represent" the voiced consonant (Freeborn, 1998, p. 24). Fennel (2001) agrees that Old English did not have distinctive voiced and voiceless fricatives which were consistently used. Instead the context indicated when the sound was voiced. For example, <þ> between other voiced sounds would itself be voiced if not it was voiceless. Fennel (2001) explains that the voiced fricatives are actually predictable allophones that "are in complementary distribution" with voiceless fricatives, meaning that where the voiceless fricatives occur they cannot (p. 61).

Texts in Early Middle English (1150-1300) also contained <þ> and <ð>, but the thorn started to look more like the letter <p> called wynn. Works from the Late Middle English period (1300-1450) were the first to contain <th> for both /θ/ and /ð/. The <ð> and <p> disappeared from the Middle English alphabet in the thirteenth century (Treharne, 2010).

Although the <þ> was still maintained it changed to <y> in word-initial position for a restricted number of function words such as *they 'yei'* and *thy 'yi'* (Freeborn, 1998). Today the <y> is still known in old signs like *Ye Olde English Pubbe*. However, Caxton's printing press from 1470 standardised the use of <th> for all present-day English representations of voiceless /θ/ and voiced /ð/.

1.2 Dutch second language speakers

The realisation of /θ/ by native Dutch speakers has been the subject of commentary since the late 1970's and seems to vary a great deal. Gussenhoven and Broeders (1976) indicate that RP dental fricatives [θ] and [ð] often present difficulties because there are no similar sounds in Dutch. They state that speakers of Dutch tend to replace [θ] with the Dutch [s]. Gussenhoven and Broeders (1976, p. 111) also noticed that the Dutch /f/ is "extremely rare as a substitute" for RP /θ/, which is somewhat surprising because acoustically /f/ is closer to /θ/ than /s/.

  Collins and Mees (1981) similarly argue that the English dental fricatives pose major problems of recognition and realisation for the Dutch learner because they lack comparable native sounds. They state that Dutch learners replace [θ] with [s] for intervocalic context and [s] or rarely [t] for syllable-initial and syllable-final context. In addition, Collins and Mees (1981) argue that because both [θ] and [ð] are represented by <th> in spelling, many Dutch learners are unaware of the fact that the English language has two different dental fricative sounds. These phoneticians also claim that Dutch speakers often replace [ð] by Dutch [d] and sometimes [z]. On the assumption that second language speakers are still unaware that <th> represents both a voiced and voiceless consonant, they might also realise [θ] as Dutch [d] or [z].

  Collins, Den Hollander, Mees and Rodd (2011) more recently comment that Dutch learners usually replace [θ] with [s] and [t], rather than rarely [t] mentioned earlier in Collins and Mees (1981). They also urge that both are completely wrong, even though native speakers of Irish and Scouse also articulate [θ] as [t]. Literature also repeatedly mentions that [θ] is easier to learn than [ð]. However, authors of these pronunciation guides do not clearly mention whether their claims of habits by foreign language speakers are based on the authors' own first language experience, second language recordings, observations or other studies conducted with second language speakers.

1.3 First language speakers

The fact that /θ/ is a voiceless dental fricative does not mean that it is always realised like one, even in native English speech. Some English varieties in Great Britain are in fact known for their distinct realisations of [θ] (Collins & Mees, 2008). For example, speakers of the Cockney accent are known to replace [θ, ð] with [f, v], which is called th-fronting. The Irish English speakers on the other hand vigorously replace [θ, ð] by dental plosives [t̪, d̪] or affricates [t̪θ, d̪ð]. These speakers demonstrate the effect of th-stopping, meaning they realise their fricatives as either dental or alveolar stops. Collins and Mees (2008) note that many speakers of Scouse also frequently exhibit th-stopping, which the authors think is an influence from Irish. First language speakers thus vary in their realisation of [θ] depending on their region of origin, and /θ/ is therefore not always realised as a voiceless dental fricative. Considering this regional variation, the mispronunciation described above by Dutch speakers of English could technically be redefined as a correct Cockney or Irish articulation of /θ/. However, the realisation of [θ] as [s] does not occur in any native English accent. Moreover, native Dutch speakers are generally not sufficiently familiar with the characteristics from various British accents in order for them to purposefully incorporate these characteristics into their L2 speech.

1.4 Previous literature

The most studied second language (L2) speech phenomenon is the acquisition of voice onset time (VOT) in stop consonants (Davidson, 2011). However, as the observations in the previous paragraphs might suggest, the acquisition of the English dental fricatives /θ, ð/ has not been left unstudied either (Lombardi, 2003; Wester et al., 2007; Rau et al., 2009). These studies have all concluded that the /θ, ð/ are problematic for second language learners of English to produce.

The most straightforward explanation for such difficulties in L2 phonology is the transfer effect (Lombardi, 2003). Language transfer refers to the fact that a speaker is, often unknowingly, applying knowledge from one language to another, which impacts the acquisition of the new language. However, the case of the English dental fricative [θ] is slightly more complex because it regards a sound that does not exist in every speaker's L1. So for these speakers transferring knowledge about this fricative while acquiring the English language would be difficult. Instead L2 speakers of English are reported to use the variants [t], [s] and [f] for the target sound [θ]. Research suggest that the different realisations for [θ] can be linked to the L1. For example, German, Korean and Japanese speakers tend to realise [θ] as [s], Russian, Thai and Hungarian speakers realise [θ] as [t], and [θ] is realised as [f] by Cantonese speakers

from Hong Kong (Rau et al., 2009). This reported variation indicates difficulties with acquiring the English fricative sounds.

Some of the earliest theories accounting for the obstacles that are L2 sounds are the Contrastive Analysis Hypothesis (CAH) by Lado (1957) and the Markedness Differential Hypothesis (MDH) by Eckman (1977). The CAH predicts speaker's difficulties based on a cross-linguistic analysis of the phonemic differences between the speaker's L1 and L2. According to this hypothesis, target language structures which are absent in the learner L1 should be more difficult to acquire. Meanwhile, L2 structures that have an L1 equivalent should be easier to acquire (Colantoni, Steele & Escudero 2015). However, if multiple phonemic substitutions exist in the L1, the CAH cannot accurately predict which of these sounds a learner will produce to realise the target sound, for example /t, d/ or /s, z/ as substitutions for /θ, ð/ (Davidson, 2011). Even though the CAH was refuted because it did not accurately predict or account for all L2 speech data, it did inspire other contrastive theories.

The MDH combines cross-linguistic influence with the universal factor of markedness. This hypothesis proposes that target structures which differ from the L1 and are more marked than what is present in the native language will cause more difficulty for the L2 learners. If the target language structures are less marked the MDH proposes they are less difficult to acquire (Colantoni et al., 2015; Wester et al., 2007). The phoneme /t/ for example is unmarked, because stop consonant categories tend to occur in all languages (Wester et al., 2007). Fricatives are more marked because they are less common than stop consonants. This means that fricatives will cause more difficulties than stops for an L2 speaker who has not acquired fricatives as native sounds. In addition, L1 and L2 phoneme inventories tend to differ in fricatives, e.g. the Dutch /f, v/ and English /θ, ð/.

A model argued to account for the difficulties in L2 sounds that is also supported by empirical evidence is the Speech Learning Model by Flege (1987). Learning a second or third language, means acquiring a new set of phoneme categories when there is already a phonetic system in place. Forming a new target-like sound category begins with the L2 speakers' perception of the new sounds followed by the production. Second language learners are likely to employ their existing L1 categories to interpret L2 sounds (Colantoni et al., 2015). This is where the SLM predicts difficulties with L2 sounds because this progress depends on the learner's sensitivity to the differences between the L1 and L2 sounds; Flege (1987) described this as the equivalence classification. The equivalence classification will "block or prevent" a language learner from forming new target-like categories if that learner perceives an L2 sound as similar to their L1 sound (Colantoni et al., 2015). It is thus more likely that L2 learners will

produce L2 sounds categorised as new more accurately than sounds that are similar to L1 ones because it is difficult for speakers to form a phonetic category that is too similar to an existing one (Flege, 1987). The SLM however does not claim that creating target-like L2 categories is impossible. It rather proposes that L2 speech production is evidently linked with L2 perception.

1.4.1 Optimality theory in SLA

Lombardi (2003) argues that transfer and other known SLA theories do not sufficiently explain the great amount of variation produced by second language speakers of English. Instead she proposes Optimality Theory (OT) as a more "suitable tool" to provide a satisfactory analysis of the diverse L2 data. Lombardi does not collect empirical evidence in her study, but uses data found by other researchers to seek the optimal ranking of constraints that comply with the data. The two OT constrains Lombardi focusses on are faithfulness to manner, which leads to [s], and markedness which leads to [t]. The faithfulness constraint requires speakers to be faithful to the manner of articulation, in other words to change [θ] to a different continuant fricative rather than to a stop consonant.

However, Lombardi demonstrates that no possible ranking of these two constraints results in [t] being the optimal output for /θ/. In spite of this, observations from second language speakers realising /θ/ as [t] demonstrate that markedness must have a role. Lombardi then suggests that the answer lies in the child language acquisition preference for the unmarked manner. Fricatives are more marked than stops because "stops are acquired earlier in L1 than fricatives" (p. 229). So if a language has fricatives it also has stops. L2 learners who realise the English fricative as a fricative are likely to display a transfer effect of some kind that makes them differ from the universal child-like constraint ranking. Lombardi (2003) therefore concludes that the realisations of English fricatives [θ] as stops [t] are the primary universal ranking of MARKEDNESS constraint dominating other constraints. To this extent OT can indeed provide more answers to the L2 fricative substitution phenomenon. Nonetheless Lombardi (2003) stressed that more work on this subject needs to be done.

More work on this proposal of using Optimality Theory for SLA purposes was done by Wester et al. (2007). Wester et al. investigated the substitutions for /θ/ and /ð/ by Dutch learners of English. Their empirical study focussed on which substitutions Dutch learners made for [θ] and how these could be explained. The recordings of 25 Dutch participants contained mostly realisations of /θ/ as [t], [s] and [f]. In syllable-initial position the majority of all realisations 64% was [t], then [s] with 21% and lastly [f] 13%. In syllable-final position,

almost half of all realisations (47%) was [f], then [t] with 33% and finally [s] with 13%. Overall the majority of the realisations of [θ] were [t], while [f] occurred less frequently (Wester et al., 2007).

In comparison with Lombardi and Wester et al. attempted to account for these varying substitutions by using OT markedness and faithfulness constraints. Wester et al. (2007) demonstrate that SEGMENTAL MARKEDNESS promotes [t] before [s] because the stop consonant has unmarked values for place, manner and voicing. They also demonstrate that the faithfulness constraint is further divided into CONTINUANT and STRIDENT. The feature [continuant] distinguishes /t/ from /s/ and the feature [strident] is responsible for the distinction between /θ/ and /s/. Wester et al. (2007) thus argue that the correct realisation of *think* requires for both CONTINUANT and STRIDENT constraints to be dominated by SEGMENTAL MARKEDNESS. If the markedness constraint, however, is not dominated, the speaker realises the word *think* with [t] rather than [θ], which in their study is the most common realisation for [θ]. Wester et al. (2007) claim that the dominating role for the feature STRIDENT proves the hardest part for speakers of Dutch, since this feature "is not active in their first language" (p. 488).

Even though OT seems to successfully account for the [t] and [s] realisations of /θ/ in various languages, these languages had the same realisation of [θ] regardless of position. As both Lombardi (2003) and Wester et al. (2007) acknowledged in their study, this is slightly different for Dutch speakers. Syllable-initial [θ] is most often realised by Dutch speakers as [t], but the final [θ] is most often realised as a fricative [s, f] rather than a stop consonant. Fikkert (1994) made similar observations in Dutch child L1 acquisition. She studied the acquisition of syllable structure and stress by infants learning Dutch as their first language. The observations Fikkert (1994) made about syllable-final fricatives are interesting for this current research study. She observed that infants between one and two years of age replace consonants in syllable-final position [d, s, t, k, m] with fricatives [ʃ, f]. Infants who also "allowed fricatives in their template hardly ever replaced" syllable-final fricatives by other types of consonants (Fikkert, 1994, p. 132). These L1 findings by Fikkert (1994) and the findings by Lombardi (2003) and Wester et al. (2007) suggest that Dutch learners of English transfer this preference for syllable-final fricatives to their second language.

1.4.2 Speech communities

The difference in realisations of syllable-initial and syllable-final position by Dutch speakers is troublesome in a theory with a single constraint ranking. Both Lombardi (2003) and Wester et

al. (2007) failed to find an explanation for the different patterns of substitutions. Rau et al. (2009) argue that OT cannot explain all reported cases regarding the L2 pronunciation of /θ/ and convincingly suggest that the reason why speakers behave differently is because they are language speakers of different speech communities. For example, the speech community of Quebec French realise [θ] as [t], but European French speakers realise [θ] as [s] (Lombardi, 2003; Rau et al., 2009). Members of a speech community are second language learners of the same L1 (or dialect thereof) who share a norm regarding an L2 target variable (Rau et al., 2009). The Canadian and European French speakers can thus be seen as two separate speech communities, because they do not share the same norm regarding the English voiceless dental fricative /θ/. This raises an interesting question as to whether there might be separate speech communities related to the difference in realisation of /θ/ within the Dutch native speaker population.

Rau et al. (2009) addressed the fact that so far L2 speech studies have stated that "each L1 group uses a fixed variant to substitute for the target variant" like the English voiceless dental fricative (p. 584). However, this is not true for the European French and Quebec French speakers (Lombardi, 2003). The L2 speech study by Rau et al. (2009) investigated whether Mandarin Chinese speakers from mainland China and Taiwan produced the same substitute variant for the target fricative /θ/ and thus whether these speakers belong to the same speech community. The sociolinguistic variationist methodology used by Rau et al. (2009) is an elicitation of L2 speech through a sociolinguistic interview containing four different production tasks: story reading, story retelling, word list reading and an interview. Eleven Mandarin Chinese speakers from mainland China and sixteen undergraduate students from Taiwan participated in this study.

Rau et al. (2009) analysed the participants' speech using VARBRUL and obtained very clear results. The mainland Chinese speakers realised /θ/ as a non-target variant for 32% of the total realisations. Among the non-target variants was [s] (99%) and other variants such as [t] and [ʃ]. The Chinese speakers from Taiwan realised a non-target variant for /θ/ 23.6% of the total realisations. Among their non-target variants were [z], [d], [t], [s], [f], [ʃ] and [∅]. 86% of these inaccurate productions of <th> were [s], which is still the vast majority as for the mainland Chinese speakers. The authors think that the wider range of variants in the Taiwan sample could be a result of the higher proficiency of the China sample, which causes a more advanced pronunciation closer to the native norm for /θ/. The authors also think that input might have had an influence, since the Taiwan sample received input mostly from their peers and the China sample received more input from native speakers.

Following the production tasks, the participants were also asked to make judgements on four orally modelled realisations for [θ]. Participants evaluated these possibilities on a 7-point Likert scale before deciding on their preferred substitute for [θ]. The self-reported preference for 22 of the total 27 participants was [s], which corresponds with the production results of the participants. Rau et al. (2009) thus conclude these speaker groups of Mandarin Chinese form one speech community that shares the same norm for the L2 target variant /θ/, although some individuals did not agree to the main preference.

1.4.3 The present study

Colantoni et al. (2015) mention that there is "no comprehensive L2 production theory" yet. In fact researchers so far have not been able to develop a second language theory that accounts for all known L2 learner data. Rau et al. (2009) believe that the most comprehensive model to date derives from sociolinguistic variationists. Wester et al. (2007) argue that instead of "attempting to predict L2 production" based on known data and previous theories, we should gather more information on L2 speech production by carefully examining substitutions produced by L2 speakers.

The study by Wester et al. (2007) is one of this paper's impetuses to dive deeper into the Dutch realisations of /θ/. However, the present study will not test a particular L2 theory but will leverage changes in the methodology that hopefully will collect more L2 speech data. Wester et al. (2007) recorded 25 native speakers of Dutch in three different situational contexts. The subjects ranged between 18 and 56 years of age and varied in their proficiency and educational background. They were asked to describe pictures in as much detail as possible. These descriptions were recorded and transcribed, after which the phrases containing realisation of /θ/ and /ð/ were isolated, then compared to the recordings and analysed.

Wester et al. (2007) had a rather small number of participants from a wide range of ages. Furthermore they addressed the fact that there was substantial "intra-subject variation" within the group of substitute sounds, so much so that all but two participants did not consistently produce the same realisation of /θ/. This observation signals that a larger study to investigate whether that "intra-subject variation" is of more importance than it would seem. A larger participant group might also reveal a pattern or some evidence of speech communities within the variation, for example younger and older Dutch speakers or female and male speakers. This study will thus record almost twice the number of participants and look at specific ages, ranging from 15 to 20 years of age and 30 to 47 years old. An equal number of

male and female speakers will be attempted for each age group.

Furthermore, Wester et al. (2007) had a spontaneous speech task eliciting words through pictures. They unfortunately do not mention how many occurrences of /θ/ an average recording ultimately had. The images may not have succeeded in eliciting many words containing /θ/, and 64% [t] may have amounted to 4 realisations. This study will have a production task with a set number of words containing /θ/ produced by each of the participants. These methodological changes will hopefully gather more data to gain insight on the "intra-subject variations" described by Wester et al. (2007), the substitution variation based on position (Lombardi, 2003; Wester et al., 2007) and will hopefully discover evidence of existing speech communities within the Dutch speaker population.

1.5 Research questions and predictions

Unlike most of the previous studies on the English dental fricatives, the present investigation concentrates on the voiceless dental fricative and carries out a quantitative study on the consonantal substitutions by two groups of native Dutch speakers of English and establishes which consonants are used in position of English /θ/ and whether that realisation differs for initial, medial or final position. These are relevant research questions as they may give a more detailed analysis of /θ/ substitutions by Dutch L2 speakers of English than is currently available in previous literature. The research questions which will be answered are:

1 What consonants do Dutch L2 speakers of English pronounce in positions of English /θ/?
2 What is the frequency distribution of these consonants in initial, medial and final positions of the word?
3 Is there an age effect and/or exposure effect on the type of consonant or their frequency distribution?

The studies by Lombardi (2003), Wester et al. (2007) and Rau et al. (2009) have already observed multiple variants used as substitutions for [θ]. Wester et al. (2007) illustrated that L2 speakers of English are most likely to replace [θ, ð] with [t, d] because these are the least marked sounds. Other likely sounds are the sibilant [s] because it is phonologically similar to [θ] and [f] because it is a phonetically (acoustically) similar sound. Wester et al. (2009) found that their Dutch subjects sometimes used [f], but [t] and [s] substitutions for [θ] occurred more frequently. The hypothesis for the first research question thus is that Dutch L2 speakers will realise the voiceless dental fricative theta as either an accurate [θ] or other variants like [t, d, f,

v, z] and [s]. The voiced consonants are also included because of their <th> spelling, which not all foreign speakers might know has a voiceless and a voiced pronunciation (Collins & Mees, 1981). It is possible that we might uncover a segment such as the dental [t̪], which could be roughly classified between [θ] and [t]. This hypothesis will be tested by recording native Dutch speakers of English when they read aloud a wordlist of 70 existing English words, of which 30 will contain /θ/.

Rau et al. (2009) analysed the realisations of /θ/ by mainland Chinese and Taiwanese speakers in syllable-initial and syllable-final position and examined which phonetic environments promoted or inhibited accurate production of [θ]. They found that syllable-initial /θ/ followed by the vowels in *thank*, *third*, *think*, *wealthy* and *thought* promoted accurate realisation of [θ]. Syllable-initial /θ/ followed by the vowels in *thunder*, *thousand* and the cluster in *throw* constrained Chinese learners of English to accurately realise an accurate [θ]. Rau et al. (2009) also found that /θ/ in coda position preceded by the vowels in *with, teeth*, *moth* and *breath* promoted accurate realisation of [θ]. But /θ/ preceded by the vowels in *math*, *youth*, *mouth* and *earth* constrained accurate realisation of [θ]. Rau et al. (2009) thus concluded that not only the position of /θ/ but also the phonetic environment such as the preceding or following vowel could help L2 speakers accurately produce [θ]. Additionally, Wester et al. (2007) and Fikkert (1994) observed that Dutch L2 speakers tend to realise the English dental fricative in syllable-initial position as [t] and syllable-final position as [f]. The hypothesis for the second research question thus is that the position of /θ/ and the preceding or following vowels matter for accurate realisation and that the most frequent non-target realisation of /θ/ in syllable-initial position will likely be [t] and in syllable-final position will likely be [f]. In order to test this hypothesis we will split the 30 English test words into groups of ten, equally divided over the three syllable positions.

Regarding the third research question, we expect a general difference in proficiency between the two age groups. Specifically, we hypothesise that older Dutch speakers of English will produce more non-target sounds than younger Dutch speakers of English. To test this third hypothesis, this study will have two groups of participants, a teenage participant group and an adult participant group. A widely known SLA theory is the Critical Period Hypothesis. This hypothesis states that there is an ideal time window or sensitive phase to acquire a language in a rich linguistic environment (Meisel, 2011). Although the exact age ranges are still under speculation, most researchers think this period starts around the age of four and ends before puberty. Consistent with this hypothesis is our expectation that the older participants in this study who started learning English later than the age of twelve are more likely to mispronounce

[θ] as [t], [s] or [f] in the production experiment.

In addition, we hypothesise that teenagers will have more exposure to English than the older participants. This hypothesis is based on the increase of exposure to the English language in everyday life, which is mostly experienced by younger people through the internet and television. To test this hypothesis, participants will be asked to fill out a short questionnaire containing demographic questions and questions about their contact with the English language.

Chapter 2. Methodology

2.1 Design

The design of this investigation is a descriptive quantitative study of the consonantal realisations by two groups of Dutch speakers of English and establishes which consonants they realise for the English phoneme /θ/. The dependent variables for this research project thus are the number of accurate realisations of [θ] and the number of inaccurate realisations [t] and [f]. The independent variables are the participants' age and gender, the intensity of their contact with the language, their interest in the English language and the position of /θ/ in the word.

2.2 Participants

The sample consisted of 42 native speakers of Dutch who did not have any hearing or visual impairments. Two groups of participants were required in order to answer the question whether realisation of /θ/ differs for adult and younger Dutch speakers of English. The first group included 20 adult (10 men and 10 women) native speakers of Dutch with ages ranging from 30 to 47 years of age with a mean of 40.4 years. This age group was chosen because the average adults above this age will likely have had little to no contact with the English language. The second group included 22 teenage native speakers of Dutch (12 girls and 10 boys) with ages ranging from 15 to 20 years of age with a mean of 16.5 years. Secondary school students were recorded rather than university students because secondary school students grow up in an environment in which English is more present on a daily basis. Both groups of participants live in the northeast of the province of Noord Brabant (Figure 2.1).

Figure 2.2.1 Map of the Netherlands, location of study population indicated in red.

The teenage participants were recruited from various secondary schools in this region, such as the Merletcollege located in Cuijk, the Elzendaalcollege in Boxmeer and Metameer in Stevensbeek. The adult participants were recruited via local social media and word-of-mouth marketing from the same area of the Netherlands. All the participants varied in age, sex and proficiency in English, this sample was intended to achieve a more accurate representation of native Dutch speakers of English. This research project excluded participants who have had bilingual education or have lived in an English speaking country.

2.3 Materials

This research project requires participants to realise a large number of the voiceless dental fricative /θ/. In view of the relatively low frequency of this consonant, spontaneous speech is unlikely to yield a large enough number, which is why a word list was chosen as an elicitation task. In order to avoid any influence from the researcher's pronunciation on that of the participants', the word list was presented in a written form. The word list created for this research project contained 30 existing English words containing /θ/. These are presented below in Table 2.1. Ten words have /θ/ in syllable-initial position, ten in medial and ten in syllable-final position, e.g. *thanks*, *thick*, *lethal*, *method*, *tooth* and *bath*.

Table 2.3.1
Test words with /θ/ in syllable-initial, medial and syllable-final position.

	Initial position theta - vowel	Medial position vowel – theta – vowel	Final position vowel – theta
1	thanks	anything	both
2	thirty	everything	tooth
3	theatre	nothing	bath
4	thing	author	mouth
5	think	method	death
6	thousand	python	health
7	thick	lethal	youth
8	throw	gothic	teeth
9	thirteen	Cathy	faith
10	Thursday	Southeast	truth

The word list also contained 40 fillers to mask the purpose of the study. This final list of 70 words was randomised. An independent pilot recording of the word list showed that the participants who read out the word list did not discover the purpose of the study after they had finished the task.

Other material for this project includes a background questionnaire containing 22 questions regarding the participants' education and personal interest in reading and listening to the English language. This questionnaire elicits information from the participants for the independent variables such as age, gender and contact with the English language. The word list and background questionnaire as presented to all participants for this research project are attached to this report as Appendix A.

2.4 Procedure

Both groups of participants were recruited on a voluntary basis. The teenage participants were approached via tutors and teachers at their secondary schools. Students who agreed to help with the investigation were asked to come to a quiet classroom one-by-one. This was done to achieve an adequate environment for the recording and to avoid any disturbance from fellow participants.

The adult participants were approached via local social media and word-of-mouth marketing. They agreed to be recorded in a quiet room in their own homes. Sometimes couples volunteered, which meant that they came into the room separately to avoid any influence from the performance of one participant on that of the other.

All 42 participants were first told that they were participating in a study on English pronunciation by Dutch native speakers. They were then given the word list and time to read through it and/or practice if they wanted. Participants were not allowed to ask the experimenter for the pronunciation of any of the words on the list. Participants were informed that the recording would begin after signalling that they had finished practicing the list.

At the start of the recording, participants were asked to read aloud the 70 words at a normal pace. The experiment included a trial recording, after which a final recording was made. The trial recording was added to make participants feel more relaxed with the assignment. After finishing the second recording, all participants were asked to fill out the background questionnaire. The procedure took about 10 to 15 minutes for each participant. All participants were recorded twice, resulting in 84 voice recordings with an average time of 1.5 minutes.

2.5 Apparatus

All participant recordings were made by using a TASCAM's DR-05 digital recorder suitable for high-quality linear PCM recordings. The stereo recordings were then analysed using Audacity®, a free audio software and PRAAT, a free acoustic analysis software.

2.6 Analysis

The original data should have been 42 recordings, because the trial recording served as a warm-up. However, after discovering that participants varied in their realisations during the trial recordings and final recordings, all 84 recordings were analysed for this study.

The recordings were analysed on an auditory and visual basis using PRAAT to establish the realisations of the voiceless dental fricative /θ/. An assessment table was made with all 30 test words (in order of the recordings) on the left and the possible realisations on top.

A second independent judge (trained in the phonology and phonetics of English) analysed a subset of the data in order to assess the reliability of the results. Due to other commitments, this second grader only had time to analyse a small amount of recordings and did so hastily. Exact agreement between the two analysers was 53.3%. Although there was some disagreement, 15.7% regarded differences between /t/, /t̪/ and /t̪θ/. Finally, disagreement in which one analyser said accurate /θ/ and the other judged it as inaccurate was 31%.

Table 2.6.1

Sample of an empty assessment table for the production experiment.

Production data – test words   Participant ID: _____

	[θ]	[t̪]	[t]	[d]	[f]	[s]	other
everything							
python							
lethal							
thirty							
mouth							

Ideally participants were graded on a scale from zero to ten on how authentic their realisation of /θ/ is. For instance, a Dutch speaker who accurately realised 40% as [θ] and 60% as [f] would receive a grade of 4. Unfortunately, such an authenticity index of /θ/ uttered by Dutch speakers of English is not yet available because we simply know too little about all the variants that Dutch L2 speakers produce. It is therefore impossible to place inaccurate/accurate realisations of /θ/ on a scale and determine which speaker has a better pronunciation of English. Moreover, an accurate realisation of /θ/ as [θ] did not guarantee that the participant had an overall accurate pronunciation of English.

So instead of using an authenticity index for each individual speaker, they will be measured on three variables. These variables are the number of instances of [θ], the number of instances of [t] and the number of instances of [f] that were produced as a realisation for /θ/, which were the three most frequent realizations. These variables with be referred to as ScoreTheta, ScoreT and ScoreF. The values of the three dependent variables are the result of dividing the total number of realisations for each participant, which is 60, by their number of [θ], [t] and [f] realisations respectively. The highest possible score a participant can thus have is 1, which would mean that such a participant realised all 60 instances of /θ/ as accurate [θ]. Participants could also have a score of 1 for ScoreT or ScoreF if they realised all 60 instances of /θ/ as [t] or [f]. The three dependent variables will be correlated with the participants' age and gender, the intensity of their contact with the language and their interest in the English language.

Chapter 3. Results

The following chapter reports our results in response to the research questions in four sections. The first section covers how the variants shown in the score sheet above were identified and discusses their phonetic features on the basis of waveforms and spectrograms of the realisations which were encountered. The second section gives the distribution of the realisations across both participant age groups and the test words. The third section gives the results of the background questionnaires. A final section extracts numerical variables from the data and correlates them with the results of the production experiment. These variables concern the three dependent variables ScoreTheta, ScoreT and ScoreF and the intensity of the contact with English as well as age and gender.

3.1 General results

The 84 recordings contain a total of 2,520 produced realisations of /θ/.[1] 898 (35.6%) of these realisations were analysed as accurate [θ]. As mentioned in the introduction, [θ] is a voiceless fricative sound. This means that the articulators (tongue and lips) form a narrow channel for air to pass. Friction is created as air passes through this channel. The energy on the left side of the spectrogram[2] below (Figure 3.1.1) shows no striations, which indicates that the vocal cords are not vibrating during this realisation of /θ/. This is visibly different for the sound [æ] which does require vibration of the vocal cords and thus displays strong striations in the lower frequency region. The burst of energy from [θ] in the spectrograms below has a high frequency of 6,000 to 10,000 Hz (indicated by the darker region in the high frequency area). This energy is relatively weak compared to the stronger energy burst from [ks] at the end of *thanks*. In addition, the [k] is a plosive which is indicated by the release burst above the left border of [ks]. A fricative sound like [θ] has no clear beginning in the shape of a release burst; instead the energy gradually forms over a wide frequency range.

---

[1] Number was established by multiplying 30 test words against two recordings. This equals 60 utterances times 42 participants equals 2,520 produced realisations of /θ/.

[2] All the spectrograms in this chapter range between 0 Hz and 10,000 Hz.
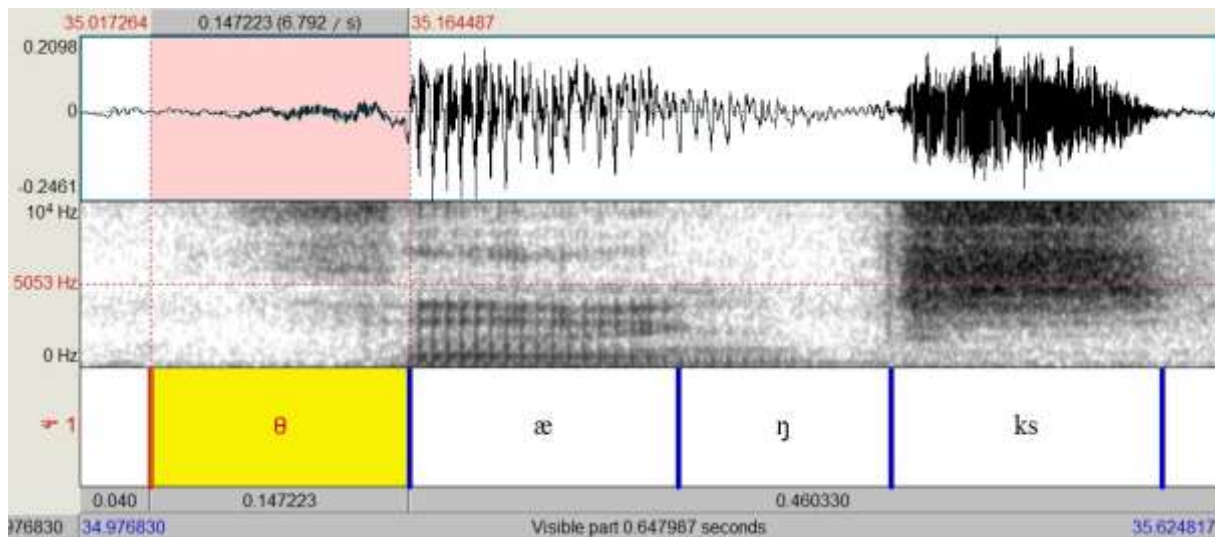
Figure 3.1.1 Waveform and spectrogram of voiceless fricative [θ] in English *thanks* /θæŋks/ as uttered by a teenage male native speaker of Dutch (Participant IDT19).
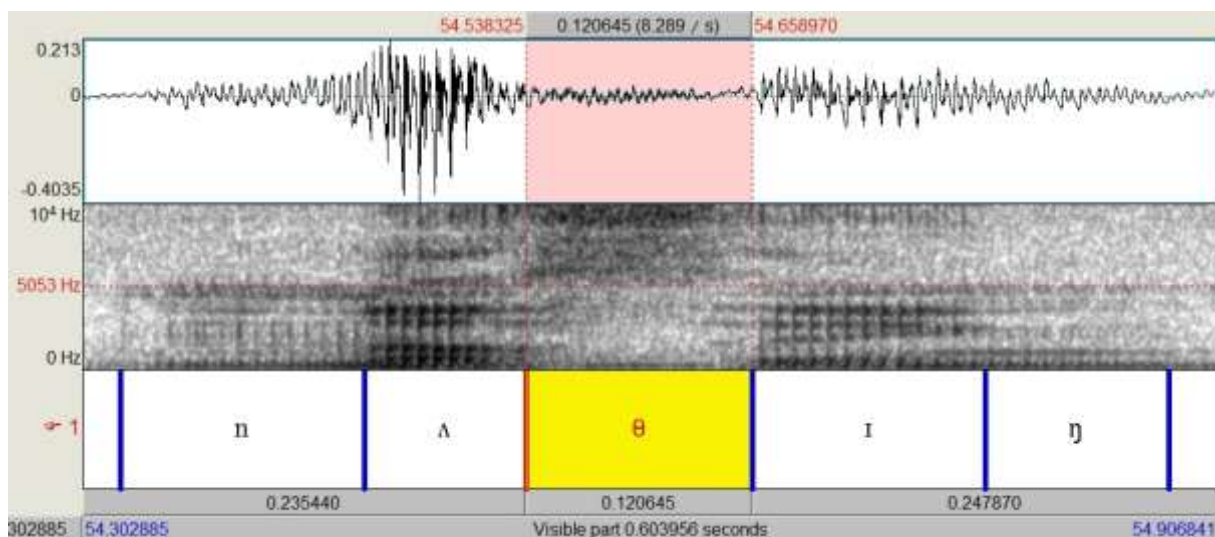
Figure 3.1.2 Waveform and spectrogram of voiceless fricative [θ] in English *nothing* /nʌθ.ɪŋ/ as produced by a teenage male native speaker of Dutch (IDT19).

The sound [θ] uttered by the teenage Dutch male in Figure 3.1.1 and Figure 3.1.2 resemble [θ] in Figure 3.1.3 uttered by a male native speaker of English; their difference in frequency is noted. The darkest cluster of energy of the native speaker is between 5,000 and 7,000 Hz, whereas the Dutch speaker's cluster of energy is between 5,000 and 10,000 Hz. However, the difference is almost imperceptible to the ear. The similarities between the [θ] uttered by the native speaker of English and the participants' realisations of /θ/ show that the participants' realisations of /θ/ as [θ] are not native-like pronunciations but rather accurate ones, which is typical for L2 end-state and can be indicated as a foreign accent (Colantoni et al., 2015).
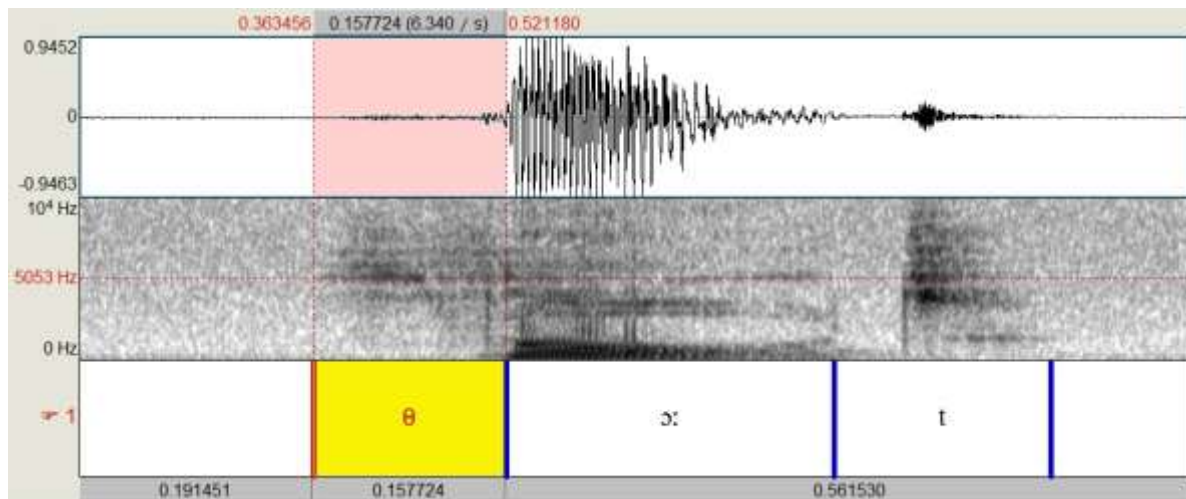
Figure 3.1.3 Waveform and spectrogram of [θ] in English *thought* /θɔːt/ as uttered by a male native speaker of English.

The segment [t] uttered by the native speaker in Figure 3.1.3 is a realisation of /t/, the final consonant of *thought*. This sound is produced by the tip and sides of the tongue touching the ridge behind the teeth (alveolar ridge). This native speaker realisation of /t/ has been added to be compared with [t] produced by the teenage Dutch female speaker in Figure 3.1.4, which is a realisation of /θ/ in *mouth*. We excluded the closure phase from [t] in Figure 3.1.4 and added it to the vowel to accentuate the difference with the [t] in Figure 3.1.3. The release burst, in the shape of a strong vertical pike is clearly present in the native speaker spectrogram above. It seems to be absent in Figure 3.1.4 however. This suggests that the Dutch speaker did not sufficiently increase the air pressure for a burst to occur. Instead the air was slowly released, showing a longer duration of energy than in Figure 3.1.3. Although it can be audibly recognised as a [t], the absence of the burst in the spectrogram below shows that it is somewhere between a plosive and a fricative. This frication of [t] appeared most often when /θ/ was realised as [t] in final position.

The sound [t] in Figure 3.1.5, which is a realisation of /θ/ in *mouth*, shows a more accurate [t] like the realisation in Figure 3.1.3. The vertical pike of the release burst is present and the energy has a shorter length and frequency range between 4,000 and 9,000 Hz. Notably, this adult female speaker of Dutch did not only pronounce the initial /θ/ in *thousand* as [t] but also the final consonant been devoiced to [t].
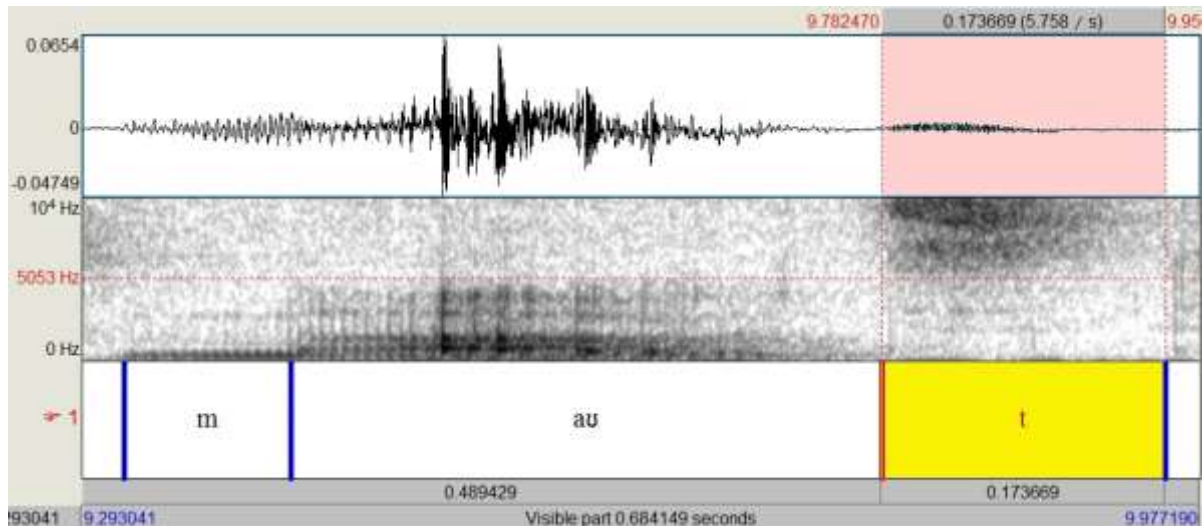
Figure 3.1.4 Waveform and spectrogram of the release of [t] in English *mouth* /maʊθ/ as uttered by a teenage female native speaker of Dutch (IDT18).
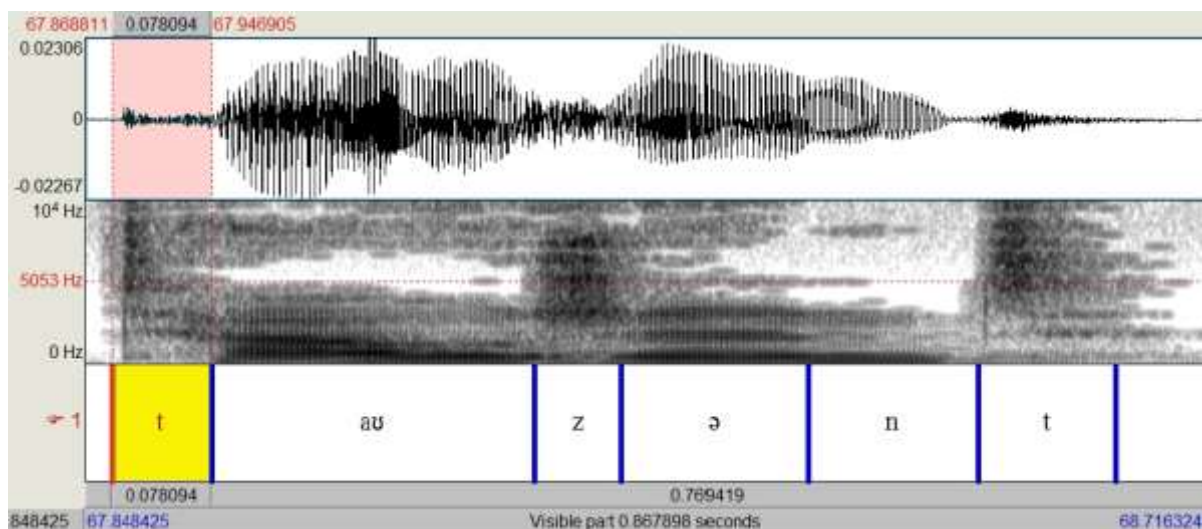
Figure 3.1.5 Waveform and spectrogram of the release of voiceless plosive [t] in English *thousand* /θaʊ.zənd/ as uttered by an adult female native speaker of Dutch (IDA12).

It is possible for the English theta to be realised as the dental plosive [t̪]. This realisation of /θ/ as [t̪] happens when the tip of the tongue forms a complete closure with the inner edge of the upper teeth instead of the alveolar ridge. The spectrograms in Figure 3.1.6 and Figure 3.1.7 illustrate [t̪] as realisations of /θ/ in *thing* and *thirteen*. Both realisations show more turbulence than [t] in Figure 3.1.5, and are also located at a lower frequency. When heard, the sound [t̪] in Figure 3.1.6 sounds weaker than [t] in Figure 3.1.5 and Figure 3.1.3. A release burst is visible in [t̪] below as well, although due to the lower frequency it resembles a [d] more than a [t]. Participants in this study realised /θ/ 878 times (34.8%) as [t] and 283 times (11.2%) as [t̪].
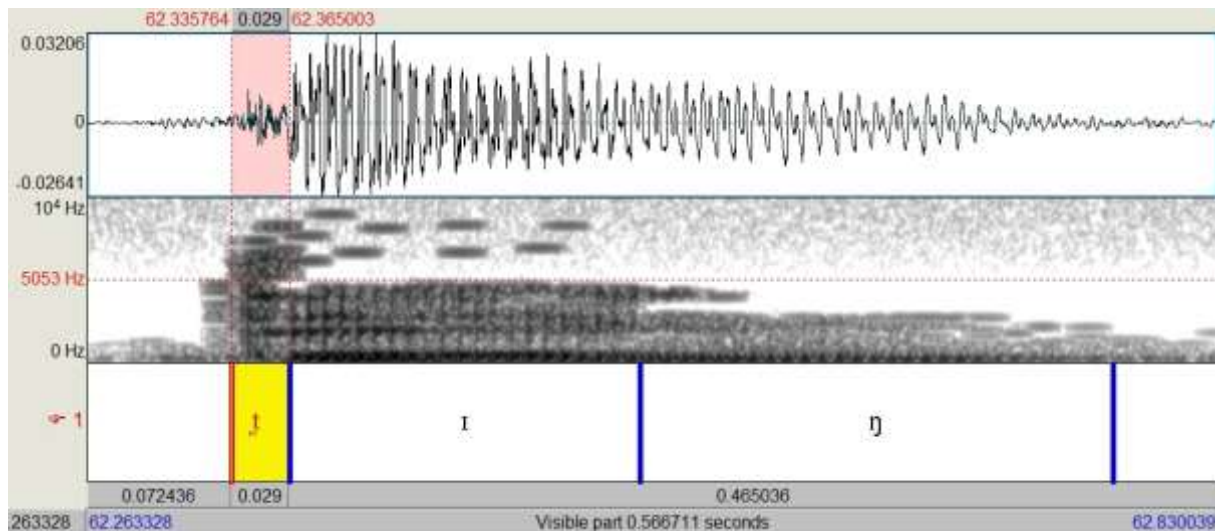
Figure 3.1.6 Waveform and spectrogram of dental plosive [t̪] in English *thing* /θɪŋ/ as uttered by a teenage male native speaker of Dutch (IDT12).
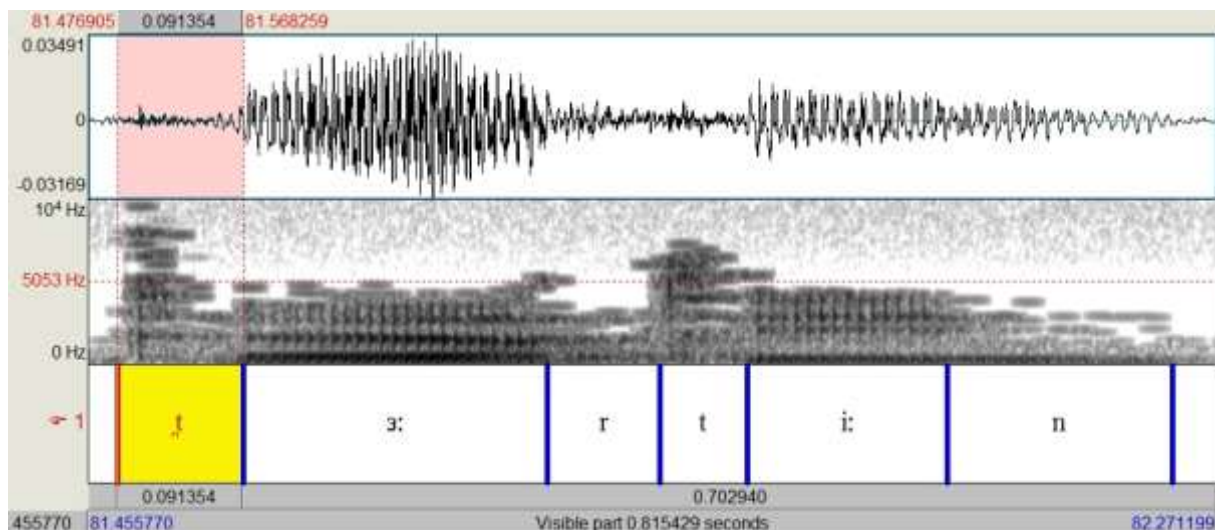
Figure 3.1.7 Waveform and spectrogram of dental plosive [t̪] in English *thirteen* /θɜː.tiːn/ as uttered by a teenage male native speaker of Dutch (IDT12).

A voiceless plosive /t/ can be realised as [t̪] when it appears in front of /θ/, in the combination *at three o'clock* for example. The tip of the tongue interacts with the back of the upper teeth instead of the alveolar ridge to prepare for the pronunciation of the dental fricative. The combination of this plosive sound [t̪] and the following dental fricative sound [θ] represents an affricate, at least in a phonetic sense. Combinations like *at three o'clock* do not occur in the word list used for this study. Nonetheless this affricate [t̪θ] was produced 68 times (2.7%) by the 42 participants. Figure 3.1.8 below displays the spectrogram of the word *thirty* realised as [t̪θɜː.ti] by an adult male speaker of Dutch. The plosive in this realisation does not have a

24

sudden release burst but is instead slowed down by the frication. Although this phoneme is acoustically similar to [t] in Figure 3.1.4, it has a lower frequency and a more detectable plosive [t̪] at the beginning.
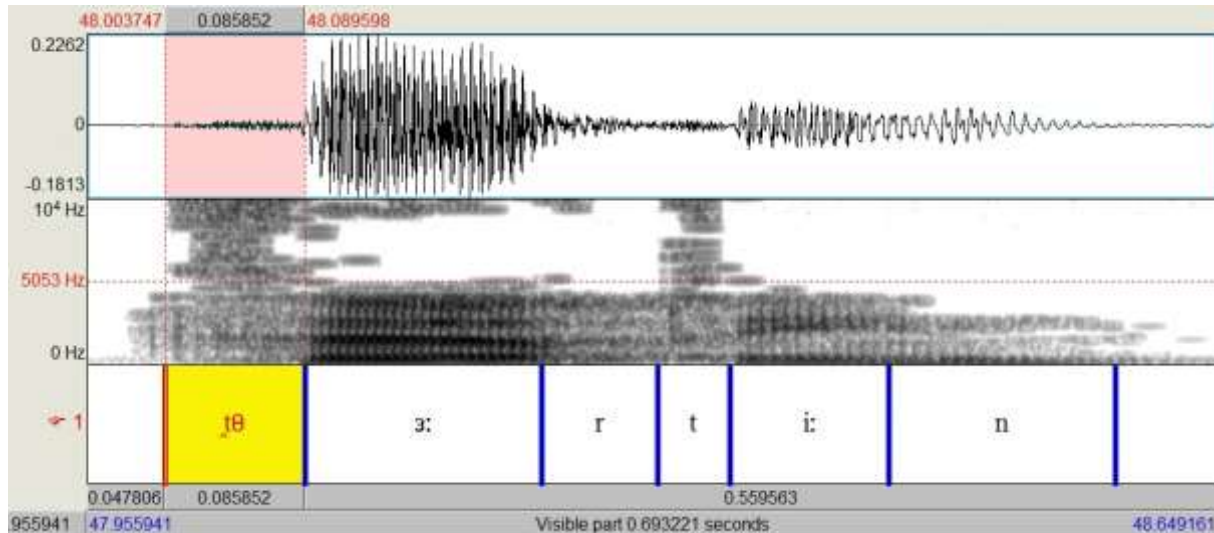
Figure 3.1.8 Waveform and spectrogram of affricate [t̪θ] in English *thirteen* /θɜːˈtiːn/ as spoken by an adult male native speaker of Dutch (IDA07).

Acoustically [f] is closer to [θ] than [s], [t] or [t̪] (Wester et al., 2007). The labio-dental fricative [f] is produced with the lower lip and the upper teeth. The air escapes through the narrow opening between the lower lip and the upper teeth, causing channel frication. The segment [f] is acontinuant consonant like [θ], meaning that is has neither a clear beginning nor a clear end. However, [f] is longer in duration and produced at a slightly lower frequency than [θ].

Figure 3.1.10 below displays [f] as realisation of /f/ in *fought* uttered by a native speaker of English. The spectrogram of this phoneme is longer and more obscure than [θ] in Figure 3.1.2 by the same male speaker. Figure 3.1.9 shows [f] as realisation of /θ/ in *thirty, mouth* and *author* by a Dutch teenage male speaker who consistently realised /θ/ as [f], independent of its position. These realisations are audibly the same and display the same energy distribution as in Figure 3.1.10. The number of instances of [f] realisations for /θ/ in this present study is 213 (8.5%) out of 2,520 produced realisations.
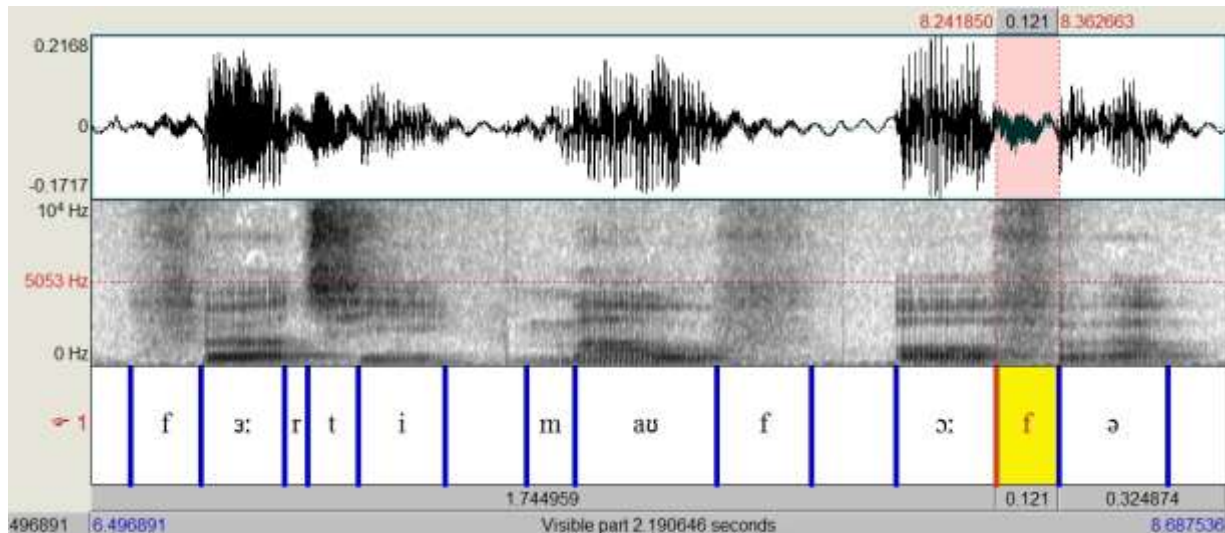
Figure 3.1.9 Waveforms and spectrograms of fricative [f] in English *thirty* /θɜː.ti/, *mouth* /maʊθ/ and *author* /ɔː.θər/ as spoken by a teenage male native speaker of Dutch (IDT14).
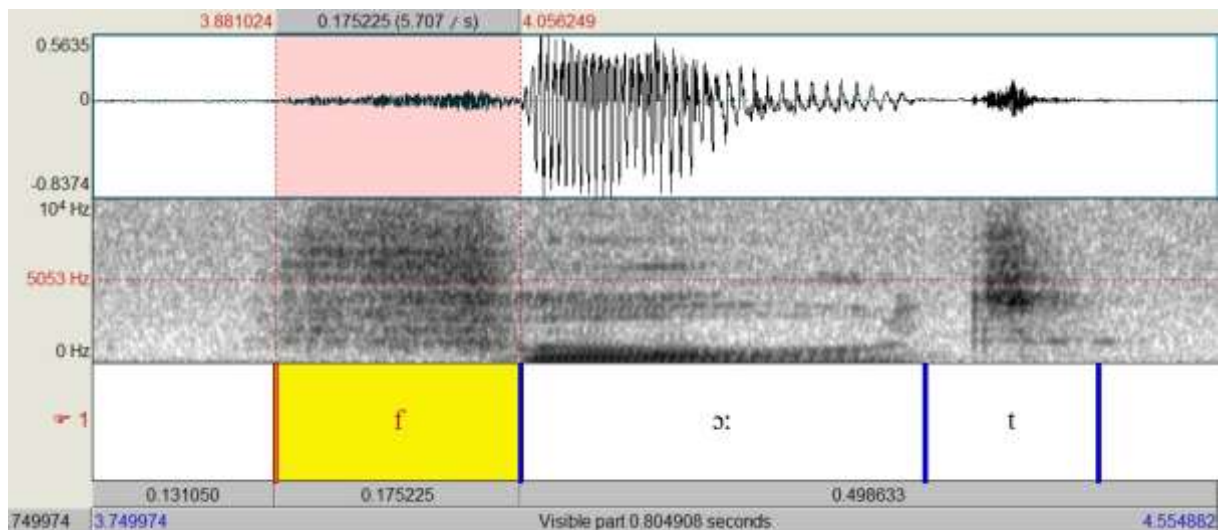
Figure 3.1.10 Waveform and spectrogram of fricative [f] in English *fought* /θɔːt/ as uttered by a male native speaker of English.

Infrequent realisations of /θ/ reported in this research project are the voiceless [s] and the voiced consonants [d] and [z]. The voiced alveolar plosive [d] sound is formed by the tip of the tongue against the alveolar ridge. Figure 3.1.11 shows [d] as the realisation of /θ/ in *author*. The sound [d] has a weaker energy and frequency than [t] in Figure 3.1.3. In addition, the striations in the spectrogram below indicate pulses from the vocal cords, thus meaning that [d] unlike [t] is voiced. The 42 participants realised /θ/ as a voiced plosive [d] 53 times (2.1%); this appeared most often when /θ/ occurred in medial position.

26
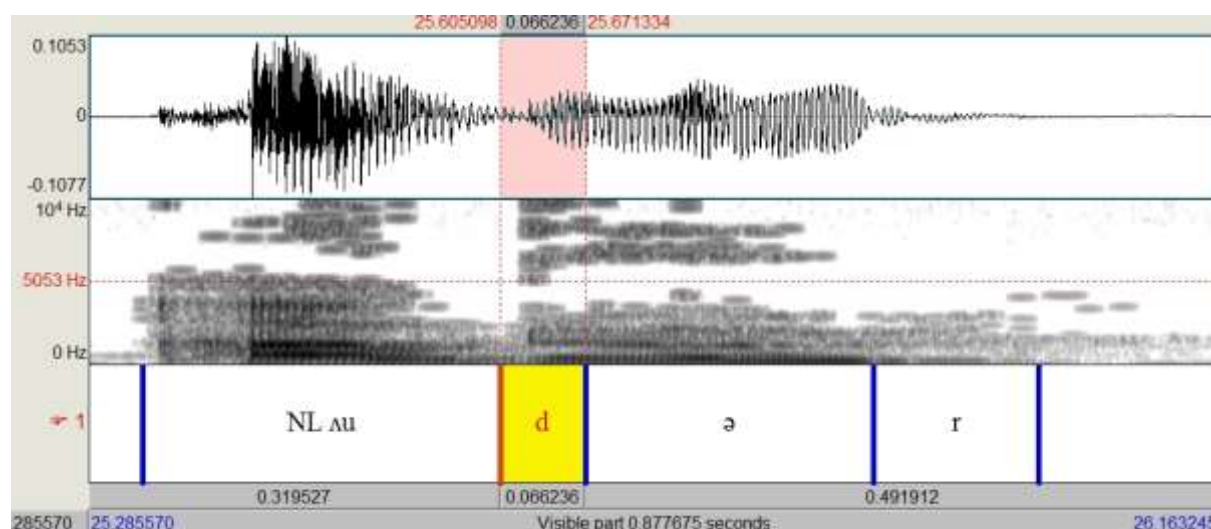
Figure 3.1.11 Waveform and spectrogram of voiced plosive [d] in *author* /ɔː.θər/ produced by an adult male native speaker of Dutch (IDA05).

The alveolar fricative [s] has channel friction created by the tongue blade and the alveolar ridge. The tip/blade of the tongue is raised during production and sides of the tongue form a closure against the upper side teeth. This creates a groove along the middle of the tongue through which the airstream is channelled. The sound [s] produced in Figure 3.1.12 by an adult male speaker shows a high amount of energy, around 4,000 Hz. This is slightly lower than the RP [s] presented in Figure 3.1.13. The realisation of /θ/ in *truth* as [s] by the adult male speaker below results in the pronunciation of *truce* rather than target *truth*.
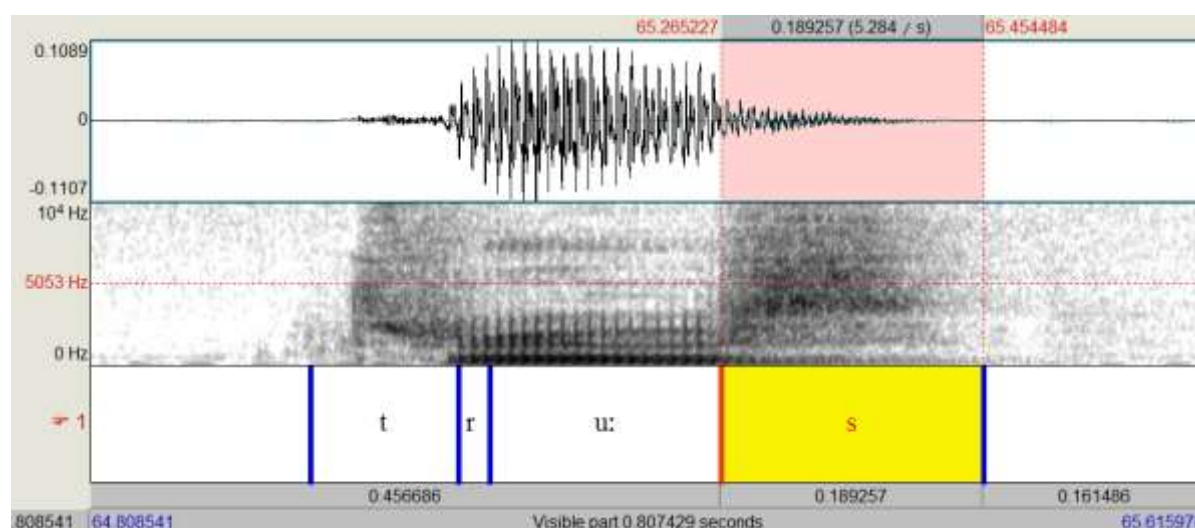
Figure 3.1.12 Waveform and spectrogram of [s] English *truth* /truːθ/ produced by an adult male speaker of Dutch (IDA18).

27
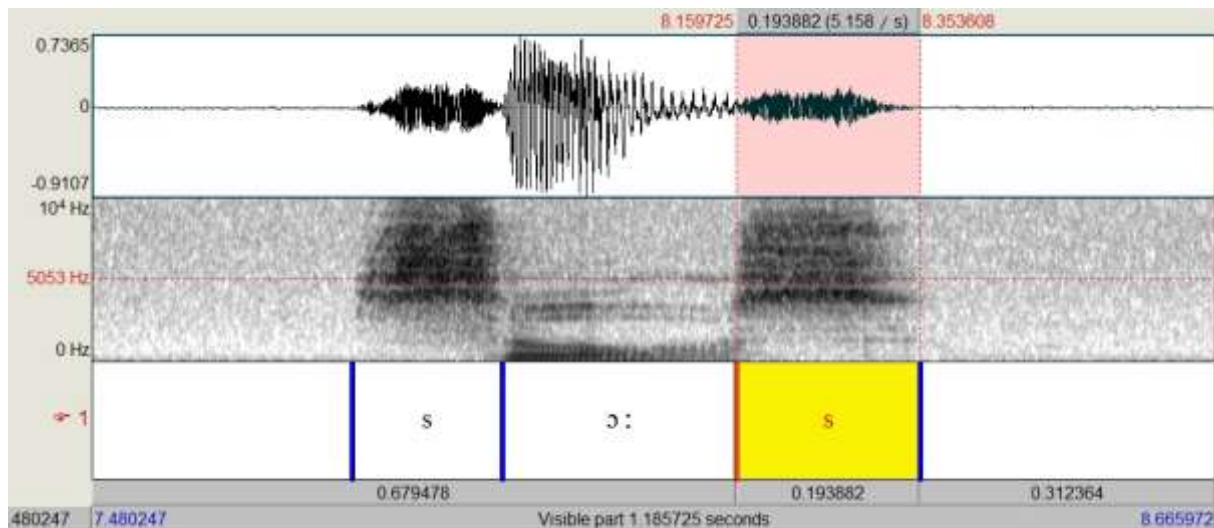
Figure 3.1.13 Waveform and spectrogram of voiceless sibilant [s] in English *sauce* /sɔːs/ as uttered by a male native speaker of English.

An isolated realisation of /θ/ is the voiced alveolar fricative [z]. This is also a groove type fricative like [s], formed with the tip/blade of the tongue risen to the alveolar ridge. The sound [z] in Figure 3.1.14 is a realisation of /θ/ in *lethal* by an adult female Dutch speaker. This [z] displays high frequency turbulence around 4,000-9,000 Hz and has a low-frequency voicing bar of striations.
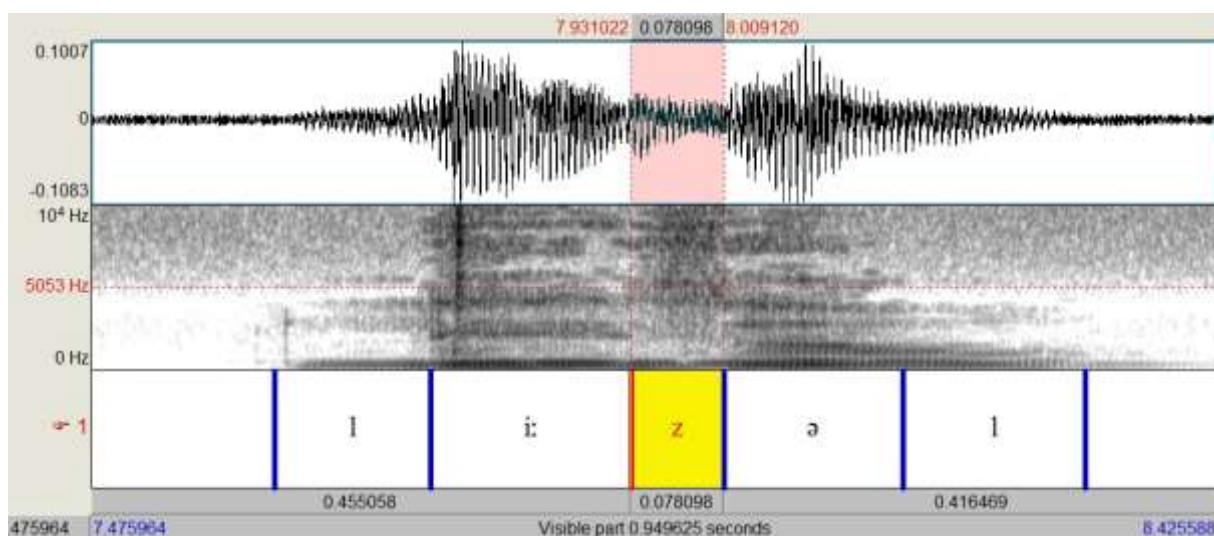
Figure 3.1.14 Waveform and spectrogram of voiced sibilant [z] in English *lethal* /liː.θəl/ as uttered by an adult female speaker of Dutch (IDA04).

An unexpected variant discovered during analysis is the realisation of /θ/ as [Ø]. The symbol [Ø] indicates a phoneme which is realised as a silent sound. The speakers in Figure 3.1.15 and Figure 3.1.16 realised /θ/ in *teeth*, *faith* and *tooth* with such low energy that a consonant can

barely be identified. The spectrogram does show a voice bar demonstrating continuing vibration of the vocal cords. This is known as voice drag, meaning a continuing free flow of air. There are no detectable articulators during this free flow of air, resulting in the silent phoneme indicated as [Ø]. The realisations of /θ/ as [Ø] were produced by both teenagers and adults and only occurred with words that have /θ/ in final position.
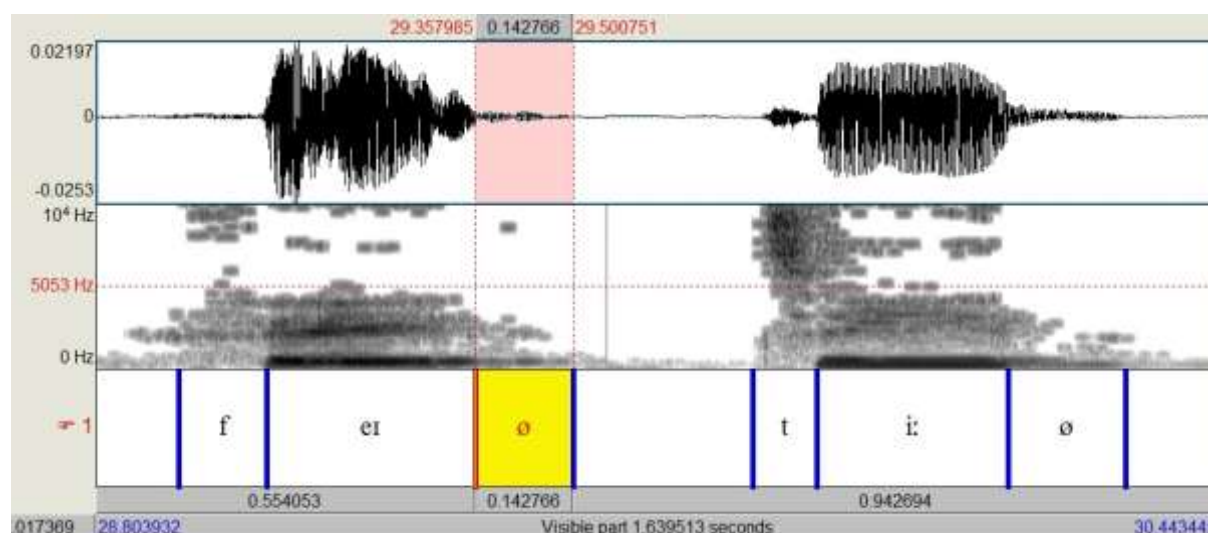
Figure 3.1.15 Waveforms and spectrograms of [Ø] in English *faith* /feɪθ/ and *teeth* /tiːθ/ as uttered by a teenage female native speaker of Dutch (IDT01).
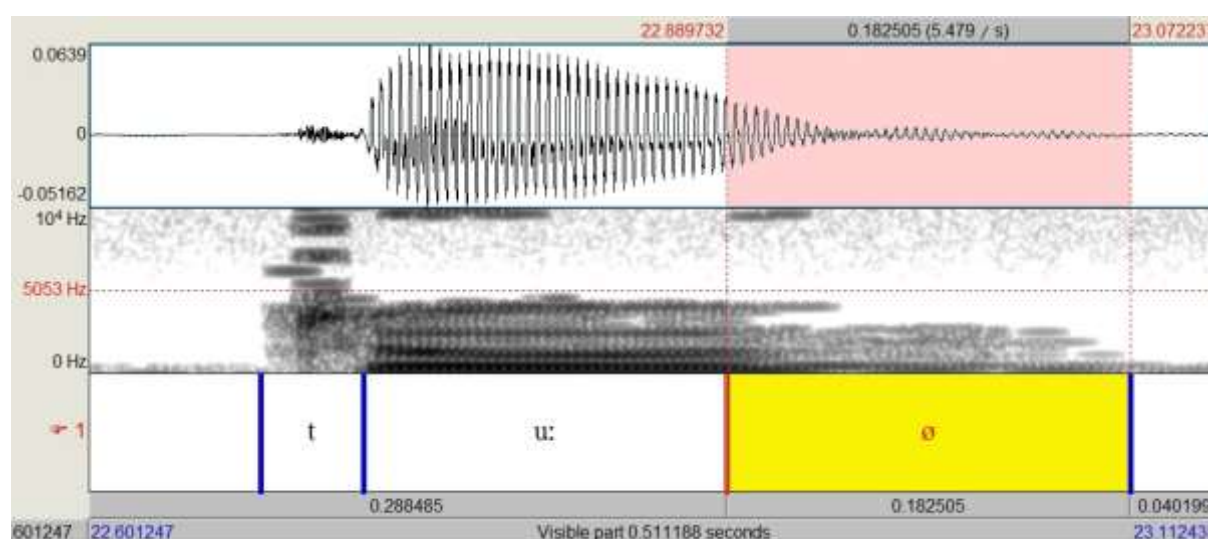
Figure 3.1.16 Waveform and spectrogram of [Ø] in English *tooth* /tuːθ/ as uttered by an adult female native speaker of Dutch (IDA06).

In summary, analysis of the 2,520 realisations of /θ/ by 42 native speakers of Dutch revealed a large variety of phonetic realisations, as detailed in this results section and as reported earlier by Wester et al. (2007). The variants include the hypothesised realisations [θ], [t], [d], [s], [z], [f] and [t̪]. In addition, the affricate [t̪θ] and silent [Ø] were discovered during analysis of the

29

recordings. Encoding these realisations as separate results for the participants is rather unfortunate. Instead the realisations have been coded using the seven categories shown in Table 3.1 This table also displays the number of instances of each of the categories in percentages indicated throughout this section. The last category, labelled 'other,' includes all the unidentifiable and less frequent sounds such as [s], [z] and [Ø]. These seven categories are used to detail the distribution of the realisations across both participant groups in the next section.

Table 3.1
Overview of the seven coded categories coupled with their number of instances by the 42 participants.

Realisations	[θ]	[t]	[t̪]	[t̪θ]	[f]	[d]	other
N	898	878	284	68	213	53	128
in %	35.6	34.8	11.3	2.7	8.4	2.1	5.1

3.2 Group results

This next section reports the distribution of the realisations encountered in the production experiment across both participant groups. The sample of 42 participants included 20 adult native speakers of Dutch (10 men and 10 women) with ages ranging from 30 to 47 years of age and a mean of 40.4 years. The adult participants together produced 1,200 realisations of /θ/. The distribution of these realisations in the adult group is presented below in Figure 3.2.1.
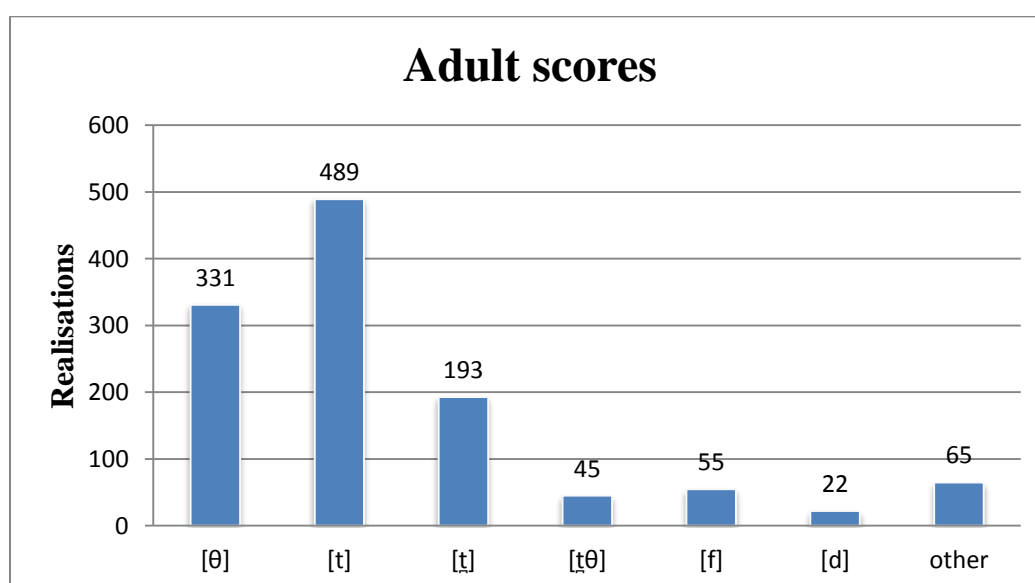
Figure 3.2.1 Distribution of the seven encoded realisations for adult participants.

The previous section already indicated that [θ], [t] and [t̪] have the highest number of instances produced by the 42 participants in this study. These three sounds are also the most common for the adult group. The adult participants scored the highest on the voiceless plosive [t] with 489 instances in total, divided across the three syllable positions. They also scored a total of 331 instances of accurate [θ]. These two phonemes together form 68.4% of the adults' realisations. The remaining 31.6% consisted mostly of the dental [t̪] (16.1%). The more infrequent affricate [t̪θ] and fricative [f] both scored around 4%, and the least occurring phoneme is the voiced plosive [d] with only 22 instances. The individual scores for the 20 adult participants are presented in the following table:

Table 3.2.1
Individual results for seven encoded realisations for adult participants.

ID	AGE	GEN	[θ]	[t]	[t̪]	[t̪θ]	[f]	[d]	other
A01	46	F	0	54	6	0	0	0	0
A02	44	M	10	26	11	2	0	0	11
A03	47	M	1	34	13	1	0	11	0
A04	47	F	34	3	12	7	1	0	3
A05	45	M	28	9	7	7	0	6	3
A06	32	F	9	30	6	3	11	0	1
A07	35	M	15	24	16	3	0	0	2
A08	46	F	11	11	20	3	10	0	5
A09	41	M	50	1	4	0	2	0	3
A10	42	F	5	33	16	0	0	0	6
A11	44	F	54	3	1	1	1	0	0
A12	37	F	2	45	9	3	0	0	1
A13	34	M	19	22	8	3	0	1	7
A14	38	F	14	32	9	2	0	1	2
A15	46	M	8	24	0	0	22	2	4
A16	46	F	0	49	6	2	0	0	3
A17	36	M	14	19	19	1	2	0	5
A18	34	M	7	21	19	5	1	0	7
A19	34	M	0	47	8	0	4	1	0
A20	33	F	50	2	3	2	1	0	2

This table shows the individual scores for the seven encoded realisations along with the incredible amount of variation this production experiment elicited. Participants did not consistently produce one realisation for all occurrences of /θ/, nor did the majority of them show a preferred or routine realisation. However, participants A01, A12, A16 and A19 clearly show a routine realisation of /θ/ as [t]. They scored over 75% for this particular consonant. Participants A09, A11 and A20 in a similar way show a routine realisation of /θ/ as [θ] because they have scored 83% or more on accurate [θ].

Table 3.2.1 also gives a good impression of the acquisition of [θ] among this group of adults. Participants A01, A03, A16 and A19 have not acquired the sound, showing either zero or 1% of possible 60 realisations. Participants A07, A13, A14 and A17 frequently realise /θ/ as an accurate [θ]. Unfortunately they also frequently produced inaccurate realisations thus showing a moderate acquisition of [θ]. Participant A04 and A05 show an acquisition pattern that is above average for this subject group and participant A09, A11 and A20 show an excellent acquisition of English [θ].

Analysing the independent variables such as age and gender, does not lead to a clear predictor for a high ScoreTheta, ScoreT or ScoreF. The three participants with high ScoreTheta are of varying ages (41, 44 and 33 years of age) and both female and male. The same goes for the four participants who have a high ScoreT. One of them was a 34 year old male and another was a 46 year old female speaker of Dutch.

Table 3.2.2 compares the results from the production experiment based on gender. This table shows that the adult females have a higher number of realisations as [t] for /θ/. However, these numbers do not differentiate much. Interesting is the number of [d] realisations. The adult male Dutch speakers have a score of 21 realisations, but only one realisation has been scored for the adult Dutch female speakers.

Table 3.2.2
Distribution of the seven encoded realisations for female and male adult participants.

Gender	[θ]	[t]	[t̪]	[t̪θ]	[f]	[d]	other
Male	152	227	105	22	31	21	42
Female	179	262	88	23	24	1	23
Total	331	489	193	45	55	22	65

The sample of 42 participants also included 22 teenage native speakers of Dutch (10 boys and 12 girls) with ages ranging from 15 to 20 years of age and a mean of 16.5 years. The 22 teenagers together produced 1,320 realisations of /θ/. The frequency distribution of the realisations in the teenager group is presented below in Figure 3.2.2. This figure shows that the two highest realisations are [θ] and [t], which are also the two highest for the adult group. However, the adult group had a total ScoreTheta of 331 and the teenage group shows a much higher score of [θ], namely 567. The teenage group also had a total score of 389 instances (29.5%) of the voiceless plosive [t]. The adults scored higher on this phoneme with a total of

489 (40.7%). The ratios for ScoreTheta and ScoreT did not differ. The adult group scored equally high on the number of instances of affricate [t̪θ] and fricative [f]. The teenagers showed equal results for [t̪θ] and [d], which were both around 2%. The least occurring consonant in the adult group was the voiced plosive [d]. The least occurring consonant in the teenage group is [t̪θ]. Interesting is the teenage score for the fricative [f]. Adults produced this sound as a realisation of /θ/ only 55 times. Teenagers on the other hand produced [f] 158 times as a realisation of /θ/.

The final category is comparable for both groups, adults score 65 and teenagers 63 instances, which means that adults and teenagers produced the same amount of unidentifiable or [s, z] realisations for /θ/.
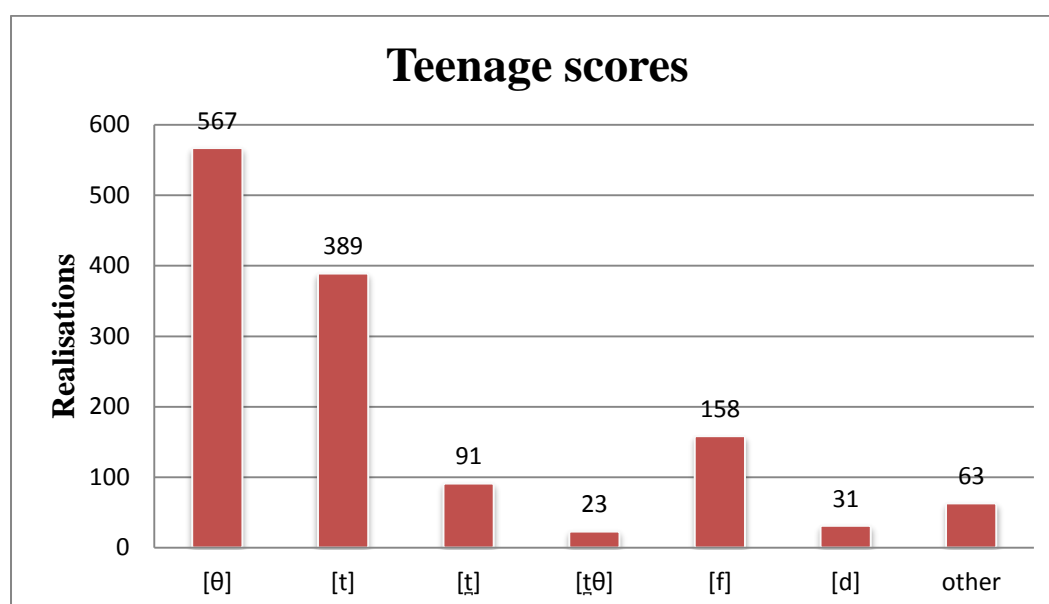
Figure 3.2.2 Distribution of the seven encoded realisations for teenage participants.

The individual results for the 22 teenage participants are presented below in Table 3.2.3. This table resembles Table 3.2.1 on the great deal of variation. Dutch teenagers thus behave the same as Dutch adults, meaning that the participants did not consistently produce one consonant for all 60 realisations of /θ/. However, there are some teenagers (A19, A20 and A21) who showed a consistent accurate manner when realising [θ]. Other teenage participants also show a preferred or routine realisation, although not always constant. Participant T10, T11, T12 and T18 scored over 60% for [t], and thus showed a routine realisation of /θ/ as [t]. Participants T01, T02 and T22 scored over 60% for [θ], and thus showed a routine realisation of /θ/ as [θ]. Participant T14 has a strong routine of realising /θ/ as [f] because he realised 86% of /θ/ realisation as [f].

Table 3.2.3
Individual results for seven encoded realisations for teenage participants.

ID	AGE	GEN	[θ]	[t]	[t̪]	[t̪θ]	[f]	[d]	other
T01	16	F	44	3	6	1	0	2	4
T02	16	F	43	0	2	1	9	0	5
T03	16	M	10	30	5	1	14	0	0
T04	17	F	36	8	10	2	1	1	2
T05	17	F	3	32	13	4	1	6	1
T06	17	M	30	11	6	1	8	3	1
T07	15	F	35	5	1	0	8	8	3
T08	15	F	9	25	5	0	19	0	2
T09	17	F	31	9	5	1	7	2	5
T10	15	F	0	44	8	0	0	0	8
T11	15	F	0	49	4	0	0	0	7
T12	17	M	0	55	5	0	0	0	0
T13	16	F	31	17	5	1	0	2	4
T14	16	M	5	1	0	0	52	0	2
T15	15	M	4	23	0	0	28	3	2
T16	19	M	16	13	13	4	2	0	12
T17	18	F	43	6	1	4	4	0	2
T18	20	F	0	56	2	0	0	0	2
T19	18	M	60	0	0	0	0	0	0
T20	16	M	60	0	0	0	0	0	0
T21	16	M	59	0	0	1	0	0	0
T22	16	M	47	2	0	2	5	4	0

Table 3.2.3 also gives a good representation of the teenagers' acquisition of [θ]. Participants T10, T11, T18 and T12 have not acquired this foreign sound to their phonetic system and realise its sound almost constantly with [t]. Participants T06, T07, T09 and T13 realised 50% of their realisations as [θ], which means they have a moderate acquisition of [θ]. Participant T19, T20 and T21 have an excellent pronunciation of [θ], meaning they have acquired this foreign sound into their phonetic system. Participant T14 has not acquired [θ], but realises it constantly with the voiceless fricative [f]. The realisation of /θ/ as [f] happens more often by teenagers than with adult speakers of Dutch.

Equivalent to the adult results, it is hard to predict high ScoreTheta based on age and gender within the teenage group. Teenage participants who show a high ScoreTheta and low score are all sixteen year old males. This endorses the great deal of "intra-subject variation" within the participant groups in this study.

Table 3.2.4 below compares results for the teenage group based on gender. This analysis

revealed some interesting effects for [t], [f] and [d]. ScoreTheta is very similar for both boys and girls, but ScoreT is almost twice as high for girls (254 times) than for boys (135 times). ScoreF had the opposite effect with a twice as high score for the boys (109 times). None of the participants had a noticeable high score of [d] realisations, however the accumulated scores are higher for the girls (21 times) than for the boys (10 times). Unfortunately, due to the high degree of variation between participants, these numbers are not significant.

Table 3.2.4
Distribution of the seven encoded realisations for male and female teenage participants.

Gender	[θ]	[t]	[t̪]	[t̪θ]	[f]	[d]	other
Male	291	135	29	8	109	10	18
Female	275	254	62	14	49	21	45
Total	566	389	91	23	158	31	63

To summarise, all realisations by the 42 participants have been analysed using the seven realisations introduced in Table 3.1. Adults scored the highest on the [t] sound with 489 realisations for /θ/ and teenagers scored the highest on the sound [θ] with 566 realisations. The second highest score for adults is [θ] and for teenagers [t]. Both the teenage and adult participants produced the segment [f] as a realisation for /θ/. However, teenagers scored noticeably higher, compared to adults. This suggests that age plays a factor in the realisations of the English voiceless dental fricative.

3.2.1 Distribution for test words in syllable-initial position

Besides reporting on the frequency distribution across the two age groups, this section also reports on how the realisations are distributed across syllable positions and English words. The production experiment contained 30 test words (see Table 2.3.1) equally divided over syllable-initial (onset) position, medial (intervocalic) positon and syllable-final (coda) position. In this section we report on all 30 test words produced by the 42 Dutch participants.

Each of the 30 words has been pronounced twice by every participant. Each test word therefore has a total of 40 realisations of /θ/ by the adult participants and 44 realisations of /θ/ by the teenage participants. Recall that these 30 test words have been randomly selected and ordered for this experiment, and all 42 participants were presented with the same word list.

Table 3.2.5

Adult distribution per word with /θ/ in syllable-initial position.

	thirty	thick	think	thing	Thursday	thanks	thousand	thirteen	theatre	throw
[θ]	9	13	19	17	9	9	6	11	10	9
[t]	5	14	13	12	8	23	19	9	16	17
[t̪]	24	8	4	5	21	6	14	16	9	13
[t̪θ]	1	1	1	0	0	1	0	2	2	1
[f]	1	2	0	2	1	1	0	0	1	0
[d]	0	0	0	0	0	0	0	0	0	0
other	0	2	3	4	1	0	1	2	2	0

The ten test words which had /θ/ in syllable-initial position were *thirty*, *thick*, *think*, *thing*, *Thursday*, *thanks*, *thousand*, *thirteen*, *theatre* and *throw*.

The adult participants realised most of the thetas in these words as [t], 136 times in total. They also often realised them accurately as the sound [θ], 112 times in total. The results in Table 3.2.5 show that /θ/ in *thirty*, *thanks*, *thousand*, *thirteen* and *throw* were difficult for adults to accurately realise. The words *thick*, *think* and *thing* were less difficult for adults. This difficultness of words can be concluded from their [t] and [θ] scores. *Thanks*, for example, has a very high ScoreT and low ScoreTheta, meaning it is more difficult for adults to produce accurately than the words *think* and *thing*. Adults realised /θ/ in *think* generally the best with 47.5% realised as accurate [θ]. The scores for [d] are zero for syllable-initial position, this shows, perhaps unconscious, knowledge by the Dutch adult speakers that initial /θ/ is never voiced. The score for the fricative [f] is relatively low as well. Adults realised the syllable-initial /θ/ only eight times as [f].

The teenage participants realised the ten words containing syllable-initial /θ/ words most often with an accurate [θ], 198 times in total. The second most common realisation is [t] with a total of 127 times. This is opposite from the adult participants who realised the syllable-initial /θ/ most often with [t] and second most often with [θ]. The words best pronounced by the teenagers were *thick*, *think*, *thing* and *thanks* (Table 3.2.6). These words have the highest ScoreTheta, meaning teenagers correctly realised them as [θ]. Only two words have a higher number for [t] than [θ], namely *theatre* and *throw*. *Theatre* has the highest ScoreT, indicating that this syllable-initial /θ/ is the most difficult for teenagers to pronounce. The teenage participants realised /θ/ in *think* the best with 59% realised as accurate [θ].

Table 3.2.6

Teenage distribution per word with /θ/ in syllable-initial position.

	thirty	thick	think	thing	Thursday	thanks	thousand	thirteen	theatre	throw
[θ]	17	23	26	25	18	24	18	20	15	12
[t]	8	14	12	12	8	12	16	8	21	16
[t̪]	14	1	1	0	10	4	7	13	1	10
[t̪θ]	0	0	0	2	1	0	0	0	2	2
[f]	4	6	5	5	4	2	2	3	2	1
[d]	1	0	0	0	0	0	1	0	0	0
other	0	0	0	0	3	2	0	0	3	3

The score for [d] is very low for teenagers as well as adults. Only two realisations of /θ/ as [d] were found. However, the number for realising /θ/ as [f] is noticeably higher for teenagers. Adults have eight realisations of /θ/ as [f], whereas teenagers had 34. Though all of the ten words are at least pronounced once with the sound [f] by a teen (Table 3.2.6), the words with the highest number of realisations of /θ/ as [f] were *thick*, *think* and *thing*.

The scores for the category 'other' are comparable for both age groups. The adult participants scored fifteen realisations of /θ/ as 'other' and the teenagers had a total of eleven realisations. This means that the majority of the syllable-initial realisations of /θ/ were able to be encoded with the six set categories, and only 26 realisations were unidentifiable or realised as [s], [sθ] or [z].

3.2.2 Distribution for test words in medial position

The ten test words which had /θ/ in medial position were *everything*, *python*, *lethal*, *author*, *anything*, *method*, *Southeast*, *Cathy*, *nothing* and *gothic*. The adult participants realised /θ/ in medial position 219 times as [t]. Their second most common realisation is [θ] which has a total of 90 occurrences. Table 3.2.7 shows that the intervocalic /θ/ in *python*, *method*, *Southeast*, *Cathy* and *gothic* were most difficult for adults to accurately produce. The adult group had a high ScoreTheta for *anything*, and a moderately high score for *everything* and *nothing*. Table 3.2.7 below shows that /θ/ in *anything* is pronounced the best. Interesting is that these three words are among the most frequent in the English language. Adults realised /θ/ in *python* and *gothic* the worst. Compared to /θ/ in syllable-initial position, adults realised the /θ/ in medial

position slightly more often as [f]. The voiced dental [d] however occurs more often as realisation of /θ/ in medial position than initial position. The adult participants scored a number of 22 realisations of /θ/ as [d]. Words realised with a [d] by the adult group were *author*, *method*, *Southeast* and *gothic*.

Table 3.2.7

Adult distribution per word with /θ/ in medial position.

	everything	python	lethal	author	anything	method	Southeast	Cathy	nothing	gothic
[θ]	13	1	8	9	23	6	4	8	16	2
[t]	22	30	19	19	13	26	25	27	9	29
[t̪]	3	8	6	6	1	2	0	2	5	3
[t̪θ]	0	1	2	1	1	0	1	0	2	1
[f]	2	0	0	0	0	0	3	0	7	0
[d]	0	0	2	4	0	4	5	3	0	4
other	0	0	3	1	2	2	2	0	1	1

The teenage participants realised /θ/ in medial position most often as [t], 172 times in total. Although the second most common sound [θ] is just slightly lower with a total of 160 realisations. *Python* and *gothic* have the highest ScoreT. Besides realising the same medial /θ/ as [t] as the adults, the teenagers also scored the same on *everything* and *anything* as their highest ScoreTheta.

The teenage participants however did something different when realising /θ/ in *nothing*. Table 3.2.8 shows that this intervocalic /θ/ is realised as [f] as often as [θ]. Overall teenagers produced more realisation of medial /θ/ as [f] than syllable-initial /θ/. They also produced a considerately higher number of [d] realisations for /θ/ in medial position. Teenagers realised syllable-initial /θ/ zero times as [d], but 22 times for /θ/ medial position. Voiceless dental fricatives in medial position realised as [d] by teenagers are the same as those by the adult group, namely *lethal*, *author*, *method*, *Southeast* and *Cathy*.

Table 3.2.8

Teenage distribution per word with /θ/ in medial position.

	everything	python	lethal	author	anything	method	Southeast	Cathy	nothing	gothic
[θ]	26	10	15	10	28	16	10	16	16	13
[t]	11	28	16	19	15	16	16	14	10	27
[t̪]	0	2	3	3	0	2	2	2	1	1
[t̪θ]	0	0	2	1	0	1	0	0	0	0
[f]	7	2	2	2	1	3	6	2	17	2
[d]	0	1	4	9	0	4	5	6	0	0
other	0	1	2	0	0	2	5	4	0	1

3.2.3 Distribution for test words in syllable-final position

The ten test words which had /θ/ in final position were *mouth*, *tooth*, *faith*, *teeth*, *youth*, *death*, *both*, *health*, *truth* and *bath*. The adult participants scored the highest number of realisations of /θ/ as [θ], namely 129 instances, with /θ/ in final position. Although all of the ScoreTheta are above ten, except for *faith*, adults scored the best on /θ/ in *mouth* and *youth*. The number of realisations of /θ/ as [t] is not much lower at 118 produced realisations. Table 3.2.9 shows that *faith* is the only one word of which the adult participants realised the final /θ/ most often as [t]. This might be due to confusion between *faith* and *fate* /feɪt/, which is also an existing English word.

Table 3.2.9

Adult distribution per word with /θ/ in syllable-final position.

	mouth	tooth	faith	teeth	youth	death	both	health	truth	bath
[θ]	16	13	4	13	18	14	13	13	12	13
[t]	8	12	24	9	7	13	10	13	13	9
[t̪]	3	6	3	8	0	5	1	4	1	4
[t̪θ]	3	2	5	2	2	2	1	3	2	5
[f]	6	3	0	2	6	1	7	1	5	4
[d]	0	0	0	0	0	1	0	0	0	0
other	2	3	2	4	5	4	5	2	5	2

The words *tooth*, *death*, *both*, *health* and *truth* are moderately difficult for adult Dutch speakers of English because their score is fairly evenly divided between realisations as [θ] and [t]. The high number of [d] realisations in medial position has decreased to almost zero realisations of /θ/ as [d] in final position. Realisations of /θ/ as [d] might have decreased, but the realisations as [f] have increased for /θ/ in syllable-final position. The adult participants realised syllable-final /θ/ as [f] a total of 35 times. This was most often done in the words *mouth*, *youth* and *both*. The fairly steady number of ScoreTheta suggests that none of these words seem especially difficult nor easy for the adult speakers.

The teenage participants also had the highest number of realisations of /θ/ as [θ] with /θ/ in final position. They accurately realised 209 instances of /θ/ as [θ]. The teenagers scored particularly well on the realisation of /θ/ in *teeth*, *health* and *bath* (Table 3.2.10). *Death*, *mouth*, *both* and *faith* were realised the worst. The final voiceless dental fricatives in *faith* and *both* were often realised as non-target [t]. Also the final /θ/ in *mouth* and *death* were often realised as non-target [f]. Teenage realisations of /θ/ as [t] are the lowest for /θ/ in final position, and realisations of /θ/ as [d] have decreased to zero.

Table 3.2.10

Teenage distribution per word with /θ/ in syllable-final position.

	mouth	tooth	faith	teeth	youth	death	both	health	truth	bath
[θ]	19	18	18	25	20	17	22	25	21	24
[t]	8	8	17	9	7	6	10	8	8	9
[t̪]	2	2	0	1	0	3	0	3	1	1
[t̪θ]	0	4	1	1	2	1	2	0	0	1
[f]	13	10	4	8	9	12	9	2	8	5
[d]	0	0	0	0	0	0	0	0	0	0
other	2	2	4	0	6	5	1	6	6	4

Even though the realisations of /θ/ as [f] by adults are also the highest for /θ/ in final position, the high numbers for ScoreF seem to be a feature of young Dutch speakers of English. The number of realisations in the final is relatively high for this position compared to the other two positions. This might be due to the realisations of syllable-final /θ/ as [∅] discussed earlier in section 3.1. The results for the adult and teenage participants scores combined are shown in the

tables below. Table 3.2.11 shows the accumulated scores for each realisation per position, and Table 3.2.12 shows the same scores per position presented per group.

Table 3.2.11
Overview seven encoded realisations per position, total of both adult and teenage group.

Realisations per position	[θ]	[t]	[t̪]	[t̪θ]	[f]	[d]	other
Initial	310	263	181	16	42	2	26
Medial	250	391	52	13	56	51	27
Final	338	208	48	39	115	1	70

Table 3.2.12
Overview seven encoded realisations per position, split representation of adult and teenage scores.

	Initial		Medial		Final	
	Adults	Teenagers	Adults	Teenagers	Adults	Teenagers
[θ]	112	198	90	160	129	209
[t]	136	127	219	172	118	90
[t̪]	120	61	36	16	35	13
[t̪θ]	9	7	9	4	27	12
[f]	8	34	12	44	35	80
[d]	0	2	22	29	1	0
other	15	11	12	15	34	36

To sum up, Table 3.2.11 shows that the most produced realisation for the voiceless dental fricative /θ/ in syllable-initial and syllable-final position is an accurate [θ]. The Dutch participants realise /θ/ in these two positions more than 35% as an accurate [θ]. The most produced realisation of /θ/ in medial position is the non-target [t] sound. Medial /θ/ was realised as [t] for more than 45%, and 30% as [θ]. Interesting is the high percentage (6%) of the non-target sound [d], considering this percentage was lower than 1% for initial and final position. Also interesting is the doubled percentage (14%) of the non-target [f] in final position, compared to the percentages for initial (5%) and medial (7%) position.

Table 3.2.12 summarises similar results but specifies these results per age group. This table shows that the teenage participants are responsible for the vast majority of accurate [θ]

realisations of /θ/, and that the adult participants produced the voiceless plosive [t] the most as realisations for /θ/. Both age groups realised the voiceless dental fricative /θ/ in medial position most often [t]. The higher number of realisations of /θ/ as [t] rather than [θ] shows that L2 teenage speakers of Dutch struggle the most with the realisation of /θ/ in intervocalic position. Table 3.2.12 also shows that adult speakers of Dutch struggle the least with the realisations of /θ/ in final position. Both age groups also realised /θ/ in medial position an equal amount of times as the voiced plosive [d]. This is therefore not a feature specified to neither adult nor teenage participants. However, in syllable-final position, the number of fricative [f] realisations for [θ] is twice as high for teenage participants than adult participants.

3.3 Results background questionnaire

This study investigates the way in which native speakers of Dutch pronounce the English voiceless dental fricative /θ/. It also considers whether variables such as the syllable position of /θ/ and the participants' age influence this pronunciation. In addition, this study investigates whether the intensity of the participants' contact with the language and their interest in the English language have an influence. The background questionnaire designed to inquire this information from the 42 participants consisted of 22 questions (Appendix B), most of which will be discussed in this section.

3.3.1 General participant information

The first nine questions were about the participants' age, gender, and hometown and whether Dutch is their mother tongue and if they speak any other languages. The participants' age and gender are already shown in the previous section. Further results from these inquiries were that all 42 participants have the Dutch language as their mother tongue. They all currently live in towns in the east of the Dutch province Noord Brabant, and 37 participants have been born there. Five participants were born in other provinces, namely two in Gelderland and a single participant in Zuid Holland, Limburg and Overijssel.

In addition, 19 participants (45.2%) reported that in addition to being a native speaker of Dutch they can sufficiently communicate in English without too many errors. Two participants reported to speak no other language than Dutch and 16 participants reported to speak sufficient Dutch, English and German. Three participants reported to speak sufficient Dutch and German. One participant indicated that he speaks sufficient Dutch, English, German, French and

Spanish. The term sufficient for this question means all languages of which the participant has a good working knowledge of and can communicate in without producing too many errors.

The last of these questions asked what level of education the participant has. Three of the adult participants reported they went to the LTS (*lagere technische school)* 'preparatory basic education', and one went to VMBO (*voorbereidend middelbaar beroepsonderwijs)* 'preparatory middle-level applied education'. Eight adults (40%) indicate they went to MBO (*middelbaar beroepsonderwijs)* 'middle-level applied education'. Another one went to the HAVO (*hoger algemeen voortgezet onderwijs)* 'higher general secondary education' and three of the adult participants report to have gone to HBO (*hoger beroepsonderwijs*) 'university of applied sciences'. Four of the adult participants reported that they went to university. Fourteen (63.6%) of the teenage participants attended to or are currently enrolled in a HAVO education. Two of the teenage participants attended to or are in a VMBO education, and three attended to or are enrolled in MAVO (*middelbaar algemeen voortgezet onderwijs)* 'intermediate general secondary education'. Another three teenage participants went to or are currently enrolled in VWO (*voorbereidend wetenschappelijk onderwijs)* 'preparatory university education'.

3.3.2 Contact with the language at primary and secondary school

The next eight questions elicit information about the participants' contact with the English language during their time at primary and secondary school. The first of these questions asked at what age the participant started learning English. Three of the participants (two teens and one adult) reported to have started learning English before the age of six. Eleven of the teenage participants reported to have started learning English at the age of ten (see Figure 3.3.1). This is in agreement with the Dutch primary schools, which usually start teaching English in the 7th grade in which most boys and girls are 10 years old.

Another eleven participants, of which ten adults, reported to have started learning English at the age of twelve years old. This can also be linked back to the Dutch school system, because English lessons used to start in the *brugklas*, where pupils go to when they are around twelve years of age (see Figure 3.3.1). Two of the teenage participants reported to have started around the age of seven. Four of the participants (three teens and one adult) indicated to have started at the age of nine. Six of the participants (three teens and three adults) indicated to have started at the age of eleven years old. Five adult participants reported that they started learning English at the age of thirteen. The graphic below shows that the age at which the participants started learning English varies notably for teenagers and adults.
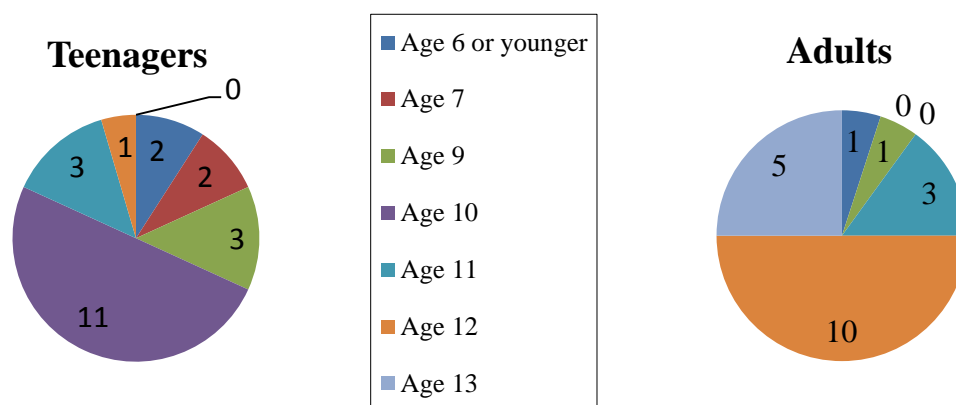
Figure 3.3.1 Pie charts of the participant's age of first contact. The teenage participants (N=22) are presented on the left and the adult participants (N=20) are on the right.

Questions about the number of hours they spent learning English at school were also asked. Nineteen of the participants (of which eighteen adults) reported to have zero hours of English at their primary schools. This is consistent with their age of acquisition previously discussed. Eleven teenage and two adult participants indicated they had one hour of English per week at their primary school, and nine teenagers reported they had two hours of English per week. One teenager reported they had three hours of English lessons each week. The fact that primary schools differ in their number of English lessons per week is not surprising as there is no set number of hours determined by the Dutch government. Nine teenage and ten adult participants reported that they had or currently have four hours of English per week at their secondary schools. Fifteen of the participants (ten teens and five adults) indicated they had or currently have three hours of English lessons per week. Four adults and one teenager reported they have two hours per week, and two teenagers reported they have six hours of English per week at their secondary school.

The next four questions in the background questionnaire were about speaking English at primary and secondary school. The participants were asked how often their teacher spoke or speaks English and how often they themselves spoke or speak English during their English lessons. Participants were asked to select one of the following as their answer *altijd* 'always', *vaak* 'frequently', *zelden* 'rarely' or *nooit* 'never'. Twenty-one of the participants (six teens and 15 adults) reported that their primary school teacher never spoke English during class. However, this is including the adult participants who did not have any English lessons at primary school. Ten teenage participants and three adults reported that their teacher rarely spoke English at primary school, and eight teenage participants reported that their teacher frequently spoke English. Seventeen of the adult and three of the teenage participants indicated that they themselves did not speak English at primary school. This again includes the adult

participants who did not receive English lessons at primary school. Thirteen (59%) teenagers reported that they rarely spoke English at their primary schools. Three adult (15%) and six teenage (27.3%) participants reported that they frequently spoke English at their primary schools. Six teenage and three adult participants reported that their teacher always speaks or spoke English at their secondary schools. Fourteen teenage and ten adult participants reported that their teacher frequently speaks or spoke English. Nine participants (six teens and three adults) indicated that their teachers rarely speak or spoke English at their secondary schools. None of the participants reported that their teachers never speak English. However, one adult participant did say about oneself to never speak English at secondary school. Eleven teenage (50%) and eight adult (40%) participants reported that they rarely speak English at their secondary school. Another eight (40%) adult and thirteen teenage (59%) participants reported to frequently speak English during lessons at their secondary school. One teenage participant indicated to always speak English at their secondary school.

3.3.3 Personal interest in the English language

The final five questions inquire information about the participant's interests in English outside of school, such as whether they read English books or magazines and watch English television, stream movies or TV-series. Fourteen teenage (64%) and five adult (25%) participants reported to never having to speak English at their full-time job or Saturday job for teens. Eleven adult (55%) and six teenage participants reported to rarely speak English at their jobs. One teenage and three adult participants reported to frequently speak English at their jobs, and one teen and one adult participant always speak English at their full-time job or Saturday job.

Figure 3.3.2 below shows that eight adults (40%) and five teenagers (23%) reported to never read anything in English, such as magazines, comics, news, the web, etc. Six teenage (27%) and nine adult (45%) participants reported to rarely read anything in English. Three adults (15%) and eight teenagers (36.5%) indicated to frequently read in English, and three other teenagers reported to always read in English. Figure 3.3.3 below shows that only one adult and six teenage (27%) participants reported to always watch English TV, movies or TV-series. Eleven teenagers (50%) and four adults (20%) reported to frequently watch TV etc. in English. Twelve adult (60%) and two teenage participants reported to rarely watch something in English, and another three teenagers (13.5%) and three adults (15%) reported to never watch TV, movies or series in English.

Teenagers

Adults

Figure 3.3.2 Pie charts of the participant's interest in reading English. The teenage participants (N=22) are presented on the left and the adult participants (N=20) are on the right.
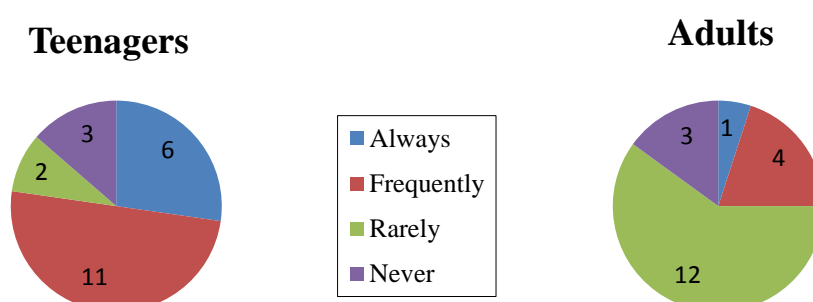
Teenagers

Adults

Figure 3.3.3 Pie charts of the participant's interest in watching English. The teenage participants (N=22) are presented on the left and the adult participants (N=20) are on the right.

None of the 42 participants indicated to always speak English at home. Thirteen teenagers (59%) and nine adults (45%) reported to never speak English at home. Eleven adult (55%) and eight teenagers (36.5%) reported to rarely speak English at home, and one other teenage participant indicated to speak English frequently at home. The final question on the background questionnaire asked how often the participants speak English when they are away on holiday. Two teenage (9%) participants reported to never speak English on vacations. Eight adults (40%) and nine teenagers (41%) reported to rarely speak English when they are on holiday. Eleven teenage (50%) and twelve adult (60%) participants indicated to frequently speak English on vacations. None of the 42 participants reported to always speak English on holidays.

The most relevant results from this background questionnaire are the participant's contact with the English language at school and the participant's interest in the language outside of school. A scoring scheme was designed to express these variables in one single score. This scheme is illustrated in Table 3.3.1 below, and shows that each relevant answer receives a value between one and four.

Applying this table, for example, to a participant who started learning English at eleven years of age (V2), who received two hours (V3) of English per week in the seventh and eighth grade (V3), who rarely spoke (V2) or was rarely spoken to in English by the teacher (V2), who received or receives four hours (V3) of English per week at secondary school and frequently speaks (V3) or is frequently spoken to in English by the teacher (V3), who also frequently speaks English at their (side) job (V3), rarely reads English (V2), never watches (V1) or speaks English at home (V1), and finally who rarely speaks English on holidays (V2) would result in giving this particular participant (IDT03) a final contact score of 30, with an interest score of nine. The contact scores thus include the scores for interest. These interest scores were later extracted to examine whether personal interest was important for the accurate realisation of [θ] and further comparisons between teenage and adult Dutch speakers.

Table 3.3.1

Scoring system for contact and interest answers from the background questionnaire.

	Value 4	Value 3	Value 2	Value 1
First started learning English	Younger than six years old	Between seven and nine years old	Ten or eleven years old	Twelve or thirteen years old
Grades in which English was subject at primary school	Grades six to eight	Grade seven and eight	Only the eighth grade	It wasn't a subject
How many hours at primary school	Three or more hours	Two hours	One hour	Zero hours or N/A
How many hours at secondary school	Six or more hours.	Four or five hours	Between two and four hours	One hour or N/A
How often did/do …	Always	Frequently	Rarely	Never

Table 3.3.1 has been applied to all the participant's questionnaire results from the thirteen relevant contact questions, question 10 to 22 (appendix B), and gives the following scores presented below in table 3.3.2. The highest achievable contact score from these thirteen questions is 52, and the table can be read as the higher the score the better the language contact of that participant. The highest achievable interest score is twenty, and again a high score equals a high interest in the English language outside of school. Table 3.3.2 below shows that participant A10 has the lowest contact score of 18 and participant T21 has the highest contact score of 43. It can be concluded from the scores in Table 3.3.2 that the younger group reported more extensive contact with the English language than the older group. Overall the teenage

participants have higher contact values than the adult participants. However, this cannot be said for their interest in English, as the values for both age groups are very similar.

Table 3.3.2
Overview of the 42 participant's contact with and interest in English scores.

		Contact	Interest in English			Contact	Interest in English
A01	F	25	10	**T01**	F	30	10
A02	M	25	12	**T02**	F	33	12
A03	M	20	7	**T03**	M	30	9
A04	F	22	10	**T04**	F	22	5
A05	M	22	8	**T05**	F	31	14
A06	F	23	8	**T06**	M	32	11
A07	M	23	10	**T07**	F	30	13
A08	F	26	13	**T08**	F	29	9
A09	M	19	8	**T09**	F	28	9
A10	F	18	7	**T10**	F	27	8
A11	F	25	12	**T11**	F	27	8
A12	F	20	6	**T12**	M	33	10
A13	M	40	16	**T13**	F	32	8
A14	F	23	10	**T14**	M	35	13
A15	M	19	8	**T15**	M	32	11
A16	F	20	10	**T16**	M	36	12
A17	M	29	14	**T17**	F	32	9
A18	M	34	11	**T18**	F	29	10
A19	M	24	11	**T19**	M	34	16
A20	F	30	10	**T20**	M	33	12
				T21	M	43	15
				T22	M	30	11

To summarise, results from the background questionnaire determined that the majority of the participants speaks either two or three languages, being Dutch, English and German. The participants are from different educational backgrounds, ranging from LTS/VMBO to HBO/university. The most common age to start learning English is either ten or twelve years old. This depends on whether the primary school teaches English as a subject or not. The majority of the adult participants did not have English as a subject at primary school. Overall the teenagers were younger when they started learning English than the adult participants.

The number of English lessons differed between participants at primary school and secondary school. The majority of the participants had one hour of English per week at primary school and three or four hours of English per week at secondary school. Most of the primary school teachers rarely spoke English and participants themselves also rarely spoke English at primary school. Most of the teachers at secondary schools frequently (some always) speak or spoke English. Participants themselves also frequently speak of spoke English at secondary school.

The teenage participants rarely speak English at their Saturday jobs and adults frequently speak English at their jobs. Both of the participant groups rarely read English outside of school, but the teenagers read more than the adults. The teenage participants also frequently watch more English TV, movies and series than the adult participants. Both of the groups never or rarely speak English at home, but both groups speak English frequently when they are away on holidays. Overall the teenage group reported more extensive contact with the English language than the adult group. The next section will show whether this notable difference in contact is significant or not.

3.4 Statistics

This final results section is interested in the extent to which the collected data from the questionnaires are related to the participants' scores in the production task. In order to answer our research questions (see section 1.5) we need to determine whether the differences between our Dutch participants and their realisations of /θ/ are significant.

Our analysis shows that the three most frequent segments in the production task were [θ], [t] and [f]. The dependent variables in this study thus are ScoreTheta, ScoreT and ScoreF for all 42 participants. These scores are used as the participants' performance scores, because there is neither a scale nor an authenticity index available which can be used to grade the realisations of [θ] produced by Dutch L2 speakers (see section 2.6). Recall that the final values for ScoreTheta, ScoreT and ScoreF are the result of dividing the total number of realisations for each participant, which is 60, by their number of accurate [θ] realisations for /θ/. The highest possible score a participant can have is 1, which would mean that that participant realised all 60 occurrences of /θ/ from the 30 test words with an accurate [θ]. It is also possible for a participant to realise all occurrences of /θ/ as [t], in which case they would have a ScoreT of 1 rather than ScoreTheta. In order to calculate statistics between all variables, numeric values were also determined for the independent variables age, gender, intensity and contact with the

English language. The final values for age and gender were constructed from the data in the participants' background questionnaire and amount to the values '1' or '2' for age group (2 being teenagers) and the values '1' or '2' for gender (2 being females). The numerical scores for contact with and interest in English are visualised above in Table 3.3.2.

3.4.1 T-tests dependent variables

In this section we report the results of the independent samples t-tests between the two age groups (adult and teenage participants) and the dependent variables ScoreTheta, ScoreT and ScoreF. We hypothesised that older Dutch speakers of English produced more non-target sounds than the younger Dutch speakers of English. In order to see whether our findings confirm this hypothesis we first examined the differences between the two age groups for the dependent variables ScoreTheta, ScoreT and ScoreF. The results are shown in Figure 3.4.1. Levene's Test for the equality of variance between the two age groups showed an inequality of variances for ScoreF, meaning that for this comparison between the two groups we report the corrected t-value. The t-tests showed that the two age groups do not differ on the measures for ScoreTheta and ScoreT. The t-tests between the two age groups also show a significant trend for ScoreF ($t_{30.032} = 0.056$). This indicates that the pronunciation of /θ/ as [f] is a feature of younger Dutch speakers of English.
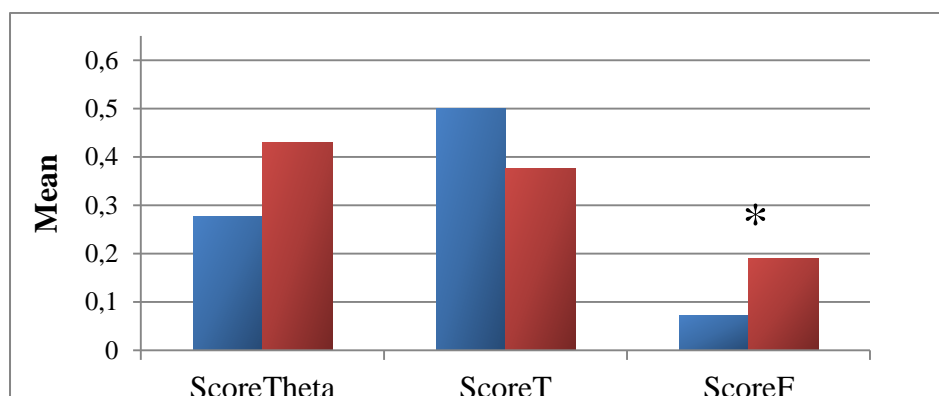
Figure 3.4.1 Means of the three dependent variables. The blue bar represents the adult group and the red bar the teenage group. Asterisk shows statistical trend.

Even though we did not hypothesis whether the gender of the participants would have an effect on the production task, we have calculated the independent samples t-tests between the male and female participants for the three dependent variables as well. Levene's Test shows an inequality of variances between the two gender groups for ScoreF, meaning that for this

comparison we report the corrected t-value. The t-tests show that the two gender groups do not differ on the measures for ScoreTheta, ScoreT and ScoreF, as shown in Figure 3.4.2
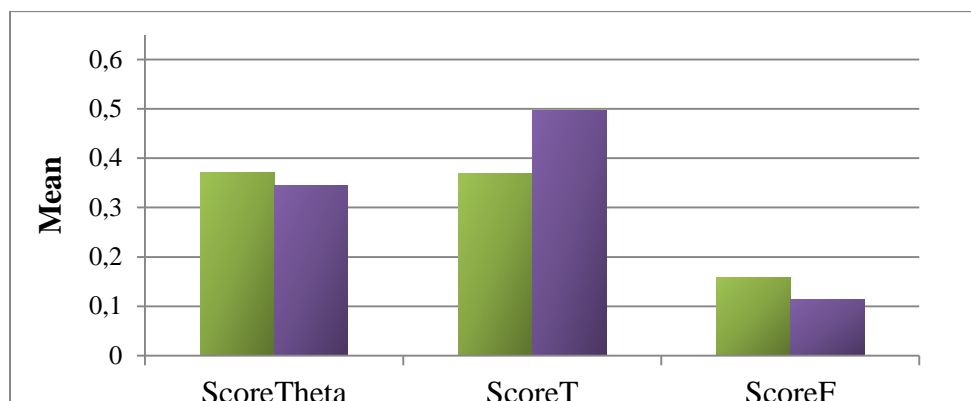

Figure 3.4.2 Means of the three dependent variables. The green bar represents the male group and the purple bar the female group.

3.4.2 T-tests independent variables

In this section we report the results of the independent samples t-tests between the two age groups and the two independent variables ScoreContact and ScoreInterest. We also report the results of the t-tests between the two gender groups and the independent variables. We hypothesised that the younger Dutch speakers of English have more exposure to the English language than the adult Dutch speakers of English. In order to see whether our findings confirm our hypothesis we examined the independent samples t-tests between the two age groups. The teenage participant group (n=22) reported more extensive contact with English on the background questionnaires, which resulted in a mean score of 31.27 (SD = 4.038). The older participant group (n=20) reported a mean score of 24.35 (SD = 5.461). The t-tests show that this is a significant difference between the adult and the teenage group for ScoreContact (t_{40}= –4.701; $p < 0.001$). These results are shown in Figure 3.4.3 below.

Additionally, t-tests between the two gender groups also show a significant trend for ScoreContact ($t_{31,617}$= 0.078) and show a significant difference for ScoreInterest (t_{40}=2.206; $p < 0.05$). These results are also presented in Figure 3.4.3. The female participants (n=22) reported a lower interest on the background questionnaire as well as lesser contact with the English language than the male participants (n=20) in this study.
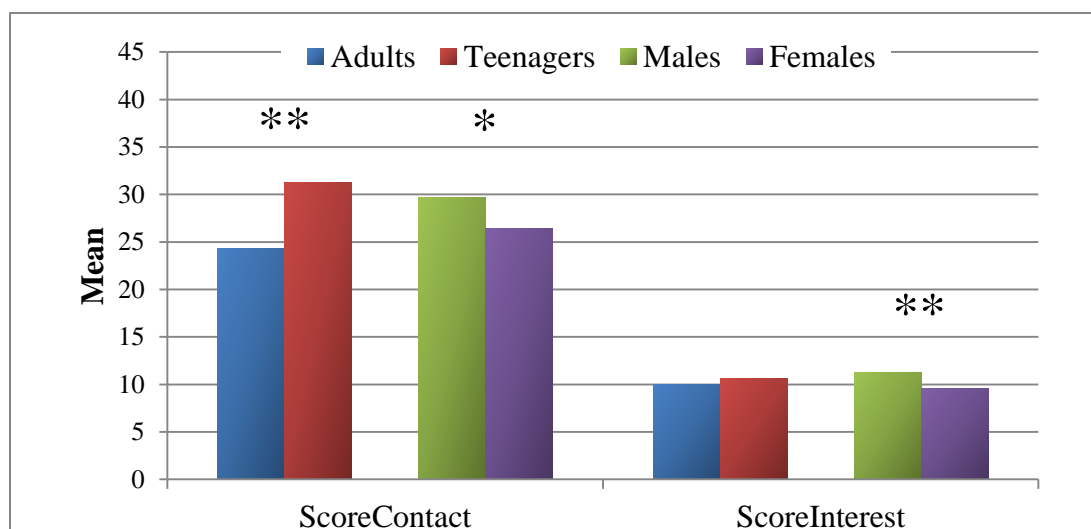
Figure 3.4.3 Means of the two independent variables, presented for the two age groups on the left and the two gender groups on the right. Asterisks show significance.

3.4.3 Correlations with age

In order to see whether our findings confirm the hypotheses we did not only examine the independent samples t-tests but have also calculated the Pearson's correlation coefficients between the dependent and independent variables to determine any significant correlations. The expected correlations from the hypotheses (see section 1.5) were that age correlated strongly with the three dependent variables ScoreTheta, ScoreT and ScoreF, in such a way that the adult participants produce more substitutions and would thus have a higher ScoreT and ScoreF than the teenage participants. The second expected correlation is between age and ScoreContact. Teenagers are hypothesised in this study to have a higher degree of contact with the English language than the adult participants.

Pearson's correlation coefficients show that the relationship between the participants' age and the three dependent variables is rather weak. In fact, the independent variable age doesn't correlate with ScoreTheta or ScoreT. ScoreF on the other hand does show a trend with age ($r = -.285$, $p = 0.067$). However this does not agree with the hypothesis. The significant trend agrees with the findings in the previous result sections and the independent samples t-tests, stating that the realisation of /θ/ as [f] is a feature of younger Dutch participants rather than Dutch adult participants.

Next the Pearson's correlation coefficients between the independent variables age, ScoreContact and ScoreInterest were calculated. These show that age strongly correlates with the amount of contact participants have with the English language ($r = -.659$, $p < 0.0001$). This

52

correlation supports the hypothesis and the findings from the background questionnaire and t-tests, which report that the teenage participants have a significantly higher contact with the language than the adult participants. ScoreContact also strongly correlates with ScoreInterest (r = .685, $p < 0.0001$), which indicates that when participants have a high degree of contact with the language, they also have a high degree of interest in the English language.

3.4.4 Correlations with contact and interest

We did not hypothesise on the relationship between a higher degree of language contact and the three dependent variables ScoreTheta, ScoreT and ScoreF. However, we expected that the teenage participants show a better result for ScoreTheta and report a higher degree of contact with the English language. So indirectly we hypothesised on a correlation between ScoreTheta and ScoreContact. Pearson's correlation coefficients show that ScoreContact has a moderate correlation with ScoreTheta (r = .304, $p = 0.05$). This means that there is indeed a correlation between the realisation of /θ/ as accurate [θ] and contact with the English language. ScoreF doesn't correlate with ScoreContact, and ScoreInterest doesn't correlate with ScoreTheta and ScoreF either. ScoreT, however, has a moderate correlation with both ScoreContact (r = –.354, $p < 0.05$) and ScoreInterest (r = .384, $p < 0.05$). In other words, the number of [t] realisations for /θ/ increases when the participants' contact and interest in the English language decreases.

In summary, the performed t-tests indicate that Dutch adult and teenage speakers of English differ greatly in their contact with the English language (t_{40}= –4.701; $p < 0.001$). Results show that the younger Dutch speakers reported more extensive contact. Also, the difference between the two age groups shows a trend for ScoreF ($t_{30.032}$ = 0.056), which means that the pronunciation of /θ/ as [f] is a feature of younger Dutch speakers of English rather than adult speakers of Dutch. Independent samples t-tests also show that female Dutch speakers report less contact and interest in the English language. Additionally, the independent variable age has a strong correlation with ScoreContact (r = –.659, $p < 0.0001$), which means that the older Dutch participants have lower contact scores than the younger ones. Unfortunately, other comparisons turned out to be non-significant.

Chapter 4. Discussion

The goal of this study is to investigate three research questions about the way in which both teenage and adult Dutch learners of English realise the English /θ/ in syllable-initial, medial and syllable-final position in English words. These research questions were:

1 What consonants do Dutch L2 speakers of English pronounce in positions of English /θ/?
2 What is the frequency distribution of these consonants in initial, medial and final positions of the word?
3 Is there an age effect and/or exposure effect on the type of consonant or their frequency distribution?

In this chapter we will discuss the hypotheses and findings for each of these questions in separate sections. First, section 4.1 will answer and discuss the findings about the general realisations of /θ/ by Dutch speakers of English. Then, section 4.2 will answer and discuss the findings about the distribution of these realisations across syllable positions. Next, section 4.3 will answer and discuss the age and exposure effects discovered in our findings. A final section will be included to deal with substantial findings unrelated to the research questions.

4.1 Realisations of /θ/

In this section we will discuss the first hypothesis about what consonants Dutch L2 speakers of English produce in positions of the English voiceless dental fricative /θ/. Our hypothesis was that native Dutch speakers would realise /θ/ as either an accurate [θ] or as other variants such as [t, d, f, v, z] and [s]. This expectation was based on previous research that presented empirical evidence on L2 speakers of English and their realisations of /θ/ (Lombardi, 2003; Wester et al., 2007). We also expected to come across a segment such as the dental [t̪], which can be roughly classified as a sound between [θ] and [t]. Although this production experiment focussed on the voiceless dental fricative, the voiced consonants [d, z, v] were also included as possible outcome variants because of the <th> spelling for both the voiceless and the voiced English fricative. We assumed that the difference in pronunciation might not be familiar to all second language speakers of English.

This hypothesis was tested by recording 42 native Dutch speakers of English as they read aloud a wordlist of 70 existing English words, of which 30 contained /θ/. In section 3.1 we

showed that the analysis of the 2,520 produced realisations of /θ/ by 42 native Dutch speakers revealed a large variety of phonetic realisations. We thus agree with Wester et al. (2007) who observed a large "intra-subject variation" within the results. Our 42 participants realised the /θ/ 898 times (35.6%) as accurate, but not authentic [θ]. /θ/ was realised 878 times (34.8%) as inaccurate [t], 53 times (2.1%) as [d] and 213 times (8.4%) as [f] (see Table 3.1). We can therefore conclude that Dutch learners of English mostly pronounce the consonants [θ], [t] and [f] in positions of English /θ/. In addition, there were a few unidentifiable and infrequent sounds such as [s] and [z] which together comprised about 5% of all produced consonants. The sound [v] was not encountered as a realisation of /θ/ and the silent segment [Ø] was not hypothesised as one but was discovered during the analysis of the voice recordings.

The present findings are consistent with our hypothesis based on consonants reported in earlier reviewed literature. However, the frequency of these various consonants replacing [θ] tends to differ from previous findings. Gussenhoven and Broeders (1976) and Collins and Mees (1981) reported that Dutch speakers tend to replace [θ] with [s] and on rare occasions with [t]. More recently Collins et al. (2011) commented that Dutch learners replace [θ] with [s] and [t], meaning that [t] occurred more often than on a rare occasion. Even so, the present study identified only few occurrences (less than 5%) of the segment [s] as a realisation for /θ/. This is a significant difference in observations, suggesting that in a few decades native Dutch speakers of English have gone from realising /θ/ most often as [s] to almost never. In a certain sense Wester et al. (2007) already announced a pronunciation shift from realising /θ/ as [s] to realising this target segment /θ/ as [t]. Findings from their empirical study showed that the segment [t] occurred more often than [s] in both syllable-initial and syllable-final position. Wester et al. (2007) observed that initial [t] was produced 64% of all realisations and [s] only 21%. In word-final position [t] was produced 33% and [s] a mere 13%. In comparison to the observations from decades earlier, these findings show that the language behaviour of Dutch learners has been changing regarding their realisations of the voiceless dental fricative /θ/. The present study shows that the native Dutch speaker realisation of /θ/ as [s] is even further declining, and that [t] has become the dominant non-target realisation of /θ/.

In addition, Collins and Mees argued that [f] was rarely used in their observations, yet this particular segment is among the three most common realisations in the present study. This change in phoneme realisation, such as the one for [s], did not happen overnight. The increase of realising /θ/ as [f] has mainly taken place in word-final position. Fikkert (1994) already observed that Dutch L1 children tend to replace consonants in syllable-final position with fricatives. Transfer of this L1 preference to L2 has also been reported in the findings from

Wester et al. (2007). However they did not discriminate between positions in their conclusion and described the overall occurrence of [f] as less frequent. The overall occurrence of [f] in this experiment is not very different from these previous findings. Realisation of /θ/ as [f] only happened 8.4% of all 2,520 occurrences of /θ/. Interestingly this was statistically enough to call the difference between the groups a trend. We will discuss the segment [f] in more detail later when we address the frequency distribution of the realisations.

　　　　Our analyses on the voice recordings of the 42 Dutch participants revealed some phonemes which have not been discussed in previous literature on the English voiceless fricative. Such are the segments [t̪], [t̪θ] and [∅]. The dental plosive [t̪] and affricate [t̪θ] show that when second language learners of English realise /θ/ they do not only use established phonemes from the L1 or L2, but also sounds that are in-between existing ones. These produced sounds suggest that the L2 participant speaker is aware of the fact that the positioning of the tip of the tongue and the upper teeth need to be adjusted in order to produce an accurate realisation of the fricative sound [θ]. Evident from the voice recordings is that this reshaping of the mouth is not easy and accurate positioning does not assure mastery of the sound.

　　　　This conclusion can be made on the basis of the great "intra-subject variation" of /θ/ realisations in the voice recordings. It was very common for the Dutch participants to realise /θ/ as [θ] in the first recording and three minutes later as [t] in the second recording, without anything being different except the shape of their own articulators. Another interesting sound which has not been discussed in previous literature is the silent [∅]. The word-final /θ/ in *teeth* and *faith* were occasionally produced with such low energy that barely anything more than voice drag could be identified. This sound occurred only with words that have /θ/ in final position, which might suggest that as the speaker is producing this final consonant devoicing occurs to the point where there is no voice left or the speaker forms a complete closure between the tongue and teeth blocking the air stream.

4.2 Distributions across syllable positions

In this section we will discuss the way in which the consonants were distributed for each syllable position as well as age groups. Our second hypothesis was that the position of /θ/ and the preceding or following vowel matter for accurate production and that the most frequent non-target realisation of /θ/ in syllable-initial position will likely be [t] and in syllable-final position will likely be [f]. These expectations were based on the empirical evidence collected by Rau et al. (2009) and Wester et al. (2007). This hypothesis was tested by presenting 30

occurrences of English /θ/ in three different syllable positions to 42 native Dutch speakers. Forcing the Dutch participants to realise /θ/ ten times in each syllable position gave us enough data to conclude whether position is important for an accurate realisation of the voiceless dental fricative. Results for each position are shown in Table 3.2.11.

4.2.1 Syllable-initial position

The most produced realisation by the Dutch participants for the voiceless dental fricative in syllable-initial position is an accurate [θ]. Figure 3.2.11 shows that the Dutch participants realise 37% of /θ/ in initial position as [θ], and 31% as [t]. Findings from Wester et al. (2007) showed that 64% of /θ/ in syllable-initial position was realised as [t]. Wester et al. (2007) thus observed that Dutch L2 speakers tend to realise /θ/ as [t] in syllable-initial position. The present findings show that initial /θ/ is more often realised as [θ] than [t]. However we note that the difference between these two realisations [θ] and [t] is only a small percentage. Also Wester et al. (2007) did not specify how many of their participant's productions were realised with an accurate [θ]. We therefore cannot draw conclusions on whether Dutch realisation of syllable-initial /θ/ has improved or whether this initial-[t] tendency has increased or decreased. This thesis does agree with Wester et al. (2007) that Dutch L2 speakers of English, who have not acquired the sound [θ], tend to realise syllable-initial /θ/ as the non-target [t].

Ra et al. (2009) examined the phonetic environment to determine which vowels and consonants promoted or constrained accurate realisation of [θ]. They concluded that syllable-initial /θ/ followed by the vowels in *thank*, *third*, *think*, and *thought* promoted accurate realisation of /θ/ as [θ]. Our word list contained /θ/ in the word *thanks* which was realised by the participants as 39% [θ] (see Table 3.2.5 and 3.2.6). It also contained /θ/ in the words *thirty*, *thirteen* and *Thursday* which were realised with 33% [θ]. We did not include a word with the vowel in *thought*, but we did include *thick*, *think* and *thing* (see Table 2.1). *Think* was realised the best by the Dutch participants. They realised this syllable-initial /θ/ 53.5% as [θ]. The segment /θ/ in these three words together were realised as 48% [θ]. Rau et al. (2009) also concluded that the vowels in *thunder*, *thousand* and *throw* constrained accurate realisations of /θ/ as [θ]. We did not include the word *thunder* in our words list, but we tested *thousand* and *throw*. The /θ/ in *thousand* was realised 28.5% as an accurate [θ] and /θ/ in *throw* was realised 21% as [θ]. Rau et al. (2009) did not include the vowel in *theatre*, but our findings show that participants realised 30% of all occurrences with [θ]. It can be said that this vowel does not constrain L2 speakers from accurate realisation, but neither promotes accuracy of [θ].

57

Our findings thus agree with Rau et al. (2009) that the vowels in *thousand* and *throw* constrain the second language speaker from accurately realising the /θ/ as [θ]. The vowels in *thanks*, *thirty* and *think* do raise the accuracy for the L2 speaker. However percentages of accurate syllable-initial [θ] are still rather low; even *think* only barely passes 50% accuracy. This indicates that the initial /θ/ is difficult for L2 speakers of English, but the phonetic environment can raise or lower the accuracy of the realisations.

4.2.2 Syllable-final position

The most produced realisation of /θ/ in syllable-final position is also an accurate [θ]. The Dutch participants realised 41% of all syllable-final /θ/ as [θ] and 25% as [t]. Interesting about this syllable position is the participant's realisation of syllable-final /θ/ as [f]. The percentage of the non-target [f] in word-initial (5%) and medial (7%) position has doubled for final position (14%). This is similar to the findings from Wester et al. (2007). Their results showed only 13% of all syllable-initial /θ/ was realised as [f], whereas 47% of all syllable-final /θ/ was realised as [f] by the Dutch L2 speakers of English.

Findings from Rau et al. (2009) show that like syllable-initial /θ/ the phonetic environment can promote accurate realisation of syllable-final /θ/. According to Rau et al. (2009) this is the case for the vowels in *with*, *teeth*, *moth* and *breath*. We did not include the words *with* and *moth*, but we tested the vowel preceding /θ/ in *teeth*. Participants realised 45% of /θ/ in *teeth* as an accurate [θ] (see Table 3.2.9 and 3.2.10). We also tested syllable-final /θ/ in the words *death* and *health* which have the same vowel as *breath*. Participants realised 41% of this syllable-final /θ/ as [θ]. Rau et al. (2009) also found that the vowels in *math*, *youth*, *earth* and *mouth* constrained accurate realisation of [θ] for L2 speakers of English. We included *bath* in our word list instead of *math*, but results show that 44% of /θ/ in *bath* was realised as [θ]. We also included *youth*, *tooth* and *mouth*. Participants realised the syllable-final /θ/ in *youth*, *tooth* and *mouth* 41% as [θ]. We did not test /θ/ in the cluster *earth* in our word list. Our results show that syllable-final /θ/ and its phonetic environment do not particularly constrain Dutch L2 speakers of English as much as it did Chinese L2 speakers of English in Rau et al. (2009). The vowel preceding /θ/ in *faith* was not discussed by Rau et al. (2009) but seems to be constraining for Dutch speakers. Only 26% of /θ/ in *faith* was realised as an accurate [θ]. The vowels preceding /θ/ in *truth* and *both* on the other hand seem to raise accuracy for Dutch speakers. They realised /θ/ in *truth* 39% as [θ] and /θ/ in *both* 41% as [θ].

4.2.3 Medial position

The most produced realisation by the Dutch participants of /θ/ in medial position is the non-target sound [t]. Some of the test words that contained /θ/ in medial position were *python*, *author* and *method*. The voiceless dental fricative in word-medial position was realised more than 45% as [t] and 30% as [θ]. This is an interesting discovery. Unfortunately we do not have any previous findings to compare with because Wester et al. (2007) only included syllable-initial and syllable-final occurrences of /θ/.

It may be said that the words chosen for this production task actually contain syllable-initial /θ/ rather than medial because, with the exception of *Cathy*, *method* and *Southeast*, they are all two syllable words with /θ/ in the onset of the second syllable (see Table 2.1). When considered as syllable-initial /θ/ the accumulated realisations of [θ] and [t] result in 33% realised as [θ] and 39% realised as [t], which agrees with the findings from Wester et al. (2007). However as said before, we do not know their percentage of accurate [θ]. This constrains us from fully comparing our findings. Also we argue that in an individual word task realising /θ/ between two vowels is not the same as realising /θ/ preceded by nothing and only followed by a vowel and consonants.

In addition, Dutch speakers of English might not tend to realise medial /θ/ as [t] as in syllable-initial position. But instead transfer their Dutch familiarities in pronunciation to their L2. The common Dutch equivalents of *python* /pitɔn/, *methode* /me.todə/, *auteur* /ɑuˈtør/ and *gothic* /ɣɔtɪk/ are all realised with [t] in medial position, which might account for these realisations of English /θ/ as [t] in English *python*, *method*, *author* and *gothic*. Also interesting is the relatively high percentage (6%) of the non-target sound [d], considering this percentage was below 1% for /θ/ in syllable-initial and syllable-final position. These findings suggest an (unconscious) awareness that syllable-initial and syllable-final /θ/ are often voiceless in English words and medial /θ/ is often voiced, e.g. *mother* and *weather*.

Similar to Wester et al. (2007), Rau et al. (2009) did not consider /θ/ between vowels in their study either. This phonetic environment in two syllable words is very interesting regarding Dutch L2 speakers. However that does not necessarily mean that this phonetic structure constrains other L2 speakers of English as well.

Our findings confirm our hypothesis that syllable position matters for an accurate realisation of [θ]. The voiceless dental fricative is more difficulty for Dutch speakers to realise in syllable-initial and medial position than syllable-final position. Our expectations for syllable-initial realisations of /θ/ as [t] were also confirmed. Research findings confirm the findings by Wester et al. (2007) that Dutch speakers of English tend to replace [θ] with [t]. Although

participants realised syllable-initial /θ/ almost as often as an accurate [θ] as [t], which suggests that this tendency manifests in L2 speakers who have not acquired accurate [θ]. We also confirmed our hypothesis on syllable-final realisation of /θ/ as [f]. The present findings on the syllable-final /θ/ confirm the findings by Wester et al. (2007). Besides the tendency to replace initial [θ] with [t], Dutch speakers also tend to replace final [θ] with [f]. Our results were very different regarding the suggested constraining vowels which precede syllable-final /θ/ by Rau et al. (2009). This confirms that second language speakers from different L1's do not behave the same when acquiring the same foreign language.

4.3 Age and exposure effects

In this section we will discuss whether the variants produced by the participants and their distribution are effected by age and/or exposure. Our third hypothesis was that we expected a general difference in proficiency between the two age groups. We hypothesised that older Dutch speakers of English produced more non-target sounds than younger Dutch speakers. This hypothesis is based on the Critical Period Hypothesis (CPH), which says that at a young age learners have an ideal time window or sensitive phase to acquire a foreign language. Our expectation is consistent with the hypothesis that the older participants in this study who started learning English later than the age of twelve are more likely to mispronounce [θ] as [t], [s] or [f] in the production experiment.

In addition, we hypothesised that teenagers will have more exposure to English than the older participants. This hypothesis is based on the increase of the English language in everyday life, which is mostly experienced by younger people through the internet and television. To test these two hypotheses on age and exposure effects we examined two groups of participants; a teenage participant group (N=22) and an adult participant group (N=20). Both participant groups were also asked to complete a short questionnaire containing 22 questions about their contact with the English language. The answers given by the participants were encoded and analysed using independent t-tests and Pearson's correlation coefficients. Results for these tests are shown in section 3.4.

4.3.1 Age effects in realisations of /θ/

In section 3.2 we reported the participant's realisations of /θ/ across the three syllable positions. Table 3.2.12 shows that the teenage participants are responsible for the vast majority of

accurate [θ] realisations of /θ/ and that the adult participants realised /θ/ mostly as [t]. This table shows that syllable-initial /θ/ was realised 45% as an accurate [θ] and 29% as [t] by the teenage participants. The adult participants realised initial /θ/ 34% as [t] and 28% as an accurate [θ]. In addition, syllable-final /θ/ was realised 47.5% as an accurate [θ] and 20.5% as [t] by the teenage participants. The adult participants realised final /θ/ 32% as an accurate [θ] and 29.5% as [t]. Both age groups realised /θ/ presented in medial position more often as [t] than [θ]. Dutch teenagers realised medial /θ/ 39% as [t] and 36% as [θ]. Dutch adults realised medial /θ/ 55% as [t] and only 22.5% as [θ]. This shows that both teenage and adult Dutch speakers struggle the most with the realisation of /θ/ in intervocalic position. The least difficult realisation for both age groups is /θ/ in syllable-final position. Both age groups of Dutch speakers show the tendency to realise initial /θ/ as [t] as described by Wester et al. (2007).

Overall it can be said that the Dutch teenage participants retain a better realisation of /θ/ than the Dutch adult participants. These findings confirm our hypothesis that the adult Dutch speakers produce more non-target realisations of /θ/ than the teenage Dutch speakers. Our findings also confirm that the Dutch teenage participants have a higher proficiency in English than the Dutch adults. However, a few adult participants did score over 80% correct realisation for accurate [θ] and thus show they have a rather high level of English. Be that as it may, multiple teenagers scored over 95% correct realisations of [θ].

4.3.2 Age effects in realisations of /θ/ as [f] and [d]

Our findings show that Dutch teenagers have an overall better realisation of /θ/ than Dutch adults. However, something interesting happens in their syllable-final realisations of /θ/. Although both teenagers and adults produce the segment [f] as a realisation of /θ/ in each syllable position, the percentages are noticeably higher in syllable-final position. The adult participants realised 2% of initial /θ/ as [f], 3% of medial /θ/ as [f] and 9% of syllable-final /θ/ as [f]. The teenage participants realised 8% of initial /θ/ as [f], 10% of medial /θ/ as [f] and an outstanding 18% of syllable-final /θ/ as [f]. These findings agree with the findings in Wester et al. (2007) and Fikkert (1994) and show that, as well as having the tendency to replace syllable-initial [θ] with [t], both Dutch age groups tend to replace syllable-final [θ] with [f].

Even though both groups show an increase of [f] realisations in syllable-final position, ScoreF remains twice as high for the teenage participants than for the adult participants. The independent t-tests we calculated in section 3.4.1 show that this difference between the two age groups is a significant trend for ScoreF ($t_{30.032} = 0.056$). In addition, the Pearson's correlation

coefficients we calculated in section 3.4.3 confirm that ScoreF shows a trend with age ($r = -$ .285, $p = 0.067$), which means that the realisation of /θ/ as [f] is a feature of younger Dutch speakers of English rather than adult speakers of Dutch.

Both age groups also show an interesting percentage of /θ/ realised as the voiced plosive [d]. The adult participants realised 0% of syllable-initial and syllable-final /θ/ as [d], but 5.5% of medial /θ/ as [d]. The teenage participants also realised 0% of syllable-initial and syllable-final /θ/ as [d], but 6.5% of medial /θ/ as [d]. This is interesting for two reasons; it shows a strong increase of the percentage for intervocalic position, and it is the only voiced consonant produced as a realisation of voiceless /θ/. This increase in percentage shows that speakers of Dutch have a strong tendency to realise medial /θ/ as [d], which might be influenced by other common English words with a voiced eth such as *mother*, *weather* and *brother*. However, the English language also has many (function) words with /ð/ in syllable-initial position such as *then*, *they*, *this* and *the*, and participants realised 0% of syllable-initial /θ/ as [d]. We therefore argue that participants cannot merely be influenced by other common English words. The fact that both age groups show a strong tendency to realise medial /θ/ as [d] means that it is a feature specified to neither Dutch adults nor Dutch teenagers.

4.3.3 Exposure effects

In order to test the amount of exposure for both age groups, we asked them to complete a background questionnaire. The answers given by the participants were encoded and analysed in section 3.4. Our reported findings show that age strongly correlates with the amount of contact participants have with the English language ($r = -.659$, $p < 0.0001$). In addition, the performed t-tests we calculated in section 3.4.2 indicate that there is a significant difference between the two age groups ($t_{40} = -4.701$; $p < 0.001$), with regard to their contact with the English language. Results from the background questionnaire show that the younger Dutch speakers reported more extensive contact with the language (see Table 3.3.2). These findings support our hypothesis that the teenage participants have a significantly higher contact with the English language than the adult participants. One of the main reasons for this difference is the participant's age of first contact (see Figure 3.3.1). The Dutch school system has changed in such a way that learners are now provided with English lessons at the age of ten (or sooner), rather than the age of thirteen at which most adult started learning English. Another reason lies in the participant's own interest in the language. Pearson's correlation coefficients show that ScoreContact strongly correlates with ScoreInterest ($r = .685$, $p < 0.0001$), which indicates that

when participants have a high degree of contact with the language, they also have a high degree of interest in the English language. Such interests as reading or listening to the foreign language were most often reported by the teenage Dutch learners of English.

Other exposure effects were observed between ScoreContact and the three dependent variables. Pearson's correlation coefficients show that ScoreContact has a moderate correlation with ScoreTheta ($r = .304$, $p = 0.05$), which means that there is indeed a correlation between the realisation of /θ/ as accurate [θ] and contact with the English language. The Dutch teenage participant group confirms this correlation as their realisations of [θ] are better than the adult participant group and they also report significantly more contact with the English language. ScoreT also has a moderate correlation with both ScoreContact ($r = -.354$, $p < 0.05$) and ScoreInterest ($r = .384$, $p < 0.05$). In other words, the number of [t] realisations for /θ/ increases when the participants' contact and interest in the English language decreases. These correlations reconfirm our hypotheses that adult participants produce more non-target realisations and report less contact with and interest in the English language than the teenage participants.

4.3.4 Gender effect

In addition to an age and exposure effect, t-tests between the two gender groups also show a significant trend for ScoreContact ($t_{31,617} = 0.078$) and show a significant difference for ScoreInterest ($t_{40} = 2.206$; $p < 0.05$). These results are presented in Figure 3.4.3. Interesting is that the female participants in both age groups reported less interest on the background questionnaire as well as less contact with the English language than the male participants in this study. Reasons were not specified by the background questionnaire, and we can only speculate that these findings are either related to the participants work or personal (dis)interests.

4.4 Speech communities

Rau et al. (2009) demonstrate in their study that an analysis of phonetic variants realised by two groups of the same first language can provide evidence of a speech norm and thus a speech community. Speech communities are comprised of second language learners who have the same L1 and share the same norm regarding an L2 target variable. The Mandarin Chinese speaker groups from mainland China and Taiwan who participated in the study by Rau et al. (2009) belonged to the same speech community because they displayed the same norm for the

L2 target variant [θ]. An example of two different speech communities are Quebec and European French speakers (Lombardi, 2003; Rau et al., 2009). The Quebec French realise [θ] as [t], but the European French realise [θ] as [s]. This difference in realisations shows that they have different speech norms for the L2 target [θ]. Recall that in the first chapter we raised the question as to whether there might be separate speech communities related to the speech norm of L2 [θ] within the current Dutch native speakers population.

Our findings show that comparable to the Mandarin Chinese speakers the teenage and adult Dutch speakers in this study belong to the same speech community. The teenage participants realise /θ/ as either an accurate target [θ] or a non-target [t] and the adult participants have the same realisations of /θ/ as [θ] or [t]. Both groups thus show the same tendency to replace [θ] with [t], which is why we argue that they share the same speech norm. The difference between the two age groups, however, is the frequency of these realisations. The Dutch teenagers produce more realisations of [θ] and the Dutch adults more of [t]. This can be explained by the amount of contact the participants have with the English language. On the grounds that the difference between the age groups was significant ($t_{40} = -4.701$; $p < 0.001$) for ScoreContact and ScoreContact correlates with Age ($r = -.659$, $p < 0.0001$) and ScoreTheta ($r = .304$, $p = 0.05$).

Both age groups also produce the same realisations when it comes to realising /θ/ as [f] and [d]. The Dutch adults as well as teenagers tend to realise intervocalic /θ/ as non-target [d] and syllable-final /θ/ as non-target [f]. However, Dutch teenagers realise the latter twice as much as the adult participants, and this shows a significant trend ($t_{30.032} = 0.056$) between the two age groups. But this can best be described as a feature of speech for younger Dutch speakers than as different speech norms regarding L2 syllable-final [θ].

Nonetheless, our findings do show that speech norms regarding L2 [θ] in the Netherlands have changed over the decades. In the first chapter we reported that previous linguists observed Dutch speakers of English realising /θ/ as [s] or [t] (Collins & Mees, 1981). Since realisations of /θ/ as [s] were declining in Wester et al. (2007) and are very rare in the present production experiment, we can argue that the Dutch speech norm for English [θ] has changed from [s] to [t].

Chapter 5. Conclusions and implications

In this final chapter we will summarise the most important findings and provide answers to the research questions. Also, we will formulate further implications and limitations of this thesis.

5.1 Summary of findings

This thesis looks at the English voiceless dental fricative /θ/, and investigates its realisations produced by a group of teenage and adult Dutch speakers of English.

The first question in this thesis dealt with the consonants produced by Dutch L2 speakers of English as realisations of /θ/. We concluded that Dutch L2 speakers of English realise the voiceless dental fricative most often as the accurate [θ], and as inaccurate [t], [t̪] or [f]. The second question dealt with the frequency distribution of these consonants divided over syllable-initial, medial and syllable-final position. We concluded that position of /θ/ matters for accurate realisation as [θ]. The most frequent realisation of /θ/ in syllable-initial and syllable-final position is [θ]. The realisation of /θ/ is most influenced in medial position, where non-target realisation [t] is more frequent than [θ]. Syllable position also influenced the number of realisations of /θ/ as [f] and [d]. The number of [d] realisations is highest in medial position, and the number of [f] realisations is highest for syllable-final position. This difference between the two age groups is a significant trend for ScoreF ($t_{30.032} = 0.056$).

The third question considers whether there is an age effect and an effect on the amount of contact with the English language. We concluded that adult participants generally realise /θ/ as [t]. By contrast, teenage participants generally have a higher number of both target [θ] and [f] realisations. A questionnaire revealed that the teenage participants have more extensive contact with the English language than the adult participants ($t_{40} = -4.701$; $p < 0.001$).

5.2 Implications

This thesis has brought to light new findings about the acquisition and realisation of the English voiceless dental fricative by Dutch speakers of English. For example the multitude of variants produced as realisations of /θ/. The many variants produced show that Dutch speakers of English do not just replace [θ] with [t] or [f] as is suggested by earlier linguists and textbooks. Instead these L2 speakers try to realise an authentic [θ], but lack the guidance in doing so.

These findings should be picked up on a pedagogical level by language teachers and coaches, who can guide L2 speakers more towards an accurate realisation of foreign sounds such as [θ]. There are, however, some Dutch speakers who indeed have acquired a fixed routine (or habit) of realising /θ/ as [f] or replacing it by a distinctive [t].

Another pedagogical issue is the syllable-final [f] realisations for /θ/ produced by teenagers. Statistics did show that the difference for [f] realisations between adult and teenage participants was a significant trend. The increasing number of this sound might mean that it is taught to new learners of English as a substitute for [θ]. This raises the question whether we accept this sound as a realisation of syllable-final /θ/. If not, then teachers and textbooks need to revise this, before the tendency becomes fixed as it has done with syllable-initial [t].

Pedagogical insights which are re-established by our findings are the positive effect of language contact, and the positive effect of an early age of acquisition. The fact that contact with a foreign language benefits acquisition of that language has already been discovered. A result of this discovery is the total immersion method, in which students are submerged in a foreign language. Our present findings confirm that language contact correlates with age and therefore with accurate realisations of foreign sounds. The younger generation reported more contact and interest in the language. Dutch primary and secondary schools should embrace these youngster's interests and guide their learners' language learning processes. Unfortunately it is still the case that some primary schools only offer half an hour of English a month or less, and secondary schools are often still using textbooks from three decades ago.

Our findings have yielded new insights on a sociolinguistic level as well. Earlier reported observations by Collins and Mees (1981) on the realisation of /θ/ by Dutch speakers showed that [θ] was often substituted by [s] and [t]. The segment [f] was rarely mentioned before Fikkert (1994) who only spoke of infants substituting [f] for [θ]. Our findings show that [s] has now become a very rare realisation, which shows that foreign languages are subject to speech norms and that these norms can change over time, even though the L2 target sound does not.

 5.3 Limitations and suggestions for further research

Although this research and its findings have contributed to this field of study, there were some unavoidable limitations. First, because it is a student master's thesis, this research was conducted only on a small sample of the Dutch teenage and adult population. Our research questions involve two rather large groups of second language speakers that each have their own

language experience and interests. The number of participants in this study might thus have been too small to discover more significant correlations and findings between the realisations of /θ/ and the participant's age and contact with the English language. A second limitation is the student researcher as a measurement tool. Even though a trained phonetician supervised the analysis, the student researcher judged the participants' realisations on an auditory basis. Still substantial findings were discovered and because the student researcher executed all judgements, there is no inequality for either of the two age groups.

These two limitations are reasons why expert linguists and phoneticians should look further into this subject. Also, the interesting findings regarding speech norms changes, on which this thesis has shed some light, are excellent starting points for further research on the L2 realisations of the English voiceless dental fricative. Another idea for further research on this topic is to incorporate the final participant judgement task done by Rau et al. (2009). Participants of their study were presented with four different realisations for /θ/, and they had to give their preference for one. This may provide further evidence of existing speech norms between teenage and adult speakers of Dutch. One final result worth further investigating is the significant difference in interest we discovered between the male and female participants in this study. As is evident from this study, as well as previous research, there is still more to be discovered about the infamous English voiceless dental fricative and its challenging realisation for second language speakers.

References

Colantoni, L., Steele, J., & Escudero, P. (2015). *Second Language Speech*. Cambridge: Cambridge University Press.

Collins, B., Den Hollander, S. P., Mees, I. M., & Rodd, J. (2011). *Sounding Better. A Practical Guide to English Pronunciation for Speakers of Dutch.* Holten: Walvaboek.

Collins, B., & Mees, I. M. (1981). *The sounds of English and Dutch*. Leiden: University Press.

Collins, B., & Mees, I. M. (2008). *Practical Phonetics and Phonology: A resource book for students*. London: Routledge.

Davidson, L. (2011). Phonetic and phonological factors in the second language production of phonemes and phonotactics. *Language and Linguistics Compass*, *5(3)*, 126-139.

Fennell, B. (2001). *A history of English: A sociolinguistic approach*. Oxford: Blackwell Publishing.

Fikkert, P. (1994). On the acquisition of rhyme structure in Dutch. *Linguistics in the Netherlands*, 37-48.

Flege, J. E., & Eefting, W. (1987). Cross-language switching in stop consonant perception and production by Dutch speakers of English. *Speech Communication*, *6*(3), 185-202.

Freeborn, D. (1998). *From Old English to Standard English: A course book in language variation across time*. Ottawa: University of Ottawa Press.

Gussenhoven, C. & Broeders, A. (1976). *The Pronunciation of English: A Course for Dutch Learners.* Groningen: Wolters-Noordhoff-Longman.

Jones, D., (1975). *An Outline of English Phonetics.* Cambridge: Cambridge University Press.

Lombardi, L. (2003). Second language data and constraints on Manner: explaining substitutions for the English interdentals. *Second Language Researc*h, *19(3)*, 225-250.

Meisel, J. M. (2011). *First and second language acquisition: Parallels and differences.* Cambridge: Cambridge University Press.

Rau, D., Chang, H. H. A., & Tarone, E. E. (2009). Think or sink: Chinese learners' acquisition of the English voiceless interdental fricative. *Language Learning*, *59(3)*, 581-621.

Treharne, E. (Eds.). (2010). *Old and Middle English c. 890-c.1450: an Anthology.* (3rd ed.). Oxford: Blackwell Publishing.

Wester, F., Gilbers, D., & Lowie, W. (2007). Substitution of dental fricatives in English by Dutch L2 speakers. *Language Sciences, 29*, 477-491.

Appendix A: Word List

Lees eerst de woorden rustig een keer door.
Je mag ze daarna in je eigen tempo hardop voorlezen.

1. sandwich	25. anything	49. death
2. everything	26. short	50. secretary
3. funny	27. pilot	51. waitress
4. python	28. teeth	52. theatre
5. waited	29. dentist	53. blue
6. lethal	30. method	54. both
7. thirty	31. guitar	55. health
8. relatives	32. routine	56. throw
9. thick	33. thing	57. shirt
10. cheese	34. sunny	58. Cathy
11. mouth	35. youth	59. jeans
12. author	36. exercise	60. worked
13. missed	37. Thursday	61. nothing
14. weak	38. computer	62. ambitious
15. thick	39. thanks	63. honest
16. chair	40. checked	64. truth
17. tooth	41. thousand	65. clinic
18. beard	42. romantic	66. bath
19. mother	43. hotel	67. shelf
20. think	44. thirteen	68. gothic
21. behind	45. weather	69. driver
22. 50	46. Southeast	70. bicycle
23. faith	47. started	
24. shoes	48. four	

Appendix B: Background Questionnaire

Background questionnaire for Dutch speakers of English

Participant research ID number: _____   Date: _____

Deze informatie is strikt vertrouwelijk.

Bij meerkeuzevragen antwoorden alsjeblieft omcirkelen.

Persoonlijke gegevens

1. Ben je een man of vrouw?   Man   Vrouw

2. Wat is je leeftijd? _____ jaar

3. In welk land ben je geboren? _____

4. In welke provincie ben je geboren? _____

5. Als je niet in Nederland bent geboren, op welke leeftijd kwam je naar Nederland? _____ jaar

6. Wat is je huidige woonplaats? _____

7. Is Nederlands je moedertaal?   Ja   Nee

8. Welke talen kun je spreken? _____

9. Wat is je hoogst behaalde opleiding?

Vmbo   IHNO/LHNO   Mavo   LTS   Havo   Vwo   MBO niveau ___   HBO   Universiteit

- -

Schooltijd

10. Op welke leeftijd begon je met het leren van Engels? _____ jaar

11. Was Engels een schoolvak op je basisschool? Zo ja, in welke groepen precies?

_____

12. Hoeveel uur per week had je (gemiddeld) Engels op je basisschool?

6   5   4   3   2   1   0   uur

13. Sprak de juf/meester Engels tijdens de les?

Altijd   Vaak   Zelden   Nooit

14. Hoeveel uur per week had je (gemiddeld) Engels op de middelbare school?

8   7   6   5   4   3   2   1   uur

15. Sprak de leraar Engels tijdens de les?

Altijd   Vaak   Zelden   Nooit

16. Sprak je zelf Engels tijdens de les?

Altijd   Vaak   Zelden   Nooit

- -

Buiten schooltijd

17. Sprak je buiten schooltijd Engels?

Altijd   Vaak   Zelden   Nooit

18. Las je buiten schooltijd Engelse tijdschriften/boeken?

Altijd   Vaak   Zelden   Nooit

19. Keek je buiten schooltijd Engelse tv? (Met Engelse ondertiteling of geen ondertiteling)

Altijd   Vaak   Zelden   Nooit

20. Werd er thuis wel eens Engels gesproken?

Altijd   Vaak   Zelden   Nooit

Hartelijk bedankt voor je medewerking.