Pronunciation errors made by Dutch secondary school students in English

By Veerle Kruitbosch

veerle.kruitbosch@student.ru.nl

MA Language and Communication Coaching

Supervisor: Dr Helmer Strik
Second reader: Dr Mirjam Broersma

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Table of contents ii
Abstract iii
1. Introduction 1
1.1 English as a second language in the Netherlands 1
1.2 The aim for L2 pronunciation 3
1.3 Intelligibility and perception 5
1.4 Acquisition of the L2 phonetic system 6
1.5 Common mistakes 9
1.5.1 Common errors in consonant pronunciation 9
1.5.2 Common errors in vowel pronunciation 14
1.5.3 Assimilation and interference 19
1.6 Advanced learners 21
1.7 Significance of errors 23
1.7.1 Significance of errors in RP English 24
1.7.3 Conclusion 26
1.8 Computer Assisted Pronunciation Training 28
1.9 Research questions and hypotheses 29
2. Method 31
2.1 Participants and material 31
2.2 Analysis 32
3. Results 34
3.1 Consonants 34
3.2 Vowels 40
4. Discussion 44
4.1 Consonants 44
4.2 Vowels 50
4.3 Significance of errors 56
4.3.1 Most significant errors 57
4.3.2 Significant errors 58
4.3.3 Conclusion 59
4.4 Implications 59
4.5 Limitations and further research 64
5. Conclusion 66
6. References 67
Appendix A – Corpus data and CPA transcriptions 72
Appendix B – Computer Phonetic Alphabet 74
Appendix B1 – The sounds of English 74
Appendix B2 – The sounds of Dutch 75

Abstract

Pronunciation errors made by Dutch learners of English have been studied mostly for adults. This research investigates the pronunciation errors in English made by Dutch secondary school students. Part of an existing corpus of audio recordings of Dutch secondary school students has been used. The pronunciation errors observed in the data of the secondary school students have been compared to pronunciation errors frequently made by adult Dutch learners of English. Most errors observed in the data are errors that are commonly made by Dutch learners of English, and could be explained by Dutch interference and/or assimilation, or confusion because of spelling. Error hierarchies have also been looked at, and errors that occur relatively frequently also appear to be the ones that are viewed as the most impactful errors. Knowledge about pronunciation errors made by Dutch secondary school students may be useful for teachers, and Computer Assisted Pronunciation Training systems based on Automatic Speech Recognition could be used to help students improve their pronunciation.

Keywords: pronunciation, second language acquisition, language learning, pronunciation errors, English as L2

1. Introduction

1.1 English as a second language in the Netherlands

Globalisation is an inescapable process due to advancements in, among others, communication and transport. As a result, people travel more and to destinations further away, people all over the world have the possibility to communicate with each other, and business takes place across borders, time zones and continents. The availability of news and entertainment from anywhere, to virtually everyone, is astonishing. The way we communicate and interact with people all over the world is more important than ever (Nejjari, Gerritsen, Van der Haagen, & Korzilius, 2012; Ridder, 1995; Ryan, 2006). Many people, regardless of their educational level or career, want, or need, to be able to successfully communicate with people whose mother tongue (L1) differs from their own. Consequently, the acquisition of a second language (L2) is becoming increasingly important. Having correct pronunciation is a vital skill for all L2 learners, and is beneficial for effective communication (Cucchiarini, Van den Heuvel, Sanders, & Strik, 2011).

Ridder (1995) already reports that "[t]he Dutch are internationally known not only to speak English well, but to speak it easily" (p. 49). She goes on to say that "[t]hey use English to communicate with foreigners both abroad and at home, often switching to English as soon as they realise they are dealing with someone who does not speak Dutch (even when that person makes an attempt to speak Dutch)" (p. 49). Dutch speakers of English thus appear to speak English fairly well, and do not seem to hesitate to use English in communication.

In the Netherlands, any person receiving any level of secondary education will be taught English (Fasoglio & Tuin, 2018; Nejjari et al., 2012). The quality and extent to which English is taught in Dutch secondary and even primary schools has increased a lot over the last three decades (Bloemert, Jansen, & Van de Grift, 2016; Goorhuis-Brouwer & De Bot, 2010). Dutch speakers of English generally tend to achieve relatively good levels of pronunciation, but they do seem to have difficulty with the production of various English sounds (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011; Van den Doel, 2006).

Stichting Leerplan Ontwikkeling is the Dutch national expertise centre for education. It develops the curriculum for primary and secondary education in the Netherlands, and determines the attainment targets for all subjects taught at the various levels of education in the Netherland (SLO, 2020a). The attainment goals for the subject English in secondary school were last determined by the SLO in 2007. The Dutch secondary school system distinguishes between various levels of education, for which the attainment goals for English vary. When students in the Netherlands graduate from the highest level of secondary education, vwo, they should be able to speak English at a B2 level according to the Common European Framework

of Reference (CEFR). Students who graduate from the havo should be able to perform at a B1+ level, and students who graduate from vmbo should be able to speak English at an A2 level (Fasoglio & Tuin, 2018). Vwo prepares students for university and normally takes six years to complete. Havo takes five years and prepares students for studies at universities of applied sciences (hogescholen), and vmbo takes four years, focuses on practical knowledge and prepares students for vocational education (IamExpat, n.d.). When they graduate from secondary school, all Dutch students should be able to effectively communicate in English at least to a basic extent (Council of Europe, 2001; Fasoglio & Tuin, 2018; Koet, 2007).

However, adequate correction of pronunciation necessitates a great amount of individualised attention and feedback, as well as a lot of practice, and is therefore extremely time-consuming. Sufficient pronunciation correction may therefore not be realistic in a secondary school environment, or in any language classroom for that matter. The use of Computer Assisted Pronunciation Training (CAPT) programs could be a valuable asset for pronunciation training for Dutch learners of English (Cucchiarini & Strik, 2018; Cucchiarini, Neri, & Strik, 2009; Cucchiarini et al., 2011; Neri, Cucchiarini, & Strik, 2006). There are many varieties of English and a great number of accents. The two most commonly taught accents, worldwide as well as in Dutch secondary schools, are Received Pronunciation (RP) and General American (GA). Dutch learners of English usually aspire to learn one of these two accent models (Koet, 2007; Van den Doel, 2006). Consequently, both accents will be considered acceptable in this research.

The difficulties adult Dutch learners of English have with the pronunciation of English sounds have been investigated quite thoroughly, e.g. by Collins and Mees (1993, 2003), Cucchiarini et al. (2011), and Van den Doel (2006). However, little research has been conducted into the pronunciation errors that adolescent Dutch learners of English tend to make. This paper attempts to investigate the pronunciation errors made by adolescent Dutch learners of English, and how they compare to the existing literature. The data used for this paper has been collected from Dutch secondary school students at a school in Nijmegen.

The structure of this thesis is as follows: the introduction section will discuss relevant findings from previous literature concerning the acquisition of the L2 phonetic system and pronunciation errors commonly made by Dutch learners of English. The introduction section consists of the following parts: the aim for L2 pronunciation; intelligibility and perception; the acquisition of an L2 phonetic system in general; pronunciation errors that Dutch learners of English frequently make; mistakes that proficient learners tend to make; error hierarchies; Computer Assisted Pronunciation Training; and the research questions and hypothesis. The

introduction section will be followed by the methodology, the results, the discussion, and the conclusion of this thesis. The thirteen sentences on which the data is based and their possible correct RP and GA English pronunciations can be found in Appendix A, the phonetic alphabet used to transcribe the sentences and represent the various phonemes in this paper can be found in Appendix B. The majority of the phonetic alphabet used in this paper is consistent with the International Phonetic Alphabet (IPA), but for some phonemes the representation has been altered to avoid confusion.

1.2 The aim for L2 pronunciation

Foreign language learning has been a compulsory part of Dutch secondary education since as early as 1863. From the late 1960 onwards, practical knowledge and the ability to use the second language became more important (Bloemert et al., 2016). Since 1998 the extent to which English is taught in Dutch secondary schools has increased tremendously, and in 2007 the focus of English language teaching in secondary education in the Netherlands shifted from 'knowledge' to 'usage' (Meijer & Fasoglio, 2007). English officially became a core subject in 2013, which means that it is a compulsory subject for all students at all levels of education. Students must achieve a certain level of English to be able to pass the secondary school leaving examination (Fasoglio & Tuin, 2018; SLO, 2020b). As a result, Dutch secondary school students are generally reasonably intelligible, although they usually do not reach a native-like level of English pronunciation (Koet, 2007).

However, the question arises whether native-like pronunciation should even be the goal for learners of a second language. According to Morley (1991), adolescent and adult L2 learners of English should be taught with their educational, professional, individual, and social needs in mind. Achieving native-like pronunciation has long been a priority in L2 language learning, but in the last few decades researchers have moved towards the view that the attainment of native-like pronunciation is not a realistic goal for most L2 learners (Flege & Schwen Bohn, 2020; Munro & Derwing, 2015; O'Brien, Derwing, Cucchiarini, Hardison, Mixdorff, Thomson, Strik, Levis, Munro, Foote, & Muller Levis, 2018).

A perfect, native-like pronunciation is not a necessary skill for most learners of English either, but a reasonable level of intelligibility and comprehensibility and the ability to communicate effectively and with confidence are crucial (Morley, 1991; Munro & Derwing, 2015). Jenkins (2000) agrees that L2 learners of English should be taught to communicate effectively, but argues that it is more important that L2 learners learn to communicate

successfully with other L2 learners than with native speakers of English. She claims that since L2 speakers of English today outnumber its native speakers, the majority of communication in English would be between non-native speakers of the language (Jenkins, 2000; Van den Doel, 2006).

According to Trudgill (2005), circa 80% of all interactions in English that involve L2 speakers do not involve native speakers at all. Jenkins's (2000) assumption that the majority of communication in English takes place between non-native speakers leads her to propose a new term: 'English as an International Language' (EIL). EIL refers to English spoken by non-native speakers to communicate exclusively with other non-native speakers (Jenkins, 2000; Trudgill, 2005). Since EIL is used on a large scale, Jenkins (2000) proposes "a pedagogical core of phonological intelligibility for speakers of EIL, the 'Lingua Franca Core'" (p. 123). According to Trudgill (2005), Jenkins argues that the use of any native-speaker pronunciation model as a goal for L2 speakers, and teachers' insistence on the achievement of near-native pronunciation, are "inefficient and counterproductive" (p. 79). The goal for teaching English as a second language should be to ensure mutual intelligibility between L2 speakers of English with different mother tongues (Jenkins, 2000; Trudgill, 2005).

Van den Doel (2006) disagrees with Jenkins's (2000) view that it is more important to teach L2 speakers of English to communicate effectively with other L2 speakers than with native speakers of English. There are approximately 375 million native speakers of English and 750 million people who speak English as a second language (Rao, 2019). However, this does not mean that more communication in English takes place between L2 speakers than between native speakers. The majority of native speakers will communicate in English for 100%, or close to 100%, every day. The average non-native speaker on the other hand will use English a lot less frequently (Trudgill, 2005). According to Trudgill (2005), it would be a safe assumption that native use of English still greatly outnumbers non-native use of English.

Teaching L2 learners of English a native-speaker pronunciation model means that both successful communication with other L2 speakers as well as successful communication with native speakers are achievable goals, and that choosing between the two is unnecessary. In fact, many learners actually want to engage in successful communication with native speakers, and therefore want to acquire native-like pronunciation. Near-native pronunciation would not only increase a learner's intelligibility, but could also lead to a more positive perception of, or attitude towards, the learner and his or her abilities (Cucchiarini et al., 2011; Koet, 2007; Nejjari et al., 2012; Trudgill, 2005; Van den Doel, 2006).

1.3 Intelligibility and perception

Although 'objective' intelligibility is an important component for effective communication, it is not the only factor which determines a native speaker's perception of, and attitude towards, a learner's intelligibility, accent and mistakes. English spoken with a foreign accent, in this case Dutch, may lead to negative reactions or a negative attitude from native speakers (Cucchiarini et al., 2011; Hendriks, Van Meurs, & Hogervorst, 2016; Koet, 2007; Munro & Derwing, 1995; Nejjari et al., 2012; Van den Doel, 2006). Pronunciation errors and a distinctive foreign accent may cause native speakers to react negatively because they can lead to distraction, amusement, or annoyance on the part of the listener, even when the message is completely clear (Munro & Derwing, 1995; Van den Doel, 2006). Morley (1991) observes that native speakers may even believe non-native speakers to be incompetent, childish, or feel that they are not being serious.

A foreign-accented utterance, although easily understandable, may require a greater cognitive load from the listener. This could lead to the perception that the utterance is less intelligible, and therefore to a more negative attitude (Munro & Derwing, 1995; Saito, Trofimovich, & Isaacs, 2015; Van den Doel, 2006). According to Trofimovich and Isaacs (2012), speech that is easier to process is generally perceived to be more truthful and friendly, while speech that is more difficult to understand will be perceived as less truthful and pleasant. Familiarity with a specific foreign accent on the other hand may lead to a relatively more positive perception of and attitude towards the speaker (Munro & Derwing, 1995; Saito et al., 2015; Van den Doel, 2006). Furthermore, even non-native speakers of English may have a negative attitude towards foreign-accented English (Nejjari et al., 2012; Van den Doel, 2006). Both native speaker bias as well as non-native speaker bias towards foreign-accented speech may therefore play a role in learners' goals concerning pronunciation models. According to Van den Doel (2006), at least some L2 learners of English will reject adapted pronunciation models such as Jenkins's (2000) Lingua Franca Core because of the aforementioned reasons.

According to Koet (2007), it would also not be advisable for L2 learners of English to choose a non-standard pronunciation model, one that is neither RP or GA English. Speakers of English may view non-standard varieties in a less positive light, or may find them more difficult to understand (Koet, 2007).

Thus, there are several arguments for the use as RP and GA English as pronunciation models for Dutch learners of English. Most Dutch learners of English aspire to sound as native-like as possible, and the acquisition of either RP or GA English pronunciation seems to be the

goal for many L2 learners in the Netherlands (Koet, 2007; Van den Doel, 2006). The use of either RP or GA English as a pronunciation model for Dutch learners of English, and training them to achieve a high proficiency level in pronunciation, would help them to achieve the goal of being intelligible and being able to communicate effectively with native speakers as well as non-native speakers of English. Furthermore, native and non-native speakers may view Dutch L2 learners in a more positive light (Koet, 2007; Munro & Derwing, 1995; Nejjari et al., 2012; Van den Doel, 2006).

1.4 Acquisition of the L2 phonetic system

The acquisition of L2 sounds has been investigated thoroughly, both in general terms as well as for specific L2s and/or L1s. Where the acquisition of L2 sounds in general is concerned, Flege (1995) developed the Speech Learning Model (SLM) to account for how learners develop L2 phonetic systems. Based on this Speech Learning Model, Flege and Schwen Bohn (2020) developed the revised Speech Learning Model (SLM-r) to take more recent research into account. While the primary aim of the SLM was to account for limitations in the acquisition of L2 sounds related to age, the SLM-r's primary aim is "to provide a better understanding of how the phonetic systems of individuals reorganize over the life span in response to the phonetic input received during naturalistic L2 learning" (Flege & Schwen Bohn, 2020, p. 1). The SLM and the SLM-r both focus on sequential bilingualism, which entails that the phonetic system of the L1 has already been established before the acquisition of the L2 (Flege, 1995; Flege & Schwen Bohn, 2020). However, unlike the SLM, the SLM-r proposes that there is no difference between the acquisition of an L1 and an L2. Consequently, the 'feature hypothesis' of the SLM has been replaced by the 'full access hypothesis' in the SLM-r (Flege & Schwen Bohn, 2020). The feature hypothesis assumes that if an L2 sound differs from an L1 sound as a result of phonetic features present in the L2 but not in the L1, the phonological difference between the sounds will be especially difficult for L2 learners to perceive, and this difficulty in perception will result in difficulty with the production of the sound (Flege, 1995; Flege & Schwen Bohn, 2020; McAllister, Flege, & Piske, 2000). The full access hypothesis proposes that L2 learners do have the ability to gain full access to L2 phonetic features not present in the L1 (Flege, 2005; Flege & Schwen Bohn, 2020). Consequently, learners of an L2 use the same mechanisms and processes to acquire L2 speech and do so in the same way as children do when learning their L1. However, using these mechanisms and processes which led to perfect results in the acquisition of the L1 does not lead to the same results in the acquisition of the L2, resulting in differences between native and non-native perception and production of L2 sounds (Flege &

Schwen Bohn, 2020). Flege and Schwen Bohn (2020) provide three reasons for the difference in outcome in the acquisition of the L1 and an L2. Firstly, since sounds of the L2 are subconsciously and automatically linked to sounds of the L1, sounds of the L2 are initially substituted with sounds of the L1 which are perceptually close. Secondly, since the phonetic categories of the L1 have already been established, these phonetic categories interfere with the formation of new phonetic categories for sounds of the L2, and may even block the formation of new categories. Thirdly, the input based on which these new L2 categories need to be formed is different from the input that L1 speakers of that same language receive during the acquisition of the language (Flege & Schwen Bohn, 2020). Consequently, the perception and production of the sounds of the L2 may be difficult for learners.

Thus, according to Flege & Schwen Bohn (2020), the influence of the L1 phonetic system on the perception and production of L2 sounds is an important factor in adult L2 speech learning. The SLM-r proposes that there is compelling evidence of a bi-directional connection between the perception and production of sounds. Consequently, perception and production of L2 sounds 'co-evolve' without either one taking precedence. However, correspondence between perception and production of sounds is not perfect, even in a person's L1. The implication of the existence of this bi-directional connection between the perception and production of L2 sounds is that not only does perception influence the production of sounds, but production influences perception as well (Flege & Schwen Bohn, 2020).

Since the phonetic system of the L1 is already established, L2 sounds are perceptually linked to, or 'mapped onto', the closest sound of the learner's L1. This hinders the accurate perception and production of the sounds of the L2. Furthermore, L2 learners appear to have more difficulty distinguishing between two foreign sounds when those two sounds are linked to one single L1 phonetic category than when two foreign sounds are linked to two different L1 sounds (Flege & Schwen Bohn, 2020). Thus, L2 learners seem to identify L2 sounds in relation to positional allophones of the L1, but, according to Flege (1995), "as L2 learners gain experience in the L2, they may gradually discern the phonetic difference between certain L2 sounds and the closest L1 sound(s)" (p. 263). As a result, the L2 learner may eventually form a new phonetic category for the L2 sound independent of the L1 sound to which it was previously linked (Flege, 1995; Flege & Schwen Bohn, 2020). The formation of a new category for an L2 sound requires a lot of input of detailed phonetic information, but input alone is not sufficient. The precision with which the closest L1 sound is defined and the degree to which the L2 sound is perceived to be different from the closest L1 sound also influence the formation of new phonetic categories. Consequently, the greater the perceived difference between the realisations

of an L1 and an L2 sound, the greater the likelihood of the formation of a new category for the L2 sound. Thus, the likelihood of the formation of a new phonetic category increases when the L1 phonetic category is more precisely defined. The precision with which L1 phonetic categories are defined differs per individual and is not language-specific (Flege & Schwen Bohn, 2020). However, according to Flege and Schwen Bohn (2020), the new phonetic categories formed by L2 learners for sounds of the L2 will likely never be identical to the phonetic categories that native speakers have for those sounds. Consequently, the chance that L2 sounds produced by L2 speakers of a language are identical to those sounds produced by native speakers is very slim (Flege & Schwen Bohn, 2020).

Furthermore, according to Flege & Schwen Bohn (2020), learners will not form new phonetic categories for L2 sounds which they perceive to be too phonetically similar to the closest sound of their L1. This does not mean that learners disregard perceptible phonetic differences between these sounds, but rather that a perceptual link between these sounds continues to exist. As a result, a composite phonetic category of the L1 sound and the L2 sound is developed. This composite category is defined by the detailed phonetic information of the perceptually linked sounds (Flege & Schwen Bohn, 2020).

Concludingly, the SLM-r proposes that the ability to form new phonetic categories is present during a person's entire life-span, although the perception and production of L2 sounds and the formation of new phonetic categories is influenced primarily by a learner's L1 (Flege & Schwen Bohn, 2020). Furthermore, according to Flege and Schwen Bohn (2020), L2 learners will increasingly be able to discern between L1 and L2 sounds when they gain experience in the L2. As a result, the learner is more likely to develop new categories for L2 sounds, and consequently the learner will be able to better distinguish between the L2 sound and the L1 sound to which it was previously linked. Composite categories may also be formed for L1 and L2 sounds which are perceived to be too phonetically similar to be placed in separate categories, although this does not mean that learners will not be able to distinguish between the sounds in such a composite category (Flege & Schwen Bohn, 2020).

1.5 Common mistakes

Second language learners of English generally tend to substitute English sounds with corresponding sounds from their mother tongue. The assimilation processes of learners' mother tongues are often applied to the L2 as well (Collins & Mees, 1993, 2003; Flege & Schwen Bohn, 2020; Koster & Koet, 1993; Van den Doel, 2006). In addition to these types of mistakes, Dutch learners of English specifically seem to have difficulty with the fortis/lenis contrast and with vowel duration in English. The loss of the fortis/lenis contrast is especially significant in stressed syllables and may cause minimal pairs to become homophones, which could result in confusion and miscommunication. Dutch learners tend to over-short vowels that precede lenis consonants, an error that is associated with the confusion of the fortis/lenis contrast. The lengthening of vowels before lenis consonants and the shortening of vowels before fortis consonants seems to be particularly difficult (Collins & Mees, 2003; Nejjari et al., 2012; Van den Doel, 2006).

A lot of research has been conducted into pronunciation errors commonly made by Dutch adult learners of English. These common errors will be discussed and will be compared to the errors made by the Dutch secondary school students.

1.5.1 Common errors in consonant pronunciation

Plosives

/p/, /t/, /k/ The fortis plosives often lack aspiration when they occur in a stressed syllable-initial position, and they often lack glottalization when they occur in a syllable-final position. Aspiration and glottalization of fortis plosives may be difficult for Dutch learners of English since neither feature occurs for the fortis plosives in Dutch (Collins & Mees, 2003; Cucchiarini et al., 2011; Simon, 2009; Van den Doel, 2006). Since Dutch /p/, /t/ and /k/ in word-initial position are not aspirated they may sound similar to English word-initial /b/, /d/ and /g/ to native speakers of English. Therefore, lack of aspiration after word-initial fortis plosives in English may lead to the perception of a lenis plosive, e.g. *tin* may be perceived as *din* (Van den Doel, 2006). In GA English, contrast between /t/ and /d/ in medial position is often lost, although in careful speech a distinction between the pronunciation of /d/ and an alveolar flap [ɾ] for /t/ and /d/ in this position may be made (Cucchiarini et al., 2011; Collins & Mees, 1993; Van den Doel, 2006).

/b/, /d/, /g/ Although the consonant sounds /b/, /d/ and /g/ are present in Dutch in initial and medial position, this does not automatically mean that Dutch learners of English will be able to produce these sounds in word-final position without difficulty (Flege & Schwen Bohn, 2020). Since in Dutch word-final plosives are always devoiced, incorrectly realising lenis plosives as voiceless fortis ones may be the result of Dutch interference (Cucchiarini et al., 2011; Flege & Schwen Bohn, 2020; Van den Doel, 2006). The lenis plosives are thus often confused with the their fortis counterparts in word-final position, resulting in the realisation of /p/, /t/, /k/ for /b/, /d/, /g/ respectively (Collins & Mees, 2003). More proficient learners sometimes realise word-final /d/ as fortis /t/, but do not seem to replace /b/ with /p/ and /g/ with /k/ (Cucchiarini et al., 2011). Dutch learners of English who are less proficient sometimes tend to replace the lenis consonant /g/ with fortis /k/ in all positions (Collins & Mees, 2003). The realisation of word-final lenis plosives as fortis plosives may lead to the confusion of minimal pairs, such as *hit* and *hid*. The possible confusion of minimal pairs causes these errors to be especially salient (Collins & Mees, 2003; Cucchiarini et al., 2011; Van den Doel, 2006).

Fricatives

/f/ The voiceless fricative /f/ is often confused with the voiced fricative /v/ (Collins & Mees, 2003). Although voiced obstruents do not occur in Dutch in final position in isolation, assimilation of /f/ in intervocalic position across syllable or word boundaries may incorrectly result in lenis /v/ (e.g. '*if any*' *[ɪv ˈeni]) (Collins & Mees, 2003; Gussenhoven & Broeders, 1997).

/v/ Voiced obstruents do not occur word-finally in isolation in Dutch (Collins & Mees, 2003; Van den Doel, 2006). Thus, since in Dutch the contrast between /f/ and /v/ in word-final position is lost, Dutch learners of English may incorrectly produce /f/ instead of /v/ in word-final position in English too (Broersma, 2010; Collins & Mees, 2003; Van den Doel, 2006). For some Dutch speakers, especially those from the west of the Netherlands, the contrast between /v/ and /f/ is lost in initial position as well. As a result, words such as *fast* and *vast* become homophones, which may lead to confusion (Collins & Mees, 2003; Van den Doel, 2006).

/s/ /s/ is part of the Dutch phoneme inventory and will therefore generally cause few problems. However, the articulatory setting of /s/ may result in confusion with /ʃ/ (Collins & Mees, 2003; Cucchiarini et al., 2011). Spelling may result in confusion between /s/ and /z/ (Collins & Mees, 2003).

/z/ The fricative /z/ is part of the Dutch phoneme inventory. However, in final position /z/ is often replaced by /s/ (Collins & Mees, 2003; Cucchiarini et al., 2011). This may be the result of Dutch interference, since in Dutch word-final obstruents are generally always voiceless (Broersma, 2010; Collins & Mees, 2003; Flege & Schwen Bohn, 2020). Since the ability to perceive and produce a position-sensitive allophone of an L2 phoneme does not automatically mean that a speaker will be able to perceive and produce allophones of the same phoneme in other positions, the fact that /z/ occurs in Dutch in some positions does not mean that Dutch learners of English will automatically be able to pronounce /z/ in positions where it does not occur in Dutch, such as in word-final position (Flege & Schwen Bohn, 2020).

/θ/ The consonant sound /θ/ is not part of the Dutch phoneme inventory (Gussenhoven & Jacobs, 2011). Dutch learners of English may therefore find it difficult to perceive and produce this sound and, since they may not yet have a phonetic category for /θ/, they may link /θ/ to the phonetic category of their L1 that they perceive to be closest (Flege and Schwen Bohn, 2020). Dutch learners frequently replace /θ/ with /s/ or /t/ (Collins & Mees, 2003; Cucchiarini et al., 2011; Wester, Gilbers, & Lowie, 2007). Van den Doel (2006) observes that Dutch learners previously replaced /θ/ with /s/ most frequently, while they now usually substitute /θ/ with /t/. According to Collins and Mees (2003), the substitution of /θ/ with /f/ is exclusively observed in final position, but this substitution has incidentally been found in other positions as well (Wester et al., 2007). Furthermore, beginning learners may not be aware of the difference between /θ/ and /ð/ since the orthographic representation for both is **th**¸ and therefore might confuse the two sounds (Collins & Mees, 2003).

/ð/ The consonant sound /ð/ is not part of the Dutch phoneme inventory (Gussenhoven & Jacobs, 2011). As a result, Dutch learners of English may have difficulty with the perception and production of this sound. Learners may initially place /ð/ in the same phonetic category as /d/ and may thus have difficulty distinguishing between the two sounds (Flege & Schwen Bohn, 2020). Consequently, the replacement of /ð/ with /d/ is a persistent error frequently made by Dutch learners of English (Collins & Mees, 2003; Cucchiarini et al.,

2011; Van den Doel, 2006). Cucchiarini et al. (2011) observe that Dutch learners of English often replace /ð/ with /d/ in all conditions. According to Collins and Mees (2003) and Wester et al. (2007), /ð/ is often replaced by /d/ in initial and medial position. However, Collins & Mees (2003) observe that in medial position /ð/ may also be replaced by /z/, and in word-final position /ð/ is usually replaced by /t/ or /s/. Even more proficient Dutch learners of English seem to have difficulty pronouncing /ð/; they frequently substitute /ð/ with /d/, and occasionally with /t/ or /θ/ (Cucchiarini et al., 2011).

/ʃ/ Because /ʃ/ does not occur in the Dutch phoneme inventory, the perception and production of /ʃ/ may be difficult for Dutch learners of English (Collins & Mees, 2003; Flege & Schwen Bohn, 2020; Gussenhoven & Jacobs, 2011). However, Dutch learners may replace /ʃ/ with Dutch /ɕ/, which is generally effective. Furthermore, some less proficient learners replace /ʃ/ with /s/, possibly because /s/ is perceptually close to /ʃ/ (Collins & Mees, 2003; Flege & Schwen Bohn, 2020).

/ʒ/ Although /ʒ/ is not part of the Dutch phoneme inventory, the realisation of /ʒ/ does not seem to cause too much difficulty for Dutch learners of English (Collins & Mees, 2003; Gussenhoven & Jacobs, 2011). The replacement of /ʒ/ by Dutch /ʑ/ is largely successful (Collins & Mees, 2003).

Affricates

/tʃ/ Since /tʃ/ is not part of the Dutch phoneme inventory, the perception and production of this sound may pose difficulty for Dutch learners of English (Flege & Schwen Bohn, 2020; Gussenhoven & Jacobs, 2011). Dutch learners tend to replace /tʃ/ with /ʃ/ (Cucchiarini et al., 2011). Learners may also produce Dutch /ɕ/, which would generally be effective for English /ʃ/ but not for /tʃ/. In syllable-final position, /tʃ/ is sometimes replaced by /ts/ (Collins & Mees, 2003). This may be the result of confusion between /ʃ/ and /s/, which is perceptually close (Collins & Mees, 2003; Flege & Schwen Bohn, 2020).

/dʒ/ /dʒ/ is not part of the Dutch phoneme inventory and may therefore cause difficulty for Dutch learners of English (Collins & Mees, 2003; Gussenhoven & Jacobs, 2011). Dutch learners often replace /dʒ/ with /tʃ/, especially in final position (Cucchiarini et al., 2011). The substitution of /dʒ/ with its voiceless counterpart /tʃ/ in final position may be the result of Dutch interference, since in Dutch final obstruents are always voiceless (Broersma, 2010; Flege

& Schwen Bohn, 2020). Dutch learners may also replace /dʒ/ with /ʃ/, especially in initial position, possibly as a result of confusion between dʒ/ and /tʃ/, and subsequently the substitution of /tʃ/ with /ʃ/ (Collins & Mees, 2003; Cucchiarini et al., 2011). Less proficient learners tend to use /ts/ for syllable-final /dʒ/ (Collins & Mees, 2003). This may be the result of confusion between /dʒ/ and /tʃ/ and subsequent substitution of /ʃ/ with /s/, resulting in /ts/ (Collins & Mees, 2003; Flege & Schwen Bohn, 2020).

Nasals

/n/ /n/ may cause Dutch learners to lower a preceding /e/ to /æ/, but the realisation of /n/ in itself usually does not cause any difficulties for Dutch learners of English (Collins & Mees, 2003).

/m/ and /ŋ/ Both generally do not cause any problems for Dutch learners of English (Collins & Mees, 1993, 2003).

Approximants

/l/ Although /l/ does occur in the Dutch phoneme inventory, /l/ may cause difficulty for Dutch learners of English in specific positions (Gussenhoven & Broeders, 1997). Syllable-final /l/ is sometimes pharyngealized. The lack of tongue-tip/alveolar contact may result in a back vowel type articulation, which is an incorrect realisation of /l/ in English. Additionally, to a native speaker of English, following an open back vowel, pharyngealised /l/ may seem to be completely omitted. When /l/ follows /e/, the vowel may be lowered to /æ/. A mistake that Dutch learners frequently make is the production of a dark [ɬ] instead of [l] in initial and medial position and, as almost all learners do, before /j/. When /l/ is followed by /p/, /f/, /m/, or /k/, beginning learners tend to insert /ə/ between the two consonants. This phenomenon, schwa-epenthesis, occurs particularly frequently in words that have a Dutch counterpart (e.g. *helm* *[heləm]) (Collins & Mees, 2003; Van den Doel, 2006).

/r/ Since /r/ does occur in the Dutch phoneme inventory, it does not necessarily cause problems for Dutch learners of English. However, some Dutch realisations of /r/ are incorrect in English, such as a uvular-r, and in particular the [ʁ], which is commonly used in the south of the Netherlands. These realisations of /r/ are unpleasant to native speakers of English (Collins & Mees, 2003; Van den Doel, 2006). Non-rhotic variants of English, such as RP, only retain /r/ before vowels, while in rhotic variants of English, such as GA, /r/ is

pronounced before consonants and pauses as well. In non-rhotic variants of English, linking-r and intrusive-r are quite common features. The use of an intrusive-r in GA would be considered an error (Van den Doel, 2006).

/j/ Generally does not cause difficulty for Dutch learners of English (Collins & Mees, 1993, 2003).

/w/ English /w/ is a velar approximant, while Dutch /ʋ/ is a labial approximant. In southern Dutch accents /ʋ/ may be a bilabial approximant (Gussenhoven & Broeders, 1997; Gussenhoven & Jacobs, 2011). Consequently, Dutch learners of English may have difficulty distinguishing between /w/ and /ʋ/ and may map English /w/ onto Dutch /ʋ/, resulting in one phonetic category for both sounds (Flege & Schwen Bohn, 2020). As a result, Dutch learners may realise /w/ as /ʋ/. Since native speakers of English may perceive /ʋ/ as /v/, this may lead to confusion between minimal pairs such as *while* and *vile*. When /w/ occurs in combination with /t/ or /k/ to form clusters /tw/ and /kw/, /w/ – or /ʋ/ – may sound like /f/ to a native English speaker (e.g. *twenty* *[tfenti]) (Collins & Mees, 1993, 2003; Van den Doel, 2006).

1.5.2 Common errors in vowel pronunciation

Monophthongs

/ɪ/ English /ɪ/ is slightly more fronted than its Dutch allophone (Gussenhoven & Broeders, 1997). As a result, Dutch learners may realise /ɪ/ too close, especially in word-final position. Some Dutch learners, particularly learners from the Randstad, may produce /ɪ/ too close in all contexts. Although this may sound dialectal to native speakers, it does not lead to confusion with /iː/. Some learners produce a vowel that is too open, which may lead to confusion with English /e/ (Collins & Mees, 2003).

/iː/ Dutch /iː/ is slightly more close and more fronted than its English allophone (Gussenhoven & Broeders, 1997). Dutch learners may therefore produce /iː/ too close and too tense. Additionally, Dutch learners may realise /iː/ too short (Collins & Mees, 2003). Furthermore, GA English usually lacks the contrast between /iː/ and /ɪ/ before /r/ whereas in RP English this contrast is retained (Collins & Mees, 1993).

/e/ and /æ/ The Dutch vowel sound /ɛ/ is perceptually close to both the English vowels /e/ and /æ/ (Collins & Mees, 1993, 2003; Flege & Schwen Bohn, 2020). All three vowels are front vowels, and compared to Dutch /ɛ/, English /e/ is more close while /æ/ is slightly more open (Gussenhoven & Jacbos, 2011). Consequently, Dutch learners of English may perceptually link both /e/ and /æ/ to Dutch /ɛ/, which results in one single category for these three different vowel sounds. Dutch learners may therefore find it difficult to perceive the difference between /e/, /æ/ and /ɛ/, and as a result may confuse these vowel sounds in speech (Collins & Mees, 1993, 2003; Flege & Schwen Bohn, 2020).

Thus, Dutch learners sometimes confuse /e/ with /æ/, and specifically before /n/ and /l/ they tend to produce an /e/ that is too open, similar to Dutch /ɛ/. Dutch learners from the south of the Netherlands tend to realise /e/ as /ɛ/ in all contexts. Learners from the Randstad may produce a vowel that is centralised and closer, which may sound like English /ɪ/ (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011).

Dutch learners appear to have particular difficulty with the production of /æ/, they almost always replace /æ/ by /e/ or by /ɛ/, which are both too close. These errors are significant because they lead to a loss of contrast between English /e/ and /æ/. Consequently, words like *bat* and *bet* become homophones. The realisation of /æ/ as Dutch /ɛ/ or English /e/ may therefore lead to confusion and miscommunication (Collins & Mees, 2003; Schmid, Gilbers, & Nota, 2014; Van den Doel, 2006). According to Cucchiarini et al. (2011), Dutch learners tend to use /ɛ/ before fortis consonants and /ɛː/ before lenis consonants. More proficient learners sometimes use /ə/ for /æ/ as well (Cucchiarini et al., 2011). Another error Dutch learners sometimes make is the substitution of /æ/ with /ɑː/, for example in the word *sand* *[sɑːnd]. The confusion between /æ/ and /ɑː/ may be caused by the incorrect assumption that /ɑː/ is the correct RP pronunciation. This assumption may be the result of a false comparison with words like *bath*, pronounced [bɑːθ] in RP (Van den Doel, 2006).

/ɑː/ The Dutch vowel sound closest to English /ɑː/ is /aː/, which is more fronted (Collins & Mees, 2003; Gussenhoven & Broeders, 1997). As a result, Dutch learners may perceptually link /ɑː/ to Dutch /aː/, and thus have difficulty perceiving the difference between these two sounds (Flege & Schwen Bohn, 2020). Consequently, Dutch learners may substitute /ɑː/ with a vowel sound that is too fronted, i.e. /aː/ or a vowel sound similar to /aː/. Furthermore, confusion between /ɑː/ and /æ/ may also cause Dutch learners to substitute /ɑː/ with /æ/ (Collins & Mees, 2003). However, more proficient learners tend to incorrectly realise /ɑː/ more often as /ɔː/, which is too close. A possible explanation for this might be that both /ɑː/ and /ɔː/ are back

vowels whereas Dutch /aː/ is a front vowel, which may cause these more proficient learners to perceive /ɑː/ as being more similar to /ɔː/ than to /aː/ (Cucchiarini et al., 2011; Flege & Schwen Bohn, 2020; Gussenhoven & Broeders, 1997). Furthermore, Dutch learners may substitute /ɑː/ with Dutch /ɔ/, which is too close, too back, too rounded, and too short, or with Dutch /ɑ/, which is too short (Collins & Mees, 1993).

/ɒ/ Since English /ɒ/ is not part of the Dutch vowel inventory, Dutch learners may not be able to distinguish between /ɒ/ and Dutch /ɔ/, which may be perceptually close but is too close and too tense, pharyngealized, and the lips are too rounded (Collins & Mees, 2003; Flege & Schwen Bohn, 2020; Gussenhoven & Broeders, 1997). As a result, learners may place /ɒ/ in the L1 phonetic category they have for /ɔ/ (Flege & Schwen Bohn, 2020). Consequently, Dutch learners of English frequently substitute /ɒ/ with /ɔ/. In addition, English spelling can lead to confusion between /ɒ/, /ʌ/ and /ɔː/ and may therefore result in incorrect realisations of /ɒ/ as /ʌ/ or /ɔː/ (Collins & Mees, 2003; Van den Doel, 2006). Cucchiarini et al. (2011) observe that more advanced learners of English sometimes realise /ɒ/ as /ʌ/, but do not tend to substitute /ɒ/ with /ɔ/ or /ɔː/.

/ɔː/ /ɔː/ is not part of the Dutch phoneme inventory, and Dutch learners may therefore perceptually link /ɔː/ to the Dutch vowel /o/, which is too close, or to Dutch /ɔ/, which is too short (Collins & Mees, 1993, 2003; Flege & Bohn, 2020; Gussenhoven & Broeders, 1997). As a result, Dutch learners may incorrectly produce /ɔː/ as /o/ or /ɔ/ (Collins & Mees, 1993, 2003). Furthermore, more proficient learners sometimes mispronounce /ɔː/ as /ɜ/, /ɒ/, or as */ɔː/, in which case the realisation of /ɔː/ is incorrect even though the phoneme is not actually substituted by a different phoneme (Cucchiarini et al., 2011). Some speakers of GA English do not distinguish between the vowel sounds /ɔː/ and /ɑː/, but use /ɑː/ in both contexts (Collins & Mees, 1993). English spelling may cause confusion about the use of /ɒ/ or /ɔː/ (Collins & Mees, 2003).

/ʊ/ and /uː/ The Dutch vowel sound close to both /ʊ/ and /uː/ is /oe/ (as in Dutch *moed*, English *courage*), which is slightly more close and more back. Furthermore, /oe/ is shorter than /uː/ (Collins & Mees, 2003; Gussenhoven & Broeders, 1997). Beginning Dutch learners of English tend to map both /ʊ/ and /uː/ onto Dutch /oe/, and the perceptual link makes it difficult for them to distinguish between these sounds (Collins & Mees, 2003; Cucchiarini et al., 2011; Flege & Schwen Bohn, 2020; Van den Doel, 2006). As a result, the contrast between /ʊ/ and

/uː/ is often lost in the pronunciation of Dutch learners of English. This error may be particularly noticeable because it may lead to confusion between minimal pairs, such as *pull* and *pool* (Collins & Mees, 2003; Van den Doel, 2006). More proficient learners virtually never seem to use /oe/ for /ʊ/ or /uː/, but occasionally seem to realise /uː/ as /əʊ/ (Cucchiarini et al., 2011).

/ʌ/ The English vowel sound /ʌ/ is a central, near-open vowel which is slightly more back in GA English than in RP English. The vowel /ʌ/ does not occur in the Dutch vowel inventory (Collins & Mees, 2003; Gussenhoven & Broeders, 1997). Consequently, Dutch learners may have difficulty with the perception and production of this sound (Flege & Schwen Bohn, 2020). Dutch learners of English tend to substitute /ʌ/ with various Dutch and English vowel sounds. Beginning learners often substitute /ʌ/ with the Dutch vowels /ʏ/, which is too close and too rounded, and /ɔ/, which is too back and too close (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011; Gussenhoven & Broeders, 1997). Furthermore, learners may also substitute /ʌ/ with English /ə/, which is too close, or with /ɒ/, which is too back (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011; Gussenhoven & Broeders, 1997). Some Dutch learners substitute /ʌ/ with Dutch /ɑ/, which is too open and too back (Collins & Mees, 1993, Gussenhoven & Broeders, 1997; Van den Doel, 2006). More proficient learners seem to mispronounce /ʌ/ relatively frequently. However, they tend to use English /ə/ or /ɒ/ for /ʌ/, but not Dutch /ʏ/ or /ɔ/ (Cucchiarini et al., 2011). A possible explanation for this is that, while proficient learners are able to discern between English /ʌ/ and Dutch vowel sounds and therefore do not place English /ʌ/ in categories for Dutch vowel sounds often used to replace /ʌ/ by less proficient learners, they still have difficulty with the realisation of /ʌ/ and, as a result, produce other English vowel sounds (Flege & Schwen Bohn, 2020). Furthermore, spelling may lead to confusion between /ʌ/ and /ɒ/ or Dutch /ɔ/ when the grapheme **o** is used to represent the sound, and between /ʌ/ and /ʏ/ or /ə/ when the grapheme **u** is used to represent the sound (Collins & Mees, 2003; Cucchiarini et al., 2011).

/ɜː/ The Dutch phoneme inventory does not include the vowel sound /ɜː/ (Gussenhoven & Broeders, 1997). Dutch learners often confuse /ɜː/ with Dutch /ʏː/ (as in Dutch *deur*, English *door*), which is slightly more fronted and more close, and too rounded (Collins & Mees, 1993, 2003; Gussenhoven & Broeders, 1997). According to Flege and Schwen Bohn (2020), this confusion may be the result of the perceptual link between /ɜː/ and /ʏː/, which is the closest sound to /ɜː/ in Dutch.

/ə/ Although the vowel sound /ə/ is included in the Dutch phoneme inventory, Dutch learners tend to substitute /ə/ with the vowel sound commonly used for the grapheme by which /ə/ is orthographically represented in English (Collins & Mees, 2003; Gussenhoven & Broeders, 1997). Cucchiarini et al. (2011) observe that even more proficient learners sometimes replace /ə/ with /æ/, /ɒ/, /ɑː/ and /ɔː/, which may support Collins and Mees' (2003) observation that spelling may be a reason for incorrect realisations of /ə/.

Diphthongs

/eɪ/ The English vowel sound /eɪ/ is not part of the Dutch phoneme inventory. However, Dutch learners sometimes substitute /eɪ/ with Dutch /eː/, which generally does not cause any problems (Collins & Mees, 2003).

/aɪ/ The Dutch phoneme inventory does not include the English vowel sound /aɪ/. Dutch learners may substitute /aɪ/ with Dutch /aːi/, since they may perceptually link /aɪ/ to /aːi/ (Collins & Mees, 1993; Flege & Schwen Bohn, 2020; Gussenhoven & Broeders, 1997). However, the Dutch diphthong /aːi/ is more fronted and ends in a more close position (Gussenhoven & Broeders, 1997). Furthermore, since Dutch learners often have difficulty with English vowel duration, they tend to make /aɪ/ too long before fortis consonants. As a result, fortis consonants may sounds like their lenis counterparts to native speakers of English (Collins & Mees, 2003). The lengthening of /aɪ/ before fortis consonants may therefore lead to confusion between minimal pairs such as *rise* and *rice*, which as a result both sound like [raɪz] (Collins & Mees, 2003; Van den Doel, 2006).

/ɔɪ/ /ɔɪ/ is not included in the Dutch phoneme inventory (Gussenhoven & Broeders, 1997). Dutch learners of English often produce this diphthong with a starting point that is too close and an ending point that is too fronted and too close, resulting in Dutch /oːi/ (as in Dutch *mooi*, English *beautiful*) (Collins & Mees, 2003; Gussenhoven & Broeders, 1997). A possible explanation for the incorrect realisation of /ɔɪ/ as /oːi/ is the perceptual link between /ɔɪ/ and Dutch /oːi/, which results in the L2 sound /ɔɪ/ being placed in the same phonetic category as the L1 sound /oːi/. Consequently, learners may have difficulty perceiving the difference between the two sounds, and thus with the production of /ɔɪ/ (Flege & Schwen Bohn, 2020).

/ɪə/ and /iːə/ Neither /ɪə/ nor /iːə/ is a diphthong that is part of the Dutch phoneme inventory (Collins & Mees, 2003; Gussenhoven & Broeders, 1997). Dutch learners often produce /ɪə/ with

a starting point that is too close. The main problem with /ɪə/ and /iːə/ occurs as a result of r-insertion; Dutch learners may pronounce /ɪə/ and /iːə/ as /iː/ before /r/ (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011).

/əʊ/ The diphthong /əʊ/ is not part of the Dutch phoneme inventory (Gussenhoven & Broeders, 1997). Dutch learners of English sometimes replace /əʊ/ by Dutch /o/, but this only causes problems for learners from some dialect areas where the glide of /o/ is too narrow. More proficient learners may produce a diphthong that is overly fronted, like the Dutch vowel sound /eʊ/ (as in Dutch *meeuw*, English *seagull*), or mispronounce /əʊ/ as /ɔː/ (Collins & Mees, 2003; Cucchiarini et al., 2011).

/ʊə/ The English vowel /ʊə/ is not part of the Dutch vowel inventory (Gussenhoven & Broeders, 1997). Dutch learners tend to start this diphthong too close or pronounce it as /oer/, possibly as a result of the common incorrect realisation of /ʊ/ as /oe/. Learners may also pronounce /ʊə/ with a glide that is too narrow (Collins & Mees, 2003).

1.5.3 Assimilation and interference

According to Gussenhoven and Broeders (1997), a learner's "'native' assimilations are extremely difficult to unlearn" (p. 160). Thus, Dutch learners commonly tend to apply Dutch assimilation patterns to English (Collins & Mees, 2003; Gussenhoven & Broeders, 1997; Neri et al., 2006; Van den Doel, 2006).

A common Dutch assimilation process is the assimilation of a consonant sound to an adjacent consonant. Both regressive and progressive assimilation occur in Dutch. Regressive assimilation, or regressive voicing, means that the sound that is assimilated is situated to the left of the sound which it is assimilated to (e.g. Dutch *opdat* [ɔb'dɑt]). In progressive assimilation, or progressive devoicing, the opposite occurs; the assimilated sound is situated to the right of the sound which it is assimilated to (e.g. Dutch *opzet* *['ɔpsɛt]). Consequently, Dutch learners of English may produce fortis plosives where lenis plosives are expected as a result of progressive assimilation to a preceding fortis consonant. Regressive assimilation may result in the realisation of a fortis consonant as a lenis one due to assimilation to a following lenis consonant (Collins & Mees, 2003; Gussenhoven & Broeders, 1997; Gussenhoven & Jacobs, 2011).

Another common assimilation pattern in Dutch is intervocalic voicing. Intervocalic voicing occurs when a fortis fricative is positioned between two voiced sounds and is consequently realised as a lenis fricative (e.g. Dutch *bosuil* ['bɔzœyl]) (Collins & Mees, 1993, 2003; Gussenhoven & Broeders, 1997). In some Dutch accents, intervocalic /t/ may also be subject to intervocalic voicing. While intervocalic /t/ may be voiced in some dialects of English as well, intervocalic voicing of fricatives is not an assimilation pattern that occurs in English (e.g. *crisis* *[ˈkraɪzɪs]) (Gussenhoven & Broeders, 1997).

Consequently, interference of these Dutch assimilation patterns may lead to the loss of the fortis/lenis contrast in medial position and across word boundaries in English (e.g. *bus driver* *[ˈbʌzdraɪvə]) (Collins & Mees, 2003; Gussenhoven & Broeders, 1997). Since the contrast between fortis and lenis consonants is an important aspect of English pronunciation, this interference may lead to problems for Dutch learners of English, especially when this causes minimal pairs to becomes homophones (Collins & Mees, 2003; Van den Doel, 2006).

Furthermore, when two identical consonants occur after another, Dutch learners of English tend to reduce this to a single consonant as a result of interference. The elision of one of two identical consecutive consonants is called degemination and may occur in Dutch in sequences of identical consonants in any position (e.g. Dutch *dakkapel* ['dɑkapɛl]). However, in English degemination is considered to be a significant error when applied to sequences of plosives (e.g. '*night train*' *[ˈnaɪtreɪn]) (Collins & Mees, 2003; Van den Doel, 2006).

Since confusion of the fortis/lenis contrast is a common issue for Dutch learners of English, degemination may also occur in sequences in which the consonant sounds are not identical, but in which a word-final lenis plosive is followed by its fortis counterpart. When the word-final lenis plosive is then mistakenly realised as a fortis one, an error frequently made by Dutch learners of English, this results in a sequence of two identical plosives which in turn may lead to degemination (e.g. '*crab pie*' *[ˈkræpaɪ]) (Collins & Mees, 2003; Van den Doel, 2006).

However, the opposite may also happen. When a word-final fortis plosive is realised as a lenis one, for example as a result of regressive or intervocalic voicing, this may lead to a sequence of two identical lenis plosives. In turn, this may lead to degemination as well (e.g. '*night dress*' *[ˈnaɪdres]) (Collins & Mees, 2003; Van den Doel, 2006).

Another common assimilation process in Dutch is the deletion of syllable-final and word-final /t/. This deletion frequently occurs in coda consonant clusters and generally does not lead to problems in Dutch (e.g. Dutch '*hoofdpijn*' [ˈhofpɛin]). However, it may lead to ungrammatical utterances, for example when /t/ signals agreement with the person performing the action (e.g. Dutch '*hij gelooft gewoon*' *[hɛi χəˈlof χəˈʊon]). The elision of syllable-final

and word-final /t/ in consonants clusters in Dutch happens frequently in fast speech and may be the result of assimilation to adjacent consonants across syllable and word boundaries (Gussenhoven & Broeders, 1997; Neri et al., 2006). Dutch learners appear to have difficulty with the production of word-final /t/ in coda consonant clusters rather than with the realisation of /t/ itself (Neri et al., 2006). Dutch learners of English may apply this assimilation process in English as a result of interference (Gussenhoven & Broeders, 1997). However, the elision of syllable-final /t/ in consonant clusters occurs in English as well, especially in fast or connected speech (e.g. *postman* [ˈpəʊsmən]). Although the elision of /t/ in syllable-final and word-final consonant clusters in English does therefore not necessarily lead to problems for Dutch learners, it may lead to the loss of contrast between verb tenses of regular verbs in English (e.g. '*you promised me*' *[ju ˈprɒmɪs miː]). Furthermore, in English /t/ is retained in coda consonant clusters when /t/ is followed by /h/ or /j/, or when it is preceded by /n/ or /l/. Dutch learners of English may not be aware of this, which may lead to pronunciation errors (e.g. *guesthouse* *[ˈgeshaʊs]) (Collins & Mees, 2003; Gussenhoven & Broeders, 1997).

Assimilation and deletion are processes triggered by anticipation of sounds preceding or following the sound which is assimilated or deleted, such as adjacent fortis or lenis consonants or adjacent vowel sounds. Since it is very difficult for L2 learners not to apply the assimilation patters of their native language to their L2, interference of Dutch assimilation patterns in English may result in pronunciation errors and even in miscommunication (Collins & Mees, 2003; Gussenhoven & Broeders, 1997; Neri et al., 2006; Van den Doel, 2006).

1.6 Advanced learners

Comparing pronunciation errors commonly made by adult Dutch learners to errors made by advanced Dutch learners of English, as well as comparing pronunciation errors made by the secondary school students in the data to errors made by advanced learners of English, may provide valuable insights. Since proficient learners generally make significantly fewer errors, information about which pronunciation errors advanced learners commonly make may show which English sounds seem to be especially difficult for Dutch learners, and which pronunciation errors are particularly persistent and thus appear to be extremely difficult to improve. Cucchiarini et al. (2011) have studied errors made in English pronunciation by proficient learners; students of the bachelor's programme English Language and Culture at the Radboud University. Generally, the findings of Cucchiarini et al. (2011) are in accordance with the relevant literature. The learners observed by Cucchiarini et al. (2011) show a low frequency

of pronunciation errors, which may explain why some errors found in literature have not been observed for these proficient learners.

Where vowels are concerned, mistakes in the pronunciation of /ɪə/ and /ʊ/ have not been observed for the proficient learners. However, these proficient learners also seem to make mistakes that have not been mentioned in the relevant literature. The vowel sound /ɒ/ is sometimes realised as /ʌ/ by these proficient learners, while Collins and Mees (2003) find that Dutch learners usually substitute /ɒ/ with /ɔ/, or sometimes with /ɔː/. Cucchiarini et al. (2011) observe that proficient learners pronounce /ɔː/ incorrectly as /ɜ/, /ɒ/ */ɔː/, or as /ɑː/. However, the use of /ɑː/ for /ɔː/ would be considered correct in GA English (Collins & Mees, 1993). In contrast, Collins and Mees (2003) find that less proficient Dutch learners of English tend to substitute /ɔː/ with the Dutch vowel /ɔ/ or a vowel that is too close, similar to Dutch /o/. Furthermore, the students of English Language and Culture at the Radboud University seem to realise /ə/ as a full vowel relatively frequently (Cucchiarini et al., 2011).

With regard to incorrect realisations of consonants, the more proficient learners studied by Cucchiarini et al. (2011) largely tend to make the same mistakes as less proficient learners. The university students sometimes incorrectly realise English lenis obstruents as fortis ones. The mispronunciation of /ð/ as /d/, an error frequently made by Dutch learners of English, is observed in the more advanced learners as well. However, mistakes in the realisation of affricates have not been observed for the more proficient learners, while these mistakes are frequently made by less proficient learners (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011).

Consequently, some mistakes commonly made by Dutch learners of English, such as incorrect realisations of /ʌ/ and /ɔː/, the use of /d/ for /ð/, and the substitution of lenis consonants with fortis ones, are made by these university students as well, despite their very high proficiency level (Cucchiarini et al., 2011). This may indicate that the realisation of these phonemes, such as word-final lenis consonants, is especially difficult for Dutch learners of English.

1.7 Significance of errors

Dutch learners of English, especially more advanced learners, often consider improving their pronunciation to sound as native-like as possible to be an important goal. Correct pronunciation is not only a significant factor in successful communication, it is also important for social acceptance (Cucchiarini et al., 2011; Morley, 1991; Van den Doel, 2006). For the vast majority of adult L2 learners of English, eliminating all traces of their mother tongue would be an unachievable goal. However, a carefully developed hierarchy of error may help both learners and teachers of English to prioritise pronunciation errors on the basis of the possible negative consequences they may have (Van den Doel, 2006). Knowledge about which aspects and sounds of English cause particular difficulty for adult and adolescent Dutch learners of English, and which mistakes in pronunciation they frequently make, may be used in education to improve learners' accents and intelligibility, as well as their self-confidence concerning their pronunciation and communicational abilities, and may lead native speakers as well as L2 speakers of English to view them in a more positive manner (Cucchiarini et al., 2011; Morley, 1991; Munro & Derwing, 1995; Van den Doel, 2006).

With this goal in mind, error hierarchies for English pronunciation have been established by, among others, Collins and Mees (1993, 2003) and Van den Doel (2006). Error hierarchies for both RP English and GA English are discussed in Van den Doel (2006). The relative impact of various errors in GA English are discussed in Collins and Mees (1993), while Collins and Mees (2003) discuss the impact of pronunciation errors in RP English. The error hierarchy discussed in Collins & Mees (1993) is based on two pronunciation courses used extensively in the Netherlands and Denmark for several years. The error hierarchy composed by Van den Doel (2006) is based on an internet survey in which a diverse group of native speakers of English was asked to judge the impact of a wide range of pronunciation errors made by Dutch learners of English. No knowledge of Dutch or linguistics was necessary for this evaluation. Collins and Mees (2003) is aimed at Dutch learners of English who study English and/or take courses in phonetics at university and teacher-training institutes. Unfortunately, Collins and Mees (2003) does not mention on what kind of data or information its error hierarchy is based. An earlier version of the book, Collins and Mees (1981), is referred to as a basis for Collins and Mees (2003). However, in Collins and Mees (1981) it is not mentioned on exactly what kind of data or information the error hierarchy is based either. According to Collins and Mees (2003), Collins and Mees (2003) "provides a complete introduction to the phonetics of English and Dutch based on an essentially practical approach to the subject" (p. VII).

The terms ‘most significant’, ‘significant’ and ‘least significant’ are used in all three error hierarchies (Collins & Mees, 1993, 2003; Van den Doel, 2006). The ‘most significant’ errors are the ones that cause a speaker to be unintelligible. These errors often involve the loss of phonemic contrast. ‘Significant’ errors are errors that involve a distortion of sound that is noticeable enough to cause distraction, frustration, or amusement for a native speaker. ‘Least significant’ errors are errors which are easily heard, but do not cause a native speaker to be distracted, annoyed or amused (Collins & Mees, 2003).

1.7.1 Significance of errors in RP English

Most significant errors

Collins and Mees (2003) and Van den Doel (2006) agree that errors in this category include:

The loss of the fortis-lenis contrast, in particular the confusion between /f/ and /v/ in initial and medial position and the confusion between /t/ and /d/.
The confusion between /v/ and /w/.
The confusion between /æ/ and /ɛ/.
The loss of contrast, or confusion, between /ʊ/ and /uː/.
The substitution of /θ/ with /t/.
The epenthesis of /ə/ between /l/ and a following non-alveolar consonant.
The use of uvular /r/.
The incorrect realisation of /ð/ in general (Collins & Mees, 2003), or the substitution of /ð/ with /d/ (Van den Doel, 2006).

According to Collins and Mees (2003), this category also includes:

Assimilation errors
The incorrect realisation of /æ/ and /ʊ/.
The replacement of word-final /dʒ/ and /tʃ/ by /ts/.
The confusion of initial /g/ with /k/.
The replacement of /θ/ with /s/, or /f/.
The confusion of the contrast between /æ/, /e/, and /eə/.
The confusion between /ʃ/ and /s/.
The production of /aɪ/ that is too long before fortis.

Van den Doel (2006) finds that this category includes the confusion between /ʌ/ and /ɒ/, and unaspirated /t/.

Significant errors

'Significant' errors Dutch learners of English tend to make according to Collins and Mees (2003) are the lack of aspiration in initial fortis stops, the use of a pharyngealised /l/, and the production of reduced and too rounded /ɜː/, /ʌ/, and /ɒ/, resulting in /ʏː/, /ʏ/, and /ɔ/ respectively. Van den Doel (2006) on the other hand reports that some substitutions of /θ/ with /t/ and /ð/ belong to this category, as well as overlong /aɪ/.

Least significant errors

The 'least significant' errors according to Collins and Mees (2003) are the production of an /ɪ/ that is too close and an /ɑː/ that is too fronted. Van den Doel (2006) has attributed pharyngealised /l/ to this category.

1.7.2 Significance of errors in GA English

Most significant errors

Collins and Mees (1993) and Van den Doel (2006) developed error hierarchies for GA English. The 'most significant' errors they agree on are the following:

The loss of contrast between fortis and lenis consonants, such as /f/ and /v/, /s/ and /z/, /b/ and /p/ and /t/ and /d/. According to Collins and Mees (1993) this is particularly significant in final position.
The substitution of /θ/ with /t/.
The substitution of /ð/ with /d/.
The confusion between /f/ and /v/.
The confusion between /æ/ and /ɛ/.
The confusion between /v/ and /w/.
The use of uvular /r/.
The epenthesis of /ə/ between /l/ and a following non-alveolar consonant.

Additionally, Collins and Mees (1993) report the following errors in this category as well:

Lack of aspiration in initial voiceless stops.
Voicing of final /t/.
The replacement of word-final /dʒ/ and /tʃ/ by /ts/.
The substitution of /θ/ with /s/.
The substitution of /ð/ with /z/ in medial position and with /z/, /s/, or /t/ in final position.
Confusion between /ʌ/ and /ɑː/.
The confusion between /ʊ/ and /uː/, and the realisation of /oe/.
The substitution of /ə/ with the vowel that orthographically represents /ə/.
The replacement of /ɑː/ by Dutch /ɔ/.
The substitution of /aɪ/ with /aːɪ/.

Significant errors

Both Collins and Mees (1993) and Van den Doel (2006) attribute a pharyngealised, over-dark /l/ to this category. However, in the 'significant' errors category this seems to be the only error they agree on. Collins and Mees (1993) conclude that this category includes:

The confusion of /s/ with /z/ and /ʃ/.
The realisation of /ʃ/ as /s/ in final position.
The confusion between /ʒ/ and /ʃ/ in final position.
The substitution of /ʌ/ with Dutch /ʏ/ or /ɑ/.
The substitution of /ɜː/ with Dutch /ʏː/.

Van den Doel (2006) reports that this category includes:

Unaspirated /t/.
The confusion between /ʌ/ and /ɒ/ and between /ʊ/ and /uː/.
Overlong /aɪ/.

1.7.3 Conclusion

Collins and Mees (1993, 2003) and Van den Doel (2006) agree on the classification of many common pronunciation errors made by Dutch learners of English. Both in RP English and in GA English the loss of contrast between fortis and lenis consonants is seen as one of the most significant errors made by Dutch learners, especially in final position (Collins & Mees, 1993, 2003; Van den Doel, 2006). Collins and Mees (1993, 2003) specifically mention assimilation errors in relation to the loss of the fortis/lenis contrast. The voicing of final /t/ has not been specifically mentioned in the relevant literature as a common error in RP, but has been classified as a 'most significant' error in GA English by Collins and Mees (1993). Substitutions

of /θ/ with /t/, /s/ or /f/ and substitutions of /ð/ with /d/, /z/, /s/ or /t/ are considered 'most significant' errors as well. The confusion between /æ/ and /e/ and between /v/ and /w/ may lead to a loss of contrast between minimal pairs and these are therefore considered 'most significant' errors. Schwa-epenthesis between /l/ and a following non-alveolar consonant and the use of uvular /r/ are also attributed to the 'most significant' category (Collins & Mees, 1993, 2003; Van den Doel, 2006). The substitution of word-final /dʒ/ and /tʃ/ by /ts/ is considered a very serious error in both RP and GA by Collins and Mees (1993, 2003).

Some discrepancies in the classification of errors can be found as well. Collins and Mees (1993, 2003) report that confusion between /ʊ/ and /uː/ and the use of Dutch /oe/ for both these vowels is a 'most significant' error in both RP and GA, while Van den Doel (2006) finds that this is a 'most significant' error in RP but a 'significant' error in GA. Van den Doel (2006) regards the lack of aspiration in initial /t/ a 'most significant' error in RP and a 'significant error' in GA, whereas Collins and Mees (1993, 2003) argue that lack of aspiration is a 'significant' error in RP while they consider this to be a 'most significant' error in GA. The confusion between /ʃ/ and /s/ is considered a 'most significant' error in RP and a 'significant' error in GA (Collins & Mees, 1993, 2003).

The pronunciation of /ʌ/ frequently seems to cause difficulty for Dutch learners, even for very advanced learners (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011; Van den Doel, 2006). Various errors for this vowel have been reported in the literature. Van den Doel (2006) classifies the confusion between /ʌ/ and /ɒ/ as a 'most significant' error in RP English, but as a 'significant' error in GA English. According to Collins and Mees (1993, 2003), the confusion between /ʌ/ and Dutch /ʏ/ is viewed as a 'significant' error in both RP and GA. Furthermore, in GA the confusion between /ʌ/ and /ɑː/ is classified as a 'most significant' error, while the confusion between /ʌ/ and /ɑ/ is considered a 'significant' error (Collins & Mees, 1993).

The substitution of /ɜː/ with Dutch /ʏː/ and the use of a pharyngealised /l/ are considered 'significant' errors in both RP and GA by Collins and Mees (1993, 2003). The use of a pharyngealised /l/ according to Van den Doel (2006) is a 'significant' error in GA, but a 'least significant' error in RP. Furthermore, the substitution of /ɑː/ with Dutch /ɔ/ is a 'most significant' error in GA, and the substitution of /ɒ/ with Dutch /ɔ/ is a 'significant' error in RP (Collins & Mees, 1993, 2003).

Collins and Mees (1993) classify the substitution of /ə/ by the vowel with which it is orthographically represented as a 'most significant' error in GA. The realisation of /s/ as /z/ and

the confusion between final /ʒ/ and /ʃ/ are considered ‘significant’ errors in GA (Collins & Mees, 1993).

Since both RP English and GA English are accepted pronunciation models for the secondary school students, errors which are considered ‘most significant’ in one of the models and ‘significant’ in the other will be viewed as ‘most significant’ errors in this paper. The loss of the fortis/lenis contrast is considered a ‘most significant’ error in both RP and GA. This includes assimilation errors and the voicing of final /t/. Furthermore, incorrect realisations of /θ/ and /ð/, confusion between /æ/ and /e/ and between /v/ and /w/, the substitution of word-final /dʒ/ and /tʃ/ by /ts/, schwa-epenthesis and the use uvular /r/ are generally considered ‘most significant’ errors as well. Confusion between /ʊ/ and /uː/ and the use of Dutch /oe/, lack of appropriate aspiration, confusion between /ʃ/ and /s/, the replacement of /ɑː/ with Dutch /ə/, the realisation of /ə/ as the sound with which it is represented in spelling will also be considered ‘most significant’ errors. Additionally, the confusion between /ʌ/ and /ɒ/, and between /ʌ/ and /ɑː/, will be classified as ‘most significant’ errors. ‘Significant’ errors include the substitution of /ɜː/ and /ɒ/ with Dutch /ʏː/ and /ə/ respectively, the use of a pharyngealised /l/, and the confusion between final /ʒ/ and /ʃ/. The confusion between /ʌ/ and Dutch /ʏ/, and between /ʌ/ and /ɑ/, are ‘significant’ errors as well (Collins and Mees, 1993, 2003; Van den Doel, 2006).

1.8 Computer Assisted Pronunciation Training

In second language learning classrooms the opportunity to teach pronunciation is often limited. There is simply not enough time for students to sufficiently practice their speaking skills and pronunciation, and not enough time for teachers to provide detailed and individualised feedback. Computer Assisted Pronunciation Training (CAPT) systems could be a valuable asset in L2 pronunciation learning (Cucchiarini & Strik, 2018; Cucchiarini et al., 2009; Cucchiarini et al., 2011).

In the last few decades, interest in the use of Computer Assisted Language Learning (CALL) systems has increased considerately. The use of Automatic Speech Recognition (ASR) based CAPT systems would enable L2 learners to practice their pronunciation in their own time and at their own pace. Furthermore, practicing pronunciation in a classroom full of students could be a stressful experience for some learners (Cucchiarini & Strik, 2018; Cucchiarini et al., 2011). The private setting provided by CAPT systems may therefore increase students’ confidence and lower their self-consciousness whilst practising their pronunciation. Additionally, CALL systems can also provide their users with an unlimited amount of input

and exercises in the target language (Cucchiarini & Strik, 2018; Cucchiarini et al., 2009; Cucchiarini et al., 2011; Strik, Truong, De Wet, & Cucchiarini, 2009).

ASR-based CAPT systems specifically may be developed to instantly provide learners with individualised and detailed feedback about their pronunciation. This individualised feedback allows learners to focus on improving pronunciation of sounds that are problematic for them personally (Cucchiarini & Strik, 2018; Cucchiarini et al., 2009; Cucchiarini et al., 2011; Strik et al, 2009).

Although various ASR-based CAPT systems have already been developed, according to Cucchiarini and Strik (2018) many of these do not contain features that would be valuable for learners, such as "immediate, detailed feedback on individual segments in the context of meaningful communicative tasks involving connected speech" (p. 368). The development of CAPT systems requires both a qualitative analysis of L2 pronunciation data as well as a quantitative analysis of commonly made pronunciation errors, the frequency with which they tend to occur, and the context in which the errors are made. This information is necessary for the development of error detection algorithms, the training of a speech recogniser, and the creation of effective pronunciation exercises (Cucchiarini & Strik, 2018; Cucchiarini et al., 2011).

1.9 Research questions and hypotheses

Dutch learners of English may have difficulty with the perception and production of English vowel and consonant sounds (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011; Flege & Schwen Bohn, 2020; Van den Doel, 2006). Most research into pronunciation errors commonly made by Dutch learners of English focuses on adult learners, while pronunciation errors made by Dutch secondary school students who learn English as a second language at school do not seem to have been investigated thoroughly yet. This research aims to provide some insight into the pronunciation errors commonly made in English by Dutch secondary school students. The following research questions and hypotheses have been formulated:

Research question 1: How do the pronunciation errors found in the data of the Dutch secondary school students compare to pronunciation errors commonly made by adult Dutch learners of English according to the relevant literature?

The expectation is that most pronunciation errors found in the data of the secondary school children will be errors that are also commonly made by adult Dutch learners of English,

since these students are sequential bilingualists and therefore their L1 phonetic systems had already been established when they started to learn English (Flege & Schwen Bohn, 2020).

Research question 2: What are possible explanations for the pronunciation errors found in the data of the Dutch secondary school children?

Common causes of mispronunciation of sounds are assimilation, deletion, interference of L1 sounds, issues with perception and production of L2 sounds, and confusion because of spelling (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011; Flege & Schwen Bohn, 2020; Van den Doel, 2006). The expectation is that these possible causes will explain most, if not all, pronunciation errors found to be commonly made by the secondary school students in the data.

2. Method

2.1 Participants and material

An existing corpus of audio recordings has been used for this study. The corpus, called the MPC Database, consists of audio recordings from secondary school students from the Canisius College in Nijmegen, the Netherlands. The database consists of three separate collections of recordings; one with 53 words, one with 41 sentences, and one with thirteen sentences. The collection of thirteen sentences has been selected for analysis. Audio recordings of these thirteen sentences were available for 70 students. However, the data that has been used for this study did not consist of (70x13=) 910 utterances. Some files were missing because not all students produced every sentence, and because files could not be used due to low quality of the recording or inaudible speech. In total, 717 utterances were available and have been analysed. The thirteen sentences and their possible correct RP and GA pronunciations can be found in Appendix A, the phonetic alphabet used to transcribe the sentences can be found in Appendix B.

Each audio file has been forced aligned with the orthographic transcriptions of what was said by the students. Forced alignment is a process in which audio files are automatically aligned to corresponding orthographic transcriptions. As a result, phone level segmentations are generated (Berkeley Linguistics Phonlab, 2018). Forced alignment has been used for this data as follows: first, the expected orthographic transcription for each of the thirteen sentences were put into TextGrid files. The thirteen different TextGrid files were then linked to all corresponding audio files. Subsequently, all orthographic transcriptions were manually checked by the transcriber against the actual realisations of the sentences and, if necessary, were corrected in Praat (Boersma & Weenink, 2020). When each sentence was checked and corrected if necessary, the combined files were forced aligned with a tool specifically made to do so for English audio and text files, called the Forced Aligner. The Forced Aligner runs in PuTTY, an SSH and telnet open source software (PuTTY, n.d.). After running the Forced Aligner in PuTTY, the files could be opened in Praat and the tiers with the correct orthographic transcriptions were aligned with the audio (Berkeley Linguistics Phonlab, 2018). Consequently, the aligned orthographic transcriptions could be used to support the interpretation of the audio and to facilitate the phonetic transcription of the audio, since the expected phonetic transcriptions of the sentences produced by the students could be used as a basis for the correct phonetic transcription of the sounds that were produced by the students.

2.2 Analysis

A BA English Language and Culture graduate, i.e. the author, transcribed the utterances in IPA, as has been done by BA students of English Language and Culture from the Radboud University before by Cucchiarini et al. (2011). The bachelor's programme in English Language and Culture at the Radboud University expects first-year students to have laid the basis for a near-native pronunciation of English. Additionally, it is the only BA degree in English language, culture, and/or literature in the Netherlands which expects its students to achieve near-native pronunciation specifically in either RP or GA English (Koet, 2007; Radboud Universiteit, 2019).

First, the expected pronunciations of the thirteen sentences for RP and GA English had been determined by the graduate of English Language and Culture in accordance with pronunciations provided by the Oxford Advanced Learners' Dictionary (OALD) (2010) and the Longman Pronunciation Dictionary (2008). After that, the transcriber listened to each audio file via Praat. Headphones were used to ensure the best possible audio quality and consistency in audio quality, as well as to filter out as much noise pollution and distractions as possible. The transcriber listened to and transcribed the audio files in the order of the sentences, i.e. first all audio files for sentence 1 were transcribed, then all audio files for sentence 2, and so on. This specific order was chosen to ensure that the transcriber was tuned to each sentence and the expected sounds of that sentence. If the transcriber had written the transcriptions in order of participant number, the transcriber would have had focus on a different sentence every time. This may have made it more difficult to focus on and correctly perceive the produced sounds, and to compare the produced sounds to the correct sound. Consequently, working in this order made it possible for the transcriber to compare produced sounds in specific words and in specific sentences to each other and to the expected sounds. Furthermore, each sentence was listened to at least ten times, or as often as was necessary to ensure that each sound had been focused on and had been heard correctly. Each part of the sentence was played in isolation as many times as necessary as well, so that specific sounds could be focused on without possible distraction by other sounds in the sentence. When the transcriber was in doubt about the exact realisation of a sound, the sound was compared to sounds produced for the exact same expected sound in audio files of the same sentence which had already been determined to be either correct or incorrect, and to the same sound in audio files of the same word in the OALD (2010) and the Longman Pronunciation Dictionary (2008). As a result, it was possible for the transcriber to determine each sound observed in the data with sufficient certainty for the data to be used for this research.

When each audio file had been transcribed, the transcriptions of the audio recordings were compared to the expected pronunciations found in the OALD (2010) and the Longman Pronunciation Dictionary (2008). The various mistakes made for each phoneme were studied separately. For each phoneme, all errors that occurred were counted. Subsequently, for each phoneme it was determined what percentage of realisations was incorrect. Each phoneme with a 5% or higher percentage of incorrect realisations has been analysed in more detail, to investigate exactly which errors occur in the realisation of these phonemes and how frequently each specific error occurs. These findings have also been calculated into percentages. The errors made in the realisations of these phonemes have been compared to errors commonly made by Dutch learners of English according to the relevant literature. Phonemes which were not incorrectly realised by substitution of another phoneme, or by elision or epenthesis have not been included in this analysis.

The threshold of a minimum error rate of 5% has been determined to allow for some incidental mistakes, but to also include as many possibly relevant errors, or errors that may occur due to more than chance, as possible.

Research question 1 will be answered by comparing the pronunciation errors observed in the data of the secondary school children to errors commonly made by adult Dutch learners of English according to the literature. Research question 2 will be answered by studying the pronunciation errors observed in the data and analysing these errors in relation to the various possible explanations for pronunciation errors made by Dutch learners of English according to the literature.

3. Results

No comparable quantitative data for adult Dutch learners of English has been found in the literature, and consequently no comparative statistical analyses could be conducted. In an attempt to ensure that the data of the secondary school students can still be compared to observations found in the literature, descriptive statistics have been used to compare the data used in this research to the qualitative data found in the literature.

3.1 Consonants

The first area of focus is consonants. Consonants which have been realised incorrectly, their position, frequency of occurrence, number of mistakes and the percentage of realisations that are incorrect can be found in Table 1. The consonants in the orange coloured rows do not meet the threshold of an error rate of 5%, and the consonants in the green coloured rows are the ones that do meet the threshold of an error rate of 5%. Each consonant for which the error rate is 5% or higher can be found in Table 2. Table 2 elaborates on the position of the consonants and as what they have been incorrectly realised, as well as how often each incorrect realisation occurs compared to the total number of mistakes in percentage.

When no context has been specified, mistakes occur in all positions. Some phonemes are described both for all positions and for specific contexts. This has been done because although the errors in all contexts seem relevant, the errors made in specific positions may differ and have therefore been determined separately as well. For the consonants which are discussed for more than one specific position but not for all positions, the total number of occurrences and number and percentage of mistakes observed in the contexts that have been analysed can also be found in Table 1. These rows are white coloured since they are not relevant for the analysis and will not be discussed.

Table 1: Consonants, their context and their percentage of incorrect realisations.

Consonant	Position	Frequency of occurrence	Total number of mistakes	% incorrect realisations
/t/	Intervocalic and between /r/ and a vowel	48	4	8.3%
/t/	Word-final	586	117	20%
/t/	Total	634	121	19.1%
/k/	Intervocalic	57	2	3.5%
/k/	Word-final	162	15	9.3%
/k/	Total	219	17	7.8%
/b/	Word-initial	432	4	0.9%
/b/	Word-medial	115	18	15.7%
/b/	Total	547	22	4%
/d/	Word-medial	291	11	3.8%
/d/	Word-final	279	144	51.6%
/d/	Total	570	155	27.2%
/g/		184	3	1.6%
/v/		120	95	79.2%
/s/		533	6	1.1%
/s/	Word-initial	229	2	0.9%
/s/	Word-final	184	3	1.6%
/z/	Intervocalic	64	17	25.6%
/z/	Word-final	422	323	76.5%
/z/	Total	486	340	70%
/θ/		160	73	45.6%
/θ/	Syllable-initial	116	64	55.2%
/θ/	Word-final	44	9	20.5%
/ð/		567	393	69.3%
/ð/	Word-initial	470	314	66.8%
/ð/	Word-final	44	42	95.5%
/dʒ/		173	59	34.1%
/dʒ/	Word-initial	110	5	4.5%
/dʒ/	Word-final	63	54	85.7%
/ʃ/		245	5	2%
/tʃ/		97	1	1%
/tʃ/	Word-final	44	1	2.3%
/l/		518	7	1.4%
/l/	Word-final	172	7	4%
/r/	Word-initial	110	18	16.4%
/j/	word-initial	204	6	2.9%
/w/	Word-initial	197	2	1%
Total		5564	1323	23.8%

Table 2: The specific mistakes observed for each consonant which meets the threshold, and the percentage of each error compared to the total number of incorrect realisations of each consonant.

C	Position	The error or errors made for each consonant which meets the 5% threshold, and the percentage of the occurrence of each error compared to the total number of errors for each consonant.				
/t/	Intervocalic and between /r/ and a vowel	/θ/ (100%)				
/t/	Word-final	/d/ (82.9%)	/-/ (11.1%)	/θ/ (2.6%)	/r/ (2.6%)	/z/ (0.9%)
/k/	Word-final	/g/ (100%)				
/b/	Word-medial	/-/ (100%)				
/d/	Word-final	/t/ (93.1%)	/-/ (6.9%)			
/v/		/f/ (98.9%)	/-/ (1.1%)			
/z/	Intervocalic	/s/ (100%)				
/z/	Word-final	/s/ (98.1%)	/-/ (1.9%)			
/θ/		/t/ (86.3%)	/d/ (6.8%)	/f/ (4.1%)	/ð/ (1.4%)	/dʒ/ (1.4%)
/θ/	Syllable-initial	/t/ (84.4%)	/d/ (7.8%)	/f/ (4.7%)	/ð/ (1.6%)	/dʒ/ (1.6%)
/θ/	Word-final	/t/ (100%)				
/ð/		/d/ (85.8%)	/t/ (7.1%)	/θ/ (6.1%)	/f/ (0.5%)	/h/ (0.5%)
/ð/	Word-initial	/d/ (95.5%)	/t/ (3.8%)	/h/ (0.6%)		
/ð/	Word-final	/θ/ (57.1%)	/t/ (38.1%)	/f/ (4.8%)		
/dʒ/		/tʃ/ (88.1%)	/tj/ (5.1%)	/ts/ (3.4%)	/ʃ/ (3.4%)	
/dʒ/	Word-final	/tʃ/ (96.3%)	/ts/ (3.7%)			
/r/	Word-initial	/wr/ (83.3%)	/w/ (11.1%)	/vr/ (5.6%)		

Plosives

/t/ Between vowels or between /r/ and a vowel, some students realise /t/ as /θ/. Although this mistake only occurs four times, it represents 8.3% of expected occurrences of /t/ in this context.

/t/ In final position, 20% of the realisations of /t/ are incorrect. The most frequent error is the substitution of /t/ with /d/, which makes up 82.9% of the total number of incorrect realisations of word-final /t/. The deletion of final /t/ accounts for 11.1% of mistakes.

/k/ In final position, /k/ is substituted with /g/ in 9.3% of realisations.

/b/ In medial position, /b/ has not been realised at all for 15.7% of its expected occurrences.

/d/ In word-final position, /d/ is realised incorrectly in 51.6% of its expected occurrences. The most frequent error by far is the substitution of /d/ with /t/, which accounts for as much as 93.1% of incorrect realisations of /d/. The remaining 6.9% of the errors involve the deletion of word-final /d/.

Fricatives

/v/ 79.2% of realisations of /v/ are incorrect. All incorrect realisations except for one involve the devoicing of /v/.

/z/ In 25.6% of its expected occurrences, intervocalic /z/ has been realised as /s/ by the secondary school students.

/z/ Final /z/ has been realised incorrectly in 76.5% of its occurrences. The most frequent error (98.1% of mistakes) is the realisation of /z/ as /s/. The remaining errors involve the deletion of final /z/. The deletion of final /z/ occurs six times.

/θ/ The error rate for /θ/ in all contexts is 45.6%. Of the total number of errors, 86.3% has been realised as /t/, 6.8% as /d/ and 4.1% as /f/. There are two outliers in the incorrect realisations of /θ/; /θ/ has been incorrectly realised once (1.4%) as /ð/, and once (1.4%) as /dʒ/. However, the difference in errors between /θ/ in initial position and in final position is substantial.

/θ/ In syllable-initial position, /θ/ has been realised incorrectly in 55.2% of its occurrences. The majority of mistakes, 84.4%, involve the realisation of /t/. Students produced /d/ instead of /θ/ in 7.8% of incorrect realisations, and substituted /θ/ with /f/ in 4.7% of errors. Both outliers, /ð/, and /dʒ/, occur once (1.6%) in syllable-initial position.

/θ/ All errors concerning /θ/ in final position, 20.5% of realisations, involve the substitution of /θ/ with /t/.

/ð/ The error rate for /ð/ in all positions is 69.3%. The most frequent error is the substitution of /ð/ with /d/, which accounts for 85.8% of mistakes. In 7.1% of errors, /ð/ has been replaced by /t/ and in 6.1% by /θ/. The incorrect realisations of /ð/ vary significantly according to their position.

/ð/ In initial position, 66.8% of realisations of /ð/ are incorrect. 95.5% of incorrect realisations of /ð/ involve the realisation of /ð/ as /d/. The realisation of /ð/ as /t/ accounts for 3.8% of mistakes.

/ð/ Word-final /ð/ has been realised incorrectly in 95.5% of its occurrences. The substitution of /ð/ with /θ/ accounts of 57.1% of mistakes, 38.1% of mistakes involve the substitution of /ð/ with /t/ and 4.8% the substitution of /ð/ with /f/.

Affricates

/dʒ/ The error rate for /dʒ/ in all positions is 34.1%. The most frequently made error is the substitution of /dʒ/ with /tʃ/, which accounts for 88.1% of errors. The substitution of /dʒ/ with /tj/ makes up 5.1% of errors and the realisation of /ʃ/ and /ts/ both account for 3.4% of the errors. Again, there is a significant difference between the errors in initial and final position.

/dʒ/ While only 4.5% of realisations in initial position are incorrect, 85.7% of realisations in final position are incorrect. 96.3% of incorrect realisations of final /dʒ/ involve the substitution of /dʒ/ by /tʃ/, the substitution of /dʒ/ with /ts/ accounts for the remaining errors in final position.

Approximants

/r/ Errors have been observed in 16.4% of realisations of word-initial /r/. All mistakes made by the secondary school students concerning /r/ involve the insertions of /w/ or /v/.

3.2 Vowels

The vowels which have been realised incorrectly by the secondary school students, the frequency of occurrence of the vowel, number of mistakes, and the percentage of realisations that are incorrect can be found in Table 3. The vowels in the orange coloured rows do not meet the threshold of an error rate of 5%, and the vowels in the green coloured rows are the ones that do meet the threshold of an error rate of 5%. Table 4 shows the vowels for which the error rate is 5% or higher, and for each vowel which errors have been observed and how frequently each error occurs in percentage compared to the total number of mistakes for each vowel. The vowels are arranged from highest to lowest percentage of errors.

Table 3: Vowels and percentage of mistakes.

Vowel	Frequency of occurrence	Total number of mistakes	% incorrect realisations
ʌ	211	153	72.5%
æ	356	255	71.6%
iːə	42	29	69%
ʊ	349	226	64%
u(ː)	496	189	43.3%
ɜː	170	49	28.8%
ɑː	493	134	27.3%
iː	168	32	19%
ɪə	50	7	14%
ə	1348	141	10.5%
e	256	25	9.8%
ɒ	159	14	8.8%
ɔɪ	103	8	7.8%
ɔː	190	8	4.2%
oʊ	143	3	2.1%
ɪ	732	10	1.4%
aɪ	412	4	1%
Total	5678	1287	22.7%

Table 4: The specific mistakes observed for each vowel which meets the threshold, and the percentage of each error compared to the total number of incorrect realisations of each vowel.

V	The different errors made for each vowel which meets the 5% threshold, and the percentage of the occurrence of each error compared to the total number of errors for each vowel.							
/ʌ/	/ʏ/ (65.4%)	/ɒ/ (31.4%)	/ɑ/ (2%)	/ɔ/ (0.7%)	/ɪ/ (0.7%)			
/æ/	/e/ (87.8%)	/ɛ/ (10.2%)	/ə/ (1.6%)	/ɑː/ (0.4%)				
/iːə/	/iː/ (89.7%)	/iːɑ/ (6.9%)	/iːa/ (3.4%)					
/ʊ/	/oe/ (87.6%)	/ʏ/ (7.5%)	/y/ (4.4%)	/ɜː/ (0.3%)				
/u(ː)/	/oe/ (92.1%)	/y/ (4.2%)	/ɒː/ (1.6%)	/ʊ/ (0.5%)	/ɑː/ (0.5%)	/ʏ/ (0.5%)	/ɒ/ (0.5%)	
/ɜː/	/ʏ/ (63.3%)	/ʏː/ (24.5%)	/ɪ/ (8.2%)	/ɔː/ (4.1%)				
/ɑː/	/ɑ/ (89.6%)	/a/ (6%)	/e/ (3%)	/ɛ/ (0.7%)	/aʊ/ (0.7%)			
/iː/	/i/ (56.3%)	/ɪ/ (37.5%)	/eɪ/ (3.1%)	/æ/ (3.1%)				
/ɪə/	/ɪ/ (100%)							
/ə/	/a/ (55.7%)	/e/ (24.3%)	/ʏ/ (11.4%)	/y/ (4.9%)	/oe/ (1.6%)	/ɑ/ (0.5%)	/ɪ/ (0.5%)	/i/ (0.5%)
/e/	/ɛ/ (52%)	/æ/ (28%)	/ə/ (12%)	/ɪ/ (4%)	/ʏ/ (4%)			
/ɒ/	/ɔ/ (57.1%)	/ʌ/ (21.4%)	/ʏ/ (7.1%)	/ə/ (7.1%)	/ɪ/ (7.1%)			
/ɔɪ/	/ɔ/ (37.5%)	/ɒ/ (25%)	/ɔː/ (12.5%)	/o/ (12.5%)	/œy/ (12.5%)			

/ʌ/ 72.5% of realisations of /ʌ/ are incorrect. The most frequent error is the substitution of /ʌ/ with Dutch /ʏ/, which accounts for 65.4% of mistakes. The substitution of /ʌ/ with /ɒ/ is a common error as well and accounts for 31.4% of incorrect realisations. Furthermore, 2% of errors involve the substitution of /ʌ/ with /ɑ/, 0.7% involves the substitution of /ʌ/ with /ɔ/, and another 0.7% involves the substitution of /ʌ/ with /ɪ/.

/æ/ The error rate for /æ/ is 71.6%. The majority of the errors, 87.8%, involve the substitution of /æ/ with /e/, while 7.3% of the errors involve the realisation of /ɛ/. The substitutions of /æ/ with /ə/ and with /ɑː/ are outliers which account for 1.6% and 0.4% of errors respectively.

/iːə/ /iːə/ has been realised incorrectly in 69% of its occurrences. In 69.1% of incorrect realisations, /iːə/ has been pronounced as /iː/. The substitution of /iːə/ with /iːɑ/ or /iːa/ accounts for 7.2% of the total number of incorrect realisations.

/ʊ/ The vowel /ʊ/ has been realised incorrectly in 64% of its occurrences. The most frequent error is the substitution of /ʊ/ with Dutch /oe/, which accounts for 87.6% of the incorrect realisations. The substitution of /ʊ/ with Dutch /ʏ/ accounts for 7.5% and the substitution with Dutch /y/ for 4.4%.

/u:/, /u/ 43.3% of realisations of /u:/ and /u/ are incorrect. The most frequently made mistake by far, with 92.1%, is the substitution with /oe/. 4.2% of mistakes involve the substitution of /u:/ with Dutch /y/. The remaining errors are outliers and account for between 1.6% and 0.5% of incorrect realisations.

/ɜː/ The error rate for /ɜː/ is 28.8%. The substitution of /ɜː/ with Dutch /ʏ/ accounts for 63.3% of the mistakes, and the substitution with Dutch /ʏː/ accounts for 24.5% of mistakes. Furthermore, 8.2% of mistakes involve the realisation of /ɜː/ as /ɪ/ and another 4.1% involve the realisation of /ɜː/ as /ɔː/.

/ɑː/ 27.3% of occurrences of /ɑː/ is incorrect. The most frequently made mistake is the shortening to /ɑ/, which accounts for 89.6% of incorrect realisations. The substitution of /ɑː/ with /aː/ accounts for 6% of mistakes. The realisations of /ɑː/ as /e/, /ɛ/ and /aʊ/ account for the remaining 4.4% of mistakes.

/i:/ The realisation of /i:/ was incorrect in 19% of its occurrences. The shortening of /i:/ to /i/ is accounts for 56.3% of the total number of errors. Furthermore, 37.5% of errors involve the substitution of /i:/ with /ɪ/.

/ɪə/ The realisation of /ɪə/ was incorrect in 14% of its occurrences. All mistakes involve the realisation of /ɪə/ as /ɪ/.

/ə/ The unstressed vowel /ə/ occurs very frequently in the data and was expected to occur as many as 1348 times. It has been realised incorrectly 185 times (13.7%). /ə/ has been incorrectly realised as /a/ (55.7% of errors), /e/ (24.3%), /ʏ/ (11.4%) and /y/ (4.9%). Some students substituted /ə/ with /oe/, /ɑ/, /ɪ/ or /i/, but together these substitutions only account for 3.1% of the errors.

/e/ 9.8% of realisations of /e/ are incorrect. The most frequently made mistake is the substitution of /e/ with /ɛ/, which accounts for 52% of mistakes. The substitution of /e/ with /æ/ accounts for 28% of the mistakes, and 12% of mistakes involve the substitution of /e/ with /ə/. The remaining two errors, the substitution of /e/ with /ɪ/ and with /ʏ/, both occur only once.

/ɒ/ The error rate for /ɒ/ is 8.8%. The most frequently made mistake is the substitution of /ɒ/ with Dutch /ɔ/ (57.1%). The substitution of /ɒ/ with /ʌ/ accounts for 21.4% of the errors. The remaining three errors, the substitutions of /ɒ/ with /ə/, with /ʏ/, and with /ɪ/, all occur only once.

/ɔɪ/ The error rate for the diphthong /ɔɪ/ is 7.8%, which means that /ɔɪ/ has been mispronounced eight times in total. Seven out of eight errors involve the substitution of /ɔɪ/ with rounded monophthongs; three times with /ɔ/, twice with /ɒ/, once with /ɔː/, and once with /o/. The remaining mistake made in the realisation of /ɔɪ/ is the substitution of /ɔɪ/ with /œy/.

4. Discussion

The pronunciation errors made by the secondary school students have been analysed and compared to mistakes found in the relevant literature. The order in which the errors are discussed in this section is the same order as in which the errors are discussed in the Results section.

4.1 Consonants

Plosives

/t/ Some students realise /t/ as /θ/ between vowels or between /r/ and a vowel. The substitution of /t/ with /θ/ is not a common error made by Dutch learners of English according to the relevant literature. This error occurs three times in the word *thirty* and once in *water*. A possible explanation might be that since the realisation of initial /θ/ in *thirty* is difficult for Dutch learners of English, the effort to produce the correct sound may lead to interference with the following syllable-initial consonant.

/t/ 20% of realisations of /t/ in final position are incorrect. The most frequent error (82.9%) is the substitution of /t/ with /d/. Assimilation across word boundaries may be the cause of this error. 67% of incorrect realisations of /t/ as /d/ occur between two vowels (‘*cat in*’ *[kæd ɪn], ‘*shoot a*’ *[ʃuːd ə], ‘*wrote a*’ *[roʊd ə]). 29.9% of incorrect substitutions with /d/ occur between a vowel and a lenis consonant (‘*at number*’ *[əd ˈnʌmbər], ‘*got blond*’ *[gɑːd blɑːnd]). One mistake (1%) occurred between an incorrectly voiced fricative and a vowel (‘*passed under*’ *[pɑːzd ˈʌndər]. Consequently, assimilation could lead in the voicing of /t/, resulting in the realisation of /d/ in these contexts (Van den Doel, 2006). The remaining three realisations of /t/ as /d/, which occur in utterance-final position, do not seem to be explained by the relevant literature.

11.1% of incorrect realisations involve the deletion of final /t/. This error could be the result of Dutch assimilation patterns, since in Dutch final /t/ in a consonant cluster is sometimes deleted. The deletion of final /t/ in English by Dutch learners might therefore be the result of L1 interference (Neri et al., 2006). The deletion of final /t/ does occur in English as well and should therefore not necessarily cause problems for Dutch learners of English, and it may not necessarily be seen as an error in fast and connected speech. However, out of the words in which final /t/ is deleted, the only one in which /t/ should definitely not have been deleted is *can’t*, because it is preceded by /n/ and, according to Gussenhoven & Broeders (1997), should

therefore be retained in English. Since Dutch learners of English may not be aware of this, interference may explain this particular error as well (Collins & Mees, 2003; Gussenhoven & Broeders, 1997). Furthermore, it is also possible that students pronounced *can* because they simply misread the word *can't*. Additionally, this deletion results in confusion between the words *can't* and *can* and may therefore lead to miscommunication.

The remaining 6.5% of incorrect realisations of final /t/ consists of several outliers and an explanation for those cannot be derived from the relevant literature.

/k/ Word-final /k/ is realised as /g/ in 9.3% of its total occurrences. All errors occur intervocalically or between a vowel and a lenis consonant ('*like water*' *[laɪg ˈwɑːdər], '*look Arthur*' *[lʊg ˈɑːrθər]). This error may therefore also be caused by assimilation (Collins & Mees, 2003; Gussenhoven & Broeders, 1997; Gussenhoven & Jacobs, 2011).

/b/ In medial position, /b/ has been omitted in 15.7% of its expected occurrences. This mistake has not been found in previous research. However, in all cases /b/ was omitted in the word *number*. Since its Dutch counterpart *nummer* is similar but is pronounced without /b/ ([ˈnʏmər]), the realisation of *number* as *[ˈnʌmər] may be the result of Dutch interference.

/d/ 51 .6% of realisations of word-final /d/ are incorrect. The substitution of /d/ with /t/ accounts for as much as 93.1% of the total number of incorrect realisations of word-final /d/. This error could definitely be expected according to the relevant literature, and could be attributed to the difficulty Dutch learners of English have with the realisation of word-final lenis consonants (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011; Van den Doel, 2006).

The deletion of word-final /d/ accounts for the remainder of the errors. The words in which deletion of final /d/ occurs are *would*, *blonde*, and *found*. Although this is not an error that has been found in the relevant literature for Dutch learners of English, Shinohara (2005) suggests that lenis plosives in final sonorant+plosive clusters may sometimes be deleted. Another explanation for this error might be that in consonant clusters in final position, /t/ may be deleted in Dutch as a result of assimilation or a problem with the realisation of /t/ in final consonant clusters (Neri et al., 2006). Since the Dutch secondary school students, like all Dutch learners of English, frequently replace final /d/ with /t/, the deletion of /d/ might be the result of L1 interference.

Fricatives

/v/ The Dutch secondary school students appear to mispronounce /v/ relatively frequently; 79.2% of realisations are incorrect. The devoicing of /v/ accounts for all incorrect realisations of /v/ except one. The realisation of /v/ as /f/ may be explained by two different processes. The word *lives* occurs 53 times, 36 times of which /v/ is incorrectly realised as /f/. However, in each case the following /z/ has been incorrectly realised as /s/, resulting in *[lɪfs]. Since Dutch learners tend to realise /z/ in final position as /s/, regressive assimilation may have caused the preceding /v/ to be realised as /f/ (Collins & Mees, 2003; Gussenhoven & Broeders, 1997; Gussenhoven & Jacobs, 2011; Neri et al., 2006). Additionally, Dutch learners frequently substitute /v/ with /f/ in final position, and the contrast between /v/ and /f/ in initial position may be lost for some speakers as well. The substitution of final /v/ with /f/ could therefore explain '*of year*' *[ɒf jir], and the loss of contrast between /v/ and /f/ in initial position may lead to the realisation of *favourite* as *[ˈfeɪfrət] (Collins & Mees, 2003; Van den Doel, 2006).

/z/ Intervocalic /z/ has been realised as /s/ in 25.6% of its occurrences. According to Collins and Mees (2003), spelling may cause confusion between /z/ and /s/ for Dutch learners of English. All mistakes in the realisation of intervocalic /z/ have been made in *Susan* [ˈsuːzən]. Therefore, the spelling of *Susan* may have caused the students to produce *[ˈsuːsən].

/z/ 76.5% of realisations of final /z/ are incorrect. The most common error by far is the realisation of /z/ as /s/, which accounts for 98.1% of the incorrect realisations of final /z/. This is in line with the observation that Dutch learners often substitute /z/ with /s/ in final position (Collins & Mees, 2003; Cucchiarini et al., 2011; Koet, 2007).

The remaining errors involve the deletion of final /z/. The deletion of final /z/ occurs six times, five of which can be found in the sequence '*is so*' [ɪz soʊ]. Since virtually all of the secondary school students realise [ɪz] as *[ɪs] or *[s], this would lead to a sequence of two identical consonants; *[ɪs soʊ]. The elision of one of the identical consonants in such a cluster, degemination, is a common assimilation process in Dutch (Collins & Mees, 2003; Gussenhoven & Jacobs, 2011; Van den Doel, 2006). Interference may thus have caused the perceived deletion of word-final /z/ in '*is so*' *[ɪ soʊ].

/θ/ 45.6% of realisations of /θ/ in all positions are incorrect. 86.3% of the incorrect realisations involve the substitution of /θ/ with /t/, 6.8% involve substitution with /d/ and 4.1% involve substitution with /f/. Two outliers have also been found; the realisation of /θ/ as /ð/ and as /dʒ/ both occur only once. The difference between incorrect realisations of /θ/ in initial position and in final position is considerable.

/θ/ In syllable-initial position, 55.2% of realisations of /θ/ are incorrect. The substitution of /θ/ with /t/ accounts for the majority of the errors (84.4%). The substitution of /θ/ with /t/ is an error that could definitely be expected according to the literature (Collins & Mees, 2003; Cucchiarini et al., 2011; Van den Doel, 2006; Wester et al., 2007). Spelling might be a factor in this error. Evidently, all words in which initial /θ/ has been replaced by /t/ are spelled with **th**. The spelling with **t** might have prompted the students to pronounce /t/. Since neither /θ/ nor /ð/ are part of the Dutch sound system but /t/ is, students may have pronounced the sound to which they have perceptually linked /θ/, and which is commonly represented by initial **t** in Dutch (Flege & Schwen Bohn, 2020; Gussenhoven & Broeders, 1997).

7.8% of incorrect realisations of /θ/ involve the substitution of /θ/ with /d/. The realisation of /θ/ as /d/ could be explained by the confusion between /θ/ and /ð/. According to Collins and Mees (2003), beginning learners of English may be unaware of the difference between /θ/ and /ð/ since both are orthographically represented by **th**, and a common error made by Dutch learners of English is the substitution of /ð/ with /d/ (Collins & Mees, 2003; Cucchiarini et al., 2011; Koster & Koet, 1993; Van den Doel, 2006; Wester et al., 2007).

The substitution of /θ/ with /f/ accounts for 4.7% of errors and occurs in the word *thirty*. Although the substitution of /θ/ with /f/ is usually observed in word-final position, it may incidentally occur in word-initial position as well (Collins & Mees, 2003; Wester et al., 2007). Both outliers that have been observed in the data for initial /θ/, /ð/ and /dʒ/, occur once in syllable-initial position. The substitution of /θ/ with /ð/ could be explained by the students' possible unawareness of the difference between /θ/ and /ð/ due to spelling as well (Collins & Mees, 2003). The substitution of /θ/ with /dʒ/ has not been found in the relevant literature.

/θ/ Final /θ/ has been realised incorrectly in 20.5% of it occurrences. All incorrect realisations involve the substitution of /θ/ with /t/. This is in line with observations made by the relevant literature (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011; Van den Doel, 2006; Wester et al., 2007).

/ð/ In total, 69.3% of realisations of /ð/ are incorrect. The substitution of /ð/ with /d/ is the most frequently made error (85.5%). 7.1% of errors involve the substitution of /ð/ with /t/, and 6.1% of errors involve the substitution of /ð/ with /θ/. The errors made by the secondary school students in the realisation of /ð/ differ considerably according to its position.

/ð/ In initial position, 66.8% of realisations of /ð/ are incorrect. The substitution of /ð/ with /d/, which accounts for 95.5% of incorrect realisations, is the most frequently made error concerning initial /ð/. This is in line with the relevant literature. The substitution of /ð/ with /d/ is a common and persistent mistake made by Dutch learners of English (Collins & Mees, 2003; Cucchiarini et al., 2011; Koster & Koet, 1993; Van den Doel, 2006; Wester et al., 2007).

3.8% of mistakes involve the substitution of /ð/ with /t/. This might be explained by the possible confusion for Dutch learners between /ð/ and /θ/ as a result of spelling with **th**. Since Dutch learners frequently substitute /θ/ with /t/, the confusion between /ð/ and /θ/ may result in the realisation of /ð/ as /t/ (Collins & Mees, 2003). However, spelling might also explain this mistake more directly. Since all words in which initial /ð/ has been replaced by /t/ are evidently spelled with **th**, the **t** might also have caused the students to pronounce /t/.

/ð/ In word-final position, 95.5% of realisations of /ð/ are incorrect. 57.1% of mistakes involve the substitution of /ð/ with /θ/. The realisation of /ð/ as /θ/ has not specifically been mentioned in the relevant literature, but might be a result of the loss of the fortis/lenis contrast common with Dutch learners of English (Collins and Mees, 2003; Koet, 2007; Van den Doel, 2006). However, Cucchiarini et al. (2011) in fact do observe this error occasionally in very proficient learners, but these Dutch secondary school students can hardly be described as proficient, with one or two possible exceptions. Therefore, a realistic explanation for this error might be lexical confusion. All substitutions of word-final /ð/ with /θ/ occur in *breathe* [briːð]. It may be the case that students confuse *breathe* with *breath* [breθ]. However, none of the students produced /e/ instead of /iː/, which might indicate that they may be aware of the difference, although possibly they may still confuse the two coda sounds. Students may pronounce [breθ] as *[briːθ] as a result of the incorrect assumption that, since the two words are the noun and verb for the same action, both are pronounced with /iː/. Additionally, since spelling sometimes causes confusion between /ð/ and /θ/, this could also explain the error.

Furthermore, the substitution of /ð/ with /t/ accounts for 38.1% of mistakes, and the remaining 4.8% of mistakes involve the substitution of /ð/ with /f/. According to Collins and Mees (2003) and Wester et al. (2007), the substitution of /ð/ with /t/ in word-final position could

be expected. The realisation of final /ð/ as /f/ might be explained by the confusion between /ð/ as /θ/, since word-final /θ/ is sometimes pronounced as /f/ by Dutch learners (Collins & Mees, 2003; Wester et al., 2007).

Affricates

/dʒ/ 34.1% of realisations of /dʒ/ in all positions are incorrect. The substitution of /dʒ/ with /tʃ/ is the most common error and accounts for 88.1% of incorrect realisations of /dʒ/. 5.1% of errors involve the substitution of /dʒ/ with /tj/. The substitutions of /dʒ/ with /ʃ/ and with /ts/ both account for 3.4% of the errors. Again, the difference between the errors in initial and final position is substantial.

/dʒ/ Whereas in initial position only 4.5% of realisations of /dʒ/ are incorrect, in final position the error rate for /dʒ/ is 85.7%. Since /dʒ/ is not part of the Dutch phoneme inventory, Dutch learners may have difficulty with the perception and production of this sound (Flege & Schwen Bohn, 2020; Gussenhoven & Broeders 1997). The substitution of /dʒ/ with /tʃ/ accounts for 96.3% of incorrect realisations of final /dʒ/. The remaining errors made in the realisation of final /dʒ/ involve the substitution of /dʒ/ with /ts/. Both mistakes are in line with the relevant literature; Cucchiarini et al. (2011) observe that Dutch learners frequently replace final /dʒ/ with /tʃ/, and Collins and Mees (1993, 2003) report that Dutch learners sometimes realise /dʒ/ as /ts/ in final position. Both errors may be the result of the loss of contrast between fortis and lenis consonants, an error frequently made by Dutch learners of English. Dutch learners frequently replace /dʒ/ with its fortis counterpart /tʃ/. Consequently, since Dutch learners, especially less proficient ones, sometimes confuse /ʃ/ with /s/, this may lead to the realisation of /ts/ instead of /dʒ/ (Collins & Mees, 2003; Van den Doel, 2006).

Approximants

/r/ The mistakes that have been made in the production of word-initial /r/ all involve the insertions of /w/ or /v/. In the pronunciation of *rocket* /r/ has been realised incorrectly only once, in which case /r/ has been substituted by /w/ resulting in *[wɒkət]. However, this error was made by a student who replaces /r/ with /w/ frequently (e.g. in *breathe* *[bwit], *interesting* *[ɪntəˈwestɪŋ] and *favourite* *[feɪfwɪt]), so this might be a person-specific speech issue.

The remaining mistakes in the pronunciation of word-initial /r/ have been made in *wrote*, which has been realised incorrectly in 31.2% of its occurrences. The total number of mistakes in this context is seventeen, out of which fifteen involve the insertion of /w/, resulting in *[wroʊt], and one involves the insertion of /v/, resulting in *[vroʊt]. These mistakes might be explained by spelling; the secondary school students might not be aware that the **w** in *wrote* is silent (Gussenhoven & Broeders, 1997). As a result, students may pronounce the normally silent /w/. Dutch learners of English sometimes realise /w/ as /v/, or as /ʋ/ which natives may then perceive as /v/. This could explain the realisation of *wrote* as *[vroʊt] (Collins & Mees, 2003; Van den Doel, 2006). In one utterance, *wrote* was pronounced *[wəʊt]. This error was not made by the student who frequently replaces /r/ with /w/, and no explanation for this realisation has been found in the relevant literature.

4.2 Vowels

/ʌ/ The vowel /ʌ/ does not occur in the Dutch phoneme inventory (Gussenhoven & Broeders, 1997). It is the most frequently mispronounced vowel sound by the secondary school students; 72.5% of realisations of /ʌ/ are incorrect. The substitution of /ʌ/ with the Dutch vowel sound /ʏ/ is the most common error and accounts for 65.4% of incorrect realisations of /ʌ/. This is a mistake Dutch learners make frequently according to the relevant literature. It has been observed that spelling with **u** may lead to the confusion between /ʌ/ and /ʏ/ for Dutch learners (Collins and Mees, 2003; Cucchiarini et al., 2011). Since all substitutions of /ʌ/ with /ʏ/ occur in the words *number*, *under*, and *much*, confusion due to spelling with **u** could very well explain why the students made this particular mistake.

The substitution of /ʌ/ with /ɒ/, which accounts for 31.4% of the incorrect realisations of /ʌ/, is another error frequently made by the students. This substitution is in line with the relevant literature as well. Dutch learners tend to realise /ʌ/ as /ɒ/ particularly often when the sound is orthographically represented by **o** (Collins & Mees, 2003; Neri et al., 2006). 87.5% of this specific error occurs in the word *some*, so confusion due to spelling seems to be a reasonable explanation. The remainder of the realisations of /ʌ/ as /ɒ/ occur in *under*, which in Dutch is *onder* [ˈɔndər]. The orthographic similarity between *under* and *onder* may have caused the students to pronounce /ɒ/.

Of the total number of incorrect realisations of /ʌ/, only 0.7% accounts for the substitution of /ʌ/ with Dutch /ə/, which is an error that has been found in the relevant literature and may be the result of spelling with **o** (Cucchiarini et al., 2011; Van den Doel, 2006).

Furthermore, 2% of errors involve the substitution of /ʌ/ with /ɑ/. This error is sometimes made by Dutch learners, but generally does not occur often according to the relevant literature (Collins & Mees, 1993; Van den Doel, 2006). Another 0.7% of errors involves the substitution of /ʌ/ with /ɪ/. The relevant literature does not describe this substitution as an error that Dutch learners commonly make, but it is an outlier in the errors made by the secondary school students as well.

/æ/ /æ/ has been realised incorrectly in 71.6% of its occurrences. The substitution of /æ/ with /e/ accounts for the majority (87.8%) of the errors, and the substitution of /æ/ with /ɛ/ accounts for 7.3% of the errors. According to the relevant literature, these substitutions are common errors made by Dutch learners (Collins & Mees, 2003; Schmid et al., 2014; Van den Doel, 2006). The vowel /æ/ does not occur in the Dutch phoneme inventory, and since English /æ/ and /e/ and Dutch /ɛ/ are perceptually similar, Dutch learners may link both /æ/ and /e/ to Dutch /ɛ/ (Collins & Mees, 1993, 2003; Flege & Schwen Bohn, 2020; Gussenhoven & Broeders, 1997). Consequently, learners may have difficulty distinguishing between these vowels (Flege & Schwen Bohn, 2020).

The substitutions of /æ/ with /ə/ and with /ɑː/ are outliers which account for 1.6% and 0.4% of errors respectively. The use of /ə/ is observed by Cucchiarini et al. (2011) in advanced learners. Although the secondary school students are not advanced learners, this does not necessarily mean that they would not make this mistake. However, since three out of four instances of this mistake occur in *that*, which is pronounced *[də] in all cases, this might also be the result of students not reading the sentence carefully and therefore saying *the* instead of *that*. According to Van den Doel (2006), the realisation of /æ/ as /ɑː/ might be caused by the false assumption that /ɑː/ is the correct pronunciation in RP English.

/iːə/ The error rate for /iːə/ is 69%. Of the total number of errors, 69.1% involve the substitution of /iːə/ as /iː/. Although the relevant literature reports this as a common error before /r/, since the error occurs in the word *idea* at the end of a sentence this does not explain the error in this case (Collins & Mees, 1993). A possible explanation for this error is that the Dutch secondary school students mistake /iːə/ for /iː/ in general, or confuse the pronunciation of *idea* with that of *ID* [aɪˈdiː].

The substitution of /iːə/ with /iːɑ/ or /iːa/ accounts for 7.2% of the total number of incorrect realisations. These substitutions might be explained by confusion due to spelling; the

a in *idea* may have caused the students to pronounce /ɑ/ or /a/, resulting in *[aɪˈdiːɑ] and *[aɪˈdiːa].

/ʊ/ 64% of realisations of /ʊ/ are incorrect. The substitution of /ʊ/ with Dutch /oe/ is the most frequently observed error and accounts for 87.6% of the incorrect realisations. This substitution is a common error made by beginning learners of English and is in line with the relevant literature (Collins & Mees, 2003; Cucchiarini et al., 2011).

Furthermore, 7.5% of incorrect realisations involve the substitution of /ʊ/ with Dutch /ʏ/, and 4.4% of incorrect realisations involve the substitution with Dutch /y/. Although neither mistake has been mentioned in the relevant literature, Collins and Mees (1993, 2003) and Van den Doel (2006) observe that more proficient Dutch learners sometimes realise /ʊ/ as an extended glide based on the Dutch vowel /ʏ/ moving towards /y/, resulting in a sound comparable to /ʏy/. Whether a similar process may have led the secondary school students to realise /ʊ/ as either /ʏ/ or /y/ remains uncertain. Another possible explanation for these errors can be found in spelling. The use of /ʏ/ occurs in the words *putting* and *sure*, and the use of /y/ occurs in *sure*. In Dutch, the word *put* (English *well*) is pronounced [pʏt], which may have led the students to pronounce *putting* as *[ˈpʏtɪŋ] (Collins & Mees, 2003). The Dutch vowel /ʏ/ is a close, rounded, lax vowel. Its tense counterpart in Dutch is /y/ (Gussenhoven & Jacobs, 2011). The spelling of *putting* and *sure* with **u**, which is used to orthographically represent these sounds in Dutch, might have caused the confusion between /ʊ/ and /ʏ/ or /y/. Consequently, spelling with **u** could have led the students to realise /ʊ/ as ʏ/ or /y/ in these words.

/u:/, /u/ The secondary school students pronounced /u:/ and short /u/ incorrectly 43.3% of the time. The most frequently made mistake is the substitution of /u:/ and /u/ with Dutch /oe/, which accounts for 92.1% of the incorrect realisations of /u:/ and /u/. The substitution with /oe/ is a common error made by beginning Dutch learners of English according to the relevant literature (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011).

The substitution of /u:/ with Dutch /y/ accounts for 4.2% of the errors. This error only occurs in *Susan* and could be explained by confusion due to spelling, like the substitution of /ʊ/ with /y/. Furthermore, the name *Susan* is pronounced [syˈzɑn] in Dutch, which may also have caused the students to pronounce /y/. The remaining errors have not been found in the relevant literature, but are outliers that only explain between 1.6% and 0.5% of the total number of incorrect realisations of /u:/ and /u/.

/ɜ:/ 28.8% of realisations of /ɜ:/ are incorrect. 63.3% of mistakes involve the substitution of /ɜ:/ with Dutch /ʏ/, and 24.5% of mistakes involve the substitution of /ɜ:/ with Dutch /ʏ:/. While the use of /ʏ:/ for /ɜ:/ could be expected according to the literature, the use of /ʏ/ is not reported by the relevant literature as a common mistake made by Dutch learners in the pronunciation of /ɜ:/ (Collins & Mees, 1993, 2003). However, Dutch learners commonly have difficulty with the variation in vowel duration in English (Collins & Mees, 2003). Consequently, the duration of the vowel produced by the students may have been too short, resulting in /ʏ/.

Furthermore, the secondary school students replaced /ɜ:/ with /ɪ/ in 8.2% of mistakes, and with /ɔ:/ in 4.1% of mistakes. Both errors have not been found in the relevant literature. However, the realisation of /ɜ:/ as /ɪ/ might be explained by spelling, since this error only occurred in *skirt* and *girl*. The orthographic representation of /ɜ:/ by **i** might have caused the students to pronounce /ɪ/.

/ɑ:/ /ɑ:/ has been realised incorrectly in 27.3% of is occurrences. The shortening to Dutch /ɑ/ accounts for the majority of the incorrect realisations (89.6%). According to Collins and Mees (1993), this error could be expected from Dutch learners of English.

The substitution of /ɑ:/ with /a:/, which accounts for 6% of mistakes, has not been found in the relevant literature. However, /a:/ occurs in the Dutch vowel inventory and is an open, unrounded, long vowel, quite similar to English /ɑ:/. The difference between the two is that English /ɑ:/ is a back vowel, while Dutch /a:/ is a front vowel (Gussenhoven & Broeders, 1997). Dutch learners may therefore confuse Dutch /a:/ with English /ɑ:/.

The remaining 4.4% of mistakes involve the substitution of /ɑ:/ with /e/, /ɛ/, or /aʊ/. These errors are outliers in the data and have not been mentioned in the relevant literature as common mistakes made by Dutch learners in the realisation of /ɑ:/.

/i:/ 19% of realisations of /i:/ are incorrect. The realisation of /i:/ as short /i/ is the most frequently observed error and accounts for 56.3% of mistakes. According to Collins and Mees (2003), this error could be expected from Dutch learners. The production of the short vowel /i/ instead of /i:/ could be the result of the difficulty Dutch learners of English generally have with the duration of English vowels (Collins & Mees, 1993, 2003; Van den Doel, 2006).

Furthermore, 37.5% of errors involve the substitution of /i:/ with /ɪ/. This substitution has not been found in the relevant literature. Since the error occurs in the word *these*, it cannot be explained by the loss of contrast between /i:/ and /ɪ/ before /r/ in GA English, which would be considered correct (Collins & Mees, 1993). However, students may have misread *these* as

this, or confused the pronunciation of these words. The remaining two errors, the substitution of /i:/ with /eɪ/ and with /æ/, both occur only once. They are outliers in the data and neither is mentioned in the relevant literature as a common substitution for /i:/.

/ɪə/ 14% of the realisations of /ɪə/ are incorrect, all of which involve the substitution of /ɪə/ with /ɪ/. This error has not been mentioned by the relevant literature, but might be due to the difficulty Dutch learners have with English vowel duration, or unfamiliarity with the vowel sound /ɪə/, which does not occur in the Dutch phoneme inventory (Collins & Mees, 2003; Gussenhoven & Broeders, 1997).

/ə/ /ə/ occurs relatively frequently in the data compared to other sounds. Of the 1348 expected occurrences of /ə/, it has been realised incorrectly 185 times (13.7%). The most frequently observed error is the substitution of /ə/ with /a/, which accounts for 55.7% of errors. The substitutions of /ə/ with /e/, /ʏ/, and /y/ account for 24.3%, 11.4%, and 4.9% of incorrect realisations respectively. Collins and Mees (2003) report that Dutch learners tend to realise /ə/ as the vowel with which it is spelled, which could explain these substitutions. The realisation of /a/ only occurs in the indefinite article *a*. The substitution of /ə/ with /e/ occurs *interesting* *[ɪntrestɪŋ], which accounts for the majority of substitutions of /ə/ with /e/ (95.6%), and in *rocket* *[ˈrɑːket] (4.4%), both spelled with **e**. Since in Dutch *raket* (English *rocket*) is pronounced [raˈkɛt], the pronunciation of *rocket* may also be the result of Dutch interference. The pronunciation of *rocket* with /e/ instead of /ə/ occurs only twice, and is pronounced once as *[ˈrɑːket] and once as *[rɑːˈket]. The Dutch stress pattern in *[rɑːˈket] may imply that interference of Dutch vocabulary due to spelling could be a realistic cause of the error.

The substitution of /ə/ with Dutch /ʏ/ occurs in *Arthur* *[ˈɑːrθʏr]. Spelling with **u** may have caused the students to pronounce /ʏ/ (Collins & Mees, 2003; Cucchiarini et al., 2011). The substitution of /ə/ by Dutch /y/ only occurs in *Arthur* as well. In Dutch, the name *Arthur* is pronounced ['ɑrtyr], so interference of the Dutch pronunciation of this name may have caused the students to realise /ə/ as /y/ in *Arthur*. Some students substituted /ə/ with /oe/, /ɑ/, /ɪ/ or /i/, but together these substitutions only account for 3.1% of the errors.

/e/ The error rate for /e/ is 9.8%. The most common mistake the secondary school students made in the realisation of /e/ is the substitution of /e/ with /ɛ/ (52% of mistakes). According to the relevant literature, this mistake usually occurs before /n/ or /l/ (Collins and Mees, 1993, 2003). However, the secondary school students substituted /e/ with /ɛ/ in the words *bed* and

hair. Collins and Mees (2003) report that Dutch learners of English from the south of the Netherlands may realise /e/ as /ɛ/ in all contexts. The secondary school students attend a school in Nijmegen, and although whether Nijmegen belongs to the south of the Netherlands might be a matter of opinion to some and will not be debated here, the city's close proximity to the Dutch southern provinces Limburg and Noord-Brabant might indicate that this could be an explanation for the realisation of /e/ as /ɛ/ in these words. Furthermore, students may have lived in the south of the Netherlands for some time when they were younger, or might be influenced by parents who spent most of their lives in the south of the Netherlands.

Furthermore, 28% of incorrect realisations of /e/ involve the substitution of /e/ with /æ/. This mistake is in line with the observation of the relevant literature that Dutch learners tend to confuse /e/ and /æ/ (Collins & Mees, 2003; Cucchiarini et al., 2011; Schmid et al., 2014). The substitution of /e/ with /ə/ accounts for 12% of the incorrect realisations of /e/. This error has not been found in the relevant literature as a common mistake made by Dutch learners. However, Dutch learners sometimes confuse /e/ with /æ/, and may substitute /æ/ with /ə/ (Cucchiarini et al., 2011). The students may thus have realised /e/ as /ə/ as a result of confusion between /e/ and /æ/.

The remaining two errors, the substitution of /e/ with /ɪ/ and with /ʏ/, both occur only once. While the substitution of /e/ with /ɪ/ has been reported as a common mistake in the relevant literature, the substitution of /e/ with /ʏ/ has not been observed as a common error made by Dutch learners of English (Collins & Mees, 2003; Cucchiarini et al., 2011). However, since both these errors only occur once in the data, they are outliers and might be 'random' errors.

/ɒ/ 8.8% of realisations of /ɒ/ are incorrect. The most common error is the substitution of /ɒ/ with Dutch /ɔ/, which accounts for 57.1% of the incorrect realisations of /ɒ/. The substitution with /ɒ/ with Dutch /ɔ/ is a mistake Dutch learners of English frequently make according to Collins and Mees (2003). The realisation of /ɒ/ as /ʌ/ accounts for another 21.4% of the errors. Since Collins and Mees (2003) observe that spelling may cause confusion between /ɒ/, /ʌ/ and /ɔː/, confusion due to spelling may explain this error. The remaining three errors, the substitutions of /ɒ/ with /ə/, with /ʏ/, and with /ɪ/, all occur only once and have not been found in the relevant literature. All three might therefore be 'random' errors.

/ɔɪ/ The vowel /ɔɪ/ has been realised incorrectly eight times (7.8%). Although incorrect realisations of /ɔɪ/ by the secondary school students do not occur frequently, the errors will be discussed since the error rate is relatively high. The substitution of /ɔɪ/ with rounded monophthongs accounts for seven of the eight incorrect realisations. /ɔɪ/ has been substituted with /ɔ/ three times and with /ʊ/ twice. The substitutions of /ɔɪ/ with /ɔ:/ and with /o/ both occur only once. However, the substitution of /ɔɪ/ with /o/ occurs when the student produces the Dutch word *olie* (English *oil*), instead of *oil*. Since the Dutch word *olie* is pronounced [ˈoli], the substitution of /ɔɪ/ with /o/ in this particular instance may be the result of confusion between the English and the Dutch word, and /ɔɪ/ may thus not even have been the intended sound. The remaining mistake made in the realisation of /ɔɪ/ is the substitution of /ɔɪ/ with /œy/. Whether the student mistakenly read Dutch *uil* [œyl] instead of *oil* or simply mispronounced /ɔɪ/ is not clear.

/ɔ:/ While only 4.2% of realisations of /ɔ:/ are incorrect and it does therefore not meet the 5% threshold, the mistakes appear to be perfectly in accordance with the literature. The observation that the error rate for /ɔ:/ is relatively low may indicate that this sound generally does not pose a problem for the secondary school students, even though it has been reported in the relevant literature as a sound commonly mispronounced by adult Dutch learners of English. Out of the total of eight mistakes, the substitution of /ɔ:/ with /ʊ/ occurs seven times. This error might be the result of confusion due to spelling with **o** or problems with vowel duration. The substitution of /ɔ:/ with Dutch /ɔ/ occurs once and has been observed as a common substitution of /ɔ:/ for Dutch learners as well (Collins & Mees, 1993, 2003).

4.3 Significance of errors

The mistakes that have been observed in the data of the secondary school students have been compared to the significance of errors determined with the error hierarchies established by Collins and Mees (1993, 2003) and Van den Doel (2006). The errors observed in the data which have not been attributed to any error category cannot be not discussed in this section, since no information about the impact of these errors is available. This also applies to errors which have not been found at all in the relevant literature or in the data, or which do not meet the 5% threshold in any way (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011; Van den Doel, 2006).

4.3.1 Most significant errors

The loss of contrast between fortis and lenis consonants, especially in word-final position, is one of the 'most significant' errors reported by the relevant literature (Collins & Mees, 1993, 2003; Van den Doel, 2006). The secondary school students frequently make this error. Final /d/ has been substituted with /t/ in as much as 48% of its occurrences. Final /t/ has been realised as /d/ in 16.6% of its occurrences. Word-final /k/ has been realised as /g/ in 9.3% of its occurrences, and word-final /z/ has been substituted by /s/ in as much as 75.5% of cases. Intervocalically, /z/ has been realised as /s/ in 25.6% of it occurrences. The substitution of /v/ with /f/ occurs in 78% of its occurrences. 57.1% of occurrences of word-final /ð/ have been realised as /θ/, and word-final /dʒ/ has been realised as /tʃ/ in 82.5% of its expected occurrences. Although the percentual differences between these errors are quite high, this comes down to a mean of 49.1% of total occurrences in which consonants are incorrectly realised as their fortis or lenis counterpart in these contexts. Consequently, the secondary school students appear to have difficulty with the contrast between fortis and lenis consonants, just as many adult Dutch learners of English do.

Furthermore, the incorrect realisation of /θ/ and /ð/ in general has also been mentioned as a 'most significant' error in the relevant literature (Collins & Mees, 1993, 2003; Van den Doel, 2006). The students realise /θ/ incorrectly in 45.6% of its occurrences and /ð/ incorrectly in 69.3% of its occurrences.

Confusion between /æ/ and /e/ accounts for 37.7% of errors in the total number of realisations of /æ/ and /e/. However, while /æ/ is substituted with /e/ in 62.9% of its occurrences, /e/ is substituted with /æ/ in only 2.7% of its occurrences. The Dutch vowel /ɛ/ is located between the English vowels /æ/ and /e/ (Gussenhoven & Broeders, 1997). Dutch learners may therefore find it hard to distinguish between /æ/ and /e/ and may realise both as Dutch /ɛ/, which is thus perceptually close to both /æ/ and /e/ (Flege & Schwen Bohn, 2020). This often leads to confusion between /æ/ and /e/, and sometimes /ɛ/ (Broersma, 2005; Collins & Mees, 2003; Koster & Koet, 1993). According to Goriot, McQueen, Unsworth, Van Hout, & Broersma (2020), even very proficient Dutch learners of English appear to have difficulty with the perception of the difference between /æ/ and /e/.

The loss of contrast between /ʊ/ and /uː/ and the realisation of both as Dutch /oe/ is considered a 'most significant' error (Collins & Mees, 1993, 2003; Van den Doel, 2006). The secondary school students realise /ʊ/ as /oe/ in 56.7% of its occurrences, and realise /uː/ as /oe/ in 35.1% of its occurrences. Thus, the students obviously have great difficulty with realising /ʊ/ and /uː/ correctly. Another 'most significant' error occurs when /ʌ/ is confused with /ɒ/ (Van

den Doel, 2006). The secondary school students realise /ʌ/ as /ɒ/ in 22.7% of expected occurrences of /ʌ/, although the substitution of /ɒ/ with /ʌ/ accounts for a mere 1.9% of total occurrences of /ɒ/. Additionally, the substitution of /ə/ with the vowel used to represent the sound in spelling is considered a 'most significant' error as well (Collins & Mees, 1993). 13.7% of realisations of /ə/ are incorrect, and at least 98.4% of those could be attributed to confusion because of spelling. These four errors comprise the list of 'most significant' errors observed in the data. Teaching learners of English to be aware of the significance of these errors and helping them to improve their pronunciation with regard to these errors may significantly improve their pronunciation and the intelligibility of their speech (Collins & Mees, 1993, 2003; Van den Doel, 2006).

4.3.2 Significant errors

According to Collins and Mees (1993, 2003), the substitution of /ɜː/ with Dutch /ʏː/ is a 'significant' error. The substitution of /ɜː/ with /ʏː/ occurs in 7.1% of the occurrences of /ɜː/. However, the substitution of /ɜː/ with Dutch /ʏ/ accounts for 18.2% of the realisations of /ɜː/. The difficulty Dutch learners often experience with the complexity of English vowel duration may have caused the expected and impactful incorrect realisation of /ʏː/ to sound like /ʏ/ (Collins & Mees, 2003).

Another 'significant' error is the incorrect realisation of /ʌ/ as Dutch /ʏ/, which accounts for 47.4% of realisations of /ʌ/. The substitution of /ʌ/ with /ɑ/ only accounts for 1.4% of realisations of /ʌ/. The substitution of /ɒ/ with Dutch /ɔ/ is also considered a 'significant' error. This substitution accounts for 5% of occurrences of /ɒ/.

These errors have been observed in the data and are errors that are considered 'significant'. Helping learners to correct these errors might be less impactful on the quality of their pronunciation than correcting the 'most significant' errors based on to the error hierarchies developed by Collins and Mees (1993, 2003) and Van den Doel (2006), but correcting these 'significant' errors may still improve the overall quality of learners' pronunciation.

4.3.3 Conclusion

Errors that occur relatively frequently in the data generally appear to be errors that are considered to be the most impactful errors, i.e. the 'most significant' and 'significant' errors, according to the error hierarchies established by Collins and Mees (1993, 2003) and Van den Doel (2006). The secondary school students seem to confuse fortis and lenis consonants frequently, possibly as a result of Dutch interference and/or assimilation. Furthermore, the mispronunciation of /θ/ and /ð/, the substitution of /æ/ with /e/, and the use of /oe/ for both /ʊ/ and /uː/ occur frequently as well. The vowel sound /ʌ/ is the most frequently mispronounced vowel sound in the data. Phoneme substitutions attributed to either the category of 'most significant' errors or the category of 'significant' errors account for 71.6% of expected occurrences of /ʌ/. Additionally, virtually all errors made by the students in the realisation of /ə/ could be attributed to confusion caused by spelling, which is considered a 'most significant' error for /ə/. The remaining 'significant errors', the substitution of /ɜː/ with Dutch /ʏː/ and the substitution of /ɒ/ with Dutch /ɔ/, only account for 7.1% and 5% of occurrences of /ɜː/ and /ɒ/ respectively. However, if the realisation of /ɜː/ as Dutch /ʏ/ is included, the confusion of /ɜː/ with Dutch /ʏ(ː)/ occurs in 25.3% of realisations of /ɜː/, which is relatively often.

Since the most frequently observed errors appear to be the ones that are considered 'most significant', correcting these might significantly improve the overall quality of Dutch L2 learners' English pronunciation. If learners are explicitly made aware of the fortis/lenis contrast and its importance in English, this may help them to perceive and produce these consonant sounds correctly in all positions. Furthermore, explicit awareness of the contrast between /æ/, /e/ and Dutch /ɛ/ and the contrast between /ʊ/, /uː/ and Dutch /oe/ may also increase students' ability to distinguish between these sounds and to produce them correctly. This of course also applies to the perception and production of the English vowel sounds /ʌ/, /ɒ/ and /ə/.

4.4 Implications

The results of this research show that in general, these secondary school students seem to make the same mistakes as adult Dutch learners do according to the relevant literature. A very common and persistent error made by Dutch learners of English is the substitution of word-final lenis consonants with their fortis counterparts (Collins & Mees, 2003). The secondary school students frequently made this type of error. Furthermore, the loss of contrast between /v/ and /f/ in all contexts, a common error according to the relevant literature, is a mistake which is also made by the secondary school students (Broersma, 2010; Collins & Mees, 2003; Van

den Doel, 2006). English vowel duration, which has been observed to be difficult for Dutch learners of English, seems to have caused some problems for the secondary school students as well (Collins & Mees, 2003; Van den Doel, 2006). Consequently, the answer to research question 1; "How do the pronunciation errors found in the data of the Dutch secondary school students compare to pronunciation errors commonly made by adult Dutch learners of English?", is that, in general, the Dutch secondary school students tend to make the same pronunciation errors as adult Dutch learners of English do, and errors frequently made by adult learners are generally also frequently made by the secondary school students.

In addition to the expected difficulty with the contrast between fortis and lenis consonants and English vowel duration, assimilation may have caused several errors observed in the data as well. The realisations of /t/ and /k/ as /d/ and /g/ respectively could be attributed to assimilation processes across word boundaries. These substitutions frequently occur between vowels or between a vowel and a lenis consonant (Van den Doel, 2006). The deletion of word-final /t/ may be explained by the interference of Dutch assimilation processes as well, since word-final /t/ is often deleted in word-final consonant clusters in Dutch, and may be caused by assimilation to adjacent consonants across syllable and word boundaries (Gussenhoven & Broeders, 1997; Neri et al., 2006). Since Dutch learners of English often substitute final /d/ with /t/, the deletion of final /d/ could also be a result of this Dutch assimilation pattern. Regressive assimilation and degemination have been observed in the data as well. Degemination is a common assimilation process in Dutch, but in English it is considered to be a significant error when it is applied to sequences of plosives (Collins & Mees, 2003; Gussenhoven & Jacobs, 2011; Van den Doel, 2006).

Furthermore, as could be expected, the secondary school students appear to have difficulty with English phonemes which do not occur in the Dutch phoneme inventory. Since English sounds that are not part of the Dutch phoneme inventory are often perceptually linked to, and thus mapped onto, existing categories of Dutch sounds, the secondary school students frequently replace English sounds with Dutch sounds that are perceptually similar (Flege & Schwen Bohn, 2020). Consequently, English vowel sounds that do not occur in the Dutch vowel inventory have often been replaced by a Dutch vowel sound perceptually close to the correct English vowel sound, such as /æ/ (often realised as Dutch /ɛ/), /e/ (sometimes realised as Dutch /ɛ/), and /ʊ/ and /u(:)/ (persistently realised as Dutch /oe/) (Collins & Mees, 2003; Cucchiarini et al., 2011; Schmid et al, 2014).

Spelling appears to have caused several errors made by the Dutch secondary school students. The substitution of intervocalic /z/ with /s/, the confusion between /θ/ and /ð/, and the pronunciation of silent consonants (such as /w/ in *wrote*) might be attributed to confusion due to spelling where consonants are concerned (Collins and Mees, 2003). Additionally, several vowels appear to have been substituted by a vowel sound commonly represented by the grapheme represented in spelling. The secondary school students frequently produced Dutch /ʏ/ or /y/ when the vowel sound was represented by **u**, /ɒ/ or Dutch /ɔ/ when the vowel sound was represented by **o**, and /iːɑ/ or /iːa/ when the sound was represented by **ea**. Furthermore, the students frequently replaced /ə/ with the vowel sound commonly used for the grapheme with which it was spelled (e.g. **e** as /e/, or **a** as /a/) (Collins & Mees, 2003; Cucchiarini et al., 2011).

Some errors may have been caused by confusion with similar words, such as the elision of /b/ in *number* as a possible result of Dutch *nummer*, and the realisation of *under* as Dutch *onder*. Some students might have confused the English words *breathe* and *breath*, resulting in word-final /θ/ instead of /ð/. Furthermore, some students pronounced the names *Arthur* and *Susan*, which both occur in Dutch as well, with /y/. These mistakes may therefore be the result of Dutch interference.

Thus, several possible explanations for the pronunciation errors made by the secondary school students have been found. Research question 2; "What are possible explanations for the pronunciation errors found in the data of the Dutch secondary school children?", therefore requires a more elaborate answer. First and foremost, many pronunciation errors could be explained by loss of contrast between fortis and lenis consonants, and difficulty with vowel duration in English appears to have caused problems as well. Both are commonly observed errors for Dutch learners of English (Collins & Mees, 1993, 2003; Cucchiarini et al., 2011; Van den Doel, 2006). Additionally, assimilation across syllable and word boundaries as well as interference of Dutch assimilation patterns may explain some of the pronunciation errors made by the students. Furthermore, English phonemes that do not occur in the Dutch phoneme inventory appear to be relatively problematic and seem to have caused many errors as well. These English phonemes have frequently been replaced by Dutch phonemes which are perceptually similar, since these L2 phonemes are frequently placed in the same phonetic category as Dutch sounds which are perceptually close (Flege & Schwen Bohn, 2020). As a result, the students may not be able to discern between the English phonemes and the Dutch phonemes to which they are perceptually linked, and the students may therefore have produced Dutch phonemes instead of the intended English ones. Some pronunciation errors appear to have been caused by confusion due to spelling; the students sometimes mistakenly pronounced

the sound by which the grapheme is commonly represented, which is not necessarily the correct pronunciation in English. Students also sometimes seem to have mispronounced words as a result of confusion with their Dutch counterparts, which in these cases are spelled similarly.

Consequently, most errors made by the secondary school students are in line with the relevant literature and could therefore have been expected. Some errors that have been observed in the data but which have not been mentioned by the relevant literature might be 'random' errors, errors that occur due to chance, since they are often outliers in the data as well. Most errors appear to have been caused by assimilation, confusion because of spelling, and the loss of contrast between, or confusion of, phonemes. Phonemes have often been substituted by sounds commonly used for the grapheme represented in the spelling or by Dutch sounds which are perceptually close. Some words appear to have been confused with words that are spelled similarly, or with Dutch counterparts. Furthermore, interference of Dutch assimilation patterns and Dutch sounds has been observed in the data. Generally, the errors that have been observed most frequently are also the errors that are considered 'most significant' according to the error hierarchies which have been studied for this research (Collins & Mees, 1993, 2003; Van den Doel, 2006).

The results of this data provide insight into the specific errors made by secondary school students, as well as some common causes for pronunciation errors. This knowledge could be used to improve teachers' awareness of common errors and common causes of errors, such as assimilation and spelling, which might help them to recognise and pay extra attention to particular impactful pronunciation errors. As a result, the pronunciation skills of secondary school students could be greatly improved. This may lead to a more positive attitude towards the learners from both native speakers and non-native speakers, and an increase in confidence in their own pronunciation and L2 communicational skills.

Specific knowledge about common and impactful errors may also be used for the development of ASR-based CAPT systems. Such pronunciation training systems could even be developed to focus on either RP or GA, since the pronunciation models for these two variants differ. Furthermore, the secondary school students observed for this data leaned towards the GA English model, but do appear to be inconsistent in their pronunciation of RP or GA. If pronunciation training software could be developed to focus on either RP or GA, it might help learners to be more consistent in their pronunciation. In addition, CAPT systems may provide Dutch learners of English with an accessible and private learning environment to improve their pronunciation (Cucchiarini & Strik, 2018; Cucchiarini et al., 2011). The opportunity for such extensive practice and immediate, personalised, and detailed feedback would be virtually

impossible in a language learning classroom (Cucchiarini & Strik, 2018; Cucchiarini et al., 2009; Cucchiarini et al., 2011; Neri et al., 2006). Including an ASR-based CAPT system in Dutch secondary education could prove a very valuable resource for Dutch secondary school students.

4.5 Limitations and further research

There are some limitations to this research. Firstly, the data for this study has been collected from secondary school students of one particular school in Nijmegen, the Netherlands. The number of the students is limited, as is the number of sentences used for this research. For such a research on a larger scale, more data could be collected from various secondary schools from different cities and areas of the Netherlands. Consequently, the mistakes made by the secondary school students from Nijmegen could be compared with mistakes made by secondary school students from different schools and from cities. Furthermore, more sounds and sound combinations could be included in the research, and additional aspects such as aspiration, vowel duration, schwa-epenthesis, pharyngealised /l/ and uvular /r/ could be investigated. This way, a more complete picture of pronunciation errors frequently made by Dutch secondary school students in English could be constructed.

Secondly, the audio data has been transcribed by one researcher only. Employing multiple researchers to transcribe the audio recordings of students to IPA may ensure that as few mistakes as possible are made, and reliability could be determined and ensured by comparing the transcriptions of the multiple transcribers. Furthermore, the transcriber is a native speaker of Dutch who started learning English at around 9 years old, and is therefore a sequential bilingualist. The transcriber is a graduate of the BA English Language and Culture programme at the Radboud University, a programme unique in its expectation that its graduates achieve near-native pronunciation specifically in RP or GA English (Koet, 2007; Radboud Universiteit, 2019). However, since the transcriber is thus not a native speaker of English and is accustomed to hearing Dutch and Dutch-accented English, their judgment of the pronunciation of the secondary school students may not be 100% accurate, although it should be fairly close. Further research may employ transcribers who are either monolingual native speakers of English or sequential bilingualists, to avoid any such influence of Dutch. Sequential bilingualists may be accustomed to Dutch and Dutch-accented English, but the advantage of employing bilingual transcribers may be that they would also be able to recognise the sounds of Dutch, whereas this part of the transcriptions may be problematic for monolingual native speakers.

Thirdly, a qualitative analysis has been conducted for this research. Further research may employ a quantitative method to compare the results with results from qualitative analyses conducted by transcribers, to investigate whether qualitative and quantitative analyses generate similar results.

Lastly, various errors made by the Dutch secondary school students could not be found in the relevant literature. Possible explanations for some of these errors could be given, but some errors could not be explained. One concern of this research is the lack of explanation for these errors, and the impossibility to determine whether these errors have a specific cause at all or whether they might be ‘random’ and inexplicable. Research conducted on a larger scale may provide answers to this question. The threshold of 5% according to which sounds have or have not been discussed has been arbitrarily determined, since no accepted error percentage could be derived from the relevant literature or from information about the Dutch secondary school system and its core subjects. This threshold allows for some incidental mistakes, but is low enough for as many relevant an common errors as possible to be included. Further research on a larger scale might be able to determine a threshold which is more accurate in allowing for incidental errors but including errors that are common or fall into a pattern.

5. Conclusion

This research has investigated the pronunciation errors made by Dutch secondary school students in English. Audio recordings of speech samples from the secondary school students were analysed, transcribed into IPA and compared to errors commonly made by adult Dutch learners of English according to previous research. The results showed that common mistakes made by adult Dutch learners of English were also frequently made by the secondary school students. English sounds that are not part of the Dutch phonetic system seem to be most problematic, possibly because learners may map these unfamiliar sounds onto Dutch sounds which are perceptually close. The majority of errors could be attributed to assimilation and/or Dutch interference, or confusion because of spelling. Furthermore, some errors that have been found in the data were not mentioned by the relevant literature as errors commonly made by Dutch learners of English, such as the substitution of /ʊ/ with Dutch /ʏ/ and /y/ and the deletion of word-final /d/. While some of these may have been 'random' errors, others may also be explained by assimilation, interference or spelling. Knowledge about what secondary school students find difficult and possible common causes for the pronunciation errors they make, as well as which errors are considered to be very impactful and which are not, may help students and their teachers to improve students' English pronunciation. Pronunciation training software based on ASR could also be a valuable and effective tool to help students improve their English pronunciation. As a result, students' overall intelligibility and the attitude of native as well as non-native speakers of English towards them may be improved.

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Appendix A – Corpus data and CPA transcriptions

S01: Would you like water or wine?

	Would	you	like	water	or	wine?
RP	wʊd	juː/ju	laɪk	ˈwɔːtə(r)	ɔː(r)	waɪn
GA	wʊd	juː/ju/jə	laɪk	ˈwɔːɾ(d)ər/ˈwɑːɾ(d)ər/ˈwɒɾ(d)ər	ɔːr/ər	waɪn

S02: Look, Arthur lives at number thirty.

	Look	Arthur	lives	at	number	thirty
RP	ˈlʊk	ˈɑːrθə, ˈɑːθə	lɪvz	ət (or strong æt)	ˈnʌmbə(r)	ˈθɜː(r)ti
GA	ˈlʊk	ˈɑːrθər	lɪvz	ət (or strong æt)	ˈnʌmbər	ˈθɜːrdi

S03: Putting a cat in bed is a bad idea.

	Putting	a	cat	in	bed	is	a	bad	idea
RP	ˈpʊtɪŋ	ə	kæt	ɪn	bed	z/ɪz	ə	bæd	aɪˈdɪə
GA	ˈpʊtɪŋ/ˈpʊdɪŋ	ə	kæt	ɪn	bed	z/ɪz	ə	bæd	aɪˈdiːə

S04: They’re going to shoot a rocket to the moon.

	They're	going	to	shoot	a	rocket	to	the	moon
RP	ðeə(r)	gəʊɪŋ	tu	ʃuːt	ə	ˈrɒkɪt/ˈrɒkət	tu	ðə	muːn
GA	ðer	goʊɪŋ	tə	ʃuːt	ə	ˈrɒkɪt/ˈrɑːkɪt/ˈrɒkət/ ˈrɑːkət	tə	ðə	muːn

S05: Their father wrote a book for his children.

	Their	father	wrote	a	book	for	his	children
RP	ðeə(r)	ˈfɑːðə(r)	rəʊt	ə	bʊk	fə(r)/fɔː(r) but linking [r]	ɪz/hɪz	ˈʧɪldrən
GA	ðer	ˈfɑːðər	roʊt	ə	bʊk	fər/fɔːr	ɪz/hɪz	ˈʧɪldrən

S06: Is that jam or oil on your skirt?

	Is	that	jam	or	oil	on	your	skirt?
RP	ɪz	ðæt	ʤæm	ɔː(r)	ɔɪl	ɒn	jə(r)/jɔː(r)	skɜː(r)t
GA	ɪz	ðæt	ʤæm	ɔːr	ɔɪl	ɑːn/ɔːn	jər/jʊr	skɜːrt

S07: Susan is a girl who likes to sing jazz.

	Susan	is	a	girl	who	likes	to	sing	jazz
RP	ˈsuːzən	ɪz/z	ə	gɜː(r)l	huː	laɪks	tu	sɪŋ	dʒæz
GA	ˈsuːzən	ɪz/z	ə	gɜːrl	huː	laɪks	tə	sɪŋ	dʒæz

S08: Are you sure these people are poor?

	Are	you	sure	these	people	are	poor?
RP	ə(r)/ɑː(r)	juː/ju	ʃʊə(r)/ʃɔː(r)	ðiːz	ˈpiːpəl	ə(r)/ɑː(r)	pʊə(r)/pɔː(r)
GA	ər/ɑːr	juː/ju/jə	ʃʊr	ðiːz	ˈpiːpəl	ər/ɑːr	pʊr/pɔːr

S09: Two ships passed under the bridge.

	Two	ships	passed	under	the	bridge
RP	tuː	ʃɪps	pɑːst	ˈʌndə(r)	ðə	brɪdʒ
GA	tuː	ʃɪps	pæst	ˈʌndər	ðə	brɪdʒ

S10: There is so much water in the bath, I can’t breathe!

	There	is	so	much	water	in	the	bath,	I	can't	breathe!
RP	ðeə(r), ðə	ɪz	səʊ	mʌtʃ	ˈwɔːtə(r)	ɪn	ðə	bɑːθ	aɪ	kɑːnt	briːð
GA	ðər, ðer	ɪz	soʊ	mʌtʃ	ˈwɔːɾ(d)ər/ ˈwɑːɾ(d)ər/ ˈwɒɾ(d)ər	ɪn	ðə	bæθ	aɪ	kænt	briːð

S11: She’s got blonde hair

	She's	got	blonde	hair
RP	ʃiz	gɒt	blɒnd	heə
GA	ʃiz	gɑːt	blɑːnd	her

S12: The boy found some interesting books in the library.

	The	boy	found	some	interesting	books	in	the	library
RP	ðə	bɔɪ	faʊnd	səm/sʌm	ˈɪntrəstɪŋ	bʊks	ɪn	ðə	ˈlaɪbrəri
GA	ðə	bɔɪ	faʊnd	səm/sʌm	ˈɪntrəstɪŋ	bʊks	ɪn	ðə	ˈlaɪbreri

S13: Spring is my favourite time of year.

	Spring	is	my	favourite	time	of	year
RP	sprɪŋ	ɪz	maɪ	ˈfeɪv(ə)rɪt	taɪm	əv, ɒv	jɪə(r), jɜː(r)
GA	sprɪŋ	ɪz	maɪ	ˈfeɪv(ə)rət	taɪm	əv, ʌv	jir

Appendix B – Computer Phonetic Alphabet

Appendix B1 – The sounds of English

A Computer Phonetic Alphabet (CPA) has been used to transcribe the sounds observed in the studied material. The English sounds have been transcribed as follows:

Vowel sounds	Example	Consonant sounds	Example
/ʌ/	under	/b/	bank
/ɑ:/	dance	/d/	dinner
/æ/	cat	/f/	finger
/e/	set	/g/	goal
/ə/	away	/h/	house
/ɜ:/	bird	/j/	year
/ɪ/	wit	/k/	kind
/i:/	meet	/l/	lesson
/ɒ/	rocket/	/m/	mine
/ɔ:/	shore	/n/	neck
/ʊ/	bull	/ŋ/	king
/u:/	moon	/p/	map
/u/	blue	/r/	rain
/aɪ/	ice	/s/	stop
/aʊ/	mountain	/ʃ/	wish
/eɪ/	may	/t/	paint
/oʊ/	home (GA)	/tʃ/	child
/əʊ/	home (RP)	/θ/	thick
/ɔɪ/	boy	/ð/	this
/eə/	there (RP)	/v/	van
/ɪə/	fear (RP)	/w/	wink
/ʊə/	poor (RP)	/z/	amazing
		/ʒ/	conclusion
		/dʒ/	jazz
		/d/ (also represented by /ɾ/ in IPA)	water (GA)

Appendix B2 – The sounds of Dutch

Dutch sounds that differ from English sounds have been transcribed as follows:

Vowel sounds	Example	Vowel sounds	Example
/ɑ/	m<u>a</u>g	/oe/ (usually represented by /u/ in IPA, but /u/ is used to indicate an English vowel sound)	m<u>oe</u>d
/a/	aul<u>a</u>	/aːɪ/ (usually represented by /aɪ/ in IPA, but /aɪ/ is used to indicate an English vowel sound)	s<u>aai</u>
/aː/	l<u>aa</u>t	/eː/ (usually represented by /e/ in IPA, but /e/ is used to indicate an English vowel sound)	m<u>e</u>ter
/ɛ/	v<u>e</u>t	/ɪː/	v<u>ee</u>r
/ɔ/	m<u>o</u>t	/ø/	k<u>eu</u>s
/o/	b<u>oo</u>t	/ɛɪ/	<u>ij</u>zer
/ʏ/	m<u>u</u>g	/eʊ/	m<u>eeuw</u>
/ʏ/	v<u>uu</u>r	/iʊ/	n<u>ieuw</u>
/ʏː/	d<u>eur</u>	/yʊ/	d<u>uw</u>
/oːɪ/	m<u>ooi</u>	/œy/	<u>ui</u>l
/oɪ/	b<u>oi</u>ler	/ɛː/	s<u>e</u>rre

Consonant sounds	Example
/ʋ/	ge<u>w</u>oon
/ɣ/ (voiceless, common in accents in the south of the Netherlands)	to<u>ch</u>
/χ/ (voiced, common in accents in other parts of the Netherlands)	to<u>ch</u>
/ɕ/	<u>sj</u>aal
/ʒ/	mana<u>g</u>er