Backward transfer of English intonation in L1 Dutch:
Music to my ears

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Abstract

The transfer of linguistic features has mostly been researched from an L1 to an L2. This research investigates the backward transfer of intonation patterns from L2 English to L1 Dutch. Two experiments were set up to investigate the influence L2 English intonation has on the production of L1 Dutch intonation patterns of students of English. Participants were gathered from the English Bachelor program of the Radboud University in Nijmegen. Experiment 1 consisted of a longitudinal study in which participants had to read a Dutch and English text in the first and third year of their studies. The main observation from experiment 1 was that the pitch range was larger in the third year of the participants’ studies. Experiment 2 used three dialogues in which Dutch and English were alternated between characters. These two experiments showed that the participants had acquired the English intonation structure and patterns in their native language. These patterns deviated from the Dutch norm as they had three intonation levels instead of two which is normally used in Dutch. A larger pitch range was also identified when three intonation levels were used. These findings show that backward transfer of intonation is possible even when the native language is still positively reinforced.

Keywords: backward transfer, F0, pitch range, intonation
1.0 Introduction

The conductor Benjamin Zander argued that “the music of language” conveys more information than people are generally aware of (TED2008, 2008). The music of language is a reference to the way people use their ability to apply intonation patterns in order to express themselves in various ways. Benjamin Zander illustrated this by giving an example of a son who is phoned by his mother. The son is not only able to immediately identify the other person as his mother but is also able to determine his mother’s mood on an instant. This anecdote portrays how the qualities of the voice can produce many layers of meaning. This idea is in accordance with Wang (2014) who states that language reflects the mind and intonation is a large part of that reflection. The transfer of information in intonation is only practical and efficient when both interlocutors use the same framework of intonation. Differing frameworks can lead to miscommunication as intonation patterns can be interpreted differently by various interlocutors. This research will deal with different intonation patterns in languages and how these can be influenced across languages.

This notion of cross linguistic influence of intonation can also be observed in music. The comparison between intonation and music has often been made and can show support for the idea that someone’s background can influence their intonation (Royen, 1952; Jones, 1972). As every healthy person has access to the same instrument, namely the speech organs, the very act of speaking is to produce music (THNK - School of Creative Leadership, 2014). It appears that music is distinguishable based on the melody and that a musician’s background influence on produced music. Examples of distinguishable pieces are some of the compositions of the English composer Edward Elgar in which English musical melodies can be found (Boston Philharmonic, May 2015). Hall (1953) has even observed linguistic intonation patterns of English in Elgar’s music. This is of interest as musicians from different cultural backgrounds play Elgar, and music of other composers, differently. Well-known interpreters of Elgar’s cello concertos, like Pablo Casals and Paul Tortelier, are from a Latin perspective which is noticeable in the way these musicians play the pieces (Boston Philharmonic (3), 2015). This is, for instance, different from Jacqueline du Pré who performed the concertos from a more traditional English perspective. Every note of Elgar’s cello concerto is played by these performers but are expressed with subtle differences. The similarity of the influence linguistic background can have on melody and musical intonation shows a parallel between music and linguistics and shows support for the subtle way intonation may influence language.

Intonation has been established as a linguistic universal (Hirst and Di Cristo, 1998). While every language in the world displays some form of intonation, it is not used in the same way in every language. There are tone languages like Mandarin and Vietnamese in which pitch height is used to differentiate between semantic constituents (Ladefoged, 2001). These constituents can have the same typology but are expressed at different pitch heights making them distinguishable from each other. This means that two identical syllables in terms of structure and phonemes may carry differing lexical meaning due to varying pitch heights. Other languages like English and Dutch use pitch changes to signify a change in the meaning of a group of words rather the meaning of individual words (Eady, 1982; Ladefoged, 2001). The production of intonation is one of the first linguistic features that babies seem to acquire (Matisoff, 2001; Hirst and Di Cristo, 1998). Babies and young children play with intonation in various ways. This is well illustrated in a well-known video of two twin babies
The video shows the babies playing with each other by imitating intonation patterns they have picked up. The babies try to imitate the complex vocal productions and incorporate these patterns in their vocal repertoire. Babies of ten months old and older also seem to spend most of their time vocalising themselves without feedback from others (Menn and Stoel-Gammon, 2005). This imitation process was crucial for the evolution of language (Fitch, 2010). The important role of intonation in language is evident.

The intonation patterns of all languages are unique and these patterns influence each other across languages. It has been well established that the acquisition of a second language (L2) is influenced by previously acquired linguistic knowledge of the first (L1) (White et al., 2004; Foley and Flynn, 2013). Learners of a second language employ, for example, the word order or structure, information system, word choice, phonology, and some form of intonation of their first language. It is for this reason that second language learners are easy to spot due to the deviating forms across the linguistic domains in terms of the target native speaker norm (Willems, 1982). Second language learners are even distinguishable from a native norm when they produce syntactically and semantically perfect native utterances based on their deviating realisations of phonemes and intonation. It is possible to identify the linguistic backgrounds of non-native speakers as a result.

Research into the transfer of intonation is needed for several reasons. Research into L2 intonation effects on the L1 could reveal the relationship two languages have with each other. The identification or absence of an effect between two languages might be inaccurate if there is an effect of the L2 on the L1. These misinterpreted observations might exist if the influence of the L2 on the L1 is not considered. In addition, this research may contribute to the identification of possible language change. L1 intonation norms may change if a large enough part of a native culture is influenced by an L2. These changes can also provide insight into foreign cultural characteristics and their incorporation in to the native country. Another significant argument for research into intonation comes from the need to improve security measures using voice recognition software (Simmons, 2017). The Hongkong and Shanghai Banking Corporation (HSBC) uses voice recognition software so its customers have to say the phrase my voice is my password and the system will grant them access if the utterance is identified. The voice recognition system checks over a hundred behavioural and physical vocal traits including the way emphasis is given to words (HSBC, 2017). Access to bank accounts may be restricted when a person’s native intonation has been influenced. Research into the influence an L2 can have on L1 intonation can improve these voice recognition systems.

This master thesis builds on the work of Lafleur (2015). This 2015 research explored the idea that bilinguals switch register when they switch between English and Dutch. This idea produced the hypothesis that languages have different values for the mean pitch and the pitch range. It was thought that this supposed difference between languages becomes measurable when a bilingual has a near native proficiency in the L2. The near native proficiency would have led to native like articulation of the L2 and naturally the L1 as well. The mean pitch, the pitch range, and the change of pitch per second were looked at in two participant groups. One participant group consisted of first year students of English and another group of third year students. It was expected that the third year student group would have had acquired the near native proficiency in English as this was a goal of the English program these students were enrolled in. The results of Lafleur (2015) suggest that there was a difference between the first
and third year student groups in terms of the mean pitch. The third year student group had a mean pitch which was twenty Hertz (Hz) higher than that of the first year group. The difference in mean pitch was hypothesised to originate from a wider pitch range. The conclusion of Lafleur (2015) was that the third year group had acquired a wider pitch range in Dutch as well as English. The wider pitch range developed through the influence of the intonation of English.

This present explorative research looks at backward transfer of English intonation pattern into Dutch native speech of proficient Dutch learners of English. It has been set up to investigate the subtle influence a second language may have on a first. The goal of this research is to investigate whether or not native Dutch speech appears to be influenced by and implemented with intonation patterns of English. It is hypothesised that the intonation of English is transferred to that of native Dutch when the length of exposure to and the L2 proficiency of English increases. This hypothesis will be operationalised with two experiments. The first experiment of this thesis is longitudinal and tries to explore the influence of English intonation and English proficiency on native Dutch speech. Experiment 1 utilises speech recordings made on two separate recording sessions which are two years apart. The first recording session was made for Lafleur (2015) and this will be used for this study as well. The second recording moment uses the same text materials and participants as Lafleur (2015). These recordings are compared and contrasted quantitatively for the mean pitch, the pitch range, and the change of pitch per second. Experiment 2 continues onward with the observations made in experiment 1. Experiment 2 explores the existence of non-native English intonation patterns and structures in Dutch with three analyses. These three analyses consist of a qualitative analysis into intonation level structures, a quantitative analysis of the pitch range, and another qualitative analysis using the ToBI model. The recordings used for the second experiment make use of three dialogues in which Dutch and English is alternated in order to elicit English intonation patterns.

The thesis is structured as follows. Section 2 presents some theoretical considerations for this research. Sections 3 and 4 present experiment 1 and 2, respectively. Included in these two sections are the methodology, the results, the discussion, and a summary of each experiment. Section 5 presents a general discussion and section 6 will conclude this thesis.
2.0 Background section

This section presents some theoretical considerations relevant for this research. Section 2.1 presents the idea of bidirectional transfer. Section 2.2 discusses matters on intonation while section 2.3 considers the implications of speech act theory in this research. Section 2.4 presents models that have been used to analyse intonation and evaluates the adaptability of them for this research. Section 2.5 presents differences between English and Dutch in terms of intonation patterns. Finally, section 2.6 discusses methodological issues concerning the measurement of pitch.

2.1 Bidirectional transfer in intonation

Acquired languages influence each other bidirectionally. Acquiring a new language is affected by other previously acquired ones. It was previously assumed that a bilingual speaker consists of two separate monolinguals in one (Weinreich, 1953). This idea has since been rejected as it was stated that languages are not isolated from each other and are able to influence one another (Grosjean, 1989; Grosjean, 1992; Grosjean, 1998). This hypothesis has found support in later research (Desmet and Duck, 2007; Pavlenko, 2014). This has led to further experiments investigating the effects of previously acquired linguistic knowledge on the later acquisition of another language (Kroll and Bialystok, 2013). Transfer from the first language to a second has been researched as early as 1969 by Selinker, but research on the bidirectional nature of transfer did not take off until 1990 (Kroll and Bialystok, 2013). The bidirectional relationship between the first and a second language has since then been well established and distinct forms of language transfer have been established for combinations of specific languages. Most research has focussed on the effect an L1 has on an L2, termed forward transfer, and less so on the effect a second language has on the first, termed backward transfer (Cook, 2003; Kartushina, Frauenfelder and Golestani, 2016). Although the impact on an L2 is more evident as an L1 is not as easily influenced due to its robustness (Odlin, 1989), evidence of backward transfer has been growing. To illustrate the research areas of backward transfer, Kartushina, Frauenfelder and Golestani (2016) give the following overview of some of the fields of research established in backward transfer: phonetic perception (More and Nadeau, 2012), phonetic duration (Chang, 2012; Major, 1992), the lexicon (Thomason, 2001), lexical and semantic access (Baus, Costa and Carreiras, 2013; Lu, 2011; Bice and Kroll, 2015), morphosyntax (Wierzbicka, 1992), syntax (Wang, 2014), and intonation (Andrews, 1999). The backward transfer of intonation is not as much researched as other linguistic areas which leaves an academic gap open for research.

It was noted in Visson (1989) that L1 intonation is particularly instable in a contact situation where the L1 does not have the constant reinforcement needed in order to maintain native patterns in a new environment. The intonation structure and patterns of individuals are influenced by the context they are exposed to daily (Andrews, 1999; McMahon, 2004; Best and Tyler, 2007). Andrews (1999) tried to find evidence for Visson’s hypothesis by investigating the intonation patterns of Russian emigrants in America. Data was collected from interviews with male and female Russian emigrants either born in the then Soviet Union who have moved to America during their childhood and second generation emigrants who were born in America to Russian speaking families. Andrews (1999) found that the intonation of the first as well as of the second generation emigrants moved towards that of American English. It was then hypothesized that this resulted in a new Russian-English dialect similar to English and American dialects. This shows backward transfer of intonation as the L1 of the emigrants had shifted towards that of an L2.
The research conducted by Andrews (1999) focussed on an immersed contact situation whilst this present research is more interested in the subtler influences a foreign language may have on an L1. The focus of this research is not on foreign speakers in a non-native country but on native speakers in their own native country. These speakers are still immersed in their own native language but are also partially immersed in a second language. This is a less strong contact situation that the one discussed in Andrews (1999) because the L1 still has enough reinforcement to maintain native intonation patterns. The L1 can still be influenced by an L2 in this context if there is enough exposure to the L2 at hand.

2.2 Intonation

Intonation, or pitch contours, involves the structured rising and falling of the fundamental frequency ($F_0$) of the voice (Gussenhoven, 2004; Wells, 2006). Not all patterns have been identified even though intonation patterns have been extensively mapped and analysed in depth. The reason for this is the considerable range of possible intonation patterns that exist which are accessible to speakers in specific languages. The intonation patterns of different languages can also differ immensely even when they are closely related. Regional variations or dialects of the same language can vary too in terms of intonation (Hirst and Di Cristo, 1998; Fletcher, Grabe and Warren, 2005; Hanssen, 2017). Differences also exist between speakers of the same variation of the same language. These differences are due to the application of intonation patterns available and not all speakers utilise the full range of intonation patterns.

Research into intonation can encompass three dimensions: the production of the acoustic signal, the perception of the acoustic signal, and the acoustic signal itself (Couper-Kuhlen, 1986; Segalowitz, 2010). The main difference between these three dimensions is that the production and perception of the acoustic signal are prone to the subjectivity of the people judging them. Analysing the production of the acoustic signal without actually looking at it is dependent on the ability of researchers to judge intonation patterns. The third dimension, the actual acoustic signal, is able to be objectively measured using recording devices and computer programs such as Praat (Boersma, 1993; Boersma, 2001, Boersma and van Heuven, 2003; Boersma and Weenink, 2017). The research in this thesis investigates the production of intonation using the dimension of the acoustic signal as it can be objectively measured. The acoustic signal is also analysed qualitatively in terms of pitch movements, but the qualitative analysis is supported by quantitative analyses.

The structured nature of intonation in language leads to the distinguishability of languages, along with other features of prosody (Ohala and Gilbert, 1981; Willems, 1982; Maidment, 1983; Barkat, Ohala and Pellegrino, 1999; Peters et al., 2003; Vicenik and Sundara, 2013). A pilot study, presented in Willems (1982), dealt specifically with the discrimination of English and Dutch by Dutch and English native speakers. The participants were presented with recordings of Dutch and near-native English sentences and the participants had to judge whether the speaker in the recording was speaking in the participant’s native language. The results of Willems (1982) show that the participants were able to judge the recordings correctly, although not perfectly. This suggests that some overlap may exist between the intonation patterns of English and Dutch that may be prone to backward transfer. The influence on the intonation patterns between English and Dutch may not be overtly, hence the influenced intonation patterns may have to be scrutinised in order to detect backward transfer.
2.3 Speech acts

Intonation conveys meaning and is used to express emotions which operate at the level of speech acts rather than the word level (Matras, 2009). In light of Austin (1962), it is accepted that identical surface forms may carry different meanings. The semantics of utterances may be identical but the underlying pragmatic force of the utterance may be different which can result in different intonation patterns. On an abstract level, the act of speaking is first and foremost an act (Birner, 2013). Embedded in every utterance is a speech act which explains why identical surface forms may convey different meanings. There seems to be a correlation between speech acts and intonation patterns as Liberman and Sag (1974) hypothesised that there is a one to one strong relationship between a speech act and its according intonation. This hypothesis states that a specific illocutionary force is accompanied with a specific intonation pattern that is unique for only that speech act. However, as Hirst (1998) noted, speech acts with identical wording and structure may have differing intonation patterns. In accordance with Hirst (1998), Glenn (1977) and Jones (1989) argue that identical surface forms may have differing intonation patterns. It is possible that people assign different speech acts to the same text due to the interpretation possibilities of the readers. It is therefore important for this research that speech act theory is kept in mind as it may provide a framework to fall back on when intonation patterns are analysed across different utterances.

2.4 Stress

Stress in language is realised in a few different ways and a pitch accent is one of them (Bolinger, 1958; Beckman, 1986). In order for a pitch accent to be realised, the pitch needs to depart from a reference line (Crystal, 1969). A stressed syllable may be realised with a change in \( F_0 \), along with other features such as duration and intensity (Fry, 1955). A difference in the stress systems of Dutch and English is how stress is assigned to syllables (Gussenhoven, 2014; van der Hulst, 2014). Dutch true lexically long vowels and diphthongs attract stress due to the quantitative sensitive nature of Dutch. English stress is assigned in the underlying representation and stressed syllables have long or no reduced vowels. Whether vowels are reduced or lengthened is debateable. The similarity is that both languages have longer vowels in stressed positions, but stressed vowels are longer in English than they are in Dutch (Gussenhoven and Broeders, 1997). The longer duration of a long vowel may open up the possibility of changes in pitch, especially when the phrase has focus domain (van der Hulst, 2014).
2.5 Intonation models

One of the problems phoneticians encounter is the creation of a practical system to mark intonation (Fuhrken, 1932). Languages can be analysed differently depending on their features, which can also be observed for the models used in describing Dutch and English intonation. In an attempt to unify analyses of twenty languages, Hirst and Di Cristo (1998) presented the INTSINT model (an International Transcription System for INTonation). This model represents intonation on a horizontal line. All the possible intonation contours used in the INTSINT model can be seen in Figure (1). This model was put forward as it is applicable to many languages and does not focus on just one which was preferable for the goals of Hirst and Di Cristio (1998).

![Figure 1. Possible intonation contour notations in INTSINT (Hirst and Di Cristo, 1998).](image)

The ToBI (Tone and Break Indices) model is similar to the INTSINT model as it is also presented on a horizontal line, but it is mainly used for English (Pierrehumbert, 1980; Hirst and Di Cristio, 1998; Ladd, 2008). It has been applied to Dutch as well but the patterns need less descriptions as there are fewer possible movements in Dutch (Gussenhoven, 2005). An advantage of this model is its ability to describe every single intonation pattern observed in English. The twenty-two pitch movements of English and their notation in the ToBI model are presented in Table (1).

<table>
<thead>
<tr>
<th>Movement</th>
<th>Notation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>H* L L%</td>
</tr>
<tr>
<td>Fall-rise</td>
<td>H* L H%</td>
</tr>
<tr>
<td>Stylised high rise</td>
<td>H* H L%</td>
</tr>
<tr>
<td>High rise</td>
<td>H* H H%</td>
</tr>
<tr>
<td>Low fall</td>
<td>L* L L%</td>
</tr>
<tr>
<td>Low rise (narrow pitch range)</td>
<td>L* L H%</td>
</tr>
<tr>
<td>Stylised low rise</td>
<td>L* H L%</td>
</tr>
<tr>
<td>Low rise</td>
<td>L* H H%</td>
</tr>
<tr>
<td>Rise-fall</td>
<td>L+H* L L%</td>
</tr>
<tr>
<td>Rise-fall-rise</td>
<td>L+H* L H%</td>
</tr>
<tr>
<td>Stylised high rise (with low head)</td>
<td>L+H* H L%</td>
</tr>
<tr>
<td>High rise (with low head)</td>
<td>L+H* H H%</td>
</tr>
<tr>
<td>Rise-fall (scooped)</td>
<td>L*+H L L%</td>
</tr>
<tr>
<td>Rise-fall-rise (scooped)</td>
<td>L*+H L H%</td>
</tr>
<tr>
<td>Stylised low rise</td>
<td>L*+H H L%</td>
</tr>
<tr>
<td>Low rise</td>
<td>L*+H H H%</td>
</tr>
<tr>
<td>Low fall (with high head)</td>
<td>H+L* L L%</td>
</tr>
<tr>
<td>Low rise (with high head)</td>
<td>H+L* L H%</td>
</tr>
<tr>
<td>Stylised low rise (with high head)</td>
<td>H+L* H L%</td>
</tr>
<tr>
<td>Low rise (high range)</td>
<td>H+L* H H%</td>
</tr>
<tr>
<td>Stylised fall (calling contour)</td>
<td>H*+L H L%</td>
</tr>
<tr>
<td>Fall-rise (high range)</td>
<td>H*+L H H%</td>
</tr>
</tbody>
</table>

Table 1. Twenty-two possible pitch contours presented in the ToBI model and previous descriptions of British-English intonation (Ladd, 2008).
A Dutch transcription, named ToDI, has also been created using this model which can be seen in Table (2). (Gussenhoven, 2005). A comparison of table 1 and 2 shows that there are more possible intonation patterns in English than there are in Dutch. The ToBI model will be used whenever required in the analyses of this research.

Movement:
Initial boundary tones:
- %L
- %H
- %HL

Final boundary tones:
- L%
- H%

Pitch accents:
- H*
- L*
- H*L
- L*H
- H*!H

Table 2. Possible pitch contours as described in the ToDI model (Gussenhoven, 2005).

Another model employed by Willems (1982), de Pijper (1983), and ‘t Hart (1998) is shown in Figure (2). This model focussed on the different intonation levels pitch contours may move to and from. It was thought that Dutch pitch contours travel between a high and a low intonation level (Collier and ‘t Hart, 1975). English applies a third middle intonation level (de Pijper, 1983). The extra level in English may also be the reason why there are more intonation pattern possibilities in English than there are in Dutch. The extra level opens up additional possibilities for movements as the pitch can travel to and from more intonations levels. Figure (2) also shows that intonation levels of this model may have declining slope. These declinations show how the pitch is lowered as a phrase goes on. Although it has been thought that they may add meaning to an utterance like in Danish, it appears that these are optional and do not carry any additional meaning (‘t Hart, 1998). In addition, Collier (1975) argues that declination slopes are a result of decreasing subglottal pressure so the pitch contour naturally declines as the pressure decreases. This conclusion was based on only one participant so no claim could be made about the universality of this observation.

Figure 2. Left: Example of intonation levels in English. Right: Example of intonation levels in Dutch. Examples have been taken from de Pijper (1983).

According to the model presented in Figure (2), English intonation allows for more variation in terms of pitch change than the intonation of Dutch. The pitch contour may fall from and rise to a total of three intonation levels in English. The contour may also rise from the lowest level to the highest level and vice versa, skipping the middle level. In other words, three intonation levels allow for more possible pitch movements than a two level intonation
structure. Pitch can only go either up or down in the two intonation level structure depending on the position in the structure. The pitch movements are restricted as it can only go to one other intonation levels. Pitch in a three intonation level structure has more freedom as it can always go to two intonation levels instead of one. This results in more possible pitch movements which can be seen when tables (1) and (2) are compared.

This research will employ the ToBI system with an actual pitch contour along the lines of Figure (3). The analysis using the ToBI model shows where the pitch movements are and the actual pitch contour verifies it. This analysis was chosen for two reasons. Firstly, such a technique will provide a clearer picture of the data. Secondly, the data can be readily checked by readers. The intonation contours will also be checked for the intonation levels as they open up the possibility for more various patterns.

![Example of a ToBI analysis with an actual pitch contour](image)

Edinburgh’s the capital of Scotland
H* L H* LL%

Figure 3. Example of a ToBI analysis with an actual pitch contour (Ladd, 2008).

2.6 Differences and similarities in intonation

The focus of this research is on the general intonation patterns in English and Dutch. Questions were added to this research as the role of intonation in questions is undisputed as intonation is used to signify a question (Couper-Kuhlen, 1986). For example, if a speaker uses a default wh-question, as with statements, a fall at the end of the utterance is used (Bolinger, 1989; Wells, 2006). It should be noted that, while the described intonation patterns have been documented through research, the intonation patterns presented here are only possibilities, i.e. there are other ways to express exactly the same utterance with a different intonation pattern (Hirst, 1998). It should be noted that this research does not attempt to map intonation patterns, but tries to investigate whether backward transfer occurs in proficient Dutch speakers of English. The analyses presented in this thesis will use specific utterances in order to elicit intonation patterns, but it is not expected that these patterns will be used by speakers for other similar utterances.
Dutch intonation is characterised by the so-called hat pattern (Collier and ‘t Hart, 1975; Collier and ‘t Hart 1981 Willems, 1982; de Pijper, 1983; ‘t Hart, 1998; Haan, 2001). The hat pattern consists of a rise and a fall which can be realised in three different ways which can be seen in Figure (4) (Gussenhoven, 1991). The rise and fall in the hat pattern have equal intervals, i.e. the pitch travels from a low to a high level and vice versa (Willems, 1982). Other intonation patterns also consist of either a fall or a rise, but the rise or fall may be stretched (Collier and ‘t Hart, 1975; Haan, 2001). Clauses may end with a fall, rise, or no change in pitch at all. It was thought that Dutch questions are characterised by five distinct features: a higher initial pitch, a final rise, a globally raised register, a raised nuclear accent peak, and less declination (de Haan, 2001). De Haan (2001) also claims that these five properties are distinctly present in declarative questions. In addition, wh-questions show an overall falling intonation pattern. The conductor of the Boston Philharmonic Orchestra claims that a declarative question ends in a rise is because the speaker in question expects a response and a rising end of a question creates an open, unfinished melody which may invoke a response (Boston Philharmonic, Dec 2015). The pitch ranges of all these movements have not explored but the general pitch ranges of Dutch and English have been looked at.

![Figure 4](image.png)

**Figure 4.** Three possible realisations of the Dutch hat pattern. Figure taken from Gussenhoven, 1991.

Specific pitch ranges have not been given for English and Dutch in previously mentioned research. It is also unclear if the maximum and minimum are similar or different in the two languages. In order to map these values, Moskvina (2013) attempted to identify the maximum and minimum of Dutch and English intonation. The experiment, in which interviews of several male professional speakers were analysed, showed that for English the minimum was 80 Hz and the maximum 250 Hz with a level in between of 150 Hz. It also followed that Dutch had a minimum of 150 Hz and a maximum between 270-300 Hz. Although Moskvina (2013) presents the extremes of the two languages, it does not show how the pitch behaves between the maximum and the minimum, although estimates of the pitch ranges of English and Dutch may be deducted. According to the data in Moskvina (2013), the pitch range of Dutch is twelve semitones (ST) and the pitch range of English is twenty ST with a middle level of ten ST from the extreme values. The units of measure mentioned here are discussed next.
2.7 Unit of measure

Different measures have been employed in order to quantify pitch. A standard measure used in physics is Hertz (Hz). One Hertz means that there is one cycle per second. This is a logical measure as sound waves are repeated vibrations which create audible sound. An analysis of pitch using only Hertz will be problematic as this scale is logarithmic. This means that the difference in pitch in the higher spectrum of the voice will be larger in Hertz than the same interval observable by humans in the lower spectrum. This may lead to wrong observations as an identical intonation pattern expressed from a different starting pitch will be observed differently using Hertz. Royen (1952) and Jones (1972) adopted music theory to describe the intervals between tones. The music framework solves the problem of differing intervals when pitch is measured in Hertz as the pitch distance in perceivable (semi)tones is the same for the entirety of the pitch range. Music theory also provides a solid background to work from as it has been used to describe pitch movements since the Middle Ages and has been improved since. An issue arises when using musical terms. The notation of pitch is different when written in staves even though the intervals between observable tones can be described similarly. An extra notation and transposition will be needed in order to account for the different starting pitch from individual participants. This transposition is needed in order to effectively analyse any data in this manner from a music theory baseline. Acoustic scales exist which are more useable for this research, but Nolan (2003) suggests that the semitone scale is the better option. The semitone scale adopts the semitones used in musical theory but omit the specific characteristic notation used in music scales. The semitone scale is therefore easier to apply as it can express pitch in analysable numbers which in turn can be used for a quantitative analysis. The semitone scale will therefore be used in this research.

This thesis will now continue with the presentation of experiment 1 and 2 now that the theoretical considerations for this research have been dealt with.
3.0 Experiment 1

The goal of experiment 1 is to explore what happens to the behaviour of F0 in terms of mean pitch, pitch range, and the change of pitch per second in Dutch and English when the proficiency of English increases over the course of two years. Experiment 1 is a longitudinal study in which previously acquired recordings are used and contrasted against newly recorded speech of the same participants. Research into backward transfer should be longitudinal as only those setups can show the transformations a first language goes through under the influence of a second language (Kartushina, Frauenfelder, and Golestani, 2016). It is assumed that the English proficiency of the participants has increased in the course of two years. The increased proficiency may have led to backward transfer of English intonation towards the Dutch. Section 3.1 presents the methodology used for this experiment, section 3.2 presents the results of the experiment, section 3.3 discusses the results, and section 3.4 provides a summary of experiment 1 and some considerations for experiment 2.

3.1 Methodology

The goal of this experiment was to investigate the effect English proficiency may have on the behaviour of F0. This was achieved by comparing two recordings of students of the English Language and Culture Bachelor program of the Radboud University in Nijmegen. These students were recorded when they were in the first year and third year of their studies. The first recordings were made in May of 2015 (Lafleur, 2015). These students were then invited back for this experiment two years later to record. Only female students were initially selected for this research given that women have a wider range, are more expressive, and vary more in terms of pitch as compared to that of men (Bolinger, 1989; Haan, 2001). The choice of inviting only female participants is therefore preferable as the female pitch results in more movements which can be analysed to a greater extent. The higher register of women is also easier to analyse when compared to the lower register of men as higher tones are less prone to misanalysis because there are more vibrations per second which translates to more complete cycles per second. Three measures were used to analyse the intonation of English and Dutch (Vicenik and Sundara, 2013). These measures were the mean pitch, the pitch range, and the change of pitch per second. The change of pitch per second has been designated as delta pitch in the results section in order for this measure to fit in the tables.

Participants included six native Dutch students from the English Language and Culture Bachelor program of the Radboud University (Mean age: 21.5, SD: 0.82). One of the goals of this Bachelor program is the acquisition of near native English (Bachelor Engelse Taal en Cultuur, 2017). This high level of proficiency is expected to have been achieved near the end of the course in the third year. It is expected that the near native proficiency in English leads to near native English intonation patterns and the hypothesised backward transfer. Although twelve students participated in the initial experiment in 2015, only seven were still enrolled in the English program in 2017. It was not possible to arrange a recording session with one of the participants resulting in a total participant group of six. Three participants have been in England for a semester for their studies in the past two years. The initial recordings of the six participants will be used as one group and the later recordings will be used as a second. Native speakers of English in the same age category as the other participants have been approached for this research in order to attempt to set a baseline for the analyses. Only one native speaker in the same age group was able to participate. This participant grew up in the South of England in Southampton. Received Pronunciation is the accent spoken in this area which is consistent with the accent the Dutch students have learned. The native speaker of English has been studying linguistics for ten months in the Netherlands. The outcome of the
three measurements of her recording of the English text will be contrasted with the first and third year version of the English text.

Two texts were chosen in order to elicit English and Dutch speech. Prefaces were chosen from the English book *The New York Cook Book* and Dutch book *Geschiedenis van de Westerse Muziek*. These are the same texts that were used in the experiment in Lafleur (2015). The lengths of the prefaces were the same as well as their overall tone. Some words or phrases that might have disrupted a fluent reading have either been changed or omitted. English words in the Dutch text which might have influenced the Dutch characteristics of the students’ speech have either been removed or replaced by a Dutch equivalent. Direct speech had also been omitted as it could have elicited different registers as the participant would have had to voice a different person. The original texts, the adjustments made to the texts, and the texts as they were presented to the participants can be found in Appendix A. Only the second, third, and ninth paragraphs of the English text and the second, third, and seventh paragraphs of the Dutch text were chosen for the analysis. The flows of these paragraphs were comparable across languages and the amount of proper nouns was limited. The resulting recordings resulted in audio files around ninety to a hundred seconds long.

All of the recordings were cut and edited using the program *Praat* version 6.0.28 (Boersma and Weenink, 2017). The recordings from 2015 were already analysed for Lafleur (2015). However, the choice was made to re-analyse these recordings to ensure that all of the recordings are analysed in the same way. The recordings were first cut so that the speech file only contains the chosen paragraphs. Coughs and sniffs were edited out of the recording. The recordings were then edited in order to omit any mistakes *Praat* produced when analysing the recordings for pitch (Gussenhoven, 2004). This was done by using the manipulate function of *Praat* in the range of 75 to 600 Hz. All segments that were either too high or too low due to a misanalysis by *Praat* have been omitted. Figure (5) shows an example of misanalyses made by *Praat*. The lower six and upper five pitch points have been misanalysed and therefore been omitted. *Praat* should only analyse F0 when measuring the pitch. Misanalyses occur when not the ground tone is analysed but one of the overtones which shape the timbre of a sound. It can also misanalyse pitch when the period or cycle of the pitch is not accurately established (Gussenhoven, 2004).

![Figure 5. Misanalyses made by the program Praat.](image)

The difference between the lower and the middle notes seems smaller than the difference between the middle and higher notes. This is due to the logarithmic increase in the Hertz scale as discussed in section 2.5 and the linear scale of the graph. It should be noted that the pitch points in the pitch contour would progress fluently if they had been correctly analysed. The recordings were then resynthesized and have been periodically analysed for pitch on a range from 75 to 600 Hz (Gussehoven, 2004). The manipulation and resynthesizing of the audio file
sometimes had to be repeated several times as *Praat* would analyse several pitch tones wrongly in the conversion process. The last file then produced the three measures for the statistical analyses for this experiment which are the mean pitch, the pitch range, and the difference in pitch per second. The mean pitch and the pitch range are measured in semitones above 100 Hertz. The change of pitch per second is measured in semitones per second.

The initial experiment in 2015 made use of the Language Lab located in the MMS in the Erasmus building of the Radboud University. Only two participants were recorded in this room in 2017 as this recording studio was no longer available as it was fully booked. The other participants were recorded in the CLS Lab (Centre for Language Studies) located on the twelfth floor of the Erasmus building. The recording equipment and the setting of the two recording studios were similar. The studios did use different software. The Language Lab used Adobe Audition CS6 and the CLS Lab used Audacity version 2.1.0. The distance between the microphone and a participant was always kept minimally at thirty centimetres as a recording may become distorted if the microphone is too close to a speaker. One of the participants was studying abroad at the moment of recording. Although not ideally, this student recorded herself in a silent room using the equipment she had on hand, namely a laptop. It is assumed that the three sets of equipment produce equal levels of recordings in term of pitch height.

Participants were asked to take place in the sound proof room of the Language Lab or the CLS Lab and take a seat in front of a microphone. They were then given either the Dutch or the English text first. The order of the texts was random in order to avoid unsystematic variation. They were instructed to read aloud the text calmly. When the first text was read, the second text was given. It was noted whether participants had been to the United Kingdom for their studies. The participant who was studying abroad was given instructions via email to record the texts one at a time.
Dependent sample t-tests were performed on the three measures using the SPSS statistics package (Field, 2013). The independent variables were the year of study, first or third year, and the language of the text, Dutch or English. The dependent variables were mean pitch, pitch range and the change of pitch per second. The first and second measurements were compared with each other for each of the two texts. Comparisons were also made across languages. A total of six pairs were formulated which can be seen in Table (3). The dependent sample t-tests determined whether there was a difference between the comparisons and the Pearson’s r correlate determined whether a pair was similar in term of the measurements.

<table>
<thead>
<tr>
<th></th>
<th>Eng1</th>
<th>Eng3</th>
<th>Du1</th>
<th>Du3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eng1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eng3</td>
<td>Eng1/Eng3</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Du1</td>
<td>Eng1/Du1</td>
<td>Du1/Eng3</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Du3</td>
<td>Eng1/Du3</td>
<td>Eng3/Du3</td>
<td>Du1/Du3</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 3. All the pairs which will be compared in the analysis of experiment 1.

### 3.2 Results experiment 1

As this is a longitudinal experiment, contrasting pairs have been formulated and the means of these pairs have been compared and contrasted. In order to do so, a hypothesis and a null hypothesis have been formulated which have been tested. The null hypothesis states that there is no difference between contrasting pairs and the hypothesis to be tested states that there is a difference between the pairs. These hypotheses are applicable to all pairs whether they consist of different languages or moment of recording.

Table (4) presents all the measurements of all the native Dutch participants and the native English participant. Mean pitch and pitch range were measured in semitones and the change of pitch per second in semitones per second. As mentioned on page twelve, the change of pitch per second will be presented as delta pitch in the tables in order for the tables to fit on the page. The data of the native English participant is presented alongside the data of the third year English data. The English native speaker group will not be included in the quantitative analyses as it consists of only one participant. It will be discussed in section 3.3 along with the other results.

<table>
<thead>
<tr>
<th>Participant</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Eng Native</th>
</tr>
</thead>
<tbody>
<tr>
<td>Du1 Mean pitch</td>
<td>11.6 ST</td>
<td>12.6 ST</td>
<td>12.3 ST</td>
<td>13.6 ST</td>
<td>14.2 ST</td>
<td>13.7 ST</td>
<td>-</td>
</tr>
<tr>
<td>Du1 Pitch range</td>
<td>13.1 ST</td>
<td>14.5 ST</td>
<td>10.8 ST</td>
<td>10.9 ST</td>
<td>12.9 ST</td>
<td>17.8 ST</td>
<td>-</td>
</tr>
<tr>
<td>Du1 Delta pitch</td>
<td>13.6 ST/s</td>
<td>15.5 ST/s</td>
<td>15.1 ST/s</td>
<td>13.4 ST/s</td>
<td>15.4 ST/s</td>
<td>18.2 ST/s</td>
<td>-</td>
</tr>
<tr>
<td>Eng1 Mean pitch</td>
<td>12.0 ST</td>
<td>13.3 ST</td>
<td>12.1 ST</td>
<td>14.3 ST</td>
<td>14.6 ST</td>
<td>12.8 ST</td>
<td>-</td>
</tr>
<tr>
<td>Eng1 Pitch range</td>
<td>13.2 ST</td>
<td>15.0 ST</td>
<td>8.9 ST</td>
<td>12.2 ST</td>
<td>13.9 ST</td>
<td>15.7 ST</td>
<td>-</td>
</tr>
<tr>
<td>Eng1 Delta pitch</td>
<td>14.0 ST/s</td>
<td>17.1 ST/s</td>
<td>12.9 ST/s</td>
<td>14.4 ST/s</td>
<td>13.9 ST/s</td>
<td>12.5 ST/s</td>
<td>-</td>
</tr>
<tr>
<td>Du3 Mean pitch</td>
<td>12.9 ST</td>
<td>13.0 ST</td>
<td>12.1 ST</td>
<td>13.5 ST</td>
<td>14.0 ST</td>
<td>14.6 ST</td>
<td>-</td>
</tr>
<tr>
<td>Du3 Pitch range</td>
<td>14.6 ST</td>
<td>14.0 ST</td>
<td>13.4 ST</td>
<td>17.7 ST</td>
<td>14.9 ST</td>
<td>18.7 ST</td>
<td>-</td>
</tr>
<tr>
<td>Du3 Delta pitch</td>
<td>15.2 ST/s</td>
<td>13.8 ST/s</td>
<td>14.8 ST/s</td>
<td>19.0 ST/s</td>
<td>13.2 ST/s</td>
<td>16.0 ST/s</td>
<td>-</td>
</tr>
<tr>
<td>Eng3 Mean pitch</td>
<td>13.1 ST</td>
<td>13.7 ST</td>
<td>11.7 ST</td>
<td>13.5 ST</td>
<td>15.0 ST</td>
<td>15.3 ST</td>
<td>10.4 ST</td>
</tr>
<tr>
<td>Eng3 Pitch range</td>
<td>12.5 ST</td>
<td>15.7 ST</td>
<td>17.1 ST</td>
<td>13.9 ST</td>
<td>13.9 ST</td>
<td>17.4 ST</td>
<td>11.4 ST</td>
</tr>
<tr>
<td>Eng3 Delta pitch</td>
<td>12.4 ST/s</td>
<td>20.0 ST/s</td>
<td>15.9 ST/s</td>
<td>16.9 ST/s</td>
<td>15.0 ST/s</td>
<td>16.8 ST/s</td>
<td>9.0 ST/s</td>
</tr>
</tbody>
</table>

Table 4. All results for the Dutch participants and the English native participant of experiment 1.
The results of the three measures will be presented in separate subsections. Furthermore, t-test and correlation results will be reported as significant when \( p > 0.05 \). This alpha level is too strict for the sample size of this experiment. Results with a \( p \)-value between 0.05 and 0.10 will also be reported. These will be reported as almost significant. The distinction between significant and almost significant is made in order to make the significance of the results identifiable. Results which are not significant will not be reported, but all the results of the analyses have been recorded in tables in the corresponding sections. Tests of Normality have shown that all groups are normally distributed which can be seen in Table (5). An Anova showed that age, the last pronunciation grade received in the English Language and Culture program, and whether the participant had studied abroad had no significant effects on the three measures \( (p > 0.05) \).

<table>
<thead>
<tr>
<th>Tests of Normality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kolmogorov-Smirnov</td>
</tr>
<tr>
<td>Statistic</td>
</tr>
<tr>
<td>Mean_Pitch_Eng1</td>
</tr>
<tr>
<td>Range_Pitch_Eng1</td>
</tr>
<tr>
<td>Delta_Pitch_Eng1</td>
</tr>
<tr>
<td>Mean_Pitch_Eng3</td>
</tr>
<tr>
<td>Range_Pitch_Eng3</td>
</tr>
<tr>
<td>Delta_Pitch_Eng3</td>
</tr>
<tr>
<td>Mean_Pitch_Du1</td>
</tr>
<tr>
<td>Range_Pitch_Du1</td>
</tr>
<tr>
<td>Delta_Pitch_Du1</td>
</tr>
<tr>
<td>Mean_Pitch_Du3</td>
</tr>
<tr>
<td>Range_Pitch_Du3</td>
</tr>
<tr>
<td>Delta_Pitch_Du3</td>
</tr>
</tbody>
</table>

Table 5. Normality tests for all measures of experiment 1. All groups are normally distributed.
3.2.1 Mean Pitch

Table (6) presents the descriptive statistics for mean pitch. The numbers presented in this table are in semitones.

<table>
<thead>
<tr>
<th>Pair</th>
<th>Mean_Pitch_Eng1</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
<td>13.183</td>
<td>6</td>
<td>1.0944</td>
<td>.4468</td>
</tr>
<tr>
<td></td>
<td>Mean_Pitch_Eng3</td>
<td>13.717</td>
<td>6</td>
<td>1.3152</td>
</tr>
<tr>
<td>Pair 2</td>
<td>13.000</td>
<td>6</td>
<td>.9899</td>
<td>.4041</td>
</tr>
<tr>
<td></td>
<td>Mean_Pitch_Du3</td>
<td>13.350</td>
<td>6</td>
<td>.8826</td>
</tr>
<tr>
<td>Pair 3</td>
<td>13.183</td>
<td>6</td>
<td>1.0944</td>
<td>.4468</td>
</tr>
<tr>
<td></td>
<td>Mean_Pitch_Du1</td>
<td>13.000</td>
<td>6</td>
<td>.9899</td>
</tr>
<tr>
<td>Pair 4</td>
<td>13.717</td>
<td>6</td>
<td>1.3152</td>
<td>.5369</td>
</tr>
<tr>
<td></td>
<td>Mean_Pitch_Du3</td>
<td>13.350</td>
<td>6</td>
<td>.8826</td>
</tr>
<tr>
<td>Pair 5</td>
<td>13.183</td>
<td>6</td>
<td>1.0944</td>
<td>.4468</td>
</tr>
<tr>
<td></td>
<td>Mean_Pitch_Du3</td>
<td>13.350</td>
<td>6</td>
<td>.8826</td>
</tr>
<tr>
<td>Pair 6</td>
<td>13.000</td>
<td>6</td>
<td>.9899</td>
<td>.4041</td>
</tr>
<tr>
<td></td>
<td>Mean_Pitch_Eng3</td>
<td>13.717</td>
<td>6</td>
<td>1.3152</td>
</tr>
</tbody>
</table>

Table 6. Descriptive statistics for all paired mean pitch groups.

Table (7) presents the mean pitch correlations. A significant correlation was found between first year English and Dutch ($r(4) = 0.825$, $p = 0.043$) and between the mean pitch of English and of third year students ($r(4) = 0.968$, $p = 0.002$). This shows that the mean pitch of the first year students is similar for English and Dutch. It also shows the same only for the third year students. A strong almost significant correlation was found between the mean pitch of first year and third year Dutch ($r(4) = 0.775$, $p = 0.070$) and between the mean pitch of first year Dutch and third year English ($r(47) = 0.737$, $p = 0.094$). The almost significant results show that there might also be a correlation across the two recording moments. These correlations show that the participants have the same mean pitch across languages, although it is not apparent whether there is a statistical difference between the mean pitch of first and third year students.

<table>
<thead>
<tr>
<th>Pair</th>
<th>Mean_Pitch_Eng1 &amp; Mean_Pitch_Eng3</th>
<th>N</th>
<th>Correlation</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
<td>Mean_Pitch_Eng1 &amp; Mean_Pitch_Eng3</td>
<td>6</td>
<td>.539</td>
<td>.269</td>
</tr>
<tr>
<td>Pair 2</td>
<td>Mean_Pitch_Du1 &amp; Mean_Pitch_Du3</td>
<td>6</td>
<td>.776</td>
<td>.070</td>
</tr>
<tr>
<td>Pair 3</td>
<td>Mean_Pitch_Eng1 &amp; Mean_Pitch_Du1</td>
<td>6</td>
<td>.825</td>
<td>.043</td>
</tr>
<tr>
<td>Pair 4</td>
<td>Mean_Pitch_Eng3 &amp; Mean_Pitch_Du3</td>
<td>6</td>
<td>.962</td>
<td>.002</td>
</tr>
<tr>
<td>Pair 5</td>
<td>Mean_Pitch_Eng1 &amp; Mean_Pitch_Du3</td>
<td>6</td>
<td>.508</td>
<td>.303</td>
</tr>
<tr>
<td>Pair 6</td>
<td>Mean_Pitch_Du1 &amp; Mean_Pitch_Eng3</td>
<td>6</td>
<td>.737</td>
<td>.094</td>
</tr>
</tbody>
</table>

Table 7. Correlates for all paired mean pitch groups.
Table (8) shows the results of the repeated measures t-test for mean pitch. A repeated measures t-test showed no significant results between mean pitch groups. This finding shows that the mean pitch does not differ regardless of recording moment or used language.

<table>
<thead>
<tr>
<th>Paired Samples Test</th>
<th>Paired Differences</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>95% Confidence Interval of the Difference</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean_Pitch_Eng1 - Mean_Pitch_Eng3</td>
<td>-5333</td>
<td>1.1725</td>
<td>.4787</td>
<td>-1.7638</td>
<td>.6971</td>
<td>-1.114</td>
<td>5</td>
<td>.316</td>
<td></td>
</tr>
<tr>
<td>Mean_Pitch_Du1 - Mean_Pitch_Du3</td>
<td>-3500</td>
<td>6.348</td>
<td>.2592</td>
<td>-1.0162</td>
<td>.3162</td>
<td>-1.350</td>
<td>5</td>
<td>.235</td>
<td></td>
</tr>
<tr>
<td>Mean_Pitch_Eng1 - Mean_Pitch_Du1</td>
<td>1833</td>
<td>6.242</td>
<td>.2548</td>
<td>-.4718</td>
<td>.8384</td>
<td>.719</td>
<td>5</td>
<td>.504</td>
<td></td>
</tr>
<tr>
<td>Mean_Pitch_Eng3 - Mean_Pitch_Du3</td>
<td>3667</td>
<td>5.241</td>
<td>.2140</td>
<td>-.1833</td>
<td>.9167</td>
<td>1.714</td>
<td>5</td>
<td>.147</td>
<td></td>
</tr>
<tr>
<td>Mean_Pitch_Eng1 - Mean_Pitch_Du3</td>
<td>-1667</td>
<td>9.973</td>
<td>.4072</td>
<td>-1.2133</td>
<td>.8800</td>
<td>-.409</td>
<td>5</td>
<td>.699</td>
<td></td>
</tr>
<tr>
<td>Mean_Pitch_Du1 - Mean_Pitch_Eng3</td>
<td>7167</td>
<td>8.886</td>
<td>.3628</td>
<td>-1.6492</td>
<td>.2159</td>
<td>-1.975</td>
<td>5</td>
<td>.105</td>
<td></td>
</tr>
</tbody>
</table>

Table 8. Repeated measures t-tests for all paired mean pitch groups.

No significant differences were found for mean pitch. This is of interest as one of the observations made in Lafleur (2015) was an identified significant difference of two semitones between the first and third year students groups. This observation has not been reproduced by the same first year student group in this experiment. Almost significant results show that the mean pitch for first year Dutch may be similar to third year Dutch and English. Strong significant correlations were found between first year English and Dutch as well as third year English and Dutch with no significant results for the repeated measures t-tests. This indicates that the mean pitch of the participants may have changed. It could be that the tests lacked statistical power due to the small sample size. For this reason, a paired sample t-test has been performed combining the produced means for pitch of first year Dutch and English as one group (M = 13.092, SD = 0.9995) and another group consisting of third year mean pitch for English and Dutch (M = 13.533, SD = 1.0849) (t(9) = -1.692, p = 0.119) (r = 0.627, p = 0.029). There is still a moderate to strong positive correlation between the produced speech in the first and third year, but the correlation has decreased in power when a larger sample size was used. The larger sample size allows for a more accurate statistical analysis. The p-value for the t-test has decreased indicating that there may be a difference between the two moments of measuring. The insignificant results and the difference of half a semitone between the two groups show nothing conclusive. The data for mean pitch does not support the idea that there is an influence of acquired English intonation on Dutch intonation in terms of the mean pitch.
3.2.2 Pitch Range

Table (9) presents the descriptive statistics for the pitch range. The numbers presented in this table are in semitones.

### Paired Samples Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
<td>Range_Pitch_Eng1</td>
<td>13,150</td>
<td>6</td>
<td>2.4271</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Eng3</td>
<td>15,083</td>
<td>6</td>
<td>1.9641</td>
</tr>
<tr>
<td>Pair 2</td>
<td>Range_Pitch_Du1</td>
<td>13,333</td>
<td>6</td>
<td>2.6036</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Du3</td>
<td>15,550</td>
<td>6</td>
<td>2.1399</td>
</tr>
<tr>
<td>Pair 3</td>
<td>Range_Pitch_Eng1</td>
<td>13,150</td>
<td>6</td>
<td>2.4271</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Du1</td>
<td>13,333</td>
<td>6</td>
<td>2.6036</td>
</tr>
<tr>
<td>Pair 4</td>
<td>Range_Pitch_Eng3</td>
<td>15,083</td>
<td>6</td>
<td>1.9641</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Du3</td>
<td>15,550</td>
<td>6</td>
<td>2.1399</td>
</tr>
<tr>
<td>Pair 5</td>
<td>Range_Pitch_Eng1</td>
<td>13,150</td>
<td>6</td>
<td>2.4271</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Du3</td>
<td>15,550</td>
<td>6</td>
<td>2.1399</td>
</tr>
<tr>
<td>Pair 6</td>
<td>Range_Pitch_Du1</td>
<td>13,333</td>
<td>6</td>
<td>2.6036</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Eng3</td>
<td>15,083</td>
<td>6</td>
<td>1.9641</td>
</tr>
</tbody>
</table>

Table 9. Descriptive statistics for all paired pitch range groups.

Table (10) shows that a significant correlation was found between the pitch range of first year English and Dutch ($r(4) = 0.832, p = 0.040$). This strong effect indicates that the first year students apply the same pitch range in English and Dutch.

### Paired Samples Correlations

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Correlation</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
<td>6</td>
<td>-.059</td>
<td>.911</td>
</tr>
<tr>
<td>Pair 2</td>
<td>6</td>
<td>.466</td>
<td>.352</td>
</tr>
<tr>
<td><strong>Pair 3</strong></td>
<td><strong>Range_Pitch_Eng1 &amp; Range_Pitch_Du1</strong></td>
<td><strong>6</strong></td>
<td><strong>.832</strong></td>
</tr>
<tr>
<td>Pair 4</td>
<td>6</td>
<td>.128</td>
<td>.809</td>
</tr>
<tr>
<td>Pair 5</td>
<td>6</td>
<td>.452</td>
<td>.369</td>
</tr>
<tr>
<td>Pair 6</td>
<td>6</td>
<td>.389</td>
<td>.446</td>
</tr>
</tbody>
</table>

Table 10. Correlates for all paired pitch range groups.
Table (11) shows that a repeated measures t-test found almost significant results for the pitch range of first \((M = 13.33, SD = 2.60)\) and third \((M = 15.55, SD = 2.14)\) year Dutch \((t(5) = -2.187, p = 0.080)\) and between first year English \((M = 13.15, SD = 2.43)\) and third year Dutch \((M = 15.55, SD = 2.14)\) \((t(5) = -2.400, p = 0.058)\). These two findings suggest that the pitch range of the participants has increased.

<table>
<thead>
<tr>
<th></th>
<th>Paired Differences</th>
<th>Std.</th>
<th>Std.</th>
<th>95% Confidence Interval of the Difference</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Deviation</td>
<td>Error</td>
<td>Mean</td>
<td>Lower</td>
</tr>
<tr>
<td>Pair 1</td>
<td>Range_Pitch_Eng1 -</td>
<td>-1,9333</td>
<td>3,2116</td>
<td>1,3111</td>
<td>-5,3037</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Eng3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair 2</td>
<td>Range_Pitch_Du1 -</td>
<td>-2,2167</td>
<td>2,4831</td>
<td>1,0137</td>
<td>-4,8225</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Du3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair 3</td>
<td>Range_Pitch_Eng1 -</td>
<td>-1.833</td>
<td>1,4675</td>
<td>.5991</td>
<td>-1,7234</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Du3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair 4</td>
<td>Range_Pitch_Eng3 -</td>
<td>-.4667</td>
<td>2,7134</td>
<td>1,1078</td>
<td>-3,3142</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Du3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair 5</td>
<td>Range_Pitch_Eng1 -</td>
<td>-2,400</td>
<td>2,4042</td>
<td>.9815</td>
<td>-4,9230</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Du3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pair 6</td>
<td>Range_Pitch_Du1 -</td>
<td>-1,7500</td>
<td>2,5797</td>
<td>1,0532</td>
<td>-4,4573</td>
</tr>
<tr>
<td></td>
<td>Range_Pitch_Eng3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 11. Repeated measures t-tests for all paired pitch range groups.

The pitch range seems to be larger in the third year than in the first year group. A significant positive strong correlation between first year Dutch and English suggests that the participants used the same pitch range for English and Dutch at the first moment of measuring. The almost significant t-test results for pitch range between the first year English and Dutch data and the third year Dutch data indicate that there may be a difference between these recording moments. This thought finds support when a paired sample t-test is performed with the first year group \((M = 13.233, SD = 2.4024)\) on one side and the third year group \((M = 15.317, SD = 1.9734)\) on the other \((t(11) = -2.635, p = 0.023)\). The significant result shows that there is a difference for pitch range of two semitones between the first and third year regardless of language. This may indicate that the range of Dutch has increased over the course of two years. This may be due to the pronunciation training the students have in that period during which time their English proficiency may advance to near-native. The near-native pitch range may be larger than that of their native Dutch which is in accordance with Moskvina (2013). The participants may have acquired this larger pitch range for English which they then also apply to their intonation patterns in Dutch which would be an indication of backward transfer.
3.2.3 Change in pitch per second

Table (12) presents the descriptive statistics for the change of pitch per second. The numbers presented in this table are in semitones per second.

Paired Samples Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 Delta_Pitch_Eng1</td>
<td>14,133</td>
<td>6</td>
<td>1,6207</td>
<td>.6616</td>
</tr>
<tr>
<td>Delta_Pitch_Eng3</td>
<td>16,167</td>
<td>6</td>
<td>2,5001</td>
<td>1,0207</td>
</tr>
<tr>
<td>Pair 2 Delta_Pitch_Du1</td>
<td>15,200</td>
<td>6</td>
<td>1,7286</td>
<td>.7057</td>
</tr>
<tr>
<td>Delta_Pitch_Du3</td>
<td>15,333</td>
<td>6</td>
<td>2,0539</td>
<td>.8385</td>
</tr>
<tr>
<td>Pair 3 Delta_Pitch_Eng1</td>
<td>14,133</td>
<td>6</td>
<td>1,6207</td>
<td>.6616</td>
</tr>
<tr>
<td>Delta_Pitch_Du1</td>
<td>15,200</td>
<td>6</td>
<td>1,7286</td>
<td>.7057</td>
</tr>
<tr>
<td>Pair 4 Delta_Pitch_Eng3</td>
<td>16,167</td>
<td>6</td>
<td>2,5001</td>
<td>1,0207</td>
</tr>
<tr>
<td>Delta_Pitch_Du3</td>
<td>15,333</td>
<td>6</td>
<td>2,0539</td>
<td>.8385</td>
</tr>
<tr>
<td>Pair 5 Delta_Pitch_Eng1</td>
<td>14,133</td>
<td>6</td>
<td>1,6207</td>
<td>.6616</td>
</tr>
<tr>
<td>Delta_Pitch_Du3</td>
<td>15,333</td>
<td>6</td>
<td>2,0539</td>
<td>.8385</td>
</tr>
<tr>
<td>Pair 6 Delta_Pitch_Du1</td>
<td>15,200</td>
<td>6</td>
<td>1,7286</td>
<td>.7057</td>
</tr>
<tr>
<td>Delta_Pitch_Eng3</td>
<td>16,167</td>
<td>6</td>
<td>2,5001</td>
<td>1,0207</td>
</tr>
</tbody>
</table>

Table 12. Descriptive statistics for all paired delta pitch groups.

No significant correlations were found for the change of pitch per second as shown in Table (13).

Paired Samples Correlations

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Correlation</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 Delta_Pitch_Eng1 &amp; Delta_Pitch_Eng3</td>
<td>6</td>
<td>.574</td>
<td>.233</td>
</tr>
<tr>
<td>Pair 2 Delta_Pitch_Du1 &amp; Delta_Pitch_Du3</td>
<td>6</td>
<td>-.294</td>
<td>.572</td>
</tr>
<tr>
<td>Pair 3 Delta_Pitch_Eng1 &amp; Delta_Pitch_Du1</td>
<td>6</td>
<td>-.300</td>
<td>.564</td>
</tr>
<tr>
<td>Pair 4 Delta_Pitch_Eng3 &amp; Delta_Pitch_Du3</td>
<td>6</td>
<td>.014</td>
<td>.979</td>
</tr>
<tr>
<td>Pair 5 Delta_Pitch_Eng1 &amp; Delta_Pitch_Du3</td>
<td>6</td>
<td>-.209</td>
<td>.690</td>
</tr>
<tr>
<td>Pair 6 Delta_Pitch_Du1 &amp; Delta_Pitch_Eng3</td>
<td>6</td>
<td>.349</td>
<td>.497</td>
</tr>
</tbody>
</table>

Table 13. Correlates for all paired delta pitch groups.
Table (14) shows that a repeated measures t-test found an almost significant result for delta pitch for first ($M = 14.13, SD = 1.62$) and third ($M = 16.17, SD = 2.50$) year English ($t(5) = -2.033, p = 0.060$). This shows that third year students change their pitch more per second than first year students in English.

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1 Delta_Pitch_Eng1 - Delta_Pitch_Eng3</td>
<td>-2.0333</td>
<td>2.0549</td>
<td>.8389</td>
<td>-4.1898</td>
<td>.1232</td>
<td>-2.424</td>
<td>5</td>
</tr>
<tr>
<td>Pair 2 Delta_Pitch_Du1 - Delta_Pitch_Du3</td>
<td>-1.333</td>
<td>3.0487</td>
<td>1.2446</td>
<td>-3.3328</td>
<td>3.0661</td>
<td>-.107</td>
<td>5</td>
</tr>
<tr>
<td>Pair 3 Delta_Pitch_Eng1 - Delta_Pitch_Du1</td>
<td>-1.0667</td>
<td>2.7009</td>
<td>1.1026</td>
<td>-3.9010</td>
<td>1.7677</td>
<td>-.967</td>
<td>5</td>
</tr>
<tr>
<td>Pair 4 Delta_Pitch_Eng3 - Delta_Pitch_Du3</td>
<td>.8333</td>
<td>3.2129</td>
<td>1.3117</td>
<td>-2.5384</td>
<td>4.2051</td>
<td>.635</td>
<td>5</td>
</tr>
<tr>
<td>Pair 5 Delta_Pitch_Eng1 - Delta_Pitch_Du3</td>
<td>-1.2000</td>
<td>2.8705</td>
<td>1.1719</td>
<td>-4.2124</td>
<td>1.8124</td>
<td>-1.024</td>
<td>5</td>
</tr>
<tr>
<td>Pair 6 Delta_Pitch_Du1 - Delta_Pitch_Eng3</td>
<td>-.9667</td>
<td>2.4937</td>
<td>1.0181</td>
<td>-3.5837</td>
<td>1.6503</td>
<td>-.950</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 14. Repeated measures t-tests for all paired delta pitch groups.

Results regarding the change of pitch per minute seem to be indecisive. No significant correlations were found between the contrasted pairs and only one almost significant result was found for the repeated measured t-test. This result was found between first and third year English. The mean of the change of pitch per second for the third year English group is one semitone higher than the Dutch groups, although there is more variation in the English group. Different means for change in pitch per second need not indicate that the behaviour of $F_0$ in Dutch has been influenced by that of English. Since $F_0$ can change more in a larger pitch range, it is a logical effect that the change of pitch per second would increase when the pitch range increases. A Pearson’s $r$ correlation test was therefore performed using the recordings of all groups to form one larger group. From this test, it appeared that there is a medium to strong correlation between pitch range and the change of pitch per second ($r = 0.598, p = 0.002$). An increased pitch range may lead to steeper slopes of $F_0$ in order to express similar utterances at the same speed as when the pitch range remained the same. If the same pitch movements were made only on a larger pitch range and time scale than the change of pitch per second must have increased. This indicates that the change of pitch per second may be influenced by the pitch range rather than any differing intonation patterns. Extra statistical tests on the data on the change of pitch per second therefore seem excessive. Instead, the next experiment in this research should shed more light on any intonation patterns that may deviate from the Dutch norm.
3.3 Discussion experiment 1

It was stated in section 2.2 that speakers have a wide scope of possible ways of expressing the same sentence which may lead to wrong interpretations of the measures. This has been observed on some occasions in this experiment. Some of these variations had little to no effect on the mean pitch but did have an effect on the change of pitch per second and mostly on the pitch range. Examples of these instances are given in Figure (6). Figure (6) present a phrase uttered by the same participant two years apart. The phrase has been uttered with different intonation patterns.

![Figure 6. Pitch realisations of the phrase *andere onderwijsinstellingen* of participant 1 of experiment 1. Top: first year Dutch. Mean Pitch: 12.7 ST. Pitch range: 10.9 ST. Delta pitch: 20.2 ST/s. Bottom: third year Dutch. Mean pitch: 11.7 ST. Pitch range: 5.3 ST. Delta pitch: 15.6 ST/s.]

These patterns increased the pitch range considerably. As these patterns were actually generated by the vocal folds, they were not omitted from this experiment in the editing process. These varying patterns do interfere with the measures overall, especially when these patterns occur more often as they did for some of the participants. Such patterns interfere with the analyses of experiment 1. A possibility is measuring a trimmed pitch range instead of the full pitch range. A trimmed pitch range, for example ninety or ninety-five percent of the full pitch range, may circumvent acoustic patterns which increase the pitch range drastically.
The utterance of some consonants can also influence the measures. Recordings of longer texts take time to analyse. This can become problematic for the analysis of some consonants. Uttered consonants are produced using the vocal tract and produce vibrations other than the ones produced by the vocal folds (Gussenhoven and Jacobos, 2011). These vibrations are picked up by Praat which interfere with analyses for the mean pitch, the pitch range, and the change of pitch per second. The pitch range is not affected by these analysed consonants as these instances usually fall in the extremes of the pitch range, although an exception was found. This can be seen in Figure (7).

The /z/ in /frendz/ is analysed on a pitch of 596.3 Hertz which is eight semitones higher than the observed pitch range than when those phonemes were omitted. In addition, instances of analysed voiceless plosives were found. An example can be seen in Figure 9. The /k/ in /krieitid/ is analysed as being two semitones higher than the following /i/ whilst the /k/ consonant does not use the vocal folds to be uttered so it should not be analysed in the first place. This shows some of the problems that exist when analysing longer recordings instead of smaller phrases, which will be the case in experiment 2.

It was observed that the choice of pitch contour of English does not change between the first and second measurement of the participants, i.e. the same intonation strategies and placement of pitch accents are used. Figures (8) and (9) illustrate pitch contour of the English phrase on the other hand of the first and second measurements of participant one to five and of the native speaker of English. Participant 6 is excluded from these and other figures in this section as the recordings were partially distorted in these phrases. Figures (8) and (9) are presented on pages 25 and 26 respectively.
A side-by-side qualitative comparison of the contours presented in Figures (8) and (9) show that the contours have not changed in two years regardless of the maxima and minima of the pitch range. Only participant 5 used a different pitch contour in this phrase. This is due to a shift in focus from other to hand. Another observation is the difference of the contour at the end of the phrase. The native speaker of English ends the phrase without any significant changes in pitch. All of the participants, excluding participant three, end the phrase with a rise. This difference seems to stem from the linguistic backgrounds of these participants (Hanssen, 2017). Participant one, two, four, and five all grew up in Limburg and the end rise of a phrase is characteristic of the dialects spoken there. Participant three grew up in Nijmegen and the dialect spoken there does not seem to have this feature. This shows L1 forward transfer as regional differences of the Dutch participants can be observed in a second language. This is even so when participants are proficient in their L1 and L2.
Figure 9. Pitch contours of the English phrase *on the other hand* of participants one to five of the second measurement and of the native speaker.
Different Dutch intonation patterns have been observed which may have been influenced by English intonation patterns. The Dutch phrase *een nadeel van historische studies* was analysed which can be seen in Figure (10). These phrases show usage of a three intonation level structure which is characteristic of English and not of Dutch (Willems, 1982; de Pijper, 1983; ‘t Hart, 1998). More changes can be observed here when compared to the analysis of the English phrase in Tables (8) and (9). Participant two and four make use of two intonation levels in their first recording but apply another level in the second. These intonation levels can also be seen in Figure (10). There does not seem to be an inclination slope on these levels as the maximum and minimum of the phrases remain the same from beginning to end.

![Figure 10. English use of pitch levels found in Dutch speech in the phrase *een nadeel van historische studies*.](image)

This observation has been noticed in other phrases as well. The first instance of the phrase *een Geschiedenis van de Westerse muziek* in the third paragraph of the Dutch text has also been analysed for different intonation levels which can be seen in figure (11). Participant one, two, three, and four all seem to apply the three levels of English instead of the two of Dutch in this specific phrase. These two phrases are examples of noun and prepositional phrases.

![Figure 11](image-url)

Figure 11. Pitch contours with intonation levels of the first and third year Dutch phrase *van een Geschiedenis van de Westerse muziek*. The $a$ represents the first year recordings and the $b$ the third year recordings.
Figure (12) presents a phrase containing a verb which is *Om die reden zijn de besprekingen*. Instances of the three intonation levels of English can be observed here as well, although it is not always as clear. For instance, the identification of intonation levels of the first year Dutch recording of participant three is vague because she was pausing between the phrases *om die reden* and *zijn de besprekingen*. This led to an interrupted articulation of the complete phrase which made it difficult to analyse in terms of intonation levels. This can be observed more clearly in the third year Dutch of participant two and five.

These observations seem to be in accordance with de Pijper (1983) which stated that Dutch applies two levels in which the pitch may vary whereas English applies three levels on which it may vary as was presented in section 2.5. It is conceivable that a change of the possible behaviour of $F_0$ may be due to an increase of English proficiency and a continued exposure to said language which in turn may have led to backward transfer from L2 English to L1 Dutch. Although these intonation pattern analyses hint towards backward transfer, any decisive conclusions cannot be drawn as the phrases have not been analysed in depth in terms of the pitch range of the intonation levels. Another consideration is the fact that experiment 1 does not centre around patterns but on mean pitch, pitch range, and the change of pitch per second. However, the analysis of intonation patterns and pitch range is the focus of experiment 2.
3.4 Summary experiment 1

It has been observed that the pitch range increases in scope in Dutch and English when English proficiency increases. The increase in pitch range leads to an increase in the change of pitch per second. Backward transfer has been observed in terms of the possible levels F0 may move to. A qualitative analysis performed on shorter recordings of more lively texts may create a clearer picture of the influence a second language may have on the first. It is for this reason that experiment 2 has been set up. The complications and observations identified in experiment 1 will be taken into consideration for experiment 2, which deals with specific pitch contours. New texts will be analysed which will be less tedious in order to elicit more expressive intonation patterns. Moreover, emphasis will be placed on the movements of F0 rather than the mean pitch, the pitch range, and the change of pitch per second. Analyses of short phrases instead of larger recordings will make sure that any wrongly analysed voiceless consonants can be paid attention to. This can be ensured further by also using the ToBI model in which the different intonation levels of English and Dutch can be investigated.
4.0 Experiment 2

This section presents experiment 2. Experiment 2 consists of qualitative and quantitative analyses of short utterances in Dutch and English. The goal of this experiment is to build upon the observation of backward transfer in experiment 1 and investigate whether English intonation patterns can be observed in Dutch. This is executed through comparing and contrasting intonation patterns in utterances in English and Dutch. In order to investigate backward transfer from English to Dutch, participants were invited to read three texts. These texts contained English and Dutch utterances. Section 4.1 presents the methodology used for this experiment, section 4.2 presents the results of the experiment, section 4.3 discusses the results of the three analyses of the experiment, and section 4.4 provides a summary of experiment 2.

4.1 Methodology

The participant pool consisted of seven Dutch students (Mean age = 21.14, SD = .8997) and one native speaker of English (Age = 22). Dutch participants who have participated in experiment 1 have been invited back for experiment 2. One of the six participants of experiment 1 was not able to participate again. Two more Dutch participants who were in the third year of the English Language and Culture Bachelor program have been willing to participate as well. Only one of these participants was suitable for this research as one of them had an American accent. The resulting pool of Dutch participants consisted of six Dutch students. Four participants were raised in Limburg, one participant was raised in Gelderland, and the last Dutch participant grew up in Zeeland. The native speaker of English, aged twenty-two, has also participated in experiment 2.

Three new texts have been written for experiment 2. These texts were livelier when compared to those of experiment 1 in order to elicit less monotonous speech. The context of a dialogue was chosen in order to achieve to lively character. A dialogue also opens up the possibility to write about any given topic. Furthermore, the interlocutors of the dialogues use either Dutch or English in order to have participants switch between Dutch and English as a result. This may lead to a better elicitation of English intonation in the Dutch sentences. However, it may also lead to Dutch intonation in the English sentences. It is possible that the participants use different registers in order to voice the two characters. However, it is expected that the used registers will only differ in starting mean pitch and not in the overall pitch range so the pitch contours used for each character in the texts will not differ much in terms of personality and according chosen pitch movements. The choice of verbs has been determined during the writing of these texts by looking at speech acts as discussed in section 2.3 in order to ensure comparable elicitations in English and Dutch. Materials consisted of three newly made dialogues. The complete texts as they were presented to the Dutch participants may be found in appendix B1. English versions of the texts were also created for the native English participant. The Dutch sentences in the dialogues were translated to English. The original English sentences were of interest in the English version as these are the same in the Dutch version. The English versions as presented to the native English participants may be found in appendix B2. The phrases which have been chosen for the analysis of this experiment are listed in table (15) on the next page.
Dutch:  
1. Al de artikelen en het boek  
2. Niet alleen zijn stem  
3. Nog steeds smal blijven  
4. Een groot stuk nek van het varken  
5. Heb je al enig idee wat je wilt gaan maken?  
6. Wil je gaan eten bij McDonalds?  
7. Ik ben klaar  
8. Ik bedoel die van Marvel  
9. Die film is van DC  

English:  
1. All the articles and the book  
2. Not only his voice  
3. The sirloin looks a bit small anyhow  
4. One and a half kilo of the pork neck  
5. Do you mean the one with Superman?  
6. Is there a big difference?  
7. I’m famished  
8. I mean the one of Marvel  
9. That guy is gorgeous  

Table 15. The phrases in the dialogues which have been chosen for analysis in experiment 2.

The recordings for experiment 2 were made in the CLS Lab in the Erasmus building of the Radboud University in Nijmegen. The participant who was abroad during the recording sessions of experiment 1 was still studying abroad. She recorded herself again in the same way as described in section 3.1. All the other participants were recorded with the same equipment in the CLS Lab.

Participants were asked to take a seat in the recording booth of the CLS Lab. They were then presented with the three texts and asked to read them aloud one by one. The texts were presented in the same order for all participants as the texts have a logical order. A different order of the texts may have resulted in confusion on the part of the participant which is unwanted. It had been noted that the first participant was enjoying the texts too much and started laughing. Participants were asked to read the texts first for themselves before reading them aloud in order to avoid any laughing in the speech recordings.

All chosen utterances have been cut separately from the main recordings and put into different sound files. The recordings were then edited as described in section 3.1. The pitch contours of these utterances were then extracted and have been put in figures. These figures contained the pitch contour, a scale in semitones, and the mean pitch and the pitch range.

Three analyses have been executed on the data. The Dutch and English pitch contours were first qualitatively analysed in terms of intonation levels based on de Pijper (1983) and Willems (1982). Utterances containing two intonation levels were put in a group and another group consisted of the utterances with three intonation levels. The second analysis was quantitative and used the groups created in the previous analysis. The quantitative analysis looked at the pitch ranges between these groups, between languages, and between questions and other phrases using t-tests. The last analysis of experiment 2 applied the ToBI model on utterances which were of interest in the previous two analyses.
The first attempt to analyse the pitch contours was troublesome. The Dutch utterances were sometimes wrongly analysed as having three levels of intonation instead of the two they actually had. This is because intonation slopes were not considered in the first attempt. Figure (13) illustrates an analysis with and without an inclination slope. This utterance of the Dutch phrase *al die artikelen en het boek* of participant 5 can be analysed as having three intonation levels when intonation slopes are not considered. The intonation slope is nearly at a zero percent angle connecting maximums and minimums in such a way that a three intonation level analysis seems to be correct. However, the pitch movements seem more accurate between two levels than three as it is in accordance with previous literature as discussed in the background section. An analysis with a steeper inclination slope therefore seems to be more fitting.

Figure 13. Example of wrongly interpreted inclination slope (top) and a correctly analysed inclination slope (bottom).
4.2 Results experiment 2

This section presents the results of experiment 2. All the pitch contours of all the utterances used in this analysis can be found in appendix C. These pitch contours are presented alongside their mean pitch and pitch range. In addition, a scale has been provided on the right hand side of the pitch contours. This section will first present an intonation level analysis of the data. The results of this first analysis will be the base of the other two analyses. These two analyses are specifically dealing with pitch range and the way F0 behaves in that range. Results from the quantitative pitch range analysis which support findings of the intonation level analysis will be used in order to select the phrases which are used in the ToBI analysis.

4.2.1 Intonation level analysis

It should be noted that every Dutch participant used the Dutch two levels of intonation as well as the English three levels of intonation. Only the Dutch phrases will be dealt with in this subsection as Dutch is the target language with regards to backward transfer.

Tables (16) and (17) present all the pitch ranges in semitones of all the Dutch and English phrases. The Dutch utterances are further divided in a green and red group. The green group consist of utterances which had three intonation levels and the orange group consist of two intonation level utterances. Five utterances were not analysable. Some Dutch utterances were ambiguous whether they had two or three levels of intonation and have been omitted from this research.

<table>
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<th>7</th>
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<td>-</td>
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Table 16. Data on the Dutch pitch range and intonation levels of experiment 2.

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<tr>
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<td>4.7</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Table 17. Data on the English pitch range of experiment 2.
Dutch utterances have been found containing the intonation levels of English. These have been found in every Dutch phrase that was going to be used for this experiment. The phrase *al die artikelen en het boek* produced two instances of the three intonation levels of English, examples of which can be seen in figure (14) an (15). The third level is realised in a pitch accent on *die*. The phrase *nog steeds smal blijven* shows four instances of the three intonation levels. The extra level is again used for pitch accents on either *steeds* or *smal*.

Figure 14. Utterances of *al die artikelen en het boek* with three intonation levels.

Figure 15. Utterances of *al die artikelen en het boek* with two intonation levels.
The phrase *een groot stuk nek van het varken* showed pitch accents which go to a third level, examples of which can be seen in figures (16) and (17). These pitch accents were found on *groot* and *nek* for participants three, five, and six.

Figure 16. Utterance of *een groot stuk nek van het varken* with three intonation levels.

Figure 17. Utterance of *een groot stuk nek van het varken* with two intonation levels.

All Dutch participants used three levels of intonation in the Dutch IP *ik ben klaar*. Examples of this phrase are given in figure (18). These have also been found in the other Dutch IPs *ik bedoel die van Marvel* and *die film is van DC*. All the other utterances show either two clear levels of intonation or are ambiguous as to where the intonation levels are.

Figure 18. Utterances of *ik ben klaar* with three intonation levels.
Three intonation levels have also been observed in the question phrases. The placement of the intonation levels seems different than those of the other phrases. The distance in pitch between the middle and the upper intonation levels seems to be larger than between the lower and the middle level. This was observed for *heb je al enig idee wat je wilt gaan maken?* and *wil je gaan eten bij McDonalds?* Figure (19) illustrates this discrepancy most clearly for participant one and three.

![Figure 19](image)

Figure 19. Utterances of *wil je gaan eten bij McDonalds?* with three intonation levels.

Instances of Dutch phrases containing three intonation levels have been identified. The following quantitative pitch range analysis will analyse the data further in order to select phrases for analysis in the ToBI model.

### 4.2.2 Pitch range analysis

Multiple statistical analyses have been performed on the data. A paired sample t-test for all of the utterances of the Dutch participants showed that there is no significant difference between the pitch ranges of English (M = 7.633, SD = 1.4081) and Dutch (M = 8.017, SD = 1.8126) (*t*(5) = 1.082, *p* = 0.329). This shows that the Dutch participants apply the same pitch ranges regardless of the language they use. This could mean that either English is expressed using a Dutch pitch range or that the participants’ Dutch has been adapted to the pitch range of English.

A one sample t-test showed that the average mean pitch range of the English utterances of the Dutch participants (M = 7.633, SD = 1.4081) is significantly larger than that of the English native speaker (M = 5.80) (*t*(5) = 3.189, *p* = 0.024). This is an unusual finding as all mentioned literature state that the pitch range in English is wider than that of Dutch. It should be kept in mind that only one native speaker of English was used for this analysis so this analysis is lacking statistical power.

An independent t-test showed that there is a significant difference between the pitch ranges in questions (M = 10.3750, SD = 1.0210) and in other phrases (M = 7.177, SD = 1.29206) (*t*(19) = -4.593, *p* < 0.001). The mean pitch range found in question phrases is three semitones larger.
than that found in the other phrases. Question phrases will be taken for the ToBI analysis because of the observed larger pitch range.

An independent sample t-test was also performed for all the identified two and the three intonation level Dutch utterances as the independent variable and the pitch range as the dependent variable. This test shows that there is a significant difference in the pitch range in the two (M = 6.0913, SD = 3.1698) and the three intonation level utterances (M = 8.5069, SD = 3.0319) ($t(43) = -2.518, p = 0.016$). It appears that the three intonation level structures are 2.5 semitones larger than those found in the two intonation level structures. This difference might indicate the actual difference in pitch range between English and Dutch. It also indicates that English structures are used in L1 Dutch. This finding will be explored further in the ToBI analysis.

The pitch range analysis showed interesting results regarding two and three level intonation structures and question phrases. The question phrases and phrases in which two and three intonation levels are used will be taken for the ToBI analysis which is presented next.

4.2.3 ToBI analysis

This section analyses Dutch phrases which were observed to contain the English three intonation levels in section 4.2.1. English phrases are not the focus here as this research looks at backward transfer and is not interested as much in forward transfer.

English norm pitch accents have been observed in noun phrases of the Dutch speak of the Dutch participants which are shown in Tables (18) and (19). The utterances of Participant 2 and 4 of *al die artikelen en het boek* in Table (18) show English pitch accents on *al die* just as the English native speaker on the respective translated phrase as illustrated in Table 17. The pitch accents used by the Dutch participants in these phrases have an English native norm steep rise followed by a gradual fall. Another pitch accent was assigned to *en het* by both participants two and four. The pitch accent of participant four showed another steep rise-fall while the one of participant two can be considered to be a rise-fall. The intonation of the native English speaker seems to fit the Dutch model of intonation rather than the English as there is only a fall rise which is typical of the Dutch hat pattern.

(P.2)  H*HL       H*LL%
(P.4)  H*HL       H*HL L%

*Al die artikelen en het boek*

(N)  H*L       H*LL%

*All the articles and the book*

Table 18. ToBI analysis of the Dutch phrase *al die artikelen en het boek* and the English equivalent *all the articles and the book*.
The same pitch accent can be observed in the phrase *een groot stuk nek van het varken* of participant five and six in Table (19). The first pitch accent on *groot* is realised similar, but the pitch falls more in the pitch contour of participant six. The following rise-fall on *nek* is realised in the same way although the movements start at different levels in the intonation contour as the pitch is higher for participant five at that moment.

(P.5) H*HL H*L L%

(P.6) H*HL LH*L L%

_Een groot stuk nek van het varken_

(N) H*L L%

_A piece of pork neck_

Table 19. ToBI analysis of the Dutch phrase *een groot stuk nek van het varken* and the English equivalent _a piece of pork neck_.

The participants seem to assign pitch accents differently in question phrases as emphasis was placed on different constituents. This can be observed in the phrase *wil je gaan eten bij McDonalds?* as shown in Table (20) and (21). It was observed that participants one, two, and three use two pitch accent in the phrase *Wil je gaan eten bij McDonalds?* in Table (20). These two pitch accents are different as in one uses a smaller pitch range and the other a larger one. The steeper pitch accent can be considered to assign focus to the phrase. Participant one has put the focus on the auxiliary *wil*, participant two has put it on the verb *gaan*, and participant three on the noun *McDonalds*.

(P.1) H*L L*H H* LH%

(P.2) H*HH L*H H%

(P.3) H*L H*H H%

_Wil je gaan eten bij McDonalds?_

Table 20. ToBI analysis of the Dutch question *Wil je gaan eten bij McDonald’s?* and the English question _Is there a big difference?_

The same can be observed in the English question phrase _is there a big difference?_ as illustrated in Table (21). Participant one again focussed on the auxiliary whilst participant two and the native speaker have a pitch accent on *there*. Furthermore, the participants all put a different pitch accent on *big*. The Dutch participants have put a fall on this constituent while the pitch of the native speaker continued to rise even further.

(P.1) H*H L*L L%

(P.2) H*H L*L L%

(N) H*H H*H H%

_Is there a big difference?_

Table 21. ToBI analysis of the English question _Is there a big difference?_

The ToBI analysis show that the placement of a pitch accent which traverses three levels of intonation is dependent on whether or not it is in focus. The three intonation levels of English are mostly observed in phrases in which constituents were the focus of the larger utterance.
Pitch accents have been observed which traverse two levels but some travelled from the lower intonation level to the upper intonation level. Pitch which traversed from the lower to the upper intonation level can also be observed in the native speaker of English as some utterance can be interpreted as having a Dutch intonation when analysed in isolation. The utterance of the native speaker of *is there a big difference* serves as a prime example of this. The focussed pitch accent is also differently realised than other pitch accents. The secondary pitch accents seem to travel only between two intonation levels while the focussed pitch accent travels between three intonation levels. The different realisations of the pitch movements as observed in *wil je gaan eten bij McDonalds?* is evidence of this. Another observation in the ToBI analysis is that the pitch may travel from the lower intonation level to the middle, remain there and then travel to the upper intonation level as seen in the utterance of *is there a big difference* of the English native speaker. Instead of a pitch accent which is realised by a rise-fall, the native speaker used a rise for the first pitch accent and another rise for the second pitch accent in the phrase. This shows how the three level intonation structure can be used. Such a combination of pitch movements is not possible in a two level structure.

A short summary of the results of this experiment will now be presented in order to give a clear overview of the three analyses.

### 4.2.3 Summary results experiment 2

Two main observations were made in the intonation level analysis. The analysis showed that native Dutch speakers used both two and three intonation levels in the Dutch phrases. Non-native intonation structures in multiple Dutch phrases have been observed in the speech of all the participants. In addition, all the phrases in Table 15 have been observed to elicit non-native intonation structure. Furthermore, All of the participants have been observed to utter non-native intonation structures in the Dutch phrases *wil je gaan eten bij McDonalds?* and *ik ben klaar*. The fact that most phrases were uttered in native as well as non-native intonation structures suggests that both the two and three level intonation structures are being applied by the Dutch participants. Another observation made in the intonation level analysis was that the distance in pitch between the upper two intonation levels seems to be larger in question phrases when compared to other kinds of phrases. This difference probably exists because the intonation levels are not strict boundaries for the pitch movements and the pitch may exceed the maximum or minimum, especially in questions (Gussenhoven, 2005). This observation is supported by the pitch range analysis as this analysis found a significant difference of three semitones between the pitch ranges of questions and the other phrases. Utterances which contain a question need a variation of the three level intonation structure in which a larger pitch range is being applied (de Haan, 2001). This is evidence of backward transfer from English to Dutch as a non-native intonation structure is used in native speech.

### 4.3 Discussion experiment 2

It is conceivable that all Dutch participants only use the non-native English intonation structure in Dutch. Analyses of the intonation levels in the uttered phrases of the native English speaker show that this speaker sometimes uses only two intonation levels. The observed two levels of intonation in L1 English would correspond to that of the structure of L1 Dutch. It can be assumed that the native speaker of English only applies the three level intonation structure and that the third intonation level is consequently not being applied in the isolated phrases. It could be the case that the extra intonation level of English is not being
applied in all phrases but that it is still there in the speech of the Dutch participants. Either the focus of the sentence may have been put on another constituent outside of the analysed phrases or the extra level may simply not have been used. This thought finds support in the t-test of the pitch ranges of the two and three intonation level structured phrases and the t-test which showed no significant difference in the pitch ranges of the English and Dutch phrases. The t-test concerning the intonation levels showed that there is a statistical significant difference of 2.5 semitones in pitch range between those two groups. This difference can mean two things. The observed different pitch ranges are the pitch ranges of the Dutch and English intonation structures. Both structures were then being applied by the participants. This means that the participants sometimes applied the Dutch intonation structure and at other occasions the English structure and that the participants vary in the use of intonation structures of English and Dutch. The observed difference in pitch range could also be the pitch distance between the middle and upper intonation level of English. This is under the assumption that the Dutch intonation structure has been fully replaced by that of English. This would mean that the Dutch participants only apply the English intonation structure. The underlying intonation structure of English would then have fully replaced the structure of Dutch.

An unfortunate observation for this experiment is that the pitch range of the native English speaker is two semitones smaller than those of the Dutch participants. This is in contrast with the findings of Moskvina (2013) which states that the pitch range of English is wider than that of Dutch. The English native speaker also seemed to use only two levels of intonation in some instances which shows that a third level is not necessarily applied in every single phrase. It was observed that the pitch ranges for participants four and six were large when compared to those of the other participants. This makes any observations about the differences between the intonation levels between Dutch and English problematic using this data. Utterances containing two intonation levels can be interpreted as either belonging to the Dutch or English norm when they are observed in isolation from a third intonation level. Individual differences in pitch range may be the cause of the contrasting observations. A pitch range analysis could be interesting to research. Such an analysis would need a larger sample size of the population in order to account for outliers of which the native English speaker of this research may belong to. Such an analysis would be more in line with experiment 1 and may provide statistical support to observations made about the movements of F0 from qualitative analyses.

The extra level of intonation opens up the possibility for speakers to use a larger variety of non-native pitch contours. The observed English pitch movements in the ToBI analysis are not possible in a two intonation level structure. The English pitch contours which were mostly observed in the Dutch phrases were pitch accents which traversed more than one intonation level. The full range of possible English pitch contours as presented in section 2.5 were not observed in these phrases. Instead, it seems that pitch contours which were already present in the Dutch languages were expanded upon. More specifically, the pitch accents can be expressed using three as well as of two intonation levels. It is possible that only the Dutch contours have been influenced by the three intonation level structure and that other English contours which are more distinct from Dutch are not present. Any other non-native Dutch pitch contours might be less prone to be acquired by Dutch speakers than the ones which already resemble the English patterns. English pitch movements which were completely unfamiliar for Dutch native speakers have not been observed often in the ToBI analysis.
Future research may shed light on the exact structure of the intonation levels. An experiment could be thought of in which the intonation levels of native English speakers are mapped. These speakers should be able to employ the three level intonation structure of English which can then be outlined. The distance in pitch between these levels could then be determined. This would allow for ambiguous intonation structures, such as those encountered in this experiment, to be analysed far more clearly. This seems like a more robust analysis than the qualitative analysis of this experiment as any observations can be backed up with more comprehensive statistical arguments. Intonation structures which may seem to have only two levels may then be examined further for a possible third intonation level. This experiment could also be used to analyse the different intonation structures found in question phrases as there seems to be a larger difference in pitch between the middle and upper intonation level when compared to other phrases. It could be interesting to explore this idea further by investigating whether there is a systematic difference in pitch between the two upper intonation levels in different kinds of phrases or speech acts.

A complication arose during this study. This was due to inclination slopes whilst measuring the pitch ranges. As the pitch range is based on the maximum and minimum, the minimum keeps decreasing as a sentence goes on as the pitch is lowered because of the inclination slope. The maximum stays the same in theory when a steep rise takes place at the beginning of the sentence. The minimum, however, is more prone to being influenced by the inclination slope as it keeps being lowered. The pitch range can therefore be measured as being too wide as the pitch range increases as the minimum decreases. This phenomenon is exemplified in figure (20). A way to minimise the effect of inclination slopes on the measurement of a pitch range would be to measure the pitch range over a small utterance. The downside of measuring smaller utterances is that not all phrases are uttered in the same manner. Pitch accents and other stylistic features a pitch contour may have are dependent on the individual who produces them. Such research would require many participants in order to elicit enough similar pitch contours in order to ensure the validity of the measurements. This complication, however, does not have a major effect on the results of this experiment as the compared recordings are of similar length and therefore have similar inclination slopes. It should finally be noted that the measured pitch ranges may not be the actual pitch ranges used by the participants but approximations.

Figure 20. Example of how the pitch range can be wrongfully measured as being wider than it actually is.
4.4 Summary experiment 2

Experiment 2 explored observations made in experiment 1 of the non-native intonation level structure in L1 Dutch. Experiment 2 demonstrated that the underlying intonation structure of English can be observed in Dutch native speech. This is evidence of backward transfer of intonation from English to Dutch. The extra intonation level of English may open up the possibility for non-native English pitch contours to appear in Dutch native speech. The English movements found in Dutch native speech consisted mostly of Dutch contours which were influenced towards the English contours. It also provided further insights into future research on the topic of pitch range and intonation levels. These insights include individual pitch range differences and a correction of the intonation slopes.

This thesis has now dealt with two experiments which investigated backward transfer in intonation. It will now continue with a general discussion of the two experiments combined.
5.0 General discussion

This research has produced two main results from the two experiments. Experiment 1 found that there was an increase in pitch range in L2 English and L1 Dutch when L2 English proficiency increased. It was argued that L1 English has a wider pitch range than L1 Dutch and that Dutch speakers of L2 English acquire the wider pitch range of L1 English. The measured pitch ranges of Dutch and English of the third year students in the second recording were two semitones larger in comparison to the pitch ranges of the first year students in the first recording. It was argued that the L2 English pitch range widened in order to resemble the pitch range of L1 English. The L2 English pitch range can then have influenced the L1 Dutch pitch range by widening it as well. Experiment 2 found that L1 English pitch contours can be used in L1 Dutch. These contours were often identified in pitch accents. Pitch movements in the L1 Dutch norm use two intonation levels (Collier and ‘t Hart, 1975; Willems, 1982; de Pijper, 1983). The observed pitch movements in Dutch made use of three intonation levels which diverged from the Dutch native norm. Analysis into the pitch ranges of two level and three level Dutch phrases showed that the difference between the two and three intonation levels is 1.5 semitones. These two main findings suggest that the L1 intonation of the Dutch participants has changed as the two intonation level structure of Dutch was influenced by the three intonation level structure of English. The intonation structure of English has a larger pitch range when compared to the structure of Dutch because of the extra level of intonation. The pitch range of the Dutch participants widened as a result. This would explain the larger pitch ranges that have been measured in the second recording moment when compared to the first of experiment 1.

The difference in pitch range between the first and second recordings of experiment 1 could also have been caused by other variables. The participants’ ability to express themselves might have improved as well as their overall reading and presenting skills. These skills have been trained in the course of the Bachelor program. Students have presentations in which their vocal skills are being taught to convey information more effectively (Engelse taal en cultuur, 2017). The increase in pitch range could not be due to the acquisition of a second language followed by backward transfer, but by an increase in overall reading and presenting skills. Another possibility is the fact that the participants are older and have learned to be more expressive in general. The participants can have matured in the period between the first and second recordings.

The Dutch participants of this research were recruited from an English Bachelor program. These students are actively encouraged to immerse themselves into the English country, culture, and literature and acquire an English accent “as native as it can get” (Studereninnijmegen, 2012). The observations made in this research show that these students of English have acquired an English intonation to such an extent that their native language is affected by it. This high attainment and the effect it has on the L1 of the participants confirms that the one of the end goals of the enrolled Bachelor program is being achieved. The findings of the research might even be used to expand the pronunciation classes provided in the Bachelor program. These classes could focus more on the usage of three intonation levels in Dutch as well in order to improve the level of English intonation. The level of intonation of this end goal might even be raised in light of this research.
The language background of the participants is a concern of this research. It was noted in section 3.3 that four of the six participants were from the province of Limburg. The dialect and accent spoken in this province have numerous linguistic differences when compared to standard Dutch (Hannsen, 2017). This is reason for some concern as it is argued that there is a difference in intonation between standard Dutch and that of the dialects spoken in Limburg (Gussenhoven and van der Vliet, 1999). The observed three level intonation structure in Dutch could also belong to the dialects spoken in Limburg, although no literature could be found on the intonation structures of the dialects in Limburg. This would be problematic for the goal of this research as the intonation patterns may belong to the dialects and not to the English language. This can be verified by recording new participants from Limburg who have little knowledge and exposure to English and analyse the recordings for the intonation levels. A control group consisting, for instance, of Dutch students whose English proficiency is lower than that of the participants used in this research. Such a control group would show whether students of the same age actually apply a three intonation level structure with little to no knowledge of English. This research’s observation of backward transfer is nevertheless valid according to the literature on English and Dutch intonation as presented in section 2.5 and 2.6.

The observations made in experiment 1 and 2 show that backward transfer has developed in the speech patterns of the Dutch participants without them being away from an L1 contact situation. It was stated in Visson (1989) that L1 intonation is particularly unstable in a contact situation wherein there is no constant reinforcement available to maintain native patterns. Three of the Dutch participants in experiment 1 and 2 have been in England for a semester for their studies so they did not receive the constant L1 reinforcement and L1 features are prone to backward transfer when they are immersed in an L2 contact situation (Andrews, 1999; Bergmann et al, 2016). The influence of L2 intonation patterns on their L1 and the impact it had on the L1 pitch contours of these three participants is in accordance with Visson (1989). The other participants had been in a contact situation in which they did receive constant L1 reinforcement and they also exhibited L2 influence in their L1 intonation patterns. The L2 influence was not unanticipated as the intonation structure and patterns of individuals are influenced by the context they are exposed to daily (Andrews, 1999; McMahon, 2004). The intonation patterns of these participants were not different from those who had studied in England. This is of interest as the amount of L1 reinforcement does not seem to affect the extent of the observed backward transfer. The difference in exposure and immersion between these participants whilst still producing the similar L2 influenced Dutch intonation patterns shows two things. It shows that all participants were influenced by the immersion and exposure offered by the enrolled Bachelor program. L1 intonation was still affected by the L2. It also shows that the L1 intonation of the participants who had been abroad for a semester had not been influenced further. These two findings would suggest that there is a ceiling effect.

The period of acquisition of L2 intonation patterns in L1 speech can be looked into as there is the possibility of a ceiling effect. The observed similarity in L2 intonation patterns between the participants who had been abroad and those who did not suggests that a ceiling effect has already been reached within in the two year time period between the two recording moments. This period can be investigated in a longitudinal study in which students a high proficiency in English who are planning to acquire a near native proficiency in English. The L2 influence on L1 phonetic production can be observed even after only one hour of articulatory training with
L2 sounds (Kartushina et al, 2016). Newly enrolled students of the English language and culture Bachelor program should be ideal for such a study. The extent of the backward transfer effect should be correlated to the exposure and immersion on L2 intonation patterns in native speech. This should determine when the transfer takes place. Multiple measurements spread through the three year time period of the Bachelor program should provide the opportunity for a step by step exploration of the backward transfer. The amount of exposure needed in the particular immersion situation of the Bachelor program can then be explored further. The immersion situation in the specific English language and culture Bachelor program should provide a stable research environment for the initial exploration. In addition, multiple recordings of English pronunciation exams are made of the students in the first and second year of the Bachelor program which opens up the possibility to acquire recordings of the students more easily (Engelse taal en cultuur, 2017).

It is difficult to assign the trend of the identified backward transfer effect. Cook (2003) states that backward transfer effects can be positive, negative, or neutral. Positive effects can include an enrichment of semantics or syntax, for example. Negative effects can lead to L1 attrition. Neutral effects have no major impact on the language. The observed transfer effect can either be positive or negative as the underlying intonation structure has been influenced by the L2. It can be positive as an extra level of intonation is being used which could lead to more expressiveness in speakers in the way semantics can enrich a language. An argument could also be made for a negative effect as the native intonation structure of Dutch was altered. It is cautiously argued that a small positive backward transfer effect was observed in this research. The Dutch of the participants involved were not perceived as deviating from the native norm in addition to an enrichment of possible intonation contours. The identified trend of the backward transfer effect can be used to predict ways in which backward transfer might come into being which is explored next.

The direction of the backward transfer effect can be reversed if the same experiments were executed with English participants who learn Dutch as a second language. It would be interesting to explore whether native speakers of English are able to apply the two intonation level structure of Dutch correctly. It would be even more interesting to research whether native speakers of English are also affected by the intonation structure of Dutch in the same way Dutch is affected by that of English in this research. This form of backward transfer should be apparent when native English learners of Dutch apply two intonation levels in L1 English. This form of backward transfer of Dutch intonation in L1 English would be problematic for the possible pitch movements in native English as described in the ToBI model. Some of the movements described in this model would be restricted in a structure which is only built out of two intonation levels. Such a backward transfer effect could be classified as negative as there would be language attrition (Cook, 2003). It can be hypothesised that the backward transfer of the intonation structures of Dutch and English only occurs from English to Dutch or is at least facilitated easier in this direction. This is because an intonation level would have to be added instead of subtracted from the structure. The width of the pitch range of L1 English may be influenced with fewer complications. The pitch range of L1 English might decrease under the influence of the smaller pitch range of Dutch. The pitch movements of English might therefore decrease in scope instead of the removal of an intonation level. This might have already been observed in this research. The pitch range of the native speaker of English used in this research was statistically significantly smaller than those of the Dutch participants. It is conceivable that backward transfer has occurred for some
of the linguistic features of the native speaker as this participant had been in the Netherlands for almost a year. The pitch range could have shrunk instead of adapting the intonation level structure. However, thoughts on the possible backward transfer in the intonation of the English participants are speculation as it more probable that this participant generally has a smaller pitch range. Future research should determine the possible bidirectionality of backward transfer between languages and the manners in which the transfer manifests itself in native languages.

Inquiries into the possible durability and loss of the L2 intonation patterns in L1 speech should be made as well. This research observed backward transfer of intonation but the persistence of this transfer is unclear. It can be investigated whether the participants involved in this research are able to lose the acquired non-native intonation structure when they have finished with their studies. The amount of exposure to English can diminish after this period and only the L1 will be reinforced. The shift in linguistic context should provide the conditions for the L1 intonation structure to revert back to the Dutch norm. The further development of L1 intonation should indicate what happens to the acquired influenced intonation patterns. A strong hypothesis would be that the backward transfer is permanent and has rooted itself in to the speech patterns of the Dutch of the participants. A weaker hypothesis would be that the observed backward transfer is fleeting and that the intonation patterns of these participants can revert back to the Dutch native norm. Both hypotheses can only be investigated if there is no exposure to English. Instead, exposure to uninfluenced L1 Dutch with only two levels of intonation should provide the correct conditions to explore the durability of the L2 intonation patterns in Dutch.

The chosen texts could have been more suitable for experiment 1. The texts which were chosen for Lafleur (2015) were nevertheless used for the second recordings as identical texts materials could be analysed. It had been noticed that participants sometimes had difficulty reading the texts which resulted in a lot of pauses and stutters. Although the pauses itself have no influence on the overall pitch movements, emphasis was given on the word following a pause. The pause itself happened because participants had trouble reading the texts. This resulted in a distorted depiction of Dutch and English intonation in these instances. This emphasis may have been there for the reader to indicate the fact that there was a long pause but that that had been repaired. The same can be said about the stutters. Although the influence of these phenomena may have been limited, they are still something to consider in the future. Another reason why other texts may have been more suitable for this experiment is because the texts were received as long and tedious. This may have led to a diminished expression of the voice which in turn could lead to a misrepresentation of the behaviour of F0 for this experiment. A more active text may elicit more stimulated acoustic patterns instead of the toned down speech produced by the participants. Nonetheless, some interesting observations have been made in terms of pitch range, the change of pitch per second and backward transfer.

The motivation of people learning a second language should be considered and the effect it can have on backward transfer. Motivation has a positive effect on the acquisition of a new language (Dörnyei, 1994; Skehan, 2012). The participants in this research all belong to a specific group of English students who want to acquire a near native proficiency in English. This motivation is evident as they these participants are students of English which is why these participants were fitting for this research. This is, however, a unique participant pool and the extent of backward transfer as observed in this research should be considered. It
should be wondered how many learners of an L2 are actually trying to acquire the language at a native like proficiency. The proficiency set as the end goal for language acquisition and the tools used to achieve that goal might have a strong effect on the manifestation of backward transfer with L1 intonation being reinforced.

The intonation levels structures of Dutch and English should be scrutinised further. Approximating the actual mean pitch ranges of Dutch and English in addition to determining the relative mean pitch heights of each intonation level should lead to a better understanding of the observed backward transfer effect. For example, these structures can be examined in the same way the intonation level structures of Standard Chinese have been analysed for specific pitch heights and ranges (Ladefoged, 2001). Such a comprehension of the different levels in intonation structures provides a dependable framework from which to do further research. This research would have benefited from such a framework. Determining the mean pitch ranges should also make it easier to determine the global behaviour of F0 by means of the mean pitch which would expand a ToBI analysis. The behaviour and contours of F0 can be approached more generally if the relative position of mean pitch within the pitch range can be related to a framework. The mean pitch can say something of the relative position of F0 between intonation structures. The notation of intonation patterns in numbers would create an abstract description if pitch movements when compared to the notation of the ToBI model, for instance.

Other areas of prosody can be explored as well for backward transfer. The observed pitch accent is used to assign stress to a constituent. Other correlates of stress can be analysed for backward transfer as well. These correlates are duration, intensity, and vowel quality (Fry, 1955; Sluiter and van Heuven, 1996). A different realisation of these correlates between languages should be reason to believe that backward transfer of intensity and duration is possible. For instance, the duration of vowels in English is longer than those of Dutch (Gussenhoven and Broeders, 1997). An analysis of the data used in experiment 1 could focus on the duration of vowels between the first and second recordings. The duration of the Dutch vowels should have increased due to backward transfer from English based on the results of this research. It would be interesting to explore whether these other areas are also subject to backward transfer, even more so when some areas are sensitive to backward transfer and others are not.
6.0 Conclusion

This research has dealt with the exploration of backward transfer of English intonation into intonation patterns of L1 Dutch. It was hypothesised that the intonation of English is transferred to that of native Dutch when the length exposure to and the L2 proficiency of English increases. A longitudinal analysis of the recordings of experiment 1 has showed that Dutch participants have a wider pitch range in the second recording when compared to the first. This difference in pitch range was two semitones. English intonation structures were observed in the recordings of L1 Dutch in experiment 1. These structures were explored further in experiment 2. Experiment 2 has shown that English pitch contours can be observed in L1 Dutch. The intonation structure of these English contours have three levels instead of the Dutch native norm of two. The pitch range of the English intonation structure is 1.5 semitones larger than that of Dutch. The results of both experiments show that the Dutch intonation of proficient Dutch speakers of English has been influenced by that of English. This backward transfer of intonation from English to L1 Dutch is just as was hypothesized at the start of this research.
References


Appendix A – Experiment 1: English and Dutch texts


M. F. K. Fisher, that redoubtable writer on food, once noted that the basis of French cuisine is butter, that of Italy olive oil, of Germany lard, and of Russia sour cream. Water or drippings are attributed to English kitchens, and to those of America, the flavor of innumerable tin cans.

Fortunately, there is a reason to believe that the circumstance in America is changing for the better, there probably never has been such an absorbing interest in fine cuisine in the home as there is in this decade. While it is true that scarcely a day passes in which some manufacturer or another does not introduce a new “instant” product, it is also true that world travel on a scale unsurpassed in history is making the American palate more sophisticated. Thanks to modern appliances, the amount of time spent in the kitchen for the average homemaker has decreased considerably over the past few years. On the other hand, more and more men, women, and children seem to discover the pleasures of the table.

Cooking is at once one of the simplest and most gratifying of the arts, but to cook well one must love and respect food. It is hoped that the major audience for this volume will be those who are willing to pamper the palates of themselves and their friends. To enjoy the pleasures of the palate does not categorize a man either as gourmand or glutton. As Dr. Samuel Johnson once observed, “He who does not mind his belly will hardly mind anything else.”

There are many people to whom full credit is due for the quality of The New York Times Cook Book. First of all Jane Nickerson, my esteemed predecessor, the first food news editor of The New York Times. A woman of exquisite taste and inquiring mind, Miss Nickerson (or more accurately now, Mrs. Alex Steinberg) is the mother of four children and lives in Lakeland, Florida.

Mrs. Ruth P. Casa-Emellos, to whom this book is dedicated, was the tireless and inspired Times home economist for eighteen years. Her contributions to this volume are without measure. She retired in the fall of 1961 to Winston-Salem, the place of her birth in North Carolina.

June Owen, Nan Ickeringill and Anne-Marie Schiro of the food news staff were vital in research and inspiration, and the debt to them is strong.

In the styling of the photographs that appear throughout this book, the influence of John Camposa is very much in evidence. His recommendations for backgrounds and for accessories are gratefully acknowledged.

Ultimately, of course, the responsibility for the illustrations as they appear belongs to the Times studio photographers, and it has been a genuine pleasure to work closely with Bill Aller, Gene Maggio and Alfred Wegener. They were responsible for most of the photographs included here.

During the course of a single year The New York Times publishes more than a thousand recipes. They come from endless sources. Many are translated and adapted from European books on food, others are borrowed from already published regional recipes of America. Some are “heirlooms” from family recipe books and others have been created in The Times test kitchen.


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In de jaren vijftig begon de musicoloog Donald J. Grout aan een haast onmogelijk taak: het schrijven van een geschiedenis van de westere muziek. Het lijvige resultaat werd in 1960 uitgegeven door de Amerikaanse uitgever W.W. Norton & Company. *A History of Western Music* kende sindsdien diverse herdrukken. Toen Grout in 1987 overleed, was zijn collega Claude V. Palisca al weer ver gevorderd met het aanpassen van de tekst. Resultaat daarvan was de grondig herziene en uitgebreide editie van 1988.

In Nederland bleek zowel bij muziekfiebbers als aan conservatoria, universiteiten en andere onderwijsinstellingen veel behoefte te bestaan aan een Nederlandse vertaling van dit beroemde naslagwerk.

Van het boek dat de lezer thans voor zich heeft liggen, kan men eigenlijk niet meer zeggen dat het alleen maar een vertaling is. Gezien het aantal en de aard van de veranderingen die noodzakelijk zijn gebleken om het boek op maat te maken voor de Nederlandse gebruiker, zou men misschien beter kunnen spreken van een vijfde, geheel herziene editie.

Stilistische en analytische besprekingen van exemplarische werken steunden in de vierde editie van *A History of Western Music* in hoge mate op de anthologie van de westere muziek, die Claude V. Palisca voor W.W. Norton & Company verzorgde. Ondanks zijn vele kwaliteiten is dit werk in Nederland weinig courant. Om die reden zijn de besprekingen ingrijpend geredigeerd en in een aantal gevallen zelfs achterwege gelaten. In plaats daarvan is met toestemming van de Amerikaanse uitgever een aantal muziekfragmenten uit de *Norton Anthology of Western Music* (afgekort als NAWM) ter illustratie in de Nederlandse editie overgenomen, vooral daar waar de tekst door het ontbreken van notenmateriaal een wat al te abstract karakter dreigde te krijgen.

Tevens is geprobeerd om deze besprekingen zoveel mogelijk in de lopende tekst te integreren als onderdeel van het meer algemene muziekhistorische vertoog, zoals ook het geval was bij eerdere edities van *A History of Western Music*. Het voornaamste inhoudelijke verschil met de Amerikaanse edities van dit boek is de toevoeging van een beknopte geschiedenis van de Nederlandse muziek van de middeleeuwen tot heden. Het betreft hier zowel in de lopende tekst opgenomen passages als aparte paragrafen. Ook de in elk hoofdstuk opgenomen chronologieën en de zogenaamde ‘Vignetten’ over specifieke onderwerpen zijn aangevuld met op de Nederlandse ontwikkelingen toegespitste cultuurhistorische achtergrondinformatie.

Een ander inhoudelijk verschil is dat de tekst van Grout en Palisca op een aantal punten is bijgewerkt, daar waar de informatie onvolledig is of door de huidige stand van zaken in de muziekwetenschap achterhaald is geraakt. Dit geldt met name voor het eerste hoofdstuk en het tweede deel van het laatste hoofdstuk. Speciale dank zijn wij verschuldigd aan drs. Deseriée Staverman van het Rotterdams Conservatorium en prof. Dr. Paul Op de Coul van de Universiteit van Utrecht voor hun waardevolle correcties en suggesties.

Een nadeel van historische studies is dat je nooit kan zeggen dat het werk echt af is. Dat geldt ook voor deze Nederlandse editie van *A History of Western Music*. Desondanks hebber de uitgever, de vertalers, de bewerker en alle andere betrokkenen ernaar gestreefd om van dit boek een zo complete mogelijk naslagwerk te maken, in het volste beten dat er altijd lezers zullen zijn die het beter zullen weten. Wij houden ons dan ook van harte aanbevolen voor *addenda* en *corrigenda*. 

Original Dutch text: Voorwoord *Geschiedenis van de Westerse Muziek* (2008)

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In de jaren vijftig begon de musicoloog Donald J. Grout aan een haast onmogelijk taak: het schrijven van een geschiedenis van de westerse muziek. Het lijvige resultaat werd in 1960 uitgegeven door een Amerikaanse uitgever. Een Geschiedenis van de Westerse Muziek kende sindsdien diverse herdrukken. Toen Grout in 1987 overleed, was zijn collega Claude V. Palisca al weer ver gevorderd met het aanpassen van de tekst. Resultaat daarvan was de grondig herziene en uitgebreide editie van 1988.

In Nederland bleek zowel bij muziekliefhebbers als aan conservatoria, universiteiten en andere onderwijsinstellingen veel behoefte te bestaan aan een Nederlandse vertaling van dit beroemde naslagwerk.

Van het boek dat de lezer thans voor zich heeft liggen, kan men eigenlijk niet meer zeggen dat het alleen maar een vertaling is. Gezien het aantal en de aard van de veranderingen die noodzakelijk zijn gebleken om het boek op maat te maken voor de Nederlandse gebruiker, zou men misschien beter kunnen spreken van een vijfde, geheel herziene editie.

Stilistische en analytische besprekingen van exemplarische werken steunden in de vierde editie van Een Geschiedenis van de Westerse Muziek in hoge mate op de anthologie van de westerse muziek die Claude V. Palisca verzorgde. Ondanks zijn vele kwaliteiten is dit werk in Nederland weinig courant. Om die reden zijn de besprekingen ingrijpend geredigeerd en in een aantal gevallen zelfs achterwege gelaten. In plaats daarvan is met toestemming van de Amerikaanse uitgever een aantal muziekfragmenten uit de Amerikaanse editie van Een Geschiedenis van de Westerse Muziek ter illustratie in de Nederlandse editie overgenomen, vooral daar waar de tekst door het ontbreken van notenmateriaal een wat al te abstract karakter dreigde te krijgen.

Tevens is geprobeerd om deze besprekingen zoveel mogelijk in de lopende tekst te integreren als onderdeel van het meer algemene muziekhistorische vertoog, zoals ook het geval was bij eerdere edities van Een Geschiedenis van de Westerse Muziek.

Het voornaamste inhoudelijke verschil met de Amerikaanse edities van dit boek is de toevoeging van een beknopte geschiedenis van de Nederlandse muziek van de middeleeuwen tot heden. Het betreft hier zowel in de lopende tekst opgenomen passages als aparte paragrafen. Ook de in elk hoofdstuk opgenomen chronologie en de zogenaamde ‘Vignetten’ over specifieke onderwerpen zijn aangevuld met op de Nederlandse ontwikkelingen toegesneden cultureelhistorische achtergrondinformatie.

Een ander inhoudelijk verschil is dat de tekst van Grout en Palisca op een aantal punten is bijgewerkt, daar waar de informatie onvolledig is of door de huidige stand van zaken in de muziekwetenschap achterhaald is geraakt. Dit geldt met name voor het eerste hoofdstuk en het tweede deel van het laatste hoofdstuk. Speciale dank zijn wij verschuldigd aan drs. Deserië Staverman van het Rotterdams Conservatorium en prof. Dr. Paul Op de Koel van de Universiteit van Utrecht voor hun waardevolle correcties en suggesties.

Een nadeel van historische studies is dat je nooit kan zeggen dat het werk echt af is. Dat geldt ook voor deze Nederlandse editie van Een Geschiedenis van de Westerse Muziek. Desondanks hebber de uitgever, de vertalers, de bewerker en alle andere betrokkenen ernaar gestreefd om van dit boek een zo complete mogelijk naslagwerk te maken, in het volste besef dat er altijd lezers zullen zijn die het beter zullen weten. Wij houden ons dan ook van harte aanbevolen voor addenda en corrigenda.
Appendix B – Experiment 2: Three English/Dutch dialogues

Appendix B1 – Experiment 2: Three Dutch dialogues

Dialogue 1

Twee vriendinnen, Sophie en Sarah, zijn met elkaar in gesprek. Sophie is Nederlandse maar Sarah is Engelse. Ze spreken elkaars taal niet maar ondanks dat kunnen ze elkaar wel begrijpen omdat ze al zo lang met elkaar omgaan. Na een dag goed te hebben gestudeerd voor hun tentamens besluiten ze op pad te gaan en ergens iets lekker te gaan eten. Hieronder volgt het gesprek wat zij samen voerden.

Sophie: “Nou, ik ben klaar. Ik kan niet geloven dat het me gelukt is al die artikelen door te nemen voor het tentamen.”

Sarah: “Well, if you had thought of preparing a bit earlier then you wouldn’t be in this situation.”

Sophie: “Tsja, al doende leert men. Ik ben er wel een beetje hongerig van geworden. Zin om iets te gaan eten?”

Sarah: “Oh thank God, I’m famished. I could eat a whole pig!”

Sophie: “Daar twijfel ik niet aan. Jij kan alles eten als je honger hebt.”

Sarah: “Where do you think we should eat? McDonalds?”

Sophie: “Wil je gaan eten bij McDonalds?”

Sarah: “Yes? What’s wrong with McDonalds? I love their burgers.”

Sophie: “Nou, als je een lekkere burger wilt dan mag je best wel een keertje komen eten, dan gaan we eerst even naar de slager om goed gehakt te halen. Doen we er een wijntje of twee bij voor de gezelligheid.”

Sarah: “That sounds lovely, but that doesn’t solve the problem of your empty stomach now. You clearly do not want to go to McDonalds. What do you recommend?”

Sophie: “Ik ben blij dat je dat vraagt. Het is vrijdag, waarom halen we geen visje op de markt?”

Sarah: “You mean those herrings which you Dutchies eat with your passionate love for raw onions?”

Sophie: “Je beseft je hopelijk toch dat jij heel vaak rauwe uien eet bij McDonalds?”

Sarah: “I see your point, but fermented fish doesn’t seem appealing to me.”

Sophie: “Ze verkopen veel meer dan haring. Je kunt er ook een gebakken visje krijgen.”

Sarah: “Add some chippies to that and I’ll feel right at home.”

Sophie: “Mooi, dan zijn we het eens.”
Dialogue 2

Twee vriendinnen, Sophie en Sarah, zijn met elkaar in gesprek. Sophie is Nederlandse maar Sarah is Engelse. Ze spreken elkaars taal niet maar ondanks dat kunnen ze elkaar wel begrijpen omdat ze al zo lang met elkaar omgaan. Hieronder volgt een gesprek dat zij voerden.

Sophie: “Heb jij die nieuwe film gezien met al die superhelden?”
Sarah: “Do you mean the one with superman?”
Sophie: “Nee, die film is van DC. Ik bedoel die van Marvel.”
Sarah: “Is there a big difference? They are all superheroes.”
Sophie: “Het zijn twee verschillende uitgevers van stripboeken met totaal andere helden.”
Sarah: “You learn something new every day. Is it a nice movie? I mean the one of Marvel.”
Sophie: “Hij is best goed. De film gaat over een oudere Wolverine.”
Sarah: “Who’s Wolverine?”
Sophie: “Die wolfman die gespeeld wordt door Hugh Jackman.”
Sarah: “Oh I loved Hugh Jackman in Les Miserables, and not only his voice.”
Sophie: “Met niet alleen zijn stem bedoel je zijn brede schouders?”
Sarah: “Or his eyes, doesn’t really matter. That guy is gorgeous.”
Sophie: “Ik snap wat je bedoelt, maar dat lichaam heeft hij dus gekregen voor zijn rol als Wolverine.”
Sarah: “Then perhaps it’s time for me to watch all his superhero movies.”
Dialogue 3

Twee vriendinnen, Sophie en Sarah, zijn met elkaar in gesprek. Sophie is Nederlandse maar Sarah is Engelse. Ze spreken elkaars taal niet maar ondanks dat kunnen ze elkaar wel begrijpen omdat ze al zo lang met elkaar omgaan. Sophie werkt in een slagerij en Sarah wil een stuk vlees bij haar halen voor een etentje met vrienden. Hieronder volgt een gesprek dat zij voerden.

Sarah: “Hey Sophie, pleasure to see you in your butcher costume.”

Sophie: “Hey Sarah, eindelijk besloten om een verstandige vleeskeuze te maken?”

Sarah: “Yes you finally convinced me. I’m having a few people over tomorrow for dinner and I want to prepare something special.”

Sophie: “Heb je al enig idee wat je wilt gaan maken?”

Sarah: “I was actually hoping that you could give me some advice on that matter. I was thinking of a roast dinner.”

Sophie: “Oh dan heb ik wel een paar suggesties voor je. Waar ik zelf voor zou gaan is een groot stuk nek van het varken. Wij noemen dat schouderkarbonade.”

Sarah: “It looks a bit fatty, don’t you have something leaner? I’m afraid the others won’t eat it otherwise.”

Sophie: “Nou, je zou voor varkensfilet kunnen gaan alleen dat stuk is een stuk saaier juist omdat het weinig vet heeft.”

Sarah: “Okay, I’ll have 1,5 kilo of the pork neck. Do you have any tips on how to cook this?”

Sophie: “Hier kunnen wij heel lang over praten maar ik heb een beter idee. Wat nou als je iets meer meeneemt, dan kook ik het morgen en eet ik gezellig mee.”

Sarah: “that’s a wonderful idea. It’s a deal! See you tomorrow.”

Sophie: “Tot dan.”
Appendix B2 – Experiment 2: three English dialogues

Dialogue 1

Two friends, Sophie and Sarah, are having a conversation together. They decide to have a bite to eat after a long day of studying. The following is the conversation they had together.

Sophie: “Well, I’m done. I can’t believe I actually managed to read all the articles and the book for the exam.”

Sarah: “If you had thought of preparing a bit earlier then you wouldn’t be in this situation. Reading all the articles and the book is a lot of work”

Sophie: “Experience is the best teacher. All this studying has made me a bit puckish. Fancy some food?”

Sarah: “Oh thank God, I’m famished. I could eat a whole pig!”

Sophie: “I don’t doubt it. You can eat anything when you’re hungry.”

Sarah: “Where do you think we should eat? McDonalds?”

Sophie: “You want to go to McDonalds?”

Sarah: “Yes? What’s wrong with McDonalds? I love their burgers.”

Sophie: “Well, if you want a good burger then you are more than welcome to come round for dinner some time. We’ll go to the butchers first for some proper minced meat. We can even add a glass of wine or two just for fun.”

Sarah: “That sounds lovely, but that doesn’t solve the problem of your empty stomach now. You clearly do not want to go to McDonalds. What do you recommend?”

Sophie: “I’m glad you asked. It’s Friday, why don’t we get a fish in the city?

Sarah: “You mean those herrings which Dutchies eat with a passionate love for raw onions?”

Sophie: “You do realise that you eat a lot of raw onion at McDonalds?”

Sarah: “I see your point, but fermented fish doesn’t seem appealing to me.”

Sophie: “They have loads more than just herring. You could eat a fried fish.”

Sarah: “Add some chippies to that and I’ll feel right at home.”

Sophie: “Good, then we’re agreed.”
Dialogue 2

Two friends, Sophie and Sarah, are having a conversation together. They are sitting on a terrace enjoying the sun and a refreshing drink. The following is the conversation they had together.

Sophie: “Have you seen that new movie with all the superheroes?”
Sarah: “Do you mean the one with Superman?”
Sophie: “No, that movie is from DC. I mean the one of Marvel.”
Sarah: “Is there a big difference? They are all superheroes.”
Sophie: “They’re two completely different publishers with totally different heroes.”
Sarah: “You learn something new every day. Is it a nice movie? I mean the one of Marvel.”
Sophie: “It’s pretty good. The movie is about an older Wolverine.”
Sarah: “Who’s Wolverine?”
Sophie: “That wolf guy who’s played by Hugh Jackman.”
Sarah: “Oh I loved Hugh Jackman in Les Miserables, and not only his voice.”
Sophie: “By not only his voice, do you mean his broad shoulders?”
Sarah: “Or his eyes, doesn’t really matter. That guy is gorgeous.”
Sophie: “I see your point, but he had to train for that body for his role as Wolverine.”
Sarah: “Then perhaps it’s time for me to watch all his superhero movies.”
Dialogue 3

Two friends, Sophie and Sarah, are having a conversation together. Sophie is working in a butcher shop and Sarah wants to buy a piece of meat for a dinner with friends. The following is the conversation they had together.

Sarah: “Hey Sophie, pleasure to see you in your butcher costume.”

Sophie: “Hey Sarah, finally decided to make a sensible meat choice?”

Sarah: “Yes you finally convinced me. I’m having a few people over tomorrow for dinner and I want to prepare something special.”

Sophie: “Do you know what you want to prepare?”

Sarah: “I was actually hoping that you could give me some advice on that matter. I was thinking of a roast dinner.”

Sophie: “Well then I have a few suggestions for you. I’d take a piece of pork neck.”

Sarah: “It looks a bit fatty, don’t you have something leaner? I’m afraid the others won’t eat it otherwise.”

Sophie: “You could go for pork sirloin, but that’s a bit boring because of the absence of fat.”

Sarah: “Okay, the sirloin looks a bit small anyhow. I’ll have 1,5 kilo of the pork neck. Do you have any tips on how to cook this?”

Sophie: “We can have a long conversation about this but I have a better idea. What if you buy a bit more and I come round tomorrow and cook it for you and join you guys for dinner?”

Sarah: “That’s a wonderful idea. It’s a deal! See you tomorrow on Friday.”

Sophie: “See you tomorrow.”
Appendix C – Pitch contours

Appendix C1 - Dutch pitch contours

1. Al de artikelen en het boek – 1 of 2
Al de artikelen en het boek – 2 of 2

al die artikelen en het boek

all of the articles and the book
2. Niet alleen zijn stem – 1 of 2

P1. Mean: 15.6, Range: 14.2-17.2

P2. Mean: 15.0, Range: 12.9-18.6

P3. Mean: 15.9, Range: 13.6-18.0

P4. Mean: 13.5, Range: 11.2-16.1 ST

niet alleen zijn stem
Niet alleen zijn stem – 2 of 2

P5. Mean: 13.6, Range: 10.8-15.1

P6. Mean: 12.0, Range: 10.4-13.6

niet alleen zijn stem

N. Mean: 12.1, Range: 7.8-15.1

not only his voice
3. Nog steeds smal blijven – 1 of 2

P1. Mean: 13.4, Range: 10.4-17.2


P4. Mean: 12.7, Range: 8.0-15.2

nog steeds smal blijven
Nog steeds smal blijven – 2 of 2


P6. Mean: 11.4, Range: 7.9-18.9

nog steeds smal blijven
4. Een groot stuk nek van het varken – 1 of 2
Een groot stuk nek van het varken – 2 of 2

**P5. Mean: 11.0, Range: 8.3-14.0**

**P6. Mean: 14.5, Range: 11.6-19.6**

**N. Mean: 10.4, Range: 7.5-12.8**

een groot stuk nek van het varken

a piece of pork neck
5. Heb je al enig idee wat je wilt gaan maken – 1 of 2

P1. Mean: 16.0, Range: 12.4-19.2

P2. Mean: 14.6, Range: 8.4-18.0

P3. Mean: 15.7, Range: 12.1-20.3

P4. Mean: 13.8, Range: 6.2-20.3

heb je al enig idee wat je wilt gaan maken
Heb je al enig idee wat je wilt gaan maken – 2 of 2

Heb je al enig idee wat je wilt gaan maken

do you know what you want to prepare
6. Wil je gaan eten bij McDonalds – 1 of 2

wil je gaan eten bij Mc Donalds
Wil je gaan eten bij McDonalds – 2 of 2

wil je gaan eten bij Mc Donalds

you want to go to Mc Donalds
7. Ik ben klaar – 1 of 2

P1. Mean: 15.2, Range: 12.8-17.9

P2. Mean: 12.7, Range: 5.1-19.6

P3. Mean: 14.6, Range: 12.0-20.0

P4. Mean: 11.6, Range: 7.5-16.9

ik    ben    klaar
Ik ben klaar – 2 of 2

ik  ben  klaar

I' m done
8. Ik bedoel die van Marvel – 1 of 2

ik bedoel die van marvel
Ik bedoel die van Marvel – 2 of 2

ik bedoel die van marvel

I mean the one of marvel
9. Die film is van DC – 1 of 2
Die film is van DC – 2 of 2

die film is van D C

that movie is from D C
Appendix C2 - English pitch contours

1. All the articles and the book – 1 of 2

P1. Mean: 14.8, Range: 13.2-17.5

P2. Mean: 10.6, Range: 8.1-13.1

P4. Mean: 13.4, Range: 9.3-17.2

**all the articles and the book**
All the articles and the book – 2 of 2

<table>
<thead>
<tr>
<th>P5. Mean: 13.4, Range: 11.5-17.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. Mean: 10.3, Range: 6.7-13.5</td>
</tr>
</tbody>
</table>

all the articles and the book
Not only his voice
Not only his voice
3. The sirloin looks a bit small anyhow – 1 of 2

the sirloin looks a bit small anyhow
The sirloin looks a bit small anyhow – 2 of 2
4. One and a half kilo of the pork neck – 1 of 2

P1. Mean: 14.4, Range: 12.1-17.9

P2. Mean: 14.6, Range: 11.7-17.8

P3. Mean: 16.7, Range: 12.2-22.8

P4. Mean: 13.3, Range: 9.3-17.1

one and a half kilo of the pork neck
One and a half kilo of the pork neck – 2 of 2

P5. Mean: 11.6, Range: 9.4-14.3


N. Mean: 10.7, Range: 8.8-13.8

one and a half kilo of the pork neck
5. Do you mean the one with superman – 1 of 2

do you mean the one with superman
Do you mean the one with Superman – 2 of 2

P5. Mean: 13.3, Range: 8.2-17.5

P6. Mean: 15.2, Range: 8.6-20.1

N. Mean: 12.9, Range: 9.4-16.4

do you mean the one with superman
6. Is there a big difference – 1 of 2

is there a big difference
Is there a big difference – 2 of 2

P5. Mean: 14.2, Range: 10.8-18.4

P6. Mean: 13.6, Range: 7.4-23.5

N. Mean: 13.3, Range: 8.0-18.9

is there a big difference
7. I’m famished – 1 of 2

P1. Mean: 14.5, Range: 11.8-20.2


P3. Mean: 14.0, Range: 12.1-16.0

P4. Mean: 11.6, Range: 9.9-13.4

I’m famished
I'm famished
8. I mean the one of Marvel – 1 of 2
I mean the one of Marvel – 2 of 2
9. That guy is gorgeous – 1 of 2

that  guy  is  gorgeous
That guy is gorgeous – 2 of 2

P5. Mean: 10.0, Range: 8.4-11.5

P6. Mean: 10.9, Range: 7.9-13.5

N. Mean: 9.7, Range: 7.6-12.3

that guy is gorgeous