THE STRENGTH OF A WEAKER FIRST LANGUAGE:

Language production and comprehension

by Turkish heritage speakers in the Netherlands

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Remy van Rijswijk

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Promotor: Prof. dr. T. Dijkstra

Copromotor: Dr. A. Muntendam

Manuscriptcommissie:

Prof. dr. P. Muysken

Prof. dr. A. Backus (Tilburg University)

Dr. Y. Chen (Universiteit Leiden)

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Remy van Rijswijk

born on January 24, 1988

in Nijmegen, the Netherlands

Supervisor: Prof. dr. T. Dijkstra

Co-supervisor: Dr. A. Muntendam

Doctoral Thesis Committee:

Prof. dr. P. Muysken

Prof. dr. A. Backus (Tilburg University)

Dr. Y. Chen (Leiden University)

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Chapter 1

Introduction

1. Introduction

Migration is an event of all time. In the 1960s, the Dutch government was in need of foreign laborers and invited Turks and Moroccans together with their families to come to the Netherlands. In 2015, the year in which the Introduction of this thesis is written, Syrian refugees are massively coming to Europe, in search of a safe place to live. So migration occurred in the past and today, and it will undoubtedly be part of the future. An important consequence of migration is the contact between different cultures and languages. When I walk through the *Kanaalstraat* in the Dutch town of Utrecht, close to my home, I see a mixture of cultures and I hear a mixture of languages, and Dutch is only one of them. Contact between languages often results in bilingualism and language change. Immigrants speak a different language than the language of their new society, and consequently they have to face the challenge of learning a new language.

The children of immigrants are coined 'second-generation heritage speakers' (e.g, Benmamoun, Montrul, & Polinsky, 2013a). Although these heritage speakers inherit their first language (L1) from their parents, they are born and raised in a society in which a different language is the majority language. This second language (L2) often becomes the dominant language in heritage speakers. The success of L2 acquisition in heritage speakers can be studied from two different perspectives, that is, from a linguistic and an educational perspective. Firstly, *linguists* generally seem to assume that second-generation heritage speakers learn their L2 without experiencing many difficulties. The L2 is the language that is taught at school, and therefore heritage children learn this language from a young age, and both the quality and quantity of its input are relatively high. A vast body of studies suggests that early bilinguals are perfectly capable of acquiring an L2, particularly when it is the dominant language in the society (e.g., Argyri & Sorace, 2007; Daller, Treffers-Daller, & Furman, 2011; Hohenstein, Eisenberg, & Naigles, 2006; Meisel, 2007, 2008, 2013; Montrul & Ionin, 2010; Schlyter, 1993). Some of these studies reveal that language dominance in the bilingual individual does not only relate to the relative competence in both languages, but that it also mirrors language dominance within the society (e.g., Daller et al., 2011; Hohenstein et al., 2006).

This observation about early bilinguals is in sharp contrast to research in SLA (Second Language Acquisition), involving adult learners of an L2. These learners usually experience difficulties during L2 acquisition that are often explained in terms of L1 transfer. In SLA research, transfer is seen as a learning process in which the language learner is using previous linguistic knowledge in another language (e.g., Gass & Selinker, 1992). It has been claimed that learners take the L1 as the starting point for L2 acquisition, and that, at a later stage, other options from universal language principles are relied on when the learner fails to map L2 input onto L1 representations (e.g., the Alternation Hypothesis by Jansen, Lalleman, & Muysken, 1981; the Full Transfer / Full Access Model by Schwartz & Sprouse, 1996; and the Conservation Hypothesis by Van de Craats, Corver, & Van Hout, 2000; Van de Craats, Van Hout, & Corver, 2002).

In adult heritage speakers, who acquired both languages in early childhood, cross-linguistic transfer plays a role as well. In this thesis about heritage speakers, we define cross-linguistic transfer as the reproduction of a linguistic pattern from one language in another language (e.g., Daller et al., 2011; Haugen, 1950). In this regard, transfer can also be described as cross-linguistic influence from one language on another, or cross-linguistic effects of one language on the other. However, various studies have demonstrated that transfer mostly goes from the dominant to the weaker language, and hence not from the heritage language to the dominant L2 (Argyri & Sorace, 2007; Daller et al., 2011; Hohenstein, Eisenberg, & Naigles, 2006; Montrul & Ionin, 2010; Schlyter, 1993). Only a few studies suggest that L1 transfer is also possible (e.g., Montrul, 2006; Queen, 2012; Van Meel, Hinskens, & Van Hout, 2013, 2014). In addition, according to Muysken (2013b, 2013c), the way in which bilinguals use and process language depends to a large extent on language dominance. That is to say, when an individual is dominant in the L1, this leads to the introduction of L1-like structures in the L2 (i.e., L1 transfer), whereas dominance in the L2 leads to L2-like structures in the L1 (i.e., L2 transfer). These findings together suggest that heritage speakers are less likely to encounter difficulties in their dominant L2 that are due to effects from the weaker L1, than the other way around. This might partly explain the extensive list of linguistic studies on heritage languages, whereas the dominant L2 of heritage speakers has received less attention (see Chapter 2).

From the second perspective, *educational* studies have shown that second- and third-generation heritage children show language delays at school as compared to their non-heritage peers (e.g., Collier, 1995; Droop & Verhoeven, 2003; Scheele, 2010; Statistics Netherlands, 2014). Although quantity of the language input has been assumed to play an important role in this delay (i.e., heritage children receive less input in the L2 than non-heritage children, because, like all bilinguals, they have to divide their time over two languages; e.g., Gollan, Montoya, Fennema-Notestine, & Morris, 2005; Unsworth, 2008), it is not clear to what extent certain aspects of the delay can be explained by specific structural differences between the heritage language and the L2 (but see Blom & Baayen, 2013). It also raises the question to what extent the L2 of heritage speakers in adulthood still differs from the variety that is spoken as an L1 in the host country, due to effects of the weaker heritage language. Up till now, the number of studies that showed that adult heritage speakers' L2's are also different from the L1 variety in the host country are limited in number (e.g., Montrul, 2006; Queen, 2012; Van Meel, Hinskens, & Van Hout, 2013, 2014). These studies point towards L1 transfer, but clearly more research is needed to be more conclusive on the precise role of the L1 and the constraints governing transfer. If it is true that a weaker L1 is still visible in the dominant L2 in adult heritage speakers, an explanation of heritage children's delays at school in terms of L1 transfer seems possible. For example, L1 transfer might lead to interpretation differences and hence reading comprehension difficulties, further complicating learning in the L2.

The aims of this thesis are, firstly, to examine whether the dominant L2 of adult second-generation heritage speakers (Dutch) is different from the variety of L1 speakers, and, second, to explore whether differences can be explained in terms of an effect of the heritage speakers' L1 (Turkish). Thus, the thesis attempts to answer the following question: To what extent does the weaker L1 affect the dominant L2? In other words, to what extent can the strength of a weaker L1 explain differences between the Dutch of adult heritage speakers and the Dutch of L1 speakers? In this sense, strength refers to the influence that the L1 may have on the L2, not because it is the dominant language, but because it is the first system that was established. That is, such an influence cannot be explained in terms of language dominance, but it can be attributed to the L1 status of the weaker heritage language. It is important to note here that cross-linguistic effects can be both quantitative and qualitative. For instance, Hahne (2001) showed that differences in language processing between L2 learners and native speakers were quantitative in terms of semantic processing (i.e., more semantic integration difficulties for L2 learners than for native speakers), whereas differences were qualitative in terms of syntactic processing (i.e., native speakers processed syntactic information in a different way than the L2 learners).

To accomplish our aims, we deal with several aspects of language. First, we compare the Dutch of heritage speakers of Turkish to the Dutch of L1 speakers in the Netherlands, covering language production (speaking) and comprehension (reading), in which we examine the use of prosody, and the encoding and decoding of information structure. Moreover, to establish the role of prosody at the word level in the mental lexicon in heritage speakers, we conducted listening experiments in Turkish and Dutch. The examination of this wide range of aspects of the language by means of various (psycho-)linguistic research techniques allows us to study the processing mechanisms that underlie the specific interactions between the heritage language and the dominant L2. We chose this approach for two main reasons. First, cross-linguistic effects may not be visible in all modalities and across all tasks. For instance, language production tasks (which measure explicit knowledge) and grammaticality judgments (which measure metalinguistic awareness) may yield differences in performance in bilinguals (e.g., Altenberg & Vago, 2004; Bowles, 2011; Muysken, 2013c). Therefore, it is important to combine several research methods to shed light on the different facets that language entails. The wide variety of psycholinguistic tools nowadays allows us to also dive into the on-line processing by heritage speakers (e.g., Montrul, Davidson, De La Fuente, & Foote, 2014; Montrul & Foote, 2014). On-line processing is often a more direct reflection of the interaction between languages in the bilingual mind than, for instance, grammaticality judgments. Convergence of results across tasks would suggest that all tasks measure a shared underlying mechanism. Moreover, using several tasks leads to a higher chance of generalizable results, because the same phenomenon is studied from multiple angles.

The second reason for the decision to include different aspects of language in this thesis relates to the relative vulnerability of linguistic levels. Previous research on bilingualism and contact linguistics has shown that, in principle, cross-linguistic transfer is possible at all linguistic levels, but that some levels are easier or more difficult to acquire, or are more or less vulnerable to effects from the other language (e.g., Benmamoun et al., 2013a; Muntendam, 2013; Sorace, 2000; Thomason, 2001, 2008). Interestingly, whereas research on L1 transfer in heritage speakers is still limited, research in contact linguistics includes numerous studies examining various types of cross-linguistic effects from an indigenous language to the majority language (e.g., Thomason, 2001, 2008). These effects are often coined ‘contact-induced change’, because the effects were not only found in individual speakers, but commonly constitute a linguistic change in the speech community, due to several centuries of contact between the languages. This change is often the result of cross-linguistic transfer in individual bilinguals. For instance, it has been revealed that Quechua has affected various aspects of Andean Spanish at several linguistic levels (e.g., Adelaar & Muysken, 2004; Escobar, 1997; Muntendam, 2009, 2013; Muntendam & Torreira, in press; O’Rourke, 2012; Sánchez, 2004; Van Rijswijk & Muntendam, 2014; Zavala, 1999).

In sum, the heritage speakers in this thesis may not experience difficulties at all linguistic levels, in all modalities, and in all tasks. Crucially, we can even be certain that effects from the weaker L1 will not be observed across the board, because the heritage speakers in this thesis are highly proficient in their dominant L2. We therefore examine various aspects of language in order to develop a comprehensive picture of potential interactions between a weaker L1 and dominant L2.

To further clarify the objectives of the thesis, the remainder of this introductory chapter is as follows. First, in section 2, we characterize the heritage speakers who participated in the research for this thesis. Second, we zoom in on the aspects of language that are examined in this thesis: prosody in general in section 3, prosody at the sentence level (to encode information structure) in section 4, and prosody at the word level (to encode word stress) in section 5. This is followed by an overview of the chapters in the thesis and the methodology used in section 6.

2. Heritage speakers of Turkish in the Netherlands

The heritage speakers who participated in the experiments reported in this thesis were second-generation heritage speakers of Turkish in the Netherlands. Before introducing the participants, we briefly discuss general characteristics of the Turkish community in the Netherlands.

2.1 The Turkish community in the Netherlands

As mentioned above, Turkish immigrants arrived in the Netherlands in the 1960s and 1970s (Backus, 2004). Initially, mainly male workers came to the Netherlands with the single purpose of earning money to send back to their families. However, at a later stage, family reunification in the Netherlands led to the development of immigrant communities (Backus, 2004). The Turkish community, which comprises 2.4% of the total population in the Netherlands, is slightly larger than the Moroccan community (Statistics Netherlands, 2014), and nowadays consists of first-, second-, and third-generation members: the original immigrants, their children, and their grandchildren, respectively.

The Turkish community (in Dutch: *Turkse Nederlanders*, ‘Turkish Dutch’) is known for its relatively high language maintenance (Backus, 2004; Doğruöz & Backus, 2007, 2009; Extra, Yağmur, & Van der Avoird, 2004). Studies on Turkish in the Netherlands reveal only subtle convergence towards Dutch in various linguistic domains, such as the expression of spatial relationships, loan translations, and case marking (e.g., Doğruöz & Backus, 2007, 2009; Şahin, 2015). According to Backus (2004), the high language maintenance can be explained by various factors. For example, there is a low rate of intermarriage and a high rate of marriages with one of the spouses coming from Turkey rather than from the community in the Netherlands. Yet, according to Şahin (2015), the rate of intermarriage is currently increasing. Moreover, Turkish people in the Netherlands frequently visit their family and friends in Turkey during the summer, and they often use Turkish media, such as television and newspapers. In addition, religion is still an important domain that is mainly covered in Turkish, due to the presence of Turkish mosques. The tight connection with Turkey also appears from a recent interview on the Dutch national radio, in which three *Turkse Nederlanders* discussed whether or not to vote during the upcoming elections in Turkey (Corton & Veenhoven, 2015). Although the Turkish community in the Netherlands has always been entitled to vote in Turkey, only recently it has become possible to vote in the Turkish elections while staying in the Netherlands. The radio interview did not only illustrate the solidarity that *Turkse Nederlanders* feel with people in Turkey, but it also shows that the connection is mutual: Turkish parties come to Europe to win the votes of European Turks.

In spite of the high maintenance of Turkish, many heritage speakers report Dutch to be their dominant language (Extra, Yağmur, & Van der Avoird, 2004). This can be explained by the fact that Dutch is the language of the society and of education. Education in Turkish is limited in the Netherlands. Since 2004, there is a Dutch-only policy in education. This decision was preceded by a period of 30 years, in which there was some heritage language instruction at primary schools, despite a fierce political debate on its value. This Turkish language instruction was about four hours per week, in addition to the main curriculum, which was entirely in Dutch. Although some initiatives for local language schools have arisen after 2004, these are very limited given the lack of financial support by the government (Extra & Yağmur, 2010). Parents of immigrant children are encouraged to raise their children in Dutch, even if they themselves are low proficient learners of Dutch (Van der Laan, 2009). More recently, there has been a more positive attitude towards bilingual education, but the advantages of bilingualism still seem to be mostly associated with languages that have more prestige, such as English, rather than minority languages such as Turkish and Moroccan Arabic (Extra & Yağmur, 2010).

2.2 The heritage speakers in this thesis

In total, 70 second-generation heritage speakers of Turkish participated in the studies in this thesis, of which 44 were female and 26 male. The mean age of the participants was 23.23 years, ranging from 18 to 37 years. Some of these bilinguals participated in more than one study. All participants filled out a detailed sociolinguistic background questionnaire, including questions about language use and proficiency. Furthermore, 60 participants performed the Boston Naming Test (BNT; Kaplan, Goodglass, Weintraub, Segal, & Van Loon-Vervoorn, 2001) in both Turkish and Dutch, which we used to obtain an objective measure of their vocabulary knowledge.

Appendix A summarizes the information from this questionnaire and the BNT. All Turkish heritage speakers in this thesis acquired both Turkish and Dutch in early childhood. Whereas some acquired Dutch simultaneously with Turkish from birth, for the majority of participants the age of acquisition (AoA) of Dutch was slightly later, that is, when they were two or four years old. Moreover, language use with both parents was predominantly Turkish for all participants, suggesting that Turkish (rather than Dutch) was the language that was most strongly established during the first stage of childhood. Furthermore, the preference for Turkish in various domains, such as with the family (in the Netherlands as well as in Turkey), while listening to music, and in the mosque, illustrates the high language maintenance of Turkish. On the other hand, the shift towards Dutch in other domains, such as with friends, in the neighborhood, at work, and while reading, and the higher proficiency (ratings) for Dutch than for Turkish, indicate that Dutch is the dominant language in these adult bilinguals. The statistics in Appendix A reveal a characterization of the heritage speakers of this thesis that is in line with general descriptions of the Turkish community in the Netherlands (e.g., Backus, 2004). The participants in this thesis thus seem to form a representative sample of the current Turkish community.

3. Prosody

Through their voice alone speakers do not only tell hearers about paralinguistic features such as gender, age, and emotions, but also reveal linguistic information. This is realized by prosody: suprasegmental phonetic cues such as pitch, duration, and intensity. The fact that pitch (or fundamental frequency, f0, or tone) can be meaningful is most evident in tone languages like Mandarin Chinese and the majority of the African languages, in which words can be distinguished by a single difference in tone. In languages that we do not consider to be tone languages, such as English and Dutch, tones can also indicate differences in meaning, although these tonal differences mostly concern meanings at the level of the sentence. This involves, for instance, the difference between a question and a declarative statement, or whether the information from the speaker is already known by the hearer (given information) or not (new information; e.g., Ladd, 2008). Differences in the information status of constituents are referred to as information structure, which is discussed in more detail in section 4.

The phonological representation of tones is often realized in the influential framework of abstract tone values: the Autosegmental Metrical Theory (AMT) (Ladd, 2008). In this theory, details of the fundamental frequency are explained by means of instrumental phonetics. Subsequently, a correspondence with phonology can be established. Intonation is regarded as a string of units, in which the level of the syllable and the level of the tone are clearly separated. Pitch accents attached to prominent syllables are distinguished from accents on the edge of the intonational phrase (i.e., boundary tones, marked by - or %). Tones are described as high (H) or low (L) (Ladd, 2008). An asterisk (*) after the tone usually indicates its association to a stressed syllable. Furthermore, accents can be prenuclear or nuclear. The nuclear accent is the final accent in the intonational group or sentence and often a special function is attributed to this accent. For instance, in Dutch its location can indicate different types of information structure. We return to this issue in Chapters 3 and 4.

In addition to tone, duration and intensity are part of the prosodic inventory. For example, duration has been found to be an important cue for word stress in many languages, such as Dutch (Sluijter & Van Heuven, 1996). The exact difference between tone and word stress is difficult to determine (Sluijter & Van Heuven, 1996), although AMT assumes a sharp distinction between pitch accent and stress. A pitch accent is a local feature of the pitch contour and hence involves a change in fundamental frequency consisting of a minimum or maximum. This leads to an increased prominence of the syllable to which the pitch change is attached (Bolinger, 1958). Therefore, pitch accents have a dual aspect: They are the building blocks of intonation contours and, at the same time, increase the prominence of associated syllables. Word stress, on the other hand, is nothing more than an abstract, lexical characteristic of individual syllables, according to Bolinger (1958).

Prosody holds a prominent position throughout this thesis, because it plays a role at both the level of the sentence and the word. Regarding the sentence level, prosody indicates differences in information structure, and differences between Turkish and Dutch regarding this issue are the focus of Chapters 3 and 4. At the word level, prosody determines which syllable receives lexical stress. Differences between Turkish and Dutch with respect to word stress position are the focus of Chapter 5.

4. Prosody within the sentence: information structure

In a conversation, speakers have a common understanding about some aspect of the world (Gussenhoven, 2007). This shared knowledge is further developed during the dialogue by adding new information to a continuously updated ‘discourse model’. That is, a speaker indicates how his newly presented information is related to the hearer’s understanding. Thus, the information structure reflects how the information conveyed by the speaker (or writer) is related to the understanding of the hearer (or listener) (Gussenhoven, 2007). Prosody is an important tool to indicate differences in information structure. For instance, new information is prosodically more prominent than given information.

New information in the sentence is commonly referred to as ‘focus’ (e.g., Jackendoff, 1972). According to Gussenhoven (2007), focus can be understood through two dimensions: the scope of focus and the meaning of focus. These will be briefly discussed below. The first dimension concerns the size or scope of the focus constituent, hence the difference between broad and narrow focus. *Broad focus* involves focus of the whole sentence, as illustrated in (1).

(1) What happened?
[Emma ate a peanut] $_{\text{BROAD FOCUS.}}$

When only one constituent or element in the sentence or phrase is focused, this is referred to as *narrow focus*, as in (2).

(2) A: What did Emma eat?
B: Emma ate [a peanut] $_{\text{NARROW FOCUS}}$.

The second dimension distinguishes various meanings of focus, of which we will only discuss the two that are relevant for this thesis. The first type here is ´presentational focus´ (Gussenhoven, 2007), which in the literature is also often referred to as neutral focus (e.g., Zubizarreta, 1998). For clarity´s sake, we will continue using the term neutral focus in what follows. The type of focus in (2) above is an instance of neutral focus. What is in neutral focus can thus easily be identified by a question-answer pair: The new information in the answer is in neutral focus.

The second type is contrastive (or corrective) focus, which occurs when information is rejected and changed into a new value. This is illustrated in (3):

(3) A: Did Emma eat an apple?
B: No, Emma ate [a peanut]$_{\text{CONTRASTIVE FOCUS}}$.

Various studies have shown the importance of focus structure for both speech comprehension and reading comprehension (e.g., Birch & Garnsey, 1995; Birch & Rayner, 1997; Bredart & Modolo, 1988; Cutler, Dahan, & Van Donselaar, 1997; Cutler & Fodor, 1979; Cutler & Foss, 1977; Dimitrova, 2012; Erickson & Mattson, 1981; Heim & Alter, 2006; Magne, Astésano, Lacheret-Dujour, Morel, Alter, & Besson, 2005; Osaka, Nishizaki, Komori, & Osaka, 2002; Toepel, Pannekamp, & Alter, 2007). Yet, languages have different strategies of focus marking. Whereas English and Dutch almost exclusively rely on prosody, other languages, such as Spanish and Turkish, also ascribe a crucial role to syntax to highlight important elements. Given these typological differences, the question arises what happens when two languages co-occur. In fact, numerous studies have shown that bilinguals encounter difficulties concerning the production and comprehension of information structure, particularly when related to syntax (e.g., Argyri & Sorace, 2007; Belletti, Bennati, & Sorace, 2007; Hopp, 2009; Montrul, 2011; Roberts, Gullberg, & Indefrey, 2008; Sorace, 2000, 2011; Sorace & Filiaci, 2006). Information structure is concerned with the syntax-discourse interface, and it has been demonstrated that this interface is a vulnerable domain for various types of bilinguals (e.g., Montrul, 2004a; Muntendam, 2013; Sorace, 2000). However, it is not yet clear whether a weaker L1 may affect a dominant L2 at the syntax-discourse interface. In Chapters 3 and 4 of this thesis on heritage speakers of Turkish, we examine this issue by analyzing both production and comprehension data to gain a better understanding of language interactions in the bilingual mind with respect to information structure.

5. Prosody within the word: the mental lexicon and word stress

Every sentence, which is provided with a prosodic pattern and an information structure, consists of words. The mental lexicon of bilinguals can be seen as one large database with all the words that bilinguals know from all the languages that they speak. These words are labeled according to the language they belong to. Many studies have demonstrated that access to this database (i.e., lexical access) is language non-selective (e.g., Dijkstra & Van Heuven, 2002; Dijkstra, 2005; Thomas & Van Heuven, 2005). That is, one word in a specific language does not only activate similar words from the same language, but also look-a-likes from the other language(s). One way to study this is by means of cognates, words of which the semantic, orthographic, and phonological representations largely overlap between languages. Examples of Turkish-Dutch cognate pairs are *volkan-vulkaan,* ‘volcano’, and *zebra-zebra*, ‘zebra’. The presentation of cognates in lexical decision tasks, in which participants need to indicate as quickly as possible whether a string of letters (or sounds) is a word or not in the language of the task, often leads to faster reaction times to cognates than to non-cognate words. This is the so-called cognate facilitation effect. What is more, the more cognates are orthographically similar, the faster lexical access is (Dijkstra, Miwa, Brummelhuis, Sappelli, & Baayen, 2010).

Studying cognate processing is an excellent manner to gain more insight in the bilingual mental lexicon and the way it is used. In particular, it leads to a better understanding of language interactions at various linguistic levels (e.g., orthographic, phonological, semantic) and of the role of language dominance. Regarding heritage speakers, several studies have shown that the lexicon is dynamic and thus vulnerable to change, and faster and more accurate lexical retrieval is associated with higher language proficiency (e.g., O'Grady, Schafer, Perla, Lee, & Wieting, 2009; Polinsky, 2006). Consequently, a decrease in the use of the L1, which often occurs in heritage speakers, generally leads to less accurate and slower word retrieval in that language (e.g., Köpke & Schmid, 2004; Montrul & Foote, 2014; Schmid & Köpke, 2009). We do not know, however, what the implications of a less frequent use of the L1 are for processing more frequent words in the dominant L2. In other words, to what extent are words of the weaker heritage language still activated in L2 processing? The experiments with Turkish-Dutch cognates in Chapter 5 are concerned with this question.

Furthermore, although numerous studies have examined lexical access in the visual domain, limited research has considered the auditory modality. Yet, the auditory modality raises interesting research questions. For example, given that more overlap between representations leads to faster word recognition, what would be the role of word stress in word recognition? Would cognates in which word stress position is the same across two languages lead to faster processing than cognates with incongruent word stress in bilinguals? This is another question that is addressed in Chapter 5.

6. Outline of the thesis and methodology

The present thesis examines how second-generation heritage speakers of Turkish deal with several aspects in their languages that are related to prosody and/or information structure. Because language can be used in different modalities, such as speaking, reading, and listening, this thesis concerns these three different modalities, in order to create a more complete picture of the participants' language use. A variety of (psycho-) linguistic research methods were used to gain insight in these different modalities. Specifically, a production task was designed to investigate the speaking modality, an eye-tracking experiment monitored reading behavior, and lexical decision tasks with

RT and EEG (electroencephalogram) measurements were developed to study the process of listening. In the following, the research question(s) and the methodology that was used is described for each chapter.

Chapter 2 is a *literature review* that zooms in on the characteristics of heritage speakers and discusses previous studies on heritage speakers' L1 and L2. Current definitions of heritage speakers include many bilinguals who differ considerably in sociolinguistic aspects. Therefore, we first propose a narrower definition by adding three core characteristics that distinguish typical heritage speakers from other bilinguals. We subsequently describe additional sociolinguistic factors that are relevant when studying heritage speakers. Finally, we consider what we know about their languages and how they differ from non-heritage L1 varieties. The systematic analysis of these studies point towards an area of research that is important for gaining more insight in the factors that affect interactions between the weaker L1 and dominant L2 in heritage speakers, such as language dominance. Up till now, this research area has not received much attention. Studies on heritage speakers generally reveal effects from the dominant L2 on the weaker L1, but it is less clear whether cross-linguistic transfer also occurs in the other direction: from the L1 to the dominant L2. This issue is addressed in Chapters 3 to 5.

Chapters 3 and **4** concern how heritage speakers of Turkish mark and comprehend focus structure in Dutch. Dutch and Turkish differ in focus marking. Dutch primarily uses prosody to encode focus, whereas Turkish uses prosody and syntax, with a preverbal area for focused information and a postverbal area for background information. The question arises how heritage speakers of Turkish cope with these differences between their languages. Previous studies have shown cross-linguistic effects from the dominant to the weaker language in bilinguals, both regarding prosody and the syntax-discourse interface, but it is less clear whether a weaker L1 may affect the dominant L2 in heritage speakers. Therefore, Chapters 3 and 4 explore potential effects of the weaker L1 (Turkish) on the dominant L2 (Dutch) regarding focus marking. While Chapter 3 examines (prosodic) focus marking in language production, Chapter 4 examines focus marking in language comprehension.

In particular, Chapter 3 explores whether the Dutch prosody of heritage speakers of Turkish in the Netherlands differs from that of L1 speakers of Dutch who do not speak Turkish. Using a *production task*, the study examines whether observed differences between the bilinguals and L1 speakers of Dutch in the prosodic marking of focus could be attributed to an effect of Turkish. Eight second-generation heritage speakers of Turkish and 8 L1 speakers of Dutch participated in the experiment. All participants were born in Nijmegen and still lived there at the time of recording. A picture-description task was designed to elicit semi-spontaneous sentences in broad and contrastive focus. This led to a corpus of nearly 1200 annotated sentences in spoken Dutch. The acoustic analysis of the production data, including f0 movements, peak alignment, and duration measures, informs us about how Turkish heritage speakers encode focus in spoken Dutch.

In Chapter 4, the research topic moves from speaking to reading, examining whether Turkish heritage speakers in the Netherlands interpret focus in written Dutch sentences differently from L1 speakers of Dutch. In written sentences no explicit prosody is available, which possibly enhances the role of syntactic cues in interpreting focus. It was hypothesized that, in the case of transfer from the L1, the heritage speakers of Turkish would rely on Turkish word order cues to determine the focus structure of sentences. To test this hypothesis, an *eye-tracking experiment* was designed, in which 25 heritage speakers of Turkish and 24 L1 speakers of Dutch participated. The materials of the eye-tracking experiment were pretested with 18 different heritage speakers of Turkish and 20 different L1 speakers of Dutch. Both the off-line pretest and the on-line experiment examined whether Turkish heritage speakers and Dutch L1 speakers relied on their L1 to decode focus in Dutch while reading.

Changing modalities again, this time from reading to listening, **Chapter 5** sheds more light on Turkish-Dutch bilinguals' processing of stress position in cognate words. Whereas in Dutch word stress is variable, with a tendency for the penultimate syllable, in Turkish word stress is predictable and mostly falls on the ultimate syllable. Consequently, Turkish-Dutch cognates can either be congruent regarding stress position (e.g., Turkish *baLON* versus Dutch *baLLON*, ‘balloon’), or incongruent (e.g., Turkish *moTOR* versus Dutch *MOtor*, 'motor'). *Auditory lexical decision experiments with reaction times and EEG* in Turkish and Dutch were conducted in order to (a) examine cognate processing in the auditory modality; and (b) examine the role of stress position in Turkish-Dutch cognates. Importantly, while most previous studies on cognate processing involved late bilinguals, this chapter (as all chapters in this thesis) is concerned with heritage speakers of Turkish, which enables us to explore the role of language dominance. Twenty heritage speakers of Turkish participated in the Dutch task, and 21 participated in the Turkish task. The RT and EEG data for both the heritage language and the dominant L2 enable us to gain more insight in the various factors that play a role in auditory cognate processing.

Finally, in **Chapter 6**, the findings from Chapters 2 to 5 are summarized and integrated. Chapter 6 addresses the main issue of this thesis: To what extent can the strength of a weaker L1 explain differences between the dominant L2 of Turkish heritage speakers and the L1 of Dutch L1 speakers? To answer this question, we combine the collected data from several (psycho-)linguistic research methods (speech recording, eye-tracking, reaction times, and EEG) in different language modalities (speaking, reading, and listening), involving prosody at the level of the sentence (information structure) and at the level of the word (stress position). In this way, we aim not only at gaining more insight in how the weaker L1 may affect the dominant L2, but also at revealing in which aspects of language the strength of the heritage language is most visible. For instance, will we find that the weaker L1 may affect all aspects of the dominant L2 that are studied in this thesis, that is the use of prosody, the encoding and decoding of information structure, and the mental lexicon? Or are some aspects more vulnerable than others? In addition, will the strength of the weaker L1 be visible in speaking, reading, and listening, or are there differences across these modalities? As the heritage speakers in this thesis are highly proficient in their dominant L2, L1 transfer will probably not be found across the board. Thus, this thesis informs us about the vulnerability of linguistic domains in the languages of heritage speakers, and it reports on a thrilling competition between the status of the L1 versus the dominance of the L2. As such, our findings have consequences for theories and models of bilingualism.

Chapter 2

Heritage speakers, their L1, and their L2: Towards a new definition

Abstract
The goals of this chapter are to characterize heritage speakers and their languages, to provide an overview of studies on heritage speakers, and to pave the road for future research on heritage speakers and other bilinguals. Heritage speakers are unbalanced bilinguals who acquired their L1 in early childhood, but are dominant in their L2 in adulthood. Current definitions of heritage speakers include many bilinguals who differ considerably in several sociolinguistic aspects. We propose a narrower definition by adding three core characteristics that distinguish heritage speakers from other bilinguals. We subsequently describe additional sociolinguistic factors that are relevant when studying heritage speakers. Finally, we consider what we know about heritage languages and how these differ from non-heritage L1 varieties. This definition and characterization of heritage speakers are crucial for gaining more insight in the factors that affect interactions between the weaker L1 and dominant L2 in heritage speakers and allow us to formulate underexplored research questions, such as questions about the role of language dominance versus the status of the heritage language as the L1 in the directionality of cross-linguistic transfer.

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1. Introduction

A central issue in bilingual research concerns the various ways in which languages affect each other during speaking, reading, and listening, and the factors that play a role in these interactions. To clarify this issue, it is informative to compare bilinguals who have acquired their languages in different sociolinguistic contexts, at different ages, and in different manners. All of these factors have been shown to contribute to differences in cross-linguistic effects, for instance, as a consequence of language dominance (e.g., Argyri & Sorace, 2007; Schlyter, 1993). As mentioned in Chapter 1, language dominance refers to the relative competence in the languages a bilingual speaks. The dominant language of an individual often reflects the dominant language of the society, particularly in early bilinguals (e.g., Daller, Treffers-Daller, & Furman, 2011; Hohenstein, Eisenberg, & Naigles, 2006). To clarify the contribution of separate factors to the linguistic outcome of bilingualism, it is important to provide a detailed profile of the bilinguals under study (e.g., Grosjean, 1998). Many different types of bilinguals can be distinguished. For instance, bilinguals may be *early* or *late* bilinguals, depending on the age of onset of acquisition (AoA) of the second language (L2); they may be *simultaneous* or *sequential* bilinguals, who acquired their languages in parallel from birth or one following the other, respectively; or they may be *balanced* or *unbalanced* bilinguals, having two equally strong languages, or one language that is dominant over the other, respectively (e.g., Grosjean, 1998). For most types of bilinguals, it is relatively clear how they should be characterized with respect to these variables. For instance, adult L2 learners are late, sequential, and unbalanced bilinguals. Bilingual children from mixed marriages, or from expat parents, by contrast, are early simultaneous or early sequential bilinguals who are generally relatively balanced in their languages. However, for at least one group of bilinguals, who are the focus of more and more research, it is less clear how they should be described: heritage speakers. Roughly speaking, heritage speakers are bilinguals who, in addition to the dominant language of the society they live in, use the language they 'inherited' from another community, i.e., from the country from which they or their ancestors emigrated (e.g., Benmamoun, Montrul, & Polinsky, 2013a). First-generation members of this population are the people who immigrated, whereas second-generation and third-generation heritage speakers have parents or grandparents who did so. Heritage speakers often acquire the heritage language as their first language (L1) and the language of society as their L2 (Benmamoun et al., 2013a). The literature on second-generation adult heritage speakers suggests that their L1 is the weaker language, and the L2, which is taught at school, the dominant one (e.g., Benmamoun et al., 2013a; Montrul, 2008).

There is currently much discussion about how we should define 'heritage speakers' and what exactly makes heritage speakers different from other groups of bilinguals (e.g., Benmamoun, Montrul, & Polinsky, 2013b; Dąbrowska, 2013; Kupisch, 2013; Meisel, 2013; Muysken, 2013c; Rothman & Treffers-Daller, 2014). Heritage speakers are early simultaneous or early sequential bilinguals who are relatively unbalanced in their two languages, as they are dominant in their L2. Yet, bilingual children from mixed marriages or with expat parents are not necessarily dominant in their L1. Should they then also be considered heritage speakers (e.g., Kupisch, 2013; Meisel, 2013)? Another group of bilinguals often included in the definition of heritage speakers concerns speakers whose L1 is an indigenous language, whereas their L2 is the majority language taught at school, e.g., Quechua-Spanish bilinguals in Peru (e.g., Benmamoun et al., 2013b; Fishman, 2006; Valdés, 2005). Thus, definitions of heritage speakers that are presently in use often include a large, heterogeneous group of bilinguals, which may lead to considerable variability in language use, language proficiency, and patterns of linguistic outcomes (including performance in experimental tasks). Notwithstanding similarities between these groups of bilinguals and typical heritage speakers, we will argue here that there are also considerable sociolinguistic differences.

Although we do not wish to claim that the linguistic outcomes observed for heritage speakers necessarily differ from those of other groups of bilinguals, we do believe that, given the sociolinguistic differences between heritage speakers and other bilinguals, a stricter definition of heritage speakers is necessary for advancing our understanding of heritage speakers' bilingualism as well as bilingualism in general. A definition that refers to a coherent group of speakers who are sociolinguistically comparable will lead to a better insight into specific patterns of language use. This will allow us to consider to what extent heritage speakers resemble other types of bilinguals, and how we can explain any similarities or differences between groups. Based on a narrower definition of heritage speakers, a comparison with other coherently defined groups of bilinguals will lead to a better insight into how languages interact in the bilingual mind. As such, our goal is somewhat different from the more practical goal of defining heritage speakers by language policy makers in the US. For example, Carreira (2004) and Wiley (2001) note that defining heritage speakers is important for the improvement of language teaching and revitalization of heritage languages. According to Carreira (2004), heritage speakers have not received "sufficient exposure to their language and culture to fulfill basic identity and linguistic needs. Consequently, they pursue language learning to fulfill these needs" (Carreira, 2004, p. 1). Therefore, Carreira (2004) proposes different categories of adult heritage speakers who all feel the urge to better learn their heritage language. This is a different goal from the goal of our narrower definition, although eventually, we hope that educational practice will benefit from the fine-tuned (psycho-)linguistic perspective that we take in this paper.

In the following, we first outline the definitions of heritage speakers that are in use and explain that these definitions include many bilinguals (section 2). We subsequently describe which three core characteristics together clearly distinguish heritage speakers from other types of bilinguals (section 3). In section 4, we discuss additional factors within the population of typical heritage speakers, which may contribute to different linguistic outcomes. Moreover, we provide an overview of what is currently known about the heritage speakers' L1 (section 5) and L2 (section 6), pointing to research questions that have rarely been addressed before. Finally, section 7 concludes with a summary of current knowledge about heritage speakers and discusses how studying heritage speakers will help to improve our understanding of bilingual language use and processing.

2. Heritage speakers: common definitions

One of the motivations for researchers to study heritage speakers originates from foreign language teachers and language policy makers who developed programs for the teaching of heritage speakers (e.g., Aalberse, Backus, & Muysken, 2015; Carreira, 2004; Valdés, 2005; Wiley, 2001). Teachers in Canada and the US encountered an increasing number of students who wanted to improve their heritage language competence. Consequently, teachers wished to learn more about their students' proficiency in L1. This led to the term 'heritage student': "a student of language who is raised in a home where a non-English language is spoken. The student may speak or merely understand the heritage language and be, to some degree, bilingual in English and the heritage language." (Valdés, 2005, p. 412). Although this definition refers to specific heritage languages that can be learned in language courses at universities (i.e., Spanish) and refers to English as the L2, the definition has nowadays been broadly applied in the field of linguistics and often also involves other languages (Benmamoun et al., 2013a; 2013b).

As a more general definition, Rothman (2009) states that any language can be a heritage language as long as it is not the majority language of the society, and as long as the language is acquired in a naturalistic setting in early childhood (i.e., spoken at home or available in a different way).

Benmamoun et al. (2013b) distinguish between a broad and a narrow definition of heritage speakers. In the broad sense, anyone who has an ethnic or cultural connection with a language is a heritage speaker (e.g., Carreira, 2004; Polinsky & Kagan, 2007; Valdés, 2005). For instance, Armenian would be considered a heritage language for native speakers of English of Armenian ancestry, even if they have never had exposure to Armenian, but are motivated to learn the language for future maintenance (Valdés, 2005). This broad definition is commonly applied in programs of heritage language teaching.

According to Benmamoun et al.'s (2013a) narrower definition of heritage speakers, (a) heritage speakers are asymmetrical (i.e., unbalanced) bilinguals who acquired their L1 in childhood and still have some knowledge of that language, but

(b) they are dominant in their L2 in adulthood. It is this latter definition that Benmamoun et al. (2013a; 2013b) use. However, this definition still includes many types of bilinguals, such as early simultaneous or early sequential bilinguals from mixed marriages or expat parents, and L1 speakers of indigenous languages. All these bilinguals acquired two or more languages in early childhood and are not necessarily balanced bilinguals. The definition thus includes bilinguals who vary largely regarding sociolinguistic factors, e.g., whether or not the L1 is an immigrant language, whether or not the L1 is fully acquired, and whether or not the bilinguals received formal instruction in their L1. Several researchers have acknowledged this heterogeneity (Aalberse & Muysken, 2013; Dąbrowska, 2013; Kupisch, 2013; Muysken, 2013c; Rothman & Treffers-Daller, 2014), and some have even emphasized the necessity of specific criteria of heritage speakers to distinguish them from other types of bilinguals (e.g., Meisel, 2013). However, up till now, this has not led to a stricter definition. The commentaries on Benmamoun et al. (2013a) (e.g., Dąbrowska, 2013; Kupisch, 2013; Meisel, 2013; Muysken, 2013c) even led Benmamoun et al. (2013b) to emphasize that their definition includes more types of bilinguals than their 2013a paper implied, such as early bilinguals from mixed marriages or expat parents and L1 speakers of indigenous languages, because they meet the criteria that Benmamoun et al. (2013a) proposed for heritage speakers.

As mentioned above, a narrower definition of heritage speakers is desirable, because it will allow us to explain any similarities or differences in linguistic outcomes between typical heritage speakers and other groups of bilinguals. To formulate a narrower definition, in section 3 we discuss the sociolinguistic factors that in our view together define typical heritage speakers and exclude several other types of bilinguals. We take Benmamoun et al.'s (2013a) definition as a starting point. Hence, heritage speakers are (a) unbalanced bilinguals who acquired their L1 in childhood and still have some knowledge of that language, and (b) are dominant in their L2 in adulthood. Moreover, we add three core characteristics to these criteria, which are (c) the L1 is an immigrant language, (d) the L1 is not fully attained, and (e) the bilingual received no or limited L1 education. Importantly, only speakers who meet all of these five criteria are considered typical heritage speakers in our definition.

3. Towards a new definition of heritage speakers: core characteristics

3.1 Immigrant languages

Heritage languages are minority languages in the society where the heritage speakers live. Moreover, according to Benmamoun et al. (2013a, p. 5), "the term heritage speakers typically refers to 2nd generation immigrants". Yet, several researchers (e.g., Fishman, 2006; Kupisch, 2013; Meisel, 2013; Valdés, 2005), including Benmamoun et al. (2013b), emphasize that the minority status of the language is not necessarily due to immigration. According to Benmamoun et al. (2013b), immigrant heritage speakers are just one type of heritage speakers. Another type involves L1 speakers of indigenous languages whose L2 is the majority language of the society, for example, L1 speakers of Quechua in South American countries, Mayan languages in Mexico, or minority languages in multilingual societies in Africa and Asia.

We would like to argue that L1 speakers of indigenous languages should not be included in the definition of heritage speakers.[1] Although there are similarities between the two groups, there are also important differences, which may result in different linguistic outcomes. The first difference concerns the length of language contact: For instance, indigenous languages in Latin America have been in contact with Spanish and/or Portuguese for several centuries, whereas immigrant languages typically have been in contact with the majority language for only a few decades. The long-term contact between indigenous languages and the majority language may have resulted in linguistic changes in both languages, which are difficult to separate from cross-linguistic effects within bilingual individuals. Although this historical language change (i.e., contact-induced change; e.g., Thomason, 2001) eventually may occur in the languages of heritage speakers as well, the fact that the contact situation of heritage speakers arose only recently makes it easier to distinguish language change from

[1] This is in line with the definition used by the Canadian government, who states that a heritage language is "a mother tongue that is neither an official language, nor an indigenous language" (Nagy, 2015, p. 310).

language interactions that take place in the bilingual mind.[2] As a second difference, an indigenous language is spoken in its country or region of origin, but there is no other area where it is spoken as a monolingual majority language. This situation is different for immigrant languages: An immigrant language is generally still a majority language with high prestige in the country of origin. Not only does this affect the status of the language, but the contact that heritage speakers have with the non-heritage L1 variety (i.e., through (social) media and contact with family members) may also influence their L1 use and language maintenance.

To conclude, whether immigrant and indigenous languages are comparable in language use remains an open question, although sociolinguistic differences (i.e., length of contact and contact with the L1 variety) possibly result in different linguistic outcomes. Theoretically, we do not see an advantage of grouping L1 speakers of immigrant languages and L1 speakers of indigenous languages together given these differences. We therefore define as the first core characteristic of heritage speakers that their L1s are immigrant languages, in this way excluding L1 speakers of indigenous languages. Crucially, an immigrant language is the result of immigration that has recently taken place, and hence their speakers are first-, second-, or maximally third-generation speakers. Indeed, studies have revealed for Spanish in the US that around the third generation a gradual language shift from Spanish towards English takes place (e.g., Rivera-Mills, 2012; Valdés, Fishman, Chávez, & Pérez, 2008). In Australia, speakers of many heritage languages (e.g., Dutch, German, Maltese, Hungarian) already switched to English in the second generation (Clyne & Kipp, 1997; Clyne, 2003). Although maintenance of the heritage language after the third generation is possible, we cannot be certain whether the linguistic outcome is the result of individual bilingualism or contact-induced change. For example, the heritage speakers of French in Pennsylvania in Bullock (2009) are not heritage speakers according to our definition, but rather speakers of a contact variety of French, because French has been in contact with English in that area for almost two centuries. The

[2] Of course, the situation becomes more complicated when the heritage language has a long contact history, such as Papiamentu in the Netherlands (e.g., Muysken, Kook, & Vedder, 1996).

same holds for the heritage speakers of German in South Central Kansas in Hopp and Putnam (2015).

On the other hand, languages like German and English that are spoken in a country where the majority language is a different language may still be heritage languages if speaking these languages as an L1 is the result of recent immigration, for instance, heritage speakers of English in Israel (Viswanath, 2013). Nonetheless, whether these languages are actually heritage languages depends on the criteria of ultimate L1 attainment and education, because in our definition bilinguals are only typical heritage speakers if they meet all of the core characteristics.

3.2 Ultimate L1 attainment

Benmamoun et al. (2013a) state that, given the prevalence of L2, heritage speakers typically do not reach a native-like level in their L1. We agree with Benmamoun et al. and would like to argue that ‘no ultimate L1 attainment’ is a core characteristic of heritage speakers. In fact, we think that the asymmetric relationship between the weaker L1 and dominant L2 is one of the (psycho-)linguistically most interesting aspects of heritage speakers. That is, it informs us about the strength of an L1 that was only prevalent in early childhood.

However, Kupisch (2013) argues that there are several studies that demonstrate that early simultaneous bilinguals, who are heritage speakers according to Benmamoun et al.’s (2013a) definition, are perfectly capable of reaching a native-like level in both their languages (e.g., Meisel, 2001) or only show minor differences from L1 speakers who acquired the language as a majority language (e.g., Kupisch, Lein, Barton, Schröder, Stangen, & Stoehr (2014). As a reply, Benmamoun et al. (2013b) state that ultimate L1 attainment is not relevant for the definition of heritage speakers.

The discussion on whether or not heritage speakers reach ultimate L1 attainment raises the question of what the terms ‘successful acquisition’ and ‘ultimate attainment’ actually mean. Kupisch (2013) seems to consider bilinguals’ high proficiency regarding one specific morpho-syntactic aspect of their languages as evidence for ultimate L1 attainment. For instance, Kupisch discusses a study of

Turkish heritage speakers in Germany, in which she and her colleagues tested the definiteness effect in Turkish and German through an acceptability judgment task. The two languages differ regarding this morpho-syntactic feature, because while in German it is ungrammatical to use definite noun phrases both in positive (i.e., '*There is the dog in my garden') and negative existentials (i.e., '*There is not the dog in my garden'), in Turkish it is ungrammatical in positive, but grammatical in negative existentials. The study revealed that the bilinguals performed native-like in both languages, except for one condition in Turkish. According to Kupisch (2013), this finding suggests that heritage speakers may be more proficient in their L1 than other researchers assume (e.g., Benmamoun et al., 2013a).

We believe that demonstrating that heritage speakers have acquired some specific aspects of their heritage language is not sufficient to claim that heritage speakers have reached ultimate L1 attainment. They may well show differences at other linguistic levels, such as the syntax-discourse interface. Whether or not a bilingual has reached ultimate L1 attainment is a question that involves several features at different linguistic levels.

Of course, heritage speakers should not be selected purely on the basis of non-native proficiency in the heritage language. We agree with Nagy (2015) that this selection procedure has serious consequences for the results of studies about heritage languages. Rather, the sociolinguistic background of bilinguals ultimately determines whether they are heritage speakers or not, but we argue that 'no ultimate L1 attainment' is often the consequence of their sociolinguistic background. It can, for example, be explained by the language dominance shift to the L2. Again, this does not imply that incomplete acquisition is visible in all linguistic domains. For example, using a variationist approach, Nagy (2015) showed that three generations of heritage speakers of Cantonese, Italian, and Russian in Canada all had full attainment of a linguistic feature that has commonly been shown to be vulnerable in heritage languages, that is, the use of subject pronouns (e.g., Montrul, 2004a; Polinsky, 1995; see section 5.1). For the second linguistic feature under study, that is, Voice Onset Time (VOT), the heritage speakers of Italian showed full attainment as well, although the Cantonese and Russian heritage speakers showed differences as compared to the non-heritage variety.

To conclude, as a second core characteristic we define typical heritage speakers as bilinguals who do not reach ultimate L1 attainment. Heritage speakers differ in this respect from other bilinguals, such as early bilinguals from mixed marriages or expat parents, whose language proficiency is often more balanced. Nonetheless, there are exceptions: If bilinguals from mixed marriages or expat parents meet all of the core characteristics, we would consider them heritage speakers (see section 6 for an example). L1 speakers of indigenous languages often do not reach ultimate L1 attainment, similar to heritage speakers. However, these bilinguals are distinguished from heritage speakers by the first core characteristic, because indigenous languages are not immigrant languages. Ultimate L1 attainment is related to the third core characteristic, that is, the degree of education in the L1.

3.3 L1 education

Whether or not bilinguals receive formal education in L1 is extremely relevant for the development of the language. Formal education in L1 makes it more likely that bilinguals fully acquire the language (e.g., Aalberse & Muysken, 2013c; Dąbrowska, 2012, 2013; Pires & Rothman, 2009). To illustrate the effect of education in L1, Schaufeli (1993) and Verhoeven and Boeschoten (1986) compared Turkish children growing up in the Netherlands to Turkish children in Turkey. The Turkish-Dutch children started receiving education in their L1 when they were seven years old. Even though the education in Turkish consisted of only four hours per week, Verhoeven and Boeschoten (1986) demonstrated that the bilingual children in their study benefitted from education in Turkish: After a period of stagnation at ages 6 and 7 (when the children in Turkey showed further development), at age 8 they showed increasing scores on several linguistic measures (i.e., productive vocabulary, morpho-syntactic features and pragmatic ability). The benefit of L1 education may be largely explained by increasing literacy skills. For example, Zaretsky and Bar-Shalom (2010) found that heritage speakers of Russian in the US with reading skills in Russian made fewer morpho-syntactic errors in the oral production of this language than heritage speakers who were not able to read in Russian.

Unfortunately, heritage speakers usually do not receive bilingual education due to the policy in many countries regarding heritage languages (e.g., Valdés, 2005 for the US; Yağmur & Van de Vijver, 2012 for Australia, France, Germany, and the Netherlands). The fact that most heritage speakers (second and later generations) mainly receive formal education in the majority language leads to increased L2 input and decreased L1 input. This explains in large part why heritage speakers become dominant in their L2. Bilinguals from mixed marriages or expat parents, by contrast, seem to receive schooling in both languages more frequently (Fishman, 2006), and can therefore often be considered as more balanced bilinguals. This can be attributed to several factors, such as the socioeconomic status (SES) and educational level of the parents: Wealthy, highly educated parents more often choose bilingual education for their children than parents with a lower SES and education level (e.g., Fishman, 2006).

In sum, the third core characteristic is that heritage speakers have had no or only limited formal education in their L1 in early childhood. This further contributes to the distinction between heritage speakers and early simultaneous bilinguals from mixed marriages or expat parents.

We added ‘in early childhood’ to the criterion to also include heritage speakers of Spanish in the US who take Spanish language courses when they go to the university, but never received Spanish education in childhood. Furthermore, we used ‘limited’ to not exclude heritage speakers who received a small amount of education in L1. For instance, second-generation heritage speakers of Turkish in the Netherlands received, before 2004, four hours of instruction in Turkish per week beside the main curriculum, which was entirely instructed in Dutch. Because four hours Turkish per week is still relatively few hours as compared to Dutch, we consider this limited L1 education.

As mentioned above, it is the combination of the three core characteristics, in addition to the two criteria that were proposed by Benmamoun et al. (2013a), that makes certain bilinguals typical heritage speakers. L1 speakers of indigenous languages in Latin America and multilinguals in Africa and Asia often do not receive education in their L1, similar to heritage speakers (e.g., Akinnaso, 1993; Brock-Utne, 2007; Hovens, 2002; Mahboob, 2009; Malone, 2004), but the fact that their L1s are not immigrant languages excludes these bilinguals from our definition. Moreover, the third core characteristic implies that first-generation immigrants should be distinguished from their children, as the first generation often received L1 education in the country of origin.

3.4 Summary

In our narrower definition, (a) heritage speakers are unbalanced bilinguals who acquired their L1 in childhood and still have some knowledge of that language, and (b) they are dominant in their L2 in adulthood, as in Benmamoun et al.'s (2013a, 2013b) definition. Moreover, heritage speakers have the following core characteristics: (c) Their L1 is an immigrant language; (d) they have not reached ultimate L1 attainment; and (e) they have received no or limited formal education in L1 in early childhood. Table 1 illustrates to what extent five groups of bilinguals meet the five criteria of heritage speakers: (1) second-generation heritage speakers according to the narrower definition; (2) first-generation immigrants; (3) bilingual children from mixed marriages or expat parents; (4) L1 speakers of indigenous languages in for instance Latin America, Asia and Africa; and (5) adult L2 learners. Although these other groups of bilinguals share some of the core characteristics with heritage speakers, only second-generation heritage speakers meet all of the criteria. Further note that early bilinguals from mixed marriages or expat parents may or may not meet all the criteria. As previously mentioned, they usually do not share all of the core characteristics with heritage speakers, but there may be exceptions.

Table 1. ***Schematic overview of sample studies that concern five groups of bilinguals (second-generation heritage speakers, first-generation immigrants, L1 speakers of indigenous languages (including multilinguals in Asia and Africa), early simultaneous/sequential bilinguals from mixed marriages/expat parents, and adult L2 learners). The + and - indicate to what extent each group of bilinguals meets the criteria that we consider core characteristics of heritage speakers: + = always; +/- = sometimes; - = never.***

Type of bilingual	Sample studies	(a) Unbalanced bilinguals; some L1 knowledge	(b) Dominant in L2 in adulthood	(c) L1 is immigrant language	(d) No ultimate L1 attainment	(e) No/limited L1 education
Second-generation heritage speakers	Benmamoun et al. (2014); Blom & Baayen (2013); Scheele (2010); Montrul (2008); Montrul et al. (2014); Polinsky (2011)	+	+	+	+	+
First-generation immigrants	Gürel (2004); Montrul (2008); Polinsky (1995); Roberts, Gullberg, & Indefrey (2008)	+	+/-	+	+/-	-
L1 speakers of indigenous languages	Hovens (2002); Malone (2004); Muntendam (2013); Sánchez (2004); O'Rourke (2012)	+/-	+/-	-	+/-	+/-
Early bilinguals from mixed marriages/ expat parents	Kupisch et al. (2014); Meisel (2001); Schlyter (1993); Serratrice (2007)	+/-	+/-	+/-	+/-	+/-
Adult L2 learners	Dussias, Valdés Kroff, Guzzardo Tamargo, & Gerfen (2013); Mulder, Dijkstra, & Baayen (2015)	+	-	-	-	-

4. Variation within the population of heritage speakers

Although our narrower definition of heritage speakers excludes several types of bilinguals, there may still be some variability among heritage speakers due to sociolinguistic factors. These additional sociolinguistic factors may also lead to qualitative differences in linguistic outcomes, and will therefore be briefly addressed here. Factors that contribute to quantitative differences, such as slower picture naming times for bilinguals than for monolinguals (e.g., Gollan, Montoya, Fennema-Notestine, & Morris, 2005), or more semantic integration difficulties for L2 learners than for native speakers (e.g., Hahne, 2001), are not discussed here. Furthermore, there are also methodological issues that possibly affect the linguistic outcomes, but discussing these is beyond the scope of this chapter.

The first factor is *age of onset of acquisition (AoA) of L2*. Whereas first-generation immigrants were born in the country of origin, the second and later generations were born in the L2 society and acquired the L1 and L2 from an early age. This results in differences regarding AoA of the L2. Several studies have demonstrated the relevance of AoA for language acquisition (e.g., Montrul, 2008). Generally, the earlier acquisition starts, the higher L2 proficiency is. Among second- or later generation heritage speakers there may also be differences regarding AoA. Heritage speakers may have acquired the L2 simultaneously with the L1, or the onset started somewhat later, for instance, at the moment they went to (pre-)school. These differences may also have consequences for the linguistic outcome. For example, in several studies in Montrul (2008), heritage speakers who acquired both languages simultaneously showed more L1 attrition than heritage speakers who acquired the languages sequentially.

A second factor concerns the *status of the heritage language in the host society.* Although heritage languages are minority languages, their actual status may differ across societies (Aalberse & Muysken, 2013). This may affect language proficiency and use to a large extent, as a lower status often results in a decreasing use and proficiency. For instance, the status of Spanish in the US depends largely on the area. The relatively high prestige of Spanish in Miami, Florida leads to an extended use of Spanish in social and professional interactions, whereas in communities in Texas Spanish has a much lower status, resulting in a reduced language use and a lower proficiency (Carreira, 2004).

The third factor involves *language use of the parents.* Both parents may choose to speak the heritage language to their children, or parents may choose the one parent - one language (OPOL) strategy (e.g., King, Fogle, & Logan-Terry, 2008). This difference in language input may have consequences for acquisition, because children receive less input in the heritage language if only one parent speaks that language to them (e.g., De Houwer, 2007). Hoff, Core, Place, Rumiche, Señor, & Parra (2012) demonstrated that bilingually developing children from age 1;10 to 2;6, who received dual language exposure, were less advanced on vocabulary and grammar measures than their monolingual peers. Moreover, the relative exposure to each language that bilingual children received was found to explain language development. That is, there was a positive relation between language exposure and development in that language (i.e., the more exposure in one language, the better development in that specific language), whereas there was a negative relation between exposure in one language and development in the other language (i.e., development in the other language lagged behind). This finding indicates that less exposure to the heritage language, for instance because it is only spoken by one of the parents, may also affect language development and, as such, linguistic outcomes. This is further supported by the differences in L1 attrition between simultaneous bilinguals and sequential bilinguals mentioned above (Montrul, 2008).

Finally, a fourth factor relates to *the domains and network* in which heritage speakers use their L1. Variation among heritage speakers can be partly attributed to the presence of a community that speaks the L1 and shares the culture (Aalberse & Muysken, 2013). That is, heritage speakers may limit their use of the L1 to conversations with their parents, but they may also frequently employ the language in interactions with their friends, and in social media, such as Facebook. For instance, Chau (2011) showed that heritage speakers of Cantonese in the Netherlands with a large Cantonese network had a higher proficiency in Cantonese than heritage speakers who lived in a smaller town, in which the Cantonese community was much smaller.

Summarizing, when studying heritage speakers' languages, at least the following factors should be taken into account: AoA, status of the L1 in the host society, language use of the parents, and domains and networks in which the L1 is used. These factors may have an effect on the heritage speakers' language use and proficiency, and ultimately on the linguistic outcomes of contact between the L1 and the L2.

One goal of our narrower definition is to develop a clearer picture of how the languages of heritage speakers interact. Therefore, in the next sections, we provide an overview of what is known about how the L1 (section 5) and L2 (section 6) of heritage speakers diverge from non-heritage L1 varieties, and how such differences can be explained in terms of cross-linguistic effects (i.e., transfer: the reproduction of a linguistic pattern from one language in another language; e.g., Daller et al., 2011; Haugen, 1950). This overview will raise research questions that, up till now, have been underexplored.

5. The L1 of heritage speakers

An important difference between heritage speakers and other types of bilinguals concerns the status of the L1 (Montrul, 2008). Although the heritage language is acquired first, it often diverges from the L1 variety in the country of origin due to an increased exposure to the L2 (see above). In section 5.1 we describe this divergence at various linguistic levels, while in section 5.2 we give four explanations for this divergence as proposed in the literature.

5.1 Differences between heritage languages and the non-heritage L1 variety

There are a large number of studies, spanning several linguistic domains, which demonstrate that heritage speakers differ in their L1 from speakers of the non-heritage L1 variety. These studies suggest that, while (narrow) syntax is relatively strongly developed in heritage speakers, vulnerable domains are morphosyntax, semantics, the lexicon, and the syntax-discourse interface (for a review, see Benmamoun et al., 2013a). Research on other types of bilinguals has found similar patterns regarding the vulnerability of linguistic domains. That is, all linguistic domains are susceptible to cross-linguistic effects, but at some levels change is more likely than at others (e.g., Thomason, 2001, 2008). For instance, in language contact situations, narrow syntax appears to be less affected, whereas the syntax-discourse interface is more vulnerable (e.g., Muntendam, 2013). The vulnerability of the syntax-discourse interface holds for many other types of bilinguals as well (e.g., Sorace, 2000). The following overview of studies demonstrates in which respects heritage languages can differ from the non-heritage L1 variety.

First, findings from phonetic studies are somewhat divergent regarding the vulnerability of the phonetic level. On the one hand, studies have revealed that phoneme knowledge is well preserved (i.e., completely acquired and not attrited) in heritage speakers (e.g., Bowers, Mattys, & Gage, 2009). For instance, studies comparing heritage speakers to L2 learners have demonstrated that heritage speakers are normally better than L2 learners at producing and perceiving sounds of their heritage language (e.g., Chang, Haynes, Yao, & Rhodes, 2008, 2009; Saadah, 2011), even when exposure to the heritage language in childhood was limited or was dramatically reduced after childhood (Au, Knightly, Jun, & Oh, 2002; Au, Oh, Knightly, Jun, & Romo, 2008 for Spanish; Oh, Jun, Knightly, & Au, 2003 for Korean; Knightly, Jun, Oh, & Au, 2003 for Spanish). On the other hand, a comparison between phoneme productions in the heritage language and phoneme productions of L1 speakers of the non-heritage variety in the country of origin showed difficulties in the production of some phoneme categories in the heritage speakers (Godson, 2003, 2004; McCarthy, Evans, & Mahon, 2013), suggesting that the phonetic level may well be affected. Moreover, according to Kupisch et al. (2014) highly proficient heritage speakers still show different VOT values from monolingual speakers, and have a foreign accent in their L1.

Studies on syntax are more in agreement and show that the (narrow) syntax of heritage languages is reasonably preserved (e.g., Montrul, 2005, 2008). For example, Håkansson (1995) demonstrated that heritage speakers of Swedish correctly used subject-verb inversion. That is, when sentences started with an adverb or object, the heritage speakers correctly placed the verb before the subject.

When syntactic rules are related to pragmatics, however, heritage speakers encounter difficulties. Several studies concerning the syntax-discourse interface (e.g., Montrul, 2004a; Polinsky, 1995) examined null subject heritage languages, in which pronominal subjects are only expressed when they contain new or contrastive information. If the L2 is a non-null subject language in which pronominal subjects cannot be dropped, heritage speakers tend to overuse overt pronominal subjects in their (null subject) L1. That is, they express pronominal subjects in pragmatic contexts in which non-heritage L1 speakers would drop them (i.e., *Ella vivía con su mamá y *ella quería mucho a su abuelita*, 'She lived with her mother and **she** loved her grandmother very much'; Montrul, 2004a, p. 133). Beside for Spanish, the overuse of subject pronouns has been demonstrated for various other heritage languages in contact with English, such as Tamil, Kabardian, Polish (Polinsky, 1995), Arabic (Albirini, Benmamoun, & Saadah, 2011), Korean (Kim, Montrul, & Yoon, 2009, 2010), and Turkish (Gürel, 2004).

Some studies suggest that the interface between syntax and semantics is also a difficult domain. For example, Cuza and Frank (2010) revealed semantic transfer from the L2 (English) to the heritage language (Spanish) in the use of the complementizer *que*, 'that', to distinguish embedded *wh*-questions (i.e., *María le dijo a Juan* ***que*** *adónde fue José,* 'Mary asked John where Joseph went') from statements (i.e., *María le dijo a Juan adónde fue José,* 'Mary told John where Joseph went') (Cuza & Frank, 2010, p. 1). Specifically, the heritage speakers' use of the complementizer was much lower than that of non-heritage L1 speakers of Spanish, which the authors explained by an influence of English.

Other linguistic domains that are often affected in heritage languages are morpho-syntax, semantics, and the lexicon. Morpho-syntactic aspects include inflectional morphology (e.g., Albirini & Benmamoun, 2014; Benmamoun, Albirini, Montrul, & Saadah, 2014; Fenyvesi, 2000; Zaretsky & Bar-Shalom, 2010), particularly nominal inflectional morphology (e.g., Albirini, Benmamoun, & Chakrani, 2013; Bolonyai, 2007; Montrul, Foote, & Perpiñán, 2008; Montrul, Bhatt,

& Bhatia, 2012; Polinsky, 2008a, 2008c). Aspectual morphology is another vulnerable domain in heritage languages (Laleko, 2010; Montrul, 2009; Pereltsvaig, 2005; Polinsky, 2006, 2008b, 2008c) and this also holds for the expression of mood: For Spanish, various studies have shown increasing usage of the indicative instead of the subjunctive (e.g., Lynch, 1999; Montrul, 2009; Potowski, Jegerski, & Morgan-Short, 2009; Silva-Corvalán, 1994).

Many studies on semantics involve semantically-based (or inherent) case (Montrul & Bowles, 2009, 2010) and the use of definite articles (Montrul & Ionin, 2010), and hence also involve morpho-syntactic aspects of the language. The heritage speakers of Spanish in Montrul and Bowles (2009) and Montrul and Sánchez-Walker (2013) showed omission of differential object marking for animate objects in Spanish due to transfer from English, which does not have differential object marking. That is, the heritage speakers omitted the preposition *a*, 'to', which marks animate objects in Spanish, e.g., *Juan vio *(a) María*, 'Juan saw Maria'. Furthermore, Montrul and Ionin (2010) showed that Spanish heritage speakers used fewer definite articles in their Spanish than non-heritage L1 speakers of Spanish did. Particularly, in English there is a difference between 'Tigers eat meat' (with a generic meaning) and 'The tigers eat meat' (with a specific meaning), whereas in Spanish only *Los tigres comen carne* (with a generic or specific meaning) is grammatically possible, and *Tigres comen carne* not. Thus, because in Spanish definite plural noun phrases can express both generic and specific reference, while in English definite articles are only used to express specific reference, the authors explained the finding by transfer from the dominant language to the heritage language.

Other studies on semantics concern the expression of motion events (Daller et al., 2011; Hohenstein et al., 2006). Roughly speaking, languages can either be satellite-framed or verb-framed languages regarding the way in which information about motion is encoded (e.g., Daller et al., 2011; Hohenstein et al., 2006; Talmy, 1985). Satellite-framed languages, like German and English, use prepositions to specify the path of motion (i.e., 'in', 'across'), whereas verb-framed languages, like Turkish and Spanish, encode this information in the verb itself (i.e., Turkish *çık-*, 'ascend', *in-*, 'descend', and *gir-*, 'enter'; Daller et al., 2011, pp. 96-97; Spanish *salir*, 'exit'; Hohenstein et al., 2006, p. 252). Daller et al. (2011) found that heritage speakers of Turkish in Germany encoded path in Turkish more often by using prepositions instead of verbs than Turkish monolinguals, which indicated a transfer from German. Similarly, Hohenstein et al. (2006) showed that heritage speakers of Spanish in the US used more prepositions instead of verbs to encode path in their Spanish, which was influenced by English.

The lexicon is also a vulnerable domain in heritage speakers. Vocabulary deficiency goes hand in hand with gaps in other language domains, such as morphology. Research has pointed out that there is a correlation between proficiency in the heritage language and lexical retrieval (e.g., O'Grady, Schafer, Perla, Lee, & Wieting, 2009 for Korean; and Polinsky, 2006, for Russian). Specifically, the better the heritage language is acquired or retained, the faster and more accurate is lexical retrieval. The available studies have shown that a decrease of language use leads to a slower retrieval of words. This can possibly result in differences between heritage speakers and adult L2 learners. For example, Montrul and Foote (2014) demonstrated that heritage speakers of Spanish in the US did not perform better in accuracy on a Spanish visual lexical decision task than late English learners of Spanish. In contrast, the L2 learners responded faster than the heritage speakers. The researchers argued that language experience at the moment of testing may affect the speed of lexical access more than AoA does (see also Schmid & Köpke, 2009, for an overview of L1 loss in the mental lexicon). In other words, the adult learners of Spanish benefitted more from the fact that they had intensive exposure to Spanish at the moment of testing than the heritage speakers benefitted from the fact that they acquired the language as their L1, even though both groups of participants took the same Spanish language course (Montrul & Foote, 2014). An additional explanation for the faster reaction times of the L2 learners as compared to the heritage speakers may be related to modality. Specifically, whereas the heritage speakers learned Spanish words mainly through aural input in early childhood, the L2 learners of Spanish learned L2 words both by listening and reading. This visual support during L2 acquisition may have led to an advantage in visual word recognition for the L2 learners, and therefore, different results might have been found for tasks in the aural modality (Montrul & Foote, 2014).

In sum, while phonological and syntactic knowledge appear to be relatively firmly established in heritage speakers, the syntax-discourse interface, semantics, and the lexicon are less robust domains of heritage languages.

5.2 Explanations for divergence of heritage languages

The literature on heritage speakers proposes four different explanations for the non-native-like behavior of heritage speakers: *incomplete acquisition* (resulting in a divergent grammar), *attrition, transfer from the dominant language*, and *incipient changes in the input* that heritage speakers receive (e.g., Benmamoun et al., 2013a; Pires & Rothman, 2009; Rothman, 2007).

Incomplete acquisition

The first explanation for the divergent grammar of the heritage speakers' L1 is incomplete acquisition, which arises because of the situation in which second-generation heritage speakers grow up. Given that the input in L2 increases in childhood, as it is the language at school and the majority language of the society, the relative input in L1 decreases and is of a different type (i.e., not instructed at school). Consequently, the L1 may not be fully developed (Montrul, 2008). For example, Verhoeven and Boeschoten (1986) and Schaufeli (1993) compared the development of Turkish between Turkish children growing up in the Netherlands and Turkish children in Turkey, revealing that L1 development was comparable across the two groups of children until age 5. After this period, at which the amount of L2 input increased enormously due to schooling, the Turkish-Dutch children showed stagnation in Turkish, while the Turkish children in Turkey showed further language development. Another example concerns the acquisition of the subjunctive in Spanish, which is a morpho-syntactic feature that is usually acquired relatively late by monolingual children (Blake, 1983). Heritage speakers of Spanish do not seem to reach complete acquisition of the subjunctive. Specifically, they use indicative forms instead of the subjunctive and have difficulty with the interpretation of constructions with subjunctive forms (e.g., Lynch, 1999; Montrul, 2009; Potowski, Jegerski, & Morgan-Short, 2009; Silva-Corvalán, 1994).

Attrition

A second explanation for the non-native-like behavior of heritage speakers is attrition. Attrition refers to the loss of a linguistic feature that had been acquired previously (Benmamoun et al., 2013a; Bylund, 2009; De Bot & Clyne, 1994; Köpke & Schmid, 2004; Montrul, 2008; Weltens & De Bot, 1986). Attrition is generally caused by a decrease in the language input, because the L2 becomes prevalent. Attrition is often associated with word loss (e.g., Schmid & Köpke, 2009), but it can also be related to other linguistic features. For example, Polinsky (2011) compared second-generation child and adult heritage speakers of Russian who had similar language backgrounds and language proficiency levels with child and adult L1 speakers of Russian in Russia regarding the comprehension of subject and object relative clauses (i.e., 'The dog that is chasing the cat' versus 'The cat that the dog is chasing') in Russian. She demonstrated that the heritage children behaved similarly to child and adult L1 speakers of Russian in Russia, whereas the adult heritage speakers showed difficulties with the interpretation of object relative clauses. Given that the heritage children showed full understanding of the relative clauses, the difference between the children and adults can be explained in terms of gradual attrition rather than incomplete acquisition.

Transfer from the dominant language

A third account of divergence is that a feature in the L1 is affected by the L2, that is, L2 transfer. One example concerns the overuse of overt subject pronouns in null subject heritage languages, when the L2 is a non-null subject language (Montrul, 2004a; Silva-Corvalán, 1994, 2008). Montrul (2004a) showed that heritage speakers of Spanish, in which subject pronouns are often dropped, use more subject pronouns in Spanish than L1-speakers of Spanish in the country of origin, possibly due to an influence of English, in which subject pronouns are always expressed. Another example is the way in which motion events are encoded in Daller et al. (2011) and

Hohenstein et al. (2006). These studies revealed that the expression of path in the heritage language was affected by the dominant L2.

Incipient changes in the input

Finally, a fourth explanation of divergence lies in the form of the input that heritage speakers receive. There are several ways in which the input can differ from the original variety. First, first-generation immigrants may have experienced attrition due to a language shift to the language of the society. If these speakers later raise their children in the heritage language, the input differs from the variety that is spoken in the country of origin. For instance, Montrul and Sánchez-Walker (2013) showed that second-generation child and adult heritage speakers of Spanish did not use differential object marking in Spanish. Importantly, the first generation (i.e., the parents of the second generation) showed the same pattern of omission, although differential object marking is used in Mexican Spanish, the variety of origin.

A second way in which input can diverge from the original variety arises when parents are multilingual and choose not to speak their L1 to their children (Aalberse & Muysken, 2013). For example, Chinese parents in Britain, Australia, and Singapore speak Mandarin to their children, although their native language is another Chinese dialect (Wei & Hua, 2010). The input that children receive may thus be affected by their parents' L1.

A third explanation lies in differences in registers of the same language. This has been found for example to explain differences between European Portuguese and Brazilian Portuguese heritage speakers (Pires & Rothman, 2009; Rothman, 2007). Both European and Brazilian Portuguese have inflected infinitives (i.e., non-finite verbs that are morphologically marked for person and number, e.g., *sai+r+mos*, 'we to leave-INF-1PL'), but in Brazilian Portuguese these are only used in written registers. Heritage speakers of Brazilian Portuguese do not have knowledge of inflected infinitives, contrary to heritage speakers of European Portuguese, because they are commonly not exposed to the written registers of their L1 (Rothman, 2007).

Summary

To conclude, four major factors that explain how heritage languages diverge from the non-heritage L1 variety can be distinguished: incomplete acquisition, attrition, L2 transfer, and changes in the input. These factors often co-occur and it is often not easy to disentangle one explanation from another. For instance, the overuse of subject pronouns in a null subject language can be explained in terms of transfer, but given that the linguistic outcome implies the loss of a functional distinction between the overt use of pronouns and pro-drop, it might also be explained by incomplete acquisition or attrition (e.g., Silva-Corvalán, 1994). Some studies have tried to separate the different explanations (e.g., Montrul & Sánchez-Walker, 2013; Polinsky, 2011). Furthermore, it should be noted that changes in the input are in fact an instantiation of contact-induced language change, as an affected linguistic feature in one generation is adopted by the next generation (e.g., Pires & Rothman, 2009).

We now turn to describing how the L2 of heritage speakers may differ from the variety that is spoken by L1 speakers.

6. The L2 of heritage speakers

The primary focus of the existing research on the L2 of heritage speakers is not on how specific linguistic features differ from the L1 variety, but rather on how the overall L2 proficiency of heritage children differs from that of non-heritage children. Therefore, before summarizing studies that considered divergence in specific features in separate linguistic domains (section 6.2), we briefly discuss studies on overall L2 proficiency, which often come from an educational perspective.

6.1 General delays in L2 acquisition

Many studies on the heritage speakers' L2 focus on whether the overall L2 proficiency of child heritage speakers is comparable to that of children of the same age who learn the language as their L1 (e.g., Collier, 1995; Driessen, Van der Slik, & De Bot, 2002; Droop & Verhoeven, 2003; Hakuta, Butler, & Witt, 2000; Leseman, 2000; Proctor, August, Carlo, & Snow, 2006; Reljić, Ferring, & Martin, 2015; Scheele, 2010). The general picture is that child heritage speakers show a delay in L2 proficiency relative to their non-heritage speaking peers. For example, Droop and Verhoeven (2003) tested reading comprehension, word decoding, oral text comprehension, morpho-syntactic knowledge, and vocabulary knowledge in Turkish-Dutch, Moroccan-Dutch, and non-heritage children who were eight years old at the beginning of the study, which lasted two years. It appeared that heritage children with high and low SES (i.e., socioeconomic status) were faster at word decoding than non-heritage low SES children, but they showed a delay in reading comprehension and oral language proficiency.

The delay in heritage speaker children's L2 acquisition may not only be explained by a limited L2 exposure, but also by reduced L1 input. Studies have illustrated that a rich L1 input both supports L1 acquisition and stimulates L2 development. Cognitive and academic L1 development leads to positive transfer of literacy and knowledge from the L1 to the L2 (e.g., Bialystok, 1991; Collier, 1995; Cummins, 1979, 1986, 2000; Kalia & Reese, 2009; Scheele, 2010).

Nonetheless, as both L1 and L2 input in heritage children are often limited, they show a delay in their general L2 development as compared to non-heritage children who acquire the language as an L1. The studies that we discussed in this section concern L2 development in child heritage speakers. Less is known about the status of the L2 in adult heritage speakers. Given the language dominance shift towards the L2, it seems likely that heritage speakers overcome the language difficulties that they experienced in childhood. However, this assumption has been rarely tested. Moreover, only a limited number of studies have examined linguistic transfer from L1 to L2. We discuss these studies below.

6.2 L1 transfer

Given the general delay in L2 development by heritage children as reported by numerous studies, we may also expect to find L1 transfer, as difficulties in L2 acquisition might be explained by an effect of the L1. However, it seems that L1 transfer in heritage speakers has not yet received much attention and the findings are somewhat mixed.

First, regarding prosody, Queen (2012) examined the intonation used in narratives in Turkish and German by three second-generation child heritage speakers of Turkish in Germany and eight second-generation adult heritage speakers. She found that their intonation in both Turkish and German was different from Turkish and German intonation as described in the literature. Additionally, Queen compared the data to the intonation of German and Turkish control groups. The bilinguals and the Turkish control group used two final rising tones in German, which were not, or to a lesser extent, used by the German control group. Queen hypothesized that these rises had their origin in Turkish. These findings tentatively point towards a prosodic transfer from the heritage language to the L2.

Regarding segmental phonetics, Van Meel, Hinskens, and Van Hout (2013, 2014) examined the L2 speech of Turkish and Moroccan second-generation heritage speakers in the Netherlands. They found that the realization of Dutch phonemes that do not exist in the heritage speakers' L1s was affected. For instance, heritage speakers of Turkish used significantly more monophtongization of the diphthong /ɛi/, which does not exist in Turkish, than L1 speakers of Dutch. This resulted in [ɛ:], a phoneme that is part of the Turkish phoneme inventory. Thus, Van Meel et al.'s (2013, 2014) findings suggest that phonetic properties of the heritage language may affect the phonetic distribution of phonemes in the dominant L2. This is in contrast to McCarthy et al. (2013), who found non-native-like realizations of Sylheti consonants in heritage speakers of Sylheti (an Indo-Aryan language spoken in Bangladesh) in the UK, but the sounds in their dominant L2 (English) were phonetically similar to those from L1 speakers of British English. In addition, Chang et al. (2008, 2009) showed that heritage speakers of Mandarin in the US are capable of making native-like phonemic distinctions in their two languages.

With respect to morpho-syntax, several studies on heritage children's L2 have examined the acquisition of grammatical gender in Dutch (e.g., Blom, Polišenská, & Weerman, 2008; Cornips & Hulk, 2008). Blom et al. (2008) investigated the acquisition of articles in Dutch by Moroccan-Dutch children, non-heritage children, and Moroccan adult learners of Dutch. The age of the child participants ranged from three to seven years. All groups showed overuse of the common definite article in neuter contexts (e.g., *de huis*, 'the house', instead of *het huis*, 'the house'), but only the monolingual children showed an increased accuracy over the years of the study. L1 transfer did not seem to play a role in the acquisition of articles in Dutch, because children with French, Moroccan-Arabic, or Berber as their L1, which also have differences in grammatical gender, did not perform better than children whose L1 was Turkish or English, which lack gender (Cornips & Hulk, 2008). Instead, Cornips and Hulk explain these findings in terms of quantity of the input and AoA.

Concerning another aspect of morpho-syntax, Blom and Baayen (2013) investigated subject-verb agreement in the Dutch of 62 Chinese, Moroccan, and Turkish heritage children of around six years old. By comparing heritage children whose L1 was an isolating language (Mandarin and Cantonese) to heritage children whose L1 had a very rich morphology (Moroccan-Arabic, Tarifit-Berber, and Turkish), the researchers examined L1 transfer. Although all children made inflectional errors, the Moroccan-Dutch and Turkish-Dutch children made fewer errors than the Chinese-Dutch children. This reveals morpho-syntactic transfer from an isolating L1 to an inflectional L2.

Cuza, Pérez-Leroux, and Sánchez (2013) examined the morpho-syntax of object clitics in the L2 (Spanish) of adult second-generation heritage speakers of Chinese in Peru. Various tasks, testing both production and comprehension, indicated that these heritage speakers behaved like Peruvian L1 speakers of Spanish in all aspects, except for the overextension of clitics. The authors explain this finding by semantic transfer from the L1, even though these heritage speakers learned the L2 from a young age and were dominant in this language.

Montrul (2006) revealed L1 transfer of a morpho-syntactic feature in adult heritage speakers of Spanish in the US, specifically, regarding the lexical-semantic and syntactic properties of unaccusative verbs (e.g., *llegar*, 'to arrive' and *salir*, 'leave'), which are semantically and syntactically different from unergative verbs (e.g., *hablar*, 'to talk' and *cantar*, 'to sing') whereas this distinction is less clear in

English. Montrul tested the heritage speakers' and L1 speakers' processing of unaccusative and unergative verbs during sentence processing. While the reaction times of L1 speakers of English did not reveal a distinction between the two types of verbs, the reaction times of the heritage speakers indicated that they made a Spanish-like distinction between the two types of verbs in English. Because these heritage speakers were relatively balanced and showed robust knowledge of unaccusativity in both their languages, Montrul explains the transfer from Spanish to English by stating that the L1 is still fairly strong in these heritage speakers.

Interestingly, another study that involved morpho-syntactic competence in second-generation heritage speakers of Spanish in the US did not find L1 to L2 transfer (Montrul & Ionin, 2010). This study concerned the interpretation of definite articles (i.e., *Los tigres comen carne*, '(The) tigers eat meat', has both a generic meaning and a specific meaning in Spanish, but only a specific meaning in English). Although this study revealed transfer from English (L2) to Spanish (L1), there was no transfer in the opposite direction, that is, from the weaker L1 to the more dominant L2.

Daller et al. (2011) and Hohenstein et al. (2006) also studied cross-linguistic transfer in both directions. As described in section 5.1, the adult heritage speakers in these studies showed effects from the dominant L2 (German and English, respectively) on the heritage language (Turkish and Spanish, respectively) regarding the encoding of path. However, no transfer was found in the opposite direction. Moreover, Daller et al. (2011) compared their findings to another group of heritage speakers of Turkish who were born in Germany or had arrived there at a very young age, similar to the other group, but had returned to Turkey seven years before testing (i.e., the returnees). Their dominant language was no longer German, but Turkish. This language dominance shift was also reflected in the results: The returnees showed an influence from Turkish in both Turkish and German. This finding reveals an important role of language dominance in the encoding of motion (Daller et al., 2011).

Another study, involving Turkish as the heritage language, concerned L1 transfer at the syntax-discourse interface. Roberts, Gullberg, and Indefrey (2008) examined the interpretation of subject pronouns in Dutch by proficient adult learners of Dutch who were L1 speakers of Turkish, a null subject language, or German, a non-null subject language (like Dutch). The fourteen Turkish L2 learners in this study varied greatly regarding AoA of Dutch, ranging from 4 to 41 years old, with a mean of 19.9 years. As the authors considered these bilinguals to be L2 learners of Dutch, most of them might have been first-generation immigrants instead of second-generation heritage speakers. The study involved off-line interpretations, grammaticality judgments, and on-line processing of subject pronouns in Dutch through the use of eye-tracking. Unlike the German learners, the Turkish learners differed from the Dutch control group in their interpretations of Dutch pronouns. Particularly, the interpretations of the Turkish learners were compatible with their L1. Nonetheless, the longer reading times of both groups of learners as compared to the L1 speakers of Dutch revealed on-line processing difficulties. The study demonstrated L1 transfer in bilinguals' interpretations in L2, and showed that discourse-related aspects of language are difficult for bilinguals in general. However, we cannot be certain that the L1 was the weaker language in these Turkish-Dutch bilinguals because of the variability in AoA.

A study that specifically addressed the role of language dominance in cross-linguistic transfer at the syntax-discourse interface is Argyri and Sorace (2007). They examined production and grammaticality judgments regarding the position of the subject in the sentence by Greek-English bilingual children, who were either dominant in Greek or in English. Although the authors do not describe the bilinguals as heritage speakers, we include the study in this chapter because the bilinguals meet all of our criteria to be considered heritage speakers. Whereas in Greek, which is a relatively free word order language, the position of the subject (i.e., before or after the verb) depends on the information structure, in English the subject is usually placed before the verb, regardless of the information structure. Argyri and Sorace showed that the English-dominant heritage speakers of Greek produced and accepted preverbal subjects in pragmatically inappropriate contexts more often than Greek monolinguals. Importantly, Greek-dominant heritage speakers of English behaved like Greek monolinguals. Thus, heritage speakers showed transfer from English to Greek when English was the dominant language, but not when it was the weaker heritage language.

This might be related to the fact that all Greek-dominant heritage speakers of English had only one parent who spoke English as an L1. Therefore, the question arises whether there would be an effect of the weaker heritage language at the syntax-discourse interface if both parents spoke the heritage language.

To summarize, some studies have demonstrated that heritage speakers do not only differ from L1 speakers regarding their L1, but also regarding their L2. Heritage children generally show a delay in L2 acquisition relative to their non-heritage peers. Moreover, some studies (but not all) suggest that the heritage language may affect learning certain features (i.e., in phonology, morpho-syntax, and the interpretation of pronouns) of the L2. This is sometimes even apparent in adulthood, when the L2 has become the dominant language. However, other studies did not reveal transfer from the heritage language on the dominant language and stress the importance of language dominance in cross-linguistic transfer. These diverging results might be explained by differences regarding the sociolinguistic factors that were discussed in section 4. More research is needed in order to pinpoint the mechanisms at play in the interaction between the heritage and the majority language and the factors affecting L1 transfer, such as language use of the parents. Furthermore, although research on heritage languages has revealed that some linguistic domains are more vulnerable than others, it remains an open issue whether the same domains are vulnerable in the dominant L2.

7. Discussion and conclusion

In this chapter, we have proposed a narrower definition of heritage speakers than before to contribute to the current theoretical discussion on how to define heritage speakers (e.g., Benmamoun et al., 2013b; Dąbrowska, 2013; Kupisch, 2013; Meisel, 2013; Muysken, 2013c; Rothman & Treffers-Daller, 2014). Our definition consists of a combination of three core characteristics in addition to the two criteria that were proposed by Benmamoun et al. (2013a, 2013b). Thus, (a) heritage speakers are unbalanced bilinguals who acquired their L1 in early childhood and have some knowledge of that language, and (b) heritage speakers are dominant in their L2 in adulthood. We have added the following core characteristics: (c) The L1 of heritage speakers is an immigrant language; (d) heritage speakers have not reached ultimate L1 attainment; and (e) heritage speakers have received no or limited formal education in L1 in early childhood. Crucially, bilinguals should meet all of these five criteria to be typical heritage speakers. Our definition excludes several groups of bilinguals that are included in broader definitions, e.g., L1 speakers of indigenous languages and certain early bilinguals from mixed marriages or expat parents. This allows us to draw a clearer picture of the interaction between heritage speakers' languages without attributing this to other (sociolinguistic) factors that are present in other types of early bilinguals (i.e., history of the language contact situation, ultimate L1 attainment, and formal education in the L1). Now that it is clear which factors characterize a typical heritage speaker (and which factors characterize other types of bilinguals), we can improve our understanding of how and why different types of bilinguals differ from each other (if they do) with respect to the linguistic outcome. This, in turn, will inform us about the factors that underlie interactions between languages in the bilingual mind.

Even within the population of typical heritage speakers there may be variation regarding additional sociolinguistic factors, such as AoA, status of the L1 in the host society, language use by the parents, and domains and networks in which the L1 is used. We discussed these factors briefly as they might result in differences in the linguistic outcome of bilingualism. Having established a narrower definition, we can compare different groups of heritage speakers to examine how these sociolinguistic factors contribute to the linguistic outcome.

In this chapter, we have provided an overview of what we know about the languages of heritage speakers. This leads to interesting, yet underexplored research questions. We will elaborate on these issues in the remainder of this section. First, we have seen in this chapter that studies on heritage speakers commonly focus on how the heritage language differs from the variety spoken in the country of origin (e.g., Benmamoun et al., 2014) or from the L2 variety of adult L2 learners (e.g., Montrul, 2008; Montrul et al., 2014, for heritage speakers of Spanish versus L2 learners of Spanish in the US). These studies together reveal that heritage languages show similarities with both the non-heritage L1 variety and the L2 variety of adult learners, but that there are also considerable differences between heritage languages and the non-heritage L1 and L2 varieties (e.g., Montrul, 2008).

Second, we have seen that research on heritage speakers generally shows that the heritage speakers' L2 (the language of society) is different from the variety that is spoken by L1 speakers. Most studies on the heritage speakers' L2 consider differences compared to the non-heritage L1 variety in terms of general language proficiency, and relate these differences to quantity and quality of the language input (e.g., Collier, 1995; Droop & Verhoeven, 2003; Scheele, 2010). Surprisingly, attempts to account for the divergence between the heritage speakers' L2 and the L1 variety in terms of cross-linguistic transfer are limited, particularly concerning second- and third-generation heritage speakers. Perhaps the general assumption that child L2 learners are capable of reaching a native-like level in their L2 as adults (e.g., Montrul, 2008) explains why it is a rather underexplored area in research on typical heritage speakers. Moreover, the fact that the L2 becomes the dominant language in heritage speakers makes it more likely to find cross-linguistic transfer in the weaker L1, rather than the other way around (e.g., Montrul & Ionin, 2010).

Yet, the asymmetrical relationship between a dominant L2 and weaker L1 in heritage speakers implies different interplays and linguistic outcomes as compared to other types of bilinguals, who commonly have a fully developed and more stable L1. Research on SLA (second language acquisition) has generally found transfer from a dominant L1 on a later acquired L2, but this chapter raises the question to what extent a weaker L1 may still affect the dominant L2. The study of this kind of interaction leads to a better understanding of the strength of an early, naturalistically acquired system, although this L1 was only prevalent in early childhood. The few available studies suggest that the weaker L1 may well affect the dominant L2 in adult heritage speakers (e.g., Cuza et al., 2013; Queen, 2012; Van Meel et al., 2013, 2014). Future research should investigate the nature of L1 transfer in heritage speakers and examine to which linguistic and sociolinguistic factors these effects can be attributed.

A second issue raised by this chapter concerns the stability and vulnerability of language domains. Previous research on heritage languages has revealed that some linguistic levels are more stable than others, particularly phonology and narrow syntax, whereas others are more vulnerable, i.e., the lexicon and the syntax-discourse interface. The question arises whether heritage speakers show more sensitivity in their dominant L2 to aspects that are firmly established in the L1, or whether linguistic levels in the L1 and L2 are similar regarding their susceptibility. More insight in the interaction between the languages that heritage speakers speak, focusing not only on the L1, but also on the L2, will inform us about this question.

Moreover, the third question that arises in this chapter is which factors determine which language 'wins' in the case of cross-linguistic transfer. For example, the absence of transfer from the weaker to the dominant language at the syntax-discourse interface in Argyri and Sorace (2007) raises the question what the effect is of the one parent - one language strategy that was used by the parents. A comparable study with bilingual children whose parents both speak the minority language could examine the role of language exposure in the directionality of transfer. If it is true that heritage speakers who acquired both languages simultaneously experience more L1 attrition than heritage speakers who acquired their languages more sequentially (e.g., Montrul, 2008), it might be the case that the latter group of heritage speakers has established their L1 more strongly, and that for this reason L1 transfer is more apparent in their L2 than for the first group of heritage speakers.

In sum, there are many unanswered questions regarding heritage speakers, their L1, and their L2. More insight in the interaction between the weaker L1 and dominant L2 does not only contribute to our knowledge of the bilingual mind, but also has more practical implications. Because immigration is an event of all time, we will encounter new groups of heritage speakers in the future. Various studies have shown a delay in the development of heritage children's L2 as compared to their non-heritage peers. A better understanding of how heritage speakers acquire both of their languages may result in practical advices in education and, as a consequence, to facilitation of heritage speakers' bilingual language acquisition. In particular, knowledge of the difficulties that heritage children experience due to differences between L1 and L2 may lead to more effective ways of language teaching.

To conclude, it is our hope that our narrower definition of heritage speakers enables us to gather homogeneous insights from speakers with similar underlying systems and will help us to differentiate between the various factors that play a role in bilingualism. Moreover, a better understanding of the interaction between a weaker L1 and a dominant L2 in heritage speakers will inform us about the vulnerability of linguistic domains and the factors that play a role in cross-linguistic transfer. Future research may further explore to what extent a weaker L1, which was only prevalent in early childhood, may affect the dominant L2 in heritage speakers.

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Chapter 3

Focus marking in Dutch by heritage speakers of Turkish and Dutch L1 speakers

Abstract
Studies on heritage speakers generally reveal effects from the dominant L2 on the weaker L1, but it is less clear whether cross-linguistic transfer also occurs in the other direction: from the L1 on the dominant L2. This study explores whether the Dutch prosody of heritage speakers of Turkish in the Netherlands differs from that of L1 speakers of Dutch who do not speak Turkish, and whether observed differences could be attributed to an effect of Turkish. The experiment elicited semi-spontaneous sentences in broad and contrastive focus. The analysis included f0 movements, peak alignment, and duration. Although both participant groups used prosody to mark focus (e.g., time-compressed f0 movements for contrastive focus), there were also differences between the groups. For instance, while the L1 speakers of Dutch showed declination, the bilinguals remained at the same pitch level throughout the sentence. Ipek (2015) and Kamalı (2011) also noted a limited pitch range in the prenuclear area in Turkish. We argue that the prosodic differences could be due to an effect of Turkish on Dutch prosody, suggesting that the weaker L1 in Turkish heritage speakers may affect the dominant L2 in the prosodic domain.

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1. Introduction

Approximately five decades ago, Turkish immigrants brought their culture, language, and family to the Netherlands, and nowadays they constitute a considerable part of Dutch society. The Turkish community, which forms 2.4% of the total population of the Netherlands, is the largest minority group in the country (Statistics Netherlands, 2014). It is known for the high maintenance of Turkish (Doğruöz & Backus, 2007, 2009; Extra, Yağmur, & Van der Avoird, 2004). Yet, many children of Turkish immigrants report Dutch, the language they usually start learning from the moment they go to (pre-)school, to be their dominant language.

The children of immigrants are often referred to as second-generation heritage speakers (Benmamoun, Montrul, & Polinsky, 2013a). These heritage speakers are born in a bilingual environment and generally acquire the heritage language, which is not the society's majority language, as their first language (L1). The language of the society is their second language (L2), and, partly because it is taught at school, it often becomes the dominant language (e.g., Daller, Treffers-Daller, & Furman, 2011; Hohenstein, Eisenberg, & Naigles, 2006). Heritage speakers are therefore a special type of bilinguals, because in most other bilinguals the L1 is generally the dominant language. Examining the interaction between a weaker L1 and dominant L2 might reveal different insights than from bilinguals whose L1 is the dominant language, thereby contributing to our general understanding of the bilingual mind. One important issue concerns language dominance. That is, whereas cross-linguistic transfer often occurs from the dominant L1 to the L2 in bilinguals (e.g., Hartsuiker, Pickering, & Veltkamp, 2004; McAllister, Flege, & Piske, 2002; Selinker & Gass, 1992), it is not yet clear whether this is also the case for heritage speakers. Rather, most research on heritage speakers has found effects of the dominant L2 on the weaker L1, and not the other way around, indicating an important role for language dominance (e.g., Hohenstein et al., 2006; Montrul & Ionin 2010, 2012).

The aim of the present study is to gain more insight in the interaction between heritage speakers' dominant L2 and weaker L1 by examining whether the dominant L2 of heritage speakers may be affected by the weaker L1. More specifically, we compared the Dutch prosody of focus marking produced by second-generation heritage speakers of Turkish in the Netherlands to that of L1 speakers of Dutch and checked for the presence of Turkish influences. Typological differences in the prosody of focus marking between Turkish and Dutch make these heritage speakers of Turkish in the Netherlands an interesting group for testing whether the dominant L2 is affected by the heritage language.

The structure of the paper is as follows. First, we zoom in on heritage speakers and discuss the general findings of previous studies (section 1.1). This is followed by a description of earlier bilingual studies on cross-linguistic transfer in the prosodic domain for various language combinations (section 1.2). In section 1.3, we discuss several scenarios to explain L1 prosodic transfer. Next, we describe what is known about Dutch and Turkish prosody with respect to word stress (section 1.4) and focus marking (section 1.5). In section 1.6, these differences are summarized and linked to the research questions addressed in the experiment to be reported. The experiment itself is described in section 2, and its results in section 3. The results are discussed by answering our research questions in section 4.

1.1 Heritage speakers

Most research on heritage speakers has concentrated on the heritage language, and not on the L2. In particular, these studies addressed the question of how the L1 of heritage speakers differs from the L1 variety that is spoken in the country of origin (e.g., Benmamoun et al., 2013a; Montrul, 2008). Differences between the two varieties involve a wide range of linguistic features at different levels, such as morpho-syntax, the lexicon, and the syntax-discourse interface (e.g., Bolonyai, 2007; Montrul, 2004a; Polinsky, 2006). Regarding phonetics, the findings are somewhat divergent: McCarthy, Evans, and Mahon (2013) showed difficulties in the production of some categories in the heritage language, but Chang, Haynes, Yao, and Rhodes (2008, 2009) revealed that heritage speakers are relatively good at distinguishing phonetic categories in their heritage language.

The considerable differences between heritage languages and the L1 variety in the country of origin often leads to a comparison between the L1 of heritage speakers and the L2 of adult learners (e.g., Montrul, 2008). In fact, studies have shown that there are similarities between heritage languages and the L2 of adult learners. For example, Montrul (2004b) showed similar incomplete grammars for the Spanish of heritage speakers of Spanish and L2 learners of Spanish.

The fact that heritage languages generally diverge from the variety in the country of origin and often pattern together with the L2 of adult language learners indicates that acquisition of the heritage language in early childhood is not sufficient for native-like attainment in that language. A more important role is therefore attributed to language input, as the input of heritage languages often decreases as soon as heritage speakers go to school (Montrul, 2008). Input in the L2, on the other hand, increases from this moment. Given the importance of language input for competence in that specific language, the question arises to what extent the dominant L2 of heritage speakers differs from the variety that is spoken by non-heritage L1 speakers in the host country. If language input plays an equally important role in L2 acquisition as in L1 acquisition, we would expect more native-like performance in the L2. In fact, several studies revealed cross-linguistic effects of the dominant language on the weaker language, and not in the opposite direction (e.g., Argyri & Sorace, 2007; Daller et al., 2011; Hohenstein et al., 2006; McCarthy et al., 2013; Montrul & Ionin, 2010; Serratrice, 2007). However, some studies suggest effects of the weaker L1 in heritage speakers on the dominant L2 (e.g., Blom & Baayen, 2013; Montrul, 2006; Queen, 2012; Van Meel, Hinskens, & Van Hout, 2013, 2014). Clearly, more research is necessary to advance our understanding of the way in which heritage speakers' languages can affect each other and what the role of language dominance is in this interaction. Our study attempts to contribute to this issue.

1.2 Cross-linguistic transfer in the prosodic domain

Previous research has shown cross-linguistic influence in the prosodic domain for other language combinations, such as German-English, Dutch-Greek, and Catalan-Spanish (e.g., Atterer & Ladd, 2004; Mennen, 2004; Simonet, 2008). These studies, which are generally based on read speech, comprise a variety of prosodic features, such as peak alignment, the transfer of pitch accents, and duration. Moreover, they differ in type of bilingual (e.g., L2 learners, early simultaneous bilinguals, and heritage speakers). Several studies found differences in peak alignment between bilinguals and a control group (e.g., Atterer & Ladd, 2004 for German L2 learners of English; Elordieta, 2003, and Elordieta & Calleja, 2005 for balanced Basque-Spanish bilinguals; Mennen, 2004 for Dutch L2 learners of Greek). Peak alignment differences were also reported for Spanish monolinguals in Buenos Aires, where the prosodic change was attributed to contact with Italian, a former immigrant language in Argentina (Colantoni & Gurlekian, 2004). In addition, these speakers lowered the final accents in the utterance compared to the initial accents more than speakers of several other varieties of Spanish, which might also reflect an influence from Italian. Other studies reported cross-linguistic prosodic influence for different f0 features. McGory (1997) showed that speakers with Mandarin Chinese or Korean as their L1 transferred f0 patterns to their L2 English. Moreover, Bullock (2009) found that French-American English bilinguals transferred pitch accents from English to French. Another study that found transfer of pitch accents in bilinguals was Simonet (2008, 2011). Specifically, Simonet's study on Majorcan Catalan-Spanish bilinguals revealed that Spanish-dominant speakers adopted features of a Catalan nuclear pitch accent in their Spanish. One of the sociolinguistic variables that Simonet studied was gender. Interestingly, he revealed that female speakers used more Catalan-like intonation in their Spanish than male speakers. Gender may thus be a relevant factor in studies on bilingual prosody. More generally, women have been found to take a leading role in studies on linguistic change, which is often motivated by their wish to behave conform the norms of the prestige variety (Labov, 2001).

The studies discussed so far concerned pitch, but other prosodic features can also be affected. Gut (2005) reported an influence from tone languages spoken in Nigeria on Nigerian English, regarding speech rhythm, syllable structure, and syllable length.

The studies above show instances of prosodic transfer in various types of bilinguals, involving pitch accents and other prosodic features. However, the effect of the speakers' heritage language on their L2 has received less attention. The only study on the effect of a weaker L1 on the dominant L2 in second-generation heritage speakers that we know of is Queen (2012), who examined the Turkish and German intonation of heritage speakers of Turkish in Germany. She found that the intonation in both Turkish and German was different from Turkish and German intonation as described in the literature. Additionally, Queen compared her bilingual data to that of a German and Turkish control group. The bilinguals and the Turkish control group used two phrase-final rising tones in German, which were not, or to a lesser extent, used by the German control group. According to Queen, one of these rises, which was marked by a relatively steep slope, had its origin in Turkish, and expressed narrative salience. Queen's study tentatively points towards the possibility of prosodic transfer from the weaker heritage language to the L2. However, the few speakers in Queen's control groups were not matched to the bilinguals in terms of age, education, and region, and most speakers had some knowledge of the other language as well. As the author notes herself, the lack of a systematic comparison between sociolinguistically comparable Turkish-German bilinguals and L1 speakers of German without any knowledge of Turkish prevents us from drawing firm conclusions on this matter. The present study examines the Dutch prosody of heritage speakers of Turkish in the Netherlands by a comparison with L1 speakers of Dutch who are similar regarding age, education, and region. We will now briefly discuss how prosodic transfer of the L1 may arise in these heritage speakers of Turkish.

1.3 Explanations for L1 prosodic transfer

At least three different scenarios are possible to explain L1 transfer: direct transfer, early childhood transfer, and indirect transfer.

Direct transfer. Direct transfer occurs through co-activation of the L1 during language production and comprehension (e.g., Costa, 2005; Dijkstra, 2005). A large body of studies has shown that both languages are activated in bilinguals, even in language-specific contexts (e.g., Amengual, 2012, for phonetic interference during language production; Blumenfeld & Marian, 2007, for lexical co-activation during spoken word recognition; Costa, 2005, for lexical co-activation during word production; Dijkstra, Grainger, & Van Heuven, 1999, for lexical co-activation during written word recognition; Hartsuiker et al. (2004) and Hatzidaki, Branigan, &

Pickering, 2011, for co-activation of syntax). In addition, for the same type of heritage speakers as in the present study, Chapter 5 demonstrates that Turkish is also activated during auditory processing in Dutch. Thus, the direct transfer scenario proposes that prosodic features of the L1 are activated while speaking in the L2, leading to transfer of these features to the L2 prosody.

Early childhood transfer. Early bilinguals are most likely to transfer L1 features to L2 during early childhood, especially when the L1 is the stronger language. After this period, they are better able at separating the two systems (e.g., Herhandez, Li, & MacWhinney, 2005). They make more efficiently use of inhibition to suppress the non-required, co-activated language (e.g., Abutalebi & Green, 2007). Verhoeven (2007) showed that second-generation Turkish heritage children in the Netherlands were still dominant in Turkish at age 5 and 6, which makes L1 transfer in this stage more probable. This may hold in particular for prosody, which is one of the first aspects of language that is acquired. Studies have demonstrated that 6- and 9-months-old infants are already able to perceive prosodic phrase boundaries in their language (e.g., Gerken, Jusczyk, & Mandel, 1994; Gout, Christophe, & Morgan, 2004; Soderstrom, Seidl, Nelson, & Jusczyk, 2003). Moreover, Christophe, Nespor, Guasti, and Van Ooyen (2003) showed that French infants between 2 to 3 months old made use of prosodic cues to correctly distinguish French sentences from Turkish sentences. In the scenario of early childhood transfer, the bilinguals transferred L1 prosodic features during L2 acquisition, creating a new variety of Dutch with distinct prosodic characteristics.

Indirect transfer. The scenario of early childhood transfer is also possible for the first generation of Turkish immigrants, who were adult L2 learners. Turkish is their dominant language, which makes L1 transfer of prosodic features (through co-activation, according to the scenario of direct transfer) to the L2 Dutch prosodic system more likely. This may also lead to a new variety of Dutch. Subsequently, the second generation acquired these prosodic features through their parents and peers. Romera and Elordieta (2013) have described this type of transfer as *accommodation*. They argue that accommodation is a more likely explanation for contact-induced prosodic change than direct transfer. This scenario has also been described as incipient changes of the input for changes of the heritage language (Benmamoun et al., 2013a).

1.4 Word stress in Dutch and Turkish

Dutch and Turkish differ regarding word stress. While stress position is free in Dutch, with a tendency for stress (indicated by capital letters in the examples) on the first syllable (Van Donselaar, Koster, & Cutler, 2005; e.g., *Appel,* 'apple'), word stress in Turkish is regular and normally falls on the final syllable (Inkelas & Orgun, 2003; e.g., *elMA*, 'apple').

Beside stress position, languages can be distinguished according to the acoustic correlates of word stress. Traditionally, a distinction is made between stress-accent languages, in which lengthening of the stressed syllable is the most important cue for word stress, and pitch-accent languages, in which f0 movements are a more important cue for word stress than duration and intensity (Beckman, 1986). Dutch is a stress-accent language (Nooteboom, 1972; Sluijter & Van Heuven, 1995, 1996; Van Heuven, 2014), but it is unclear how Turkish should be categorized. Although several studies suggest that Turkish is a stress-accent language (e.g., Inkelas, 1999; Ipek, 2015), Levi (2005) found noticeable differences between stressed and non-stressed syllables for f0 peaks in Turkish, with higher f0 peaks for stressed syllables, as in pitch-accent languages. However, Levi's analysis is limited to words that received the final accent in the phrase (Ipek, 2015; Ladd, 2008). It is therefore not clear whether f0 movements are the result of word stress or are due to this phrasal accent, because these two factors can be easily confounded (Sluijter & Van Heuven, 1996). Thus, whether Turkish should be described as a stress-accent or pitch-accent language is an unresolved issue.

1.5 Focus marking

An important notion that is expressed by means of prosody in many languages is focus. Roughly speaking, focus is the new information in a sentence (Jackendoff, 1972). Different types of focus have been discerned: broad and narrow focus, and neutral and contrastive focus (Gussenhoven, 2007). Broad focus involves the whole sentence and can be evoked by the question in (1a).

(1) a. What is happening?
b. [Emma is eating a peanut]$_{F.}$

Focus on one constituent in the sentence is narrow focus (2b):

(2) a. What is Emma eating?
b. Emma is eating [a peanut]$_{F.}$

The focus in (2b) is neutral, non-contrastive focus. Contrastive or corrective focus, on the other hand, which occurs when information in the question is rejected and changed into a new value (3b) (Gussenhoven, 2005a, 2007):

(3) a. Is Emma eating an apple?
b. No, Emma is eating [a peanut]$_{F.}$

Further note that 'Emma' in (2b) and (3b) is topic: It is information that has been introduced previously in the context and is thus not in focus. According to Chen (2007), topic is the entity in the sentence about which information is given.

Languages have different strategies to encode focus, such as the use of syntax or prosody. Regarding syntax, information can be highlighted by a change in word order. That is, the focused element can be moved to a marked position in the sentence, e.g., fronting. Prosodically, a constituent can be made more prominent through changes in suprasegmental features, such as pitch and duration. As discussed below, Dutch mostly uses prosody to mark focus (e.g., Bouma, 2008; Chen, 2009; Hanssen, Peters, & Gussenhoven, 2008), whereas Turkish uses both word order and prosody (e.g., İşsever, 2003; Özge & Bozsahin, 2010).

1.5.1 Focus in Dutch

Dutch word order is relatively fixed, and main clauses that do not start with an adverb have SVO order (Bouma, 2008). Focus is mainly marked in prosody. Several studies have examined prosodic features of focus marking in Dutch. Hanssen et al. (2008) observed phonetic differences in duration and f0 between broad, neutral, and contrastive focus for the nuclear accent (i.e., the final accent in the sentence[3]), which was described as a fall (H*L). In particular, they found a longer duration for the syllable carrying the nuclear accent in contrastive and neutral focus than in broad focus. Regarding f0, a higher peak was found for broad and contrastive focus than for neutral focus. Moreover, contrastive and neutral focus were marked by a steeper fall than broad focus and by postfocal pitch reduction. Furthermore, peak alignment and the alignment of the minimum after the peak occurred earlier in contrastive and neutral focus than in broad focus. In conclusion, Hanssen et al. (2008) showed a time-compressed pitch movement for the nuclear accent in contrastive and neutral focus as compared to broad focus.

Chen (2007, 2009) compared the phonetic realization of topic and neutral focus. She examined sentence-initial and sentence-final accents. While in sentence-final position topic was frequently deaccented, in sentence-initial position it was often accompanied by H*L. The nuclear accent was frequently downstepped. Phonetically, words in neutral focus were marked by a larger f0 excursion, earlier peak alignment, and a lower and earlier f0 minimum after the peak than topics. Moreover, words in neutral focus were longer than topics.

As described above, Hanssen et al. (2008) examined nouns in broad, neutral, and contrastive focus in nuclear position, while Chen (2007, 2009) studied topic and neutral focus in sentence-initial and sentence-final position. No studies seem yet to have explored the phonetic realization of sentence-initial constituents in broad and contrastive focus in declaratives. The only studies that considered prenuclear accents

[3] Although the nuclear accent is the final accent in the sentence, it does not necessarily occur on the final word in the sentence: It can be followed by deaccented words. This was for example the case in Hanssen et al. (2008), in which the nuclear accent was followed by two verb forms.

in broad and contrastive focus in Dutch are Ladd, Mennen, and Schepman (2000) and Krahmer and Swerts (2001). Ladd et al. (2000) examined the phonetic factors that affect the alignment of prenuclear rising accents on adjectives in broad focus sentences, such as *rennende*, 'running' in (4).

(4) Wij konden de rennende atleten met geen mogelijkheid bijhouden.
'There was no way we could keep up with the running athletes.'

Their study indicates that prenuclear accents in broad focus are characterized by a rise within the stressed syllable, with the end of the rise in the vowel in the case of long vowels and in the following consonant in the case of short vowels.

Krahmer and Swerts (2001) analyzed contrastive focus in noun phrases consisting of an adjective followed by a noun. They concluded that contrastive accents are similar to nuclear accents. That is, although the adjective occurred before the noun, the nuclear accent was located on the adjective when this word was in contrastive focus, because the following noun was deaccented (Krahmer & Swerts, 2001).

In sum, Dutch uses differences in f0 movements and duration to mark focus (Chen, 2007, 2009; Hanssen et al., 2008). Sentence-initial constituents in whole sentences in broad and contrastive focus have not been examined prosodically. Ladd et al. (2000) described prenuclear accents that are not in sentence-initial position in broad focus that are accompanied by a rising accent, and Krahmer and Swerts (2001) showed that deaccenting usually follows after contrastive focus in noun phrases. Because up till now no studies have examined the prosody of sentence-initial subjects in complete sentences in broad and contrastive focus in Dutch, the present study examines sentence-initial subjects and sentence-final objects in broad and contrastive focus in complete sentences. In this way, our study does not only compare the Dutch prosody of L1 speakers of Dutch to that of heritage speakers of Turkish, but also informs about aspects of Dutch prosody that have not been investigated before.

1.5.2 Focus in Turkish

Turkish uses both word order and prosody to convey focus (Güneş, 2013; İşsever, 2003; Kamalı, 2011; Özge & Bozsahin, 2010). The canonical word order in Turkish is SOV, but other word orders are possible depending on the information structure of the sentence. Preverbal constituents can express focused information and are accented. Postverbal elements cannot be in focus and are obligatorily deaccented. In (5), the subject is placed after the verb and deaccented, indicating that the subject is not in focus (Vallduví & Engdahl, 1996).

(5)	[Öldü]$_F$	başkan. (VS)
	die-PST-3S	president
	‘The president died.’	

Another example is (6) (İşsever, 2003: 1047). While in (6a) *ağaçtan,* tree-ABL, ‘from the tree’, appears before the verb and is accented and focused, in (6b) it occurs after the verb and is deaccented and unfocused. In (6b), the focus is on *bir çocuk*, ‘a child’.

(6)	a.	Bir çocuk	[ağaçtan	düşmüş.]$_F$ (SOV)
		a child	tree-ABL	fall-PERF
		‘A child fell down from the tree.’		
	b.	[Bir çocuk]$_F$	düşmüş	ağaçtan. (SVO)
		a child	fall-PERF	tree-ABL
		‘A child fell down from the tree.’		

Descriptions of Turkish intonation are relatively scarce and the majority concern broad focus and neutral focus (e.g., Ipek, 2011, 2015; Ipek & Jun, 2013; Kamalı, 2011). Kamalı (2011) and Ipek (2015) propose different phonological models of Turkish intonation. Whereas Kamalı (2011) follows Levi (2005) and assumes that Turkish is a pitch-accent language, Ipek (2015) argues that Turkish is a stress-accent language.

Kamalı (2011) analyzed the intonation of broad focus sentences in Turkish, with a nominative argument, accusative argument, dative argument, and a verb (in this order). The dative argument carried the nuclear accent, and is referred to as 'nuclear word'. Kamalı investigated intonational differences between words with lexical (non-final) stress and words with regular (final) stress, and found that only words with lexical stress carried a H*L pitch accent. Words with regular stress, on the other hand, were accentless. Furthermore, nuclear words were marked by a terracing pattern L-: No pitch accent was observed on these words, but only a low tone that continued at the same level, until an f0 drop into the following verb. Kamalı attributes this L- to the presence of the verb after the nuclear word. That is, the even lower f0 level on the verb triggers the L- on the nuclear word. Kamalı's explanation of the L- on nuclear words is based on separate prosodic phrasing of the prenuclear and nuclear domain. This distinction in Turkish between the prenuclear area on the one hand, and nuclear and postnuclear areas on the other hand, has also been made by other researchers (e.g., Güneş, 2013; Kabak & Vogel, 2001). In further support of this distinction, Kamalı observed that the pitch range of Turkish sentences was limited and that there did not seem to be declination or downstep in the prenuclear area. A following peak could even be higher than its predecessor.

Ipek's (2015) model for broad focus declaratives differs in some aspects from Kamalı's model. First, unlike Kamalı, Ipek considers Turkish to be a stress-accent language. All words carry pitch accents, regardless of stress position. If these pitch accents occur on a prenuclear word at the edge of a prosodic phrase, they have a dual function and are also boundary tones (H*H-). Second, Ipek proposes that the high boundary tone (H-) on the word preceding the nuclear word has an important function marking sentence prominence. Whereas in other languages the nuclear word is the most prominent in the sentence and marks sentence prominence, in Turkish this is not the case, because (post-)nuclear words have a rather compressed pitch range. In Turkish, sentence prominence is marked by the boundary tone that precedes the nuclear domain. This explanation is further supported by a prominence judgement task in Ipek (2015), in which listeners showed more difficulties determining the most prominent word when the boundary tone was removed from the acoustic signal than when the nuclear pitch accent was deleted.

To our knowledge, there are no phonetic studies on contrastive focus in Turkish. Ipek (2011) examined the acoustic correlates of non-contrastive narrow focus in different positions (initial, medial, and final) in SOV sentences. Focused words had a longer duration and higher intensity than non-focused words. Ipek did not find a pitch range expansion, but the f0 peaks preceding the word in focus were higher, similar to the nuclear words in broad focus in Ipek (2015) and Kamalı (2011). Sentence-initial focus was followed by postfocal pitch reduction, but no lowered pitch for pre- or postfocus was observed for the other two positions. Thus, Ipek (2011) suggests that focus in Turkish may be marked by longer durations and higher intensity rather than by f0 movements on the word in focus.

To summarize, Turkish uses both word order and prosody to mark focus. Although Kamalı (2011) and Ipek (2015) differ regarding their interpretation of word stress in Turkish, both argue that there is a clear distinction between the prenuclear and nuclear area in Turkish broad focus sentences, with a high prominence-lending boundary tone at the rightmost edge of the prenuclear area and a compressed pitch range in the (post-)nuclear domain.

1.6 Summary and research questions

As discussed above, Turkish and Dutch differ in terms of focus marking and intonation. Focus in Dutch is mainly indicated by prosody, while Turkish also makes use of word order, and has more restrictions with respect to prosody. Specifically, in Turkish there is a distinction between the prenuclear prosodic phrase, which is marked with a high boundary tone at the right edge, and the (post-)nuclear domain, which is characterized by a compressed pitch range and declination (Ipek, 2015; Kamalı, 2011). Focused, accented elements are not allowed in the postnuclear area (e.g., İşsever, 2003; Özge & Bozsahin, 2010). In Dutch, no such distinction between the prenuclear and (post-)nuclear area exists in SVO main clauses (e.g., Bouma, 2008): Each word can be accented in each position in the sentence. Dutch uses differences in pitch for the prosodic marking of topic and (contrastive) focus (e.g., Chen, 2007, 2009;

Hanssen et al., 2008). For Turkish, it is less clear how contrastive focus is marked, but Ipek (2011) shows that there may be a larger contribution of other suprasegmental features in Turkish, such as duration. In all, the studies mentioned above suggest that there are prosodic differences between the two languages, involving the interplay of prosodic features, such as pitch and duration.

This study explores potential differences between heritage speakers of Turkish and a control group of L1 speakers of Dutch with respect to prosodic focus marking in Dutch. We designed a production task to elicit semi-spontaneous declaratives in three focus conditions: broad focus, contrastive focus on the subject (in sentence-initial position), and contrastive focus on the object (in sentence-final position). The prosody of sentence-initial subjects in broad and contrastive focus in SVO sentences has not yet been studied in Dutch. The present study therefore not only contributes to the field of bilingualism, exploring to what extent a dominant L2 may be affected by the weaker L1, but also offers a more fine-tuned picture of Dutch prosody. Another novel aspect of the study concerns the semi-spontaneous character of the data. To our knowledge, no experiments have yet been conducted that elicited Turkish or Dutch semi-spontaneous complete sentences in broad and contrastive focus (but see Chen, 2007, 2009, 2011, for neutral focus in Dutch complete sentences; Krahmer & Swerts, 2001, for broad and contrastive focus in Dutch noun phrases; and Turco, Braun, & Dimroth, 2014, for polarity contrasts in Dutch). Given that the prosody of spontaneous speech may differ considerably from read speech (e.g., Blaauw, 1994; Face, 2003), it is important to study semi-spontaneous speech as a form of speech that approaches natural, spontaneous speech more than read speech.

The research questions addressed in this paper are:

(1) *How do Dutch L1 speakers and Turkish heritage speakers mark focus in Dutch?* More specifically, how do L1 speakers of Dutch and heritage speakers of Turkish phonetically mark sentence-initial and sentence-final constituents in broad and contrastive focus in semi-spontaneous speech?

(2a) *Are there any differences in focus marking between the bilinguals and L1 speakers?* and
(2b) *Can such differences be explained based on what we know about Turkish prosody?*

To answer these questions, a picture-matching question-answer task was developed to elicit utterances in broad focus, and contrastive focus in sentence-initial and sentence-final position, following Muntendam (2009, 2013, 2015).

2. Method

2.1 Participants

The participants were eight Turkish-Dutch bilinguals and a control group of eight L1 speakers of Dutch who did not speak Turkish. Half of each group was female. Given that there are prosodic differences across regional varieties of Dutch (Peters, Hanssen, & Gussenhoven, 2014), only participants who were born in Nijmegen and were living there at the time of recording were selected. The two groups of participants were matched for age (mean for the Turkish-Dutch bilinguals: 31.5 years, ranging from 26 to 37 years; mean for the Dutch L1 speakers: 31 years, ranging from 25 to 37 years). The groups were also comparable regarding education: Five Dutch L1 speakers and four Turkish-Dutch participants finished intermediate vocational education, three Dutch L1 speakers and two Turkish-Dutch bilinguals finished higher professional education, and two Turkish-Dutch bilinguals only finished high school.

Prior to the experiment, all participants completed a sociolinguistic background questionnaire about language acquisition and language use, and language proficiency ratings. All Turkish-Dutch bilinguals had Turkish as their L1, and learned Dutch from a young age (generally between two and four years). The bilinguals' parents were born in Turkey. All bilinguals reported to communicate at least once a year with family and friends in Turkey.

After the experiment, the participants performed the Boston Naming Test (BNT) (Kaplan, Goodglass, Weintraub, Segal, & Van Loon-Vervoorn, 2001) in Dutch and Turkish. This test was used, together with the self-rated language proficiency scores, to measure the participants' language proficiency. The results indicate that Dutch was the bilinguals' dominant language (see Appendix A). A paired t-test showed that the bilinguals had significantly higher scores on the Dutch than on the Turkish BNT ($t(7) = 4.10$, $p < .01$); mean score (SD) for Dutch: 100 (19.04); mean (SD) for Turkish: 72.88 (14.1)). Moreover, an independent t-test showed that the female bilinguals scored significantly higher on the Turkish BNT than the male bilinguals ($t(5.81) = 2.48$, $p < .05$; mean (SD) females: 82.25 (11.64), versus 63.50 (9.68) for the male bilinguals), whereas there was no significant gender difference for the Dutch BNT (mean (SD) for females: 97.75 (14.36); mean (SD) for males: 102.25 (25.02)). Furthermore, an independent t-test revealed that the Dutch L1 speakers had significantly higher scores on the Dutch BNT (mean (SD): 136.75 (11.97)) than the bilinguals ($t(11.88) = 4.62$, $p < .001$). Moreover, the language proficiency scores of the bilinguals were higher for Dutch than for Turkish regarding all aspects (i.e., speaking, listening, reading, writing, and pronunciation), although paired t-tests only revealed a significant difference for reading ($t(7) = -2.97$, $p < .05$), with higher scores for Dutch than for Turkish (mean score (SD) for Dutch: 4.88 (0.35); mean score (SD) for Turkish: 4 (0.76)). Furthermore, independent t-tests showed that there was a significant difference between the bilinguals and Dutch L1 speakers for reading in Dutch ($t(12.37) = 2.26$, $p < .05$): The bilinguals had significantly higher scores than the Dutch L1 speakers (mean score (SD) for the bilinguals: 4.88 (0.35); mean score (SD) for the Dutch L1 speakers: 4.38 (0.52)). While the Dutch L1 speakers only rated their Dutch, the bilinguals rated their proficiency in two languages. The fact that the bilinguals compared their Dutch proficiency to Turkish might have caused the bilinguals' higher scores for Dutch on reading.

2.2 Stimulus materials

The participants heard questions that they were requested to answer by describing pictures. Every picture occurred three times throughout the experiment, with different questions, leading to three focus types: broad focus (BROAD) (7), contrastive focus on the subject (CONTR.S) (8), and contrastive focus on the object (CONTR.O) (9). There were no pre-scripted answers; the utterances in (7)-(9) are target answers (i.e., the expected answers).

(7) a. Wat gebeurt er?
'What is happening?'
b. De oma wast de ramen.
'The grandmother is washing the windows.'

(8) a. Wast de heks de ramen?
'Is the witch washing the windows?'
b. Nee, de oma wast de ramen.
'No, the grandmother is washing the windows.'

(9) a. Wast de oma de borden?
'Is the grandmother washing the plates?'
b. Nee, de oma wast de ramen.
'No, the grandmother is washing the windows.'

There were 45 target utterances. Beside these 45 * 3 experimental items, there were 64 distractor question-answer pairs, which elicited neutral narrow focus and contained different lexical items. This led to a total of 199 question-answer pairs.

The target constituents in the target utterances were definite noun phrases. Voiceless stops in the target words (subjects and objects) were avoided to facilitate the analysis of pitch and peak alignment. Only 9% of the words had a voiceless stop in its onset. The target words consisted of two (78.9%) or three syllables (21.1%) and carried stress on the first syllable. A total of 83.3% of the stressed syllables were open syllables, whereas 16.7% were closed. The vowel in the stressed syllable was short in 44.4% and long in 55.6% of the cases. Because the number of syllables, syllable type, and vowel length may affect the alignment of pitch movements (e.g., Ladd et al., 2000), these factors were considered in the analysis (see section 2.5). The objects in the target utterances were direct objects, indirect objects, or prepositional objects. Because the grammatical function of the object affected the length of the utterance, it was taken in account in the statistical analysis (section 2.5).

2.3 Procedure

The questions were recorded by a 26-year old male native speaker of Dutch from the eastern part of the Netherlands. Recordings were made in a soundproof studio at the Radboud University. The task was presented using Presentation® software (Version 16.3, www.neurobs.com).

In the experiment, an animated figure asked the questions in a pseudo-random order. None of the target pictures and target words in one trial was repeated in the subsequent trial. The stimuli were presented in a different order for each participant.

The data were recorded with a head set and recorder using mini-discs (Sony MiniDisc Recorder MZ-NH700; Sony ECM-MS907 microphone). Prior to the task, the participants received instructions from the animated figure and were requested to respond in complete sentences. In the instructions, the animated figure gave examples of question-answer pairs to illustrate how the participants should respond. The instructions were followed by a practice part with 14 question-answer pairs.

During the task, pictures appeared on the computer screen, for instance a drawing of a grandmother washing the windows. To elicit contrastive focus, two additional pictures appeared below the target picture, one of the target referent and one of an alternative (i.e., one of a grandmother and one of a witch) (see Appendix C). The experiment took approximately 30 minutes.

2.4 Data selection and analysis

The semi-spontaneous character of the data resulted in great variability regarding the way in which the speakers uttered the target sentences. Because our aim was to analyze the speakers' prosody as systematically as possibly, it was important that the utterances were comparable. Therefore, a subset of 24 target sentences * 3 focus conditions was selected for analysis. These sentences were most fluent and comparable across the 16 speakers. The following data were excluded from the analysis: (1) utterances with a different word order, e.g., with objects in non-final position; (2) utterances with lexical items that did not have word stress on the first syllable or contained voiceless stops (e.g., *papa*, ‘dad’ for *vader*, ‘father’); (3) sentences with a boundary tone after the subject; (4) sentences with pauses and/or hesitations, and (5) repeated or corrected utterances.

The data were analyzed in *Praat* (Boersma & Weenink, 2010). Syllable boundaries were determined by using both visual (the waveform and spectrogram) and auditory information. A script was used to automatically determine f0 minima and maxima. These were manually checked and corrected when necessary, that is, in the case of octave jumps, increased pitch on voiceless stops, or creaky voice.

Given the differences in f0 movements, peak alignment, and duration between broad and narrow focus that were found by Hanssen et al. (2008) and Chen (2009), we were interested in several variables of the target words (subjects and objects). Concerning f0 movements, we examined the minimum before the peak within the word (min1), the peak, the minimum after the peak within the word (min2), the rise from the first minimum to the peak, the fall from the peak to the second minimum, and the slopes of the rises and falls. All f0 values were converted to semitones (ST) with 100 Hz as a reference. Semitones reflect listeners’ perception of changes in pitch more accurately than Hertz, and are used to make a fair comparison between male and female speakers’ f0 movements (e.g., Simpson, 2009)[4]. For peak alignment, we measured the location of the peak in ms relative to the end of the stressed syllable, yielding negative values for peak alignment within the stressed syllable, and positive values for peaks in the posttonic syllable. We also measured the duration of the stressed syllable and of the word (in ms). The durational difference between the stressed and posttonic syllable(s) was also measured. Moreover, given that prosodic prominence is dependent on its surroundings (e.g., Krahmer & Swerts, 2001), we also measured the difference between the subject and object in the sentence, by calculating

[4] Physical f0 changes (as reflected in Hertz) do not correspond to what we perceive: The higher the pitch, the larger the physical f0 difference needs to be to be perceived as a difference in f0. This leads to larger f0 changes for women than what listeners perceive, and smaller f0 changes for men than what listeners perceive. This non-linear perception of f0 changes is captured in the logarithmic measure of semitones (e.g., Simpson, 2009).

the difference between the peaks on the subject and object (peak range). We expected positive values, with higher peaks on the subject than on the object, given the natural trend of declination in declaratives (Gussenhoven, 2005a). We further computed durational differences between subject and object, concerning the stressed syllable, the total duration of the word, and the relative duration. We expected that the durational differences between subject and object would show negative values because of final lengthening in Dutch sentences (Hofhuis, Gussenhoven, & Rietveld, 1995): The final word in the sentence is usually longer compared to preceding words. Table 1 summarizes the measurements that were taken in *Praat*, and Table 2 lists the acoustic variables that were calculated from the measurements.

Table 1. ***Measurements from the target sentences in Praat.***

F0 movements	
min1	f0 minimum within the word before the peak in ST
peak	f0 maximum within the word in ST
min2	f0 minimum within the word after the peak in ST
Peak alignment	
peak location	location of the peak in ms relative to the end of the stressed syllable
Duration	
Duration stressed syllable	duration of the stressed syllable in ms
total duration	duration of the entire word in ms

Table 2. ***Variables that were calculated from the measurements in Table 1.***

F0 movements	
rise	peak – min1 in ST
fall	peak – min2 in ST
slope of the rise	(rise) / (distance between peak and min1 in ms)
slope of the fall	(fall) / (distance between peak and min2 in ms)
peak range	peak subject – peak (direct/prepositional/indirect) object in the sentence, in ST
Duration	
relative duration	duration stressed syllable / total duration in ms
difference stressed syllable	sduration subject – sduration object in the sentence, in ms

duration difference total duration	total duration subject – total duration object in the sentence, in ms
difference relative duration	relative duration subject – relative duration object in the sentence, in ms

2.5 Statistical data analysis

For all acoustic variables, we fitted mixed-effect models using the *lmer* function of the lmerTest package (Kuznetsova, Brockhoff, & Bojesen Christensen, 2014) in R (R Core Team, 2014). The random factors were 'Subject' and 'Sentence'. The fixed factors were 'Group' (Turkish, Dutch) and 'Focus' (BROAD, CONTR.S, CONTR.O). Furthermore, Simonet (2011) revealed a leading role of Catalan-Spanish bilingual women regarding prosodic transfer. Therefore, we examined our data for gender differences. The fixed effects were only incorporated in the model if they led to a better fit, which was tested with the *anova* function in R. The effect of 'Gender' (Female, Male) is only discussed when the effect can be explained by other factors than the intrinsic differences in pitch between male and female speakers (i.e., in the case of interactions with Focus and Group).[5] A Bonferroni correction was applied and therefore all effects are reported at a .0167 level of significance. Only significant differences are discussed.

[5] In a different analysis, in addition to 'Group' (Turkish, Dutch), 'Focus' (BROAD, CONTR.S, CONTR.O), and 'Gender' (Female, Male), we included the following fixed factors in the models: 'Education' (High School, Intermediate vocational education, Higher professional education), 'Number of syllables' (Two, Three), 'Vowel length' (Long, Short), 'Syllable structure' (Open, Closed), 'Duration of the stressed syllable', 'Function' (Direct object, Prepositional object, Indirect object) 'Dutch BNT score', and the five self-rated language proficiency scores for Dutch (Speaking, Listening, Reading, Writing, Pronunciation). Word intrinsic variables (e.g., 'Number of syllables') might especially be relevant for peak alignment and duration measures (e.g., Ladd et al., 2000). Variables that describe characteristics of the participants also could have an effect on speakers' prosody. Although our bilingual speakers were all dominant in Dutch, we expected that there might be individual differences in language input that can be explained by variables such as age, education, BNT scores, and the language proficiency scores. Adding or removing these variables did not affect our main results, but to avoid any issues of potential collinearity we focus on the simpler analysis in the main text.

3. Results

All speakers used prosodic features to mark differences in focus structure. In general, according to ToDI (Transcription of Dutch Intonation; e.g., Gussenhoven, 2005b), the nuclear pitch accent can be described as a fall (H*L), whereas the shape of the sentence-initial prenuclear accent was dependent on the focus condition; H*L was used in the CONTR.S condition, whereas a prenuclear rise (L*H) was often realized in the BROAD and CONTR.O conditions.

To consider research question 1 ('How do Dutch L1 speakers and Turkish heritage speakers mark focus in Dutch?'), differences between focus conditions observed for both groups of speakers are described in section 3.1. Subsequently, following research question 2a ('Are there any differences in focus marking between the bilinguals and L1 speakers?'), the prosodic features that revealed differences between the bilinguals and the controls are described in section 3.2. We return to research question 2b ('Can such differences be explained based on what we know about Turkish prosody?') in the discussion. Section 3.1 and 3.2 both deal with f0 movements, peak alignment, and duration differences. Graphs with means and error bars and statistical effects highlight main findings described in the text. Additional descriptive statistics (N, means, and standard deviations) for all measurements with significant results can be found in Appendix B.

3.1 How do Dutch L1 speakers and Turkish heritage speakers mark focus in Dutch?

In this section, we describe how both Dutch L1 speakers and Turkish heritage speakers phonetically mark sentence-initial and sentence-final constituents in broad and contrastive focus in semi-spontaneous speech. That is, we summarize significant differences across focus conditions for both groups of speakers.

3.1.1 F0 movements

Minimum before the peak on the object

The model for the minimum before the peak on the object shows that male speakers produced lower values for the minimum before the peak on the object in general, probably due to intrinsic differences between male and female speech. Furthermore, the minimum before the peak on the object was significantly lower for the CONTR.S condition than for the BROAD and CONTR.O conditions (Figure 1 and Table 3). Given that the object is the final word in the sentence and thus follows the subject, a lower minimum on the object in or deaccenting after the word in contrastive focus.

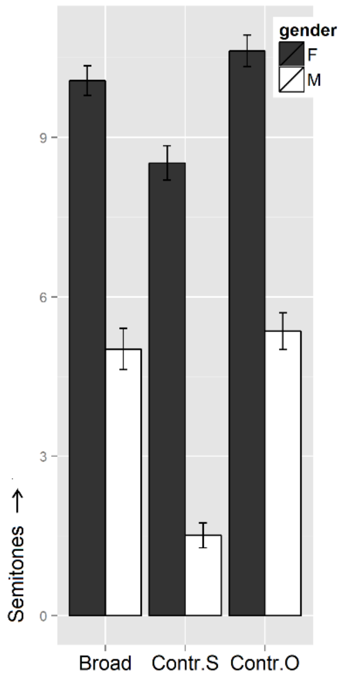


Fig. 1. Means and error bars of the minimum before the peak on the object (in semitones) for the three focus conditions.

Table 3. ***Effects on the minimum before the peak on the object.***

	Fixed effect	*β*	*t* (df)	*p*
Minimum before peak	Contr.S (intercept: Broad)	-1.75	-6.33 (809.5)	< .0001
	Contr.S (intercept: Contr.O)	-2.30	-8.64 (809.6)	< .0001
	Gender	-5.41	-3.51 (14.7)	< .01
	Gender * Contr.S (intercept: Broad)	-1.69	-4.39 (810.1)	< .0001
	Gender * Contr.S (intercept: Contr.O)	-1.40	-3.74 (809.9)	< .001

F0 movements on the subject

For the slope of the rise on the subject, the model demonstrates that the rise on the subject was less steep in the CONTR.O condition than in the BROAD and CONTR.S conditions (see Figure 2 and Table 4). This indicates prefocal pitch reduction to mark contrastive focus on the final word in the sentence.

Regarding the minimum after the peak on the subject, the model reveals that the minimum after the peak on the subject was highest in the BROAD condition compared to the CONTR.S and CONTR.O conditions (Figure 2 and Table 4). Furthermore, it was significantly lower in CONTR.S than in BROAD and CONTR.O, indicating a reduction in pitch following the word in contrastive focus.

For the fall on the subject, the model demonstrates that there was a larger fall in pitch on the subject in the CONTR.S condition than in the BROAD and CONTR.O conditions (Figure 2; Table 4). Additionally, the fall was significantly larger in the BROAD condition than in the CONTR.O condition. The smaller fall on the subject in the CONTR.O condition can also be explained by prefocal pitch reduction.

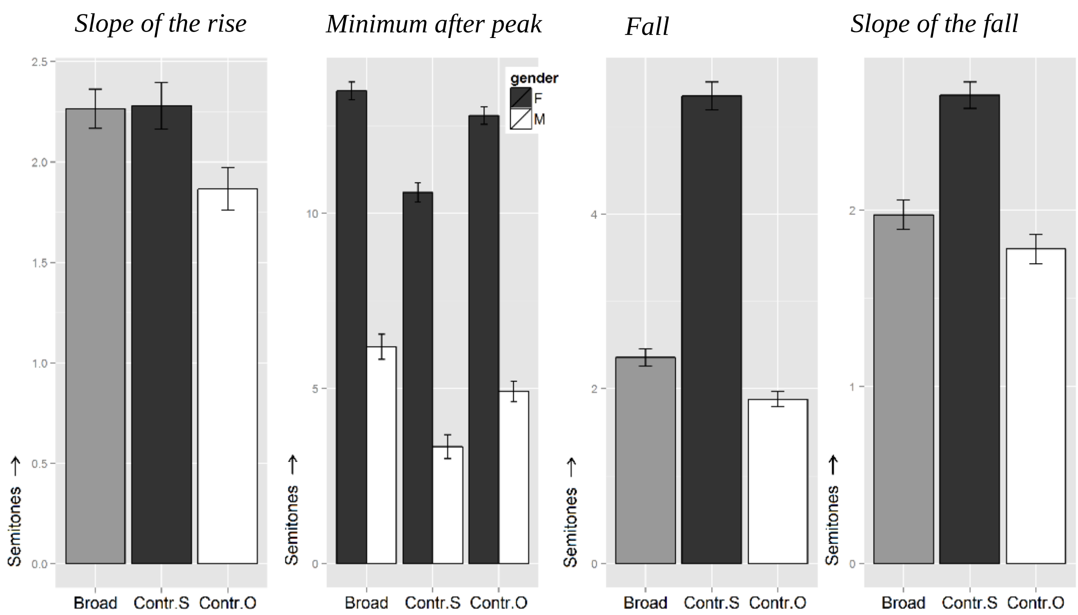


Fig. 2. Means and error bars of f0 movements on the subject (in semitones) for the three focus conditions: slope of the rise, minimum after the peak, fall, and slope of the fall.

For the slope of the fall on the subject, the model shows that the fall on the subject was not only larger, but also steeper in the CONTR.S condition compared to the BROAD and CONTR.O conditions (Figure 2; Table 4). This indicates that the speakers used a time-compressed pitch movement on the subject to signal contrastive focus on this word.

Table 4. ***Effects on f0 movements on the subject.***

	Fixed effect	*β*	*t* (df)	*p*
Slope rise	Contr.O (intercept: Broad)	-0.50	-3.93 (812.4)	< .0001
	Contr.S (intercept: Contr.O)	0.44	3.64 (812)	< .001
Minimum after peak	Contr.O (intercept: Broad)	-0.76	-3.13 (811.3)	< .01
	Contr.S (intercept: Broad)	-3.02	-12.74 (810.6)	< .0001
	Contr.S (intercept: Contr.O)	-2.27	-9.73 (809.9)	< .0001
	Gender	-7.45	-4.93 (14.6)	< .001
	Gender * Contr.S (intercept: Contr.O)	0.93	2.79 (810.5)	< .01
Fall	Contr.O (intercept: Broad)	-0.55	-3.41 (815.2)	< .001
	Contr.S (intercept: Broad)	2.94	18.6 (814.9)	< .0001
	Contr.S (intercept: Contr.O)	3.49	22.81 (813.5)	< .0001
Slope fall	Contr.S (intercept: Broad)	0.69	6.84 (813)	< .0001
	Contr.S (intercept: Contr.O)	0.90	9.18 (811.8)	< .0001

3.1.2 Peak alignment

For peak location on the subject, the model indicates that peak alignment was significantly earlier in the CONTR.S condition than in the BROAD and CONTR.O generally fell within the stressed syllable, whereas the peak fell more often in the posttonic syllable in the BROAD and CONTR.O conditions.

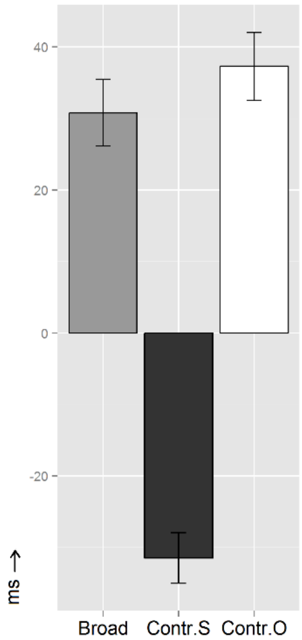


Fig 3. Means and error bars for peak location on the subject (in ms, relative to the end of the stressed syllable) for the three focus conditions.

Table 5. *Effects on peak location on the subject.*

	Fixed effect	β	t (df)	p
Peak location	Contr.S (intercept: Broad)	-66.49	-12.7 (815.1)	< .0001
	Contr.S (intercept: Contr.O)	-69.35	-13.64 (814.5)	< .0001

The differences between the focus conditions for peak alignment and f0 movements are illustrated in Figure 4, which presents the pitch contours from a female L1 speaker of Dutch: The rise on the subject is steeper, peak alignment is earlier, the minimum after the peak is lower, and the fall is larger and steeper in CONTR.S than in the other conditions.

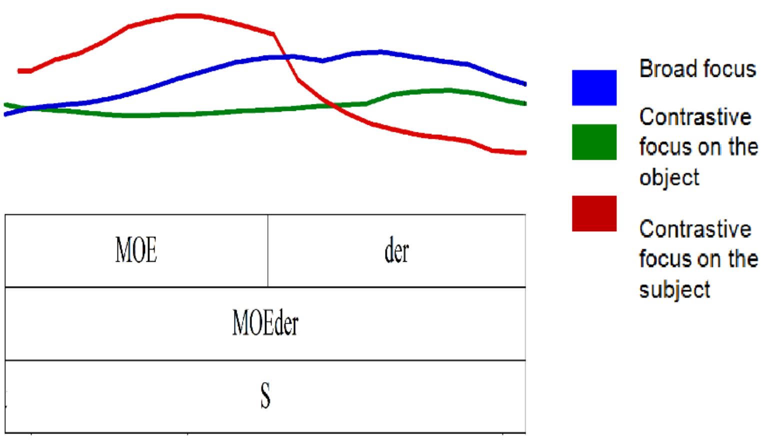


Fig. 4. Pitch contours (in Hertz) from a Dutch female speaker from the control group uttering the sentence-initial subject (S) *moeder*, 'mother' in the three focus conditions.

3.1.3 Duration

The model reveals that the stressed syllable of the subject had a significantly longer duration in the BROAD condition than in the CONTR.S and CONTR.O conditions (Figure 5; Table 6).

For total duration of the subject, the model shows that all speakers shortened the subject significantly more in the CONTR.O condition than in the BROAD and CONTR.S conditions (Figure 5; Table 6).

For the relative duration of the subject (i.e., the duration of the stressed syllable divided by the total duration of the word), the model demonstrates that the relative duration of the subject was significantly longer in the CONTR.O condition than in the BROAD and CONTR.S conditions (Figure 5; Table 6). Given that the stressed syllable and total word were shortest in CONTR.O, a longer relative duration suggests that the speakers shortened the posttonic syllable rather than that they lengthened the stressed syllable.

Concerning the duration of the stressed syllable of the object, the model shows again that duration was shortest when the other word was in contrastive focus, whereas it was longer in the CONTR.O condition (Figure 5; Table 6). This points towards a strategy to shorten words that are not in contrastive focus, but instead contain repeated information.

For the total duration of the object, the model shows that the final word in the CONTR.S condition was significantly shorter than in the BROAD and CONTR.O conditions, again indicating the shortening of repeated words (Figure 5; Table 6). Although the incorporation of gender in the model led to an improvement, the effect itself was not below the significance level of .0167.

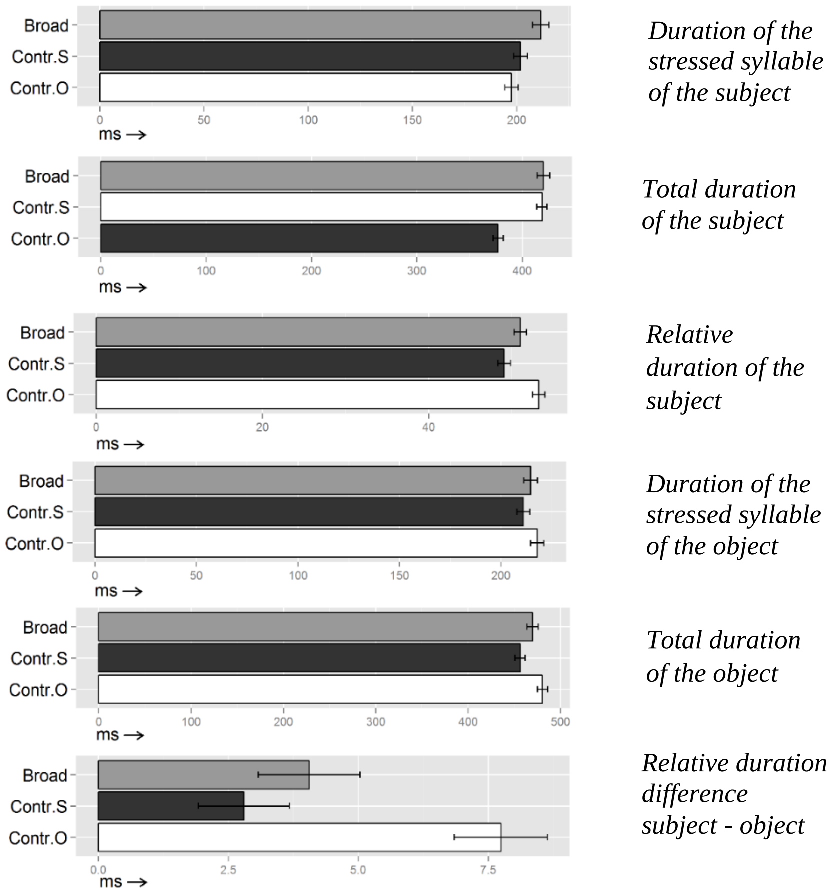


Fig. 5. Means and error bars of six duration variables (in ms) for the three focus conditions: duration of the stressed syllable of the subject, total duration of the subject, relative duration of the subject, duration of the stressed syllable of the object, total duration of the object, and the relative duration difference between subject and object.

Regarding the relative duration difference between subject and object, the model reveals that it is the largest in the CONTR.O condition as compared to the BROAD and CONTR.S conditions. The positive values for the mean in all focus conditions indicate that the relative duration of the subject is longer than the relative duration of the object (Figure 5; Table 6). Given that a longer relative duration would indicate a longer stressed syllable compared to the duration of the posttonic syllable(s), it might also reveal that the part after the stressed syllable is shortened. As is shown in section 3.2.3 for the durational difference between subject and object, this is indeed the case: The object is longer than the subject in all conditions, and longest when this object is in the CONTR.O condition. Longer relative durations for the subject thus indicate shorter posttonic syllables. Therefore, the posttonic syllables of the subject were the shortest in CONTR.O.

Table 6. ***Effects on duration.***

	Fixed effect	*β*	*t* (df)	*p*
Duration of the stressed syllable of the subject	Contr.O (intercept: Broad)	-11.50	-4.82 (828.3)	< .0001
	Contr.S (intercept: Broad)	-6.38	-2.73 (828.8)	< .01
Relative duration of the subject	Contr.O (intercept: Broad)	3.06	5.57 (827.7)	< .0001
	Contr.S (intercept: Contr.O)	-3.63	-6.97 (827.5)	< .0001
Duration of the stressed syllable of the object	Contr.S (intercept: Contr.O)	-7.69	-3.88 (810.2)	< .001
Total duration of the object	Contr.S (intercept: Broad)	-15.55	-3.48 (810.4)	< .001
	Contr.S (intercept: Contr.O)	-25.69	-5.89 (810.4)	< .0001
	Gender	-64.84	-3.04 (14)	< .01
Relative durationdiff	Contr.O (intercept: Broad)	3.68	4.69 (716.2)	< .0001
	Contr.S (intercept: Contr.O)	-4.20	-5.76 (715.1)	< .0001

Summarizing, both groups of speakers showed a time-compressed pitch movement on the subject in the CONTR.S condition and prefocal pitch reduction in the CONTR.O condition. Furthermore, the stressed syllable of the subject was longest in the BROAD condition, and repeated words were shortened.

3.2 Are there any differences in focus marking between the bilinguals and L1 speakers?

In this section we describe the prosodic differences between the two groups of speakers to explore a potential influence from Turkish in the Dutch prosody of the Turkish-Dutch bilinguals.

3.2.1 F0 movements

F0 movements on the subject

The model demonstrates that the minimum before the peak on the subject in the CONTR.S condition for the bilinguals was significantly higher than in the BROAD and CONTR.O conditions (Figure 6; Table 7). The L1 speakers of Dutch did not show a large difference between BROAD, CONTR.S, and CONTR.O. The difference was particularly clear for the female speakers: While the Turkish-Dutch female bilinguals used a higher minimum before the peak to signal contrastive focus, the female L1 speakers of Dutch did not show a difference across the focus conditions. Regarding the male speakers, the Turkish-Dutch male bilinguals started a bit lower than the male L1 speakers of Dutch in general. However, the difference between BROAD and CONTR.S for the Turkish-Dutch male bilinguals was larger than for the male L1 speakers of Dutch.

For the rise on the subject, the model shows that, while the L1 speakers of Dutch employed a larger rise in the CONTR.S than in the CONTR.O condition, the Turkish-Dutch bilinguals used a larger rise on the subject in the CONTR.O than in the CONTR.S condition (Figure 6; Table 7). For all speakers the rise on the subject was largest in the BROAD condition, which can be explained by the later peak alignment in this condition compared to the CONTR.S condition.

Concerning the peak on the subject, the model reveals that, while the Turkish-Dutch bilinguals realized a significantly higher peak in the CONTR.S than in the BROAD condition, the L1 speakers of Dutch realized somewhat higher peaks in the BROAD than in the CONTR.S condition. Moreover, while the peak on the subject was higher in all conditions for the Turkish-Dutch female bilinguals compared to the female L1 speakers of Dutch, it was lower for the Turkish-Dutch male bilinguals than for the male L1 speakers of Dutch (Figure 6; Table 7).

F0 movements on the object

For the rise on the object, the model shows that all speakers used a smaller rise in the CONTR.S condition (Figure 7; Table 8), indicating postfocal pitch reduction. Furthermore, the Dutch L1 speakers realized a larger rise on the object in the CONTR.O than in the BROAD condition. Although the rise on the object for the Turkish-Dutch bilinguals was a bit larger on the object in the CONTR.O condition than in the BROAD condition, the difference between conditions was much smaller than for the Dutch L1 speakers. This suggests that the Turkish-Dutch bilinguals did not use a larger rise to signal contrastive focus, which is comparable to the findings for the subject.

Regarding the peak, the model demonstrates that, similar to the peak on the subject, the peak on the object was realized higher by the Turkish-Dutch female bilinguals than by the female Dutch L1 speakers, in all focus conditions (Figure 7; Table 8). For the male speakers, the difference was somewhat smaller, although the Turkish-Dutch male bilinguals realized the peak on the object somewhat lower than the male Dutch L1 speakers. Moreover, whereas for the peak on the subject only the Turkish-Dutch bilinguals produced higher peaks in the CONTR.S than in the BROAD condition, the Dutch L1 speakers showed larger differences for the peak on the object. That is, the Dutch L1 speakers realized a higher peak on the object in the CONTR.O than in the BROAD condition. The peak on the object in the CONTR.O condition for the Turkish-Dutch bilinguals was also somewhat higher compared to the BROAD condition, but the difference is smaller, particularly for the Turkish-Dutch male bilinguals.

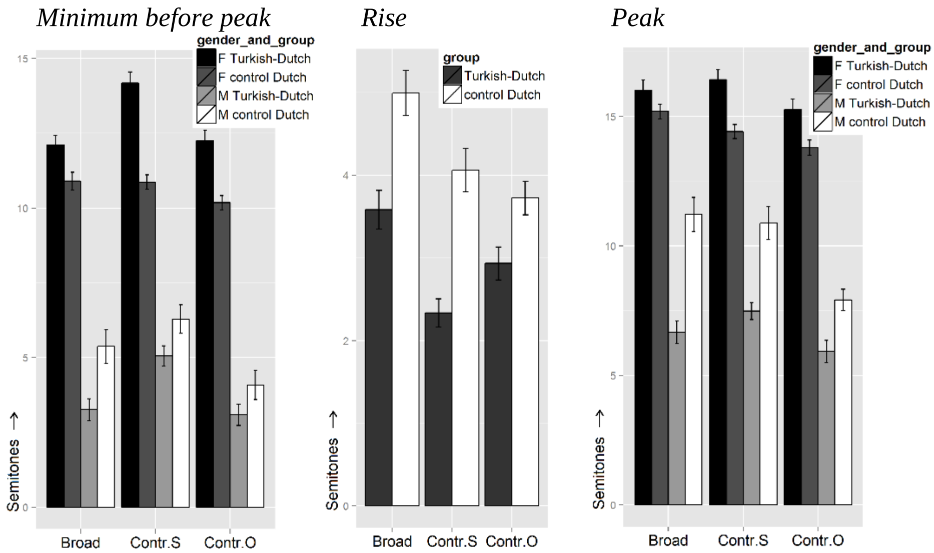


Fig. 6. Means and error bars of the f0 movements on the subject for the three focus conditions (in semitones): minimum before the peak, rise, and the peak.

Table 7. ***Effects on f0 movements on the subject.***

	Fixed effect	*β*	*t* (df)	*p*
Minimum before peak	Group * Contr.S (intercept: Broad)	1.87	4.06 (807.9)	< .0001
	Group * Contr.S (intercept: Contr.O)	1.29	2.84 (807.6)	< .01
	Gender	-6.19	-3.57 (12.7)	< .01
	Gender * Contr.S (intercept: Broad)	1.36	2.93 (807.5)	< .01
	Gender * Contr.S (intercept: Contr.O)	1.88	4.27 (807.4)	< .0001
Rise	Contr.O (intercept: Broad)	-1.39	-6.12 (811)	< .0001
	Contr.S (intercept: Broad)	-0.97	-4.32 (811.6)	< .0001
	Group * Contr.S (intercept: Contr.O)	-1.16	-3.67 (810.5)	< .001
Peak	Contr.O (intercept: Broad)	-1.33	-5.46 (809.6)	< .0001
	Contr.S (intercept: Broad)	-0.83	-3.46 (809.4)	< .001
	Group * Contr.S (intercept: Broad)	1.01	2.89 (809.3)	< .01
	Gender * Contr.O (intercept: Broad)	-1.86	-5.21 (808.3)	< .0001
	Gender * Contr.S (intercept: Contr.O)	2.96	8.87 (807.5)	< .0001

	Group * Gender * Contr.O (intercept: Broad)	1.66	3.19 (808.8)	< .01
	Group * Gender * Contr.S (intercept: Contr.O)	-2.58	-5.21 (809.9)	< .0001

For the fall on the object, the model shows that in general, all speakers used a smaller fall in the CONTR.S condition than in the BROAD and CONTR.O conditions (Figure 8; Table 8), again indicating postfocal pitch reduction. In addition, male speakers seemed to employ larger falls than female speakers, except in CONTR.S. This difference was particularly clear in the BROAD condition. Furthermore, the Turkish-Dutch male bilinguals employed an equally large fall on the object in the BROAD and CONTR.O condition, whereas all other speakers realized larger falls in the CONTR.O than in the BROAD condition. Moreover, the difference between the CONTR.O condition on the one hand and the BROAD and CONTR.S conditions on the other hand was larger for the Turkish-Dutch female bilinguals than for the female L1 speakers of Dutch.

For the slope of the fall on the object, the model shows that the slope of the fall realized by the Turkish-Dutch male bilinguals was equally steep in the BROAD and CONTR.O conditions, whereas all other speakers showed a steeper slope for CONTR.O than for BROAD (Figure 8; Table 8). In other words, all speakers except for the Turkish-Dutch male speakers marked contrastive focus on the object with a steeper slope.

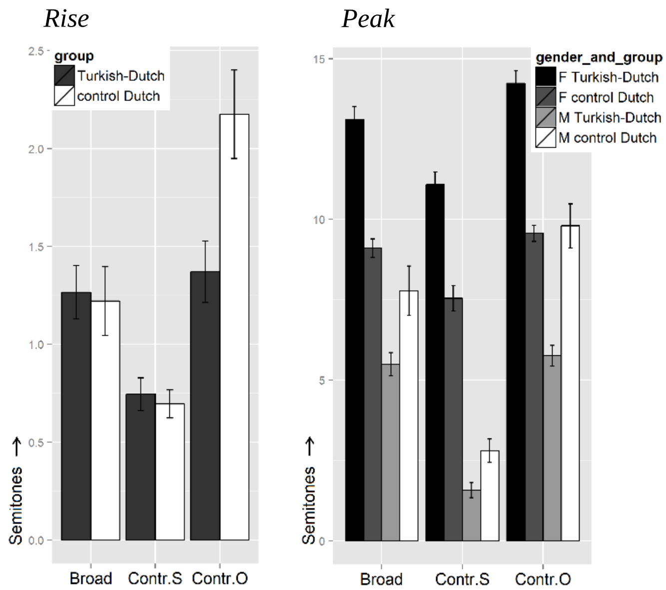


Fig. 7. Means and error bars of the rise and peak (in semitones) on the object for the three focus conditions.

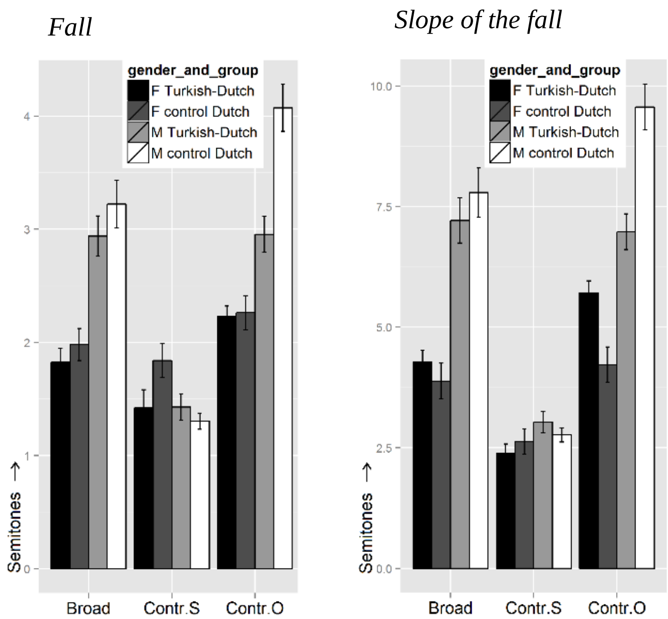


Fig. 8. Means and error bars of the fall and slope of the fall (in semitones) on the object for the three focus conditions.

Table 8. ***Effects on f0 movements on the object.***

	Fixed effect	*β*	*t* (df)	*p*
Rise	Contr.O (intercept: Broad)	0.88	5.29 (804.6)	< .0001
	Contr.S (intercept: Broad)	-0.58	-3.45 (804.4)	< .001
	Contr.S (intercept: Contr.O)	-1.46	-8.95 (804.1)	< .0001
	Group * Contr.O (intercept: Broad)	-0.79	-3.18 (804.7)	< .01
	Group * Contr.S (intercept: Contr.O)	0.81	3.34 (804.7)	< .001
Peak	Contr.S (intercept: Broad)	-1.50	-4.41 (800.8)	< .0001
	Contr.S (intercept: Contr.O)	-2.04	-6.21 (802.1)	< .0001
	Group * Contr.S (intercept: Contr.O)	-1.26	-2.6 (801.9)	< .01
	Gender * Contr.O (intercept: Broad)	1.49	3.17 (803.8)	< .01
	Gender * Contr.S (intercept: Broad)	-3.28	-6.95 (800.9)	< .0001
	Gender * Contr.S (intercept: Contr.O)	-4.78	-10.37 (802)	< .0001
	Group * Gender * Contr.O (intercept: Broad)	-2.58	-3.67 (805.3)	< .001
	Group * Gender * Contr.S (intercept: Contr.O)	3.97	5.81 (802.6)	< .0001
Fall	Contr.S (intercept: Broad)	-1.20	-3.58 (797.6)	< .001
	Contr.S (intercept: Contr.O)	-1.72	-5.24 (798.6)	< .0001
	Gender (intercept: Contr.O)	5.30	3.26 (12.6)	< .01
	Group * Contr.S (intercept: Contr.O)	-1.58	-3.29 (798.5)	< .01
	Gender * Contr.S (intercept: Broad)	-3.80	-8.11 (797.6)	< .0001
	Gender * Contr.S (intercept: Contr.O)	-5.01	-10.96 (798.5)	< .0001
	Group * Gender * Contr.O (intercept: Broad)	-2.97	-4.24 (802.3)	< .0001
	Group * Gender * Contr.S (intercept: Contr.O)	4.38	6.47 (799.2)	< .0001
Fall slope	Contr.S (intercept: Contr.O)	-0.44	-2.60 (797.8)	< .01
	Gender (intercept: Contr.O)	1.81	3.17 (13.4)	< .01
	Gender * Contr.S (intercept: Broad)	-1.73	-7.11 (797.1)	< .0001
	Gender * Contr.S (intercept: Contr.O)	-2.30	-9.66 (797.7)	< .0001
	Group * Gender * Contr.O (intercept: Broad)	-0.90	-2.47 (800.6)	.0138
	Group * Gender * Contr.S (intercept: Contr.O)	1.59	4.5 (798.2)	< .0001

Peak range

The model shows that there was a difference between the Turkish-Dutch bilinguals and the Dutch L1 speakers concerning declination (Figure 9; Table 9). The difference was particularly clear in the BROAD condition: While the L1 speakers of Dutch showed a large difference between the peak on the subject and the peak on the object, this difference was much smaller for the Turkish-Dutch bilinguals, who remained more at the same pitch level throughout the sentence. The difference is most visible for the female speakers: The difference in height between the peak on the subject and the object is substantially larger for the female Dutch L1 speakers than for the female bilinguals. This also follows from the finding that was mentioned above concerning the peak on the object. That is, the peak on the object was significantly higher for the female bilinguals than for the female Dutch L1 speakers. For the male speakers, the same difference can be observed in Figure 9: The male Dutch L1 speakers showed more declination in the BROAD condition than the Turkish-Dutch male bilinguals. Unlike for the female speakers, however, the difference for the male speakers follows from the finding that the Turkish-Dutch male bilinguals realized a lower peak on the subject than the male Dutch L1 speakers, leading them to continue at the same pitch level when realizing the peak on the object. The differences between the female bilinguals and female L1 speakers of Dutch on the one hand, and between the male bilinguals and male L1 speakers of Dutch on the other hand, are illustrated by the pitch contours of broad focus sentences in Figure 10 and 11, respectively. Whereas the Turkish-Dutch female bilingual used a higher peak on the object to maintain the same pitch level throughout the sentence, the limited peak range of the Turkish-Dutch male bilingual is due to the lower peak at the beginning of the utterance than that of the control group.

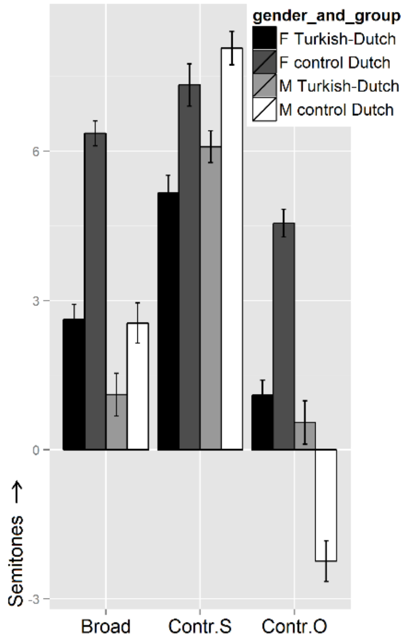
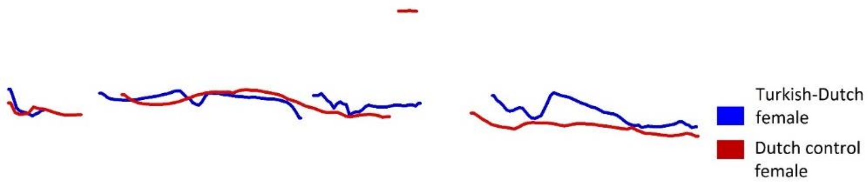


Fig. 9. Means and error bars of the difference (in semitones) between the peak on the subject and the peak on the object, for the three focus conditions.

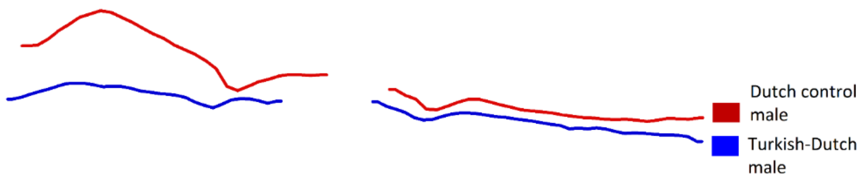
Table 9. ***Effects on peak range.***

	Fixed effect	*β*	*t* (df)	*p*
Peak range	Contr.O (intercept: Broad)	-1.78	-3.87 (709)	< .001
	Contr.S (intercept: Contr.O)	2.69	6.08 (707.1)	< .0001
	Group	-3.84	-4.26 (20.2)	< .001
	Gender	-3.57	-3.99 (19.6)	< .001
	Group * Gender (intercept: Contr.O)	6.12	4.92 (18.1)	< .001
	Group * Contr.S (intercept: Broad)	1.7	2.46 (711.8)	.0143
	Gender * Contr.S (intercept: Broad)	4.52	6.83 (706.6)	< .0001
	Gender * Contr.O (intercept: Broad)	-3.10	-4.63 (707.7)	< .0001
	Gender * Contr.S (intercept: Contr.O)	7.62	12.39 (706.6)	< .0001
	Group * Gender * Contr.S (intercept: Broad)	-2.55	-2.62 (709.7)	< .01
	Group * Gender * Contr.O (intercept: Broad)	3.70	3.72 (711)	< .001
	Group * Gender * Contr.S (intercept: Contr.O)	-6.26	-6.77 (709.8)	< .0001



de	VA	der	wast	de	HON	den
de	VAder		wast	de	HONden	
art	S		V	art	O	

Fig. 10. Pitch contours (in Hertz) of the broad focus sentence *De vader wast de honden*, 'The father is washing the dogs' spoken by a Turkish-Dutch female bilingual and female Dutch L1 speaker from the control group.



O	ma	wast	de	RA	men
Oma		wast	de	RAmen	
S		V	art	O	

Fig. 11. Pitch contours (in Hertz) of the broad focus sentence *Oma wast de ramen*, 'Grandmother is washing the windows' spoken by a Turkish-Dutch male bilingual and male Dutch L1 speaker from the control group.

3.2.2 Peak alignment

Peak location on the object

The model reveals that there was a difference between the Turkish-Dutch bilinguals and the L1 speakers of Dutch. That is, although the peak fell within the stressed syllable in all conditions, which is typical of the H*L nuclear pitch accent, the bilinguals realized the peak significantly earlier in the CONTR.O condition than in the BROAD condition, whereas the Dutch L1 speakers showed the opposite pattern, with earlier alignment for the BROAD condition than for the CONTR.O condition (Figure 12; Table 10).

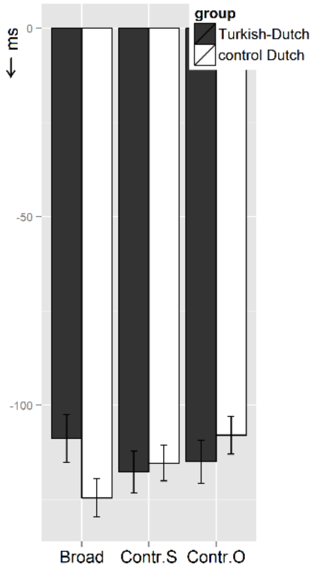


Fig 12. Means and error bars of peak location (in ms, relative to the end of the stressed syllable) on the object for the three focus conditions.

Table 10. ***Effects on peak location on the object.***

	Fixed effect	*β*	*t* (df)	*p*
Peak location	Contr.O (intercept: Broad)	16.22	2.97 (803.7)	< .01
	Group * Contr.O (intercept: Broad)	-21.60	-2.65 (804.2)	< .01

3.2.3 Duration

For the total duration difference, the model indicates that all speakers used longer durations for the object than for the subject, which can be attributed to final lengthening (Figure 13 and Table 11). Furthermore, the object is relatively longer in the CONTR.O condition than in the BROAD and CONTR.S conditions (Table 20). However, the Turkish-Dutch bilinguals used more final lengthening in the BROAD and CONTR.S conditions than the Dutch L1 speakers. In other words, the final word of the Turkish-Dutch bilinguals was longer relative to the subject than the final word of the Dutch L1 speakers in these conditions. Moreover, the L1 speakers of Dutch shortened the object in the CONTR.S condition, while the Turkish-Dutch bilinguals did not mark the difference between the BROAD and CONTR.S conditions by means of duration differences of the object.

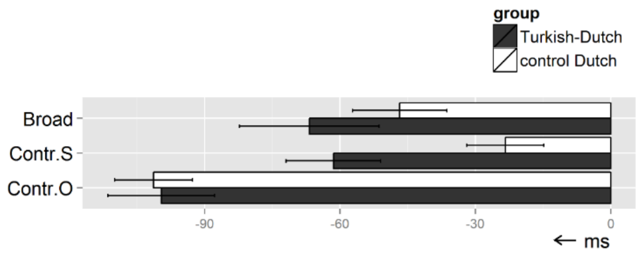


Fig. 13. Means and error bars of the total duration difference between the subject and object (in ms), for the three focus conditions.

Table 11. ***Effects on total duration difference between subject and object.***

	Fixed effect	*β*	*t* (df)	*p*
Total duration subject - total duration object	Contr.O (intercept: Broad)	-69.35	-7.26 (713)	< .0001
	Contr.S (intercept: Contr.O)	76.03	8.64 (712.4)	< .0001
	Group * Contr.O (intercept: Broad)	37.71	2.67 (713.2)	< .01

In sum, differences were observed between the groups regarding f0 movements, peak alignment, and duration, which are summarized in the next section.

4. Discussion and conclusion

This study examined the prosodic marking of focus in semi-spontaneous Dutch by eight Turkish-Dutch bilinguals and a control group of eight L1 speakers of Dutch. By determining the similarities and differences between the two groups of speakers, we aimed at establishing a potential influence from Turkish on the Dutch prosody of these heritage speakers of Turkish, possibly revealing that a weaker L1 affects the prosody of the dominant L2. In the following sections, we return to the research questions and discuss our findings on f0 movements, peak alignment, and duration.

4.1 How do Dutch L1 speakers and Turkish heritage speakers mark focus in Dutch?

4.1.1 F0 movements

Both Turkish-Dutch bilinguals and L1 speakers of Dutch marked contrastive focus on the subject with a lower f0 minimum after the peak on the subject, which was combined with a larger and steeper fall. Thus, we found that the intonation of sentence-initial, preverbal constituents in contrastive focus (i.e., a time-compressed pitch movement) in this study was similar to the nuclear accents in Hanssen et al. (2008), which occurred later in the sentence. This has not been demonstrated before for Dutch. Furthermore, in this study, the object in the CONTR.S condition was characterized by a lower f0 minimum before the peak, a smaller rise, a lower peak, and a smaller fall than in the other two conditions. These findings indicate postfocal pitch reduction or deaccenting after the word in contrastive focus (Gussenhoven, 2005a). Finally, the rise on the subject was more gradual in the CONTR.O condition than in the BROAD and CONTR.S conditions.

4.1.2 Peak alignment

Regarding peak alignment, all speakers marked contrastive focus on the subject with an early peak, while the peak on the subject generally fell in the posttonic syllable in the BROAD and CONTR.O conditions. The later peak alignment for the BROAD condition also accounts for the finding that both groups of speakers employed a larger rise on the subject in this condition. The late peak alignment on prenuclear accents in complete sentences in the BROAD and CONTR.O conditions, which can be described as a rise (L*H), is a novel finding regarding Dutch prosody. Although Ladd et al. (2000) found that peak alignment on prenuclear accents was affected by the vowel in the stressed syllable (i.e., somewhat later on short vowels than on long vowels), the peak fell within the stressed syllable in their study. This can possibly be explained by the location of the accent under study: Whereas we examined subjects in sentence-initial position, Ladd et al. (2000) concerned prenuclear accents on adjectives that did not occur sentence-initially. Another explanation might be related to the difference between read speech in Ladd et al. and the semi-spontaneous nature of our data. In fact, Face (2003) also found differences in peak alignment between read speech and spontaneous speech for Spanish.

Moreover, our findings regarding the prenuclear rise on the subject in the CONTR.O condition do not correspond to Chen (2007). The subject in the CONTR.O condition is topic (i.e., given information that was introduced in the question), similar to the subjects in Chen, who also used question-answer pairs. However, Chen found a fall (H*L) for sentence-initial topics. This suggests that the intonation of sentences in which the final word is in contrastive focus (our study) differs from that of sentences in which the final word is in neutral focus (Chen's study).

4.1.3 Duration

For duration, we found that the stressed syllable of the subject was the longest in the BROAD condition. Both the duration of the stressed syllable and the total duration of the subject were the shortest in the CONTR.O condition. Likewise, the object was the shortest in the CONTR.S condition. Additionally, the relative duration of the subject was longer in the CONTR.O condition, indicating that durations of the posttonic syllables were also reduced. These findings indicate that topics were shorter than words in focus. Furthermore, the relative duration difference between the subject and object was also the largest in the CONTR.O condition, confirming that the posttonic syllables of the subject as compared to those of the object were also the shortest in this condition. Even though in the present study non-focal words were shortened, the stressed syllable of the subject in contrastive focus was shorter than in broad focus. This is in contrast to Hanssen et al. (2008), who found longer durations for contrastive focus. The difference might be due to the somewhat more spontaneous character of the data for this study than the data from Hanssen et al. (2008), in which the participants read sentences. That is, the longer durations for broad focus in the present study might arise because the speakers needed some time to think about the best way to describe a given picture by answering the question: 'What is happening?'. An utterance in contrastive focus, on the other hand, requires less time for sentence formulation, because it is mainly a repetition of the question, except for the word in contrastive focus. This may account for the durational differences between the focus conditions in our study.

Importantly, the difference between the total duration of the subject and the object was the largest for all speakers in the CONTR.O condition. Again, this does not seem to point toward lengthening as a strategy to mark contrastive focus. Rather, the subject seemed to be shortened. One account of this observation is related to the informational status of the subject in CONTR.O: The subject is repeated, given information, because it was already introduced in the question by the animated figure. The object, on the other hand, contains new, contrastive information. A further explanation lays in the perception of prominence, which depends on the prosodic context (Krahmer & Swerts, 2001). That is, an f0 peak followed by a peak of comparable height is perceived as less prominent than a peak followed by a lower peak. Krahmer and Swerts's (2001) account of pitch movements may be extended to durational differences: A shorter subject lends more prominence to the longer, final word in the sentence. Whether a word is lengthened or not might thus be determined by the prosodic context rather than by comparing it to the same word in a different context. In this perspective, all speakers in the present study used longer durations to signal contrastive focus on the object. This is in line with Chen (2009), who also found shorter durations for topics than for words in focus.

To conclude, both groups of speakers in this study marked contrastive focus by a time-compressed pitch movement and used duration differences to indicate the informational status of words. Moreover, all speakers showed late peak alignment of the subject in the BROAD and CONTR.O conditions, which has not been described before for Dutch before.

4.2 (a) Are there any differences in focus marking between the bilinguals and L1 speakers? and (b) Can such differences be explained based on what we know about Turkish prosody?

There were several differences between the Turkish-Dutch bilinguals and the L1 speakers of Dutch in the prosodic marking of focus. Before turning to these differences, we briefly discuss to what extent our findings inform us about the acoustic correlates of word stress in Turkish and Dutch. As was mentioned in the introduction, Dutch is a stress-accent language (e.g., Van Heuven, 2014), whereas for Turkish there is debate about whether this language should be classified as a stress-accent or pitch-accent language (e.g., Ipek, 2015; Levi, 2005). If Turkish were a pitch-accent language, and the bilinguals in our study transferred the acoustic correlates of Turkish word stress to Dutch, we would expect differences between the bilinguals and L1 speakers of Dutch. However, we did not find any differences in f0 movements on stressed syllables, nor were there any duration differences that were related to the marking of stress. This might indicate either that Turkish and Dutch have different acoustic correlates for word stress but that there is no evidence for transfer from Turkish to Dutch regarding these correlates, or that Turkish is a stress-accent language and marks stress the same way as Dutch.

In the following, we first describe the differences between the two groups of speakers for f0 movements, peak alignment, and duration, and then indicate whether the group differences can be explained as an effect of Turkish on Dutch. Finally, we discuss two important issues that are raised by our study: (a) gender differences, and (b) language dominance.

4.2.1 F0 movements

First, the Turkish-Dutch bilinguals produced a higher minimum before the peak and a higher peak on the subject in the CONTR.S condition compared to the BROAD and

CONTR.O conditions, while for the L1 speakers of Dutch there was no difference between contrastive focus and broad focus for these f0 movements on the subject. The slightly, though not significantly higher peak height for the subject in broad focus than in contrastive focus for the Dutch L1 speakers is consistent with what was found for the nuclear accent in Hanssen et al. (2008), who concluded that (contrastive) narrow focus in Standard Dutch is not realized by a higher peak than broad focus. No studies have yet explored whether contrastive focus in Turkish is marked by higher peaks. If contrastive focus in Turkish is marked by a higher peak, the difference between the bilinguals and the Dutch L1 speakers could be explained by an effect of Turkish. A systematic comparison between the phonetic realization of broad focus and contrastive focus in Turkish is required to test this prediction.

Notably, we found the reversed picture for the peak on the object. The Dutch L1 speakers marked contrastive focus in sentence-final position with an increased peak height compared to broad focus. The difference between the CONTR.O and BROAD conditions for the Turkish-Dutch bilinguals, on the other hand, was more limited. In particular, for the Turkish-Dutch male bilinguals the difference between the CONTR.O and BROAD conditions did not reach significance. To account for this finding, the difference between sentence-initial position (subject) and sentence-final position (object) may be relevant for two reasons. First, there may be a difference between a nuclear accent on the subject, as is the case in CONTR.S, when the following words are deaccented, and a nuclear accent on the object in CONTR.O. Even though the shape of these pitch accents is similar, given that they are all nuclear, there may be some phonetic differences due to the position in the sentence. For instance, the finality of the pitch accent in sentence-final position may lead to prosodic differences compared to accents on non-final words. Second, the difference between the two groups concerning the peak on the object may be linked to the presence of declination. As described below, broad focus sentences spoken by the Dutch L1 speakers were characterized by a clear downward trend, whereas the bilinguals did not lower the final peak in this condition. Instead, they provided the object with a high peak. This resulted in a smaller difference between the BROAD and CONTR.O conditions for the Turkish-Dutch bilinguals than for the L1 speakers of Dutch.

Gender also appeared to play a role in some of the f0 differences that were found between the groups. First, the peak on the subject was higher in all conditions for the female bilinguals than for the female L1 speakers of Dutch, whereas the male bilinguals realized lower peaks than the male L1 speakers of Dutch in all conditions. Thus, the difference between the male and female bilinguals regarding the difference in peak height was much larger than the difference between the male and female L1 speakers of Dutch. The female bilinguals also employed higher peaks on the object in all conditions than the female L1 speakers of Dutch. The difference between the two female groups was even larger here than for the peak on the subject. Concerning the male speakers, the male bilinguals realized somewhat lower peaks on the object than the male L1 speakers of Dutch, although the difference between the male groups was smaller than for the peak on the subject.

Second, male speakers of both groups generally employed a larger fall on the object than female speakers, particularly in broad focus. Third, all speakers, except for the male bilinguals, marked contrastive focus on the object with a larger and steeper fall than in the other conditions; the male bilinguals employed an equally large fall on the object in broad and in contrastive focus. Possible explanations for the gender differences are discussed below.

Another difference between Turkish-Dutch bilinguals and L1 speakers of Dutch is that the L1 speakers of Dutch marked contrastive focus with a larger rise on both the subject and the object, whereas the bilinguals did not. Ipek's (2011) study demonstrated that words in neutral narrow focus were not marked by an expanded pitch range, but rather by duration and intensity differences. If contrastive focus in Turkish is also associated with an increased duration and intensity instead of f0 movements, the findings could be explained by transfer from Turkish.

The final difference concerning f0 movements is peak range. Whereas the Dutch L1 speakers showed declination throughout the sentence, the Turkish-Dutch bilinguals did not lower the final peak compared to the peak on the subject. This difference was most clear in broad focus. The declination we found for the Dutch L1 speakers is in line with Chen (2007), who reported downstepped accents in her study. Moreover, according to Gussenhoven (2005a), final lowering in Dutch marks finality.

The Turkish-Dutch bilinguals seemed to use two different strategies instead of declination, depending on gender. The female bilinguals used a higher peak on the object than the female Dutch L1 speakers, whereas the male bilinguals realized a lower peak on the subject than the male Dutch L1 speakers, leading both female and male bilinguals to continue at the same pitch level throughout the sentence.

Could these differences regarding declination between the bilinguals and Dutch L1 speakers point towards an influence from Turkish? To answer this question, two related features need to be considered: peak range and the nuclear accent. First, for peak range, Ipek (2015) and Kamalı (2011) noted a limited peak range for Turkish broad focus in the prenuclear area, which is comparable to the lack of declination in Dutch that was observed for the bilinguals in our study. According to Kamalı (2011), declination in Turkish is reserved for the (post-)nuclear area, in which no accentuation is allowed. However, there is also a difference between what the bilinguals in our study did and what has been observed for Turkish (Ipek, 2015; Kamalı, 2011). This concerns the second feature: the nuclear accent. In Turkish, the nuclear accent following the prenuclear domain is marked by a compressed f0 range. Yet, the bilinguals in our study marked the nuclear accent in Dutch by a high peak. An important difference between Turkish and Dutch is that in Dutch there is no distinction between a prenuclear and (post-)nuclear area in SVO sentences. Kamalı (2011) argues that the f0 lowering of the Turkish nuclear accent is triggered by the declination in the postnuclear area. Sentence prominence is therefore not indicated on the nuclear accent, but by a high boundary tone at the right edge of the word preceding the nuclear accent (Ipek, 2015). The absence of a postnuclear area in Dutch might explain the equally high peaks in sentence-initial and sentence-final position in the bilinguals: There is no trigger to lower the pitch on the final word, and hence the relatively high peak on the nuclear accent marks prominence (instead of the high boundary tone in Turkish). This prominence-marking function of the nuclear accent might also explain why the bilinguals have not adopted the typical Dutch feature of final lowering to express finality of the sentence.

This finding can be related to Colantoni and Gurlekian (2004), who reported an influence of Italian regarding peak range in Argentinian Spanish. Instead of raising the final accent in other varieties of Spanish, Argentinian Spanish speakers lowered the final accent in the sentence compared to the initial accent, as in Italian. The question also arises whether our findings can be related to Queen (2012), who found a phrase-final rise in the German of heritage speakers of Turkish in Germany. This rise indicated narrative salience, and was interpreted as a possible transfer from Turkish to German. The relatively high nuclear peak in broad focus sentences by the heritage speakers in our study also marks sentence prominence. However, the rise in German was characterized by a steep slope, whereas our bilinguals did not use a steeper rise on the object than the L1 speakers of Dutch. Further note that the different types of data (i.e., narratives in Queen, and answers to questions in our study) make a comparison between the German and Dutch prosody difficult.

4.2.2 Peak alignment

There was also a difference between the Turkish-Dutch bilinguals and the Dutch L1 speakers concerning peak alignment, in particular the location of the peak on the object. Although this peak fell within the stressed syllable in all conditions, which is typical of the H*L nuclear accent in Dutch, the Turkish-Dutch bilinguals realized the peak earlier in the CONTR.O than in the BROAD condition, whereas the Dutch L1 speakers showed the opposite (i.e., earlier peak alignment for the BROAD than for the CONTR.O condition).

The difference in peak alignment in the present study might be attributed to an influence from Turkish. Interestingly, peak alignment differences were found in various language contact situations (e.g., Atterer & Ladd, 2004; Elordieta, 2003; Mennen, 2004), suggesting that peak alignment is sensitive to the effects of language contact. However, an analysis of peak alignment in Turkish is needed to test whether the observed differences are due to an effect of Turkish. Hanssen et al. (2008) also found earlier peak alignment for contrastive focus than broad focus on the nuclear accent for native speakers of Dutch, similar to the Turkish-Dutch bilinguals, and unlike the Dutch L1 speakers in the present study. Differences in alignment might thus also be related to other factors, such as differences in other f0 movements and differences between read and (semi-)spontaneous speech (e.g., Face, 2003).

4.2.3 Duration

Finally, there was one durational difference between the bilinguals and the Dutch L1 speakers. The Turkish-Dutch bilinguals showed longer objects relative to the subject than the Dutch L1 speakers in all conditions. Final lengthening is a characteristic of Dutch (Hofhuis et al., 1995), but the fact that the bilinguals used even more final lengthening, regardless of focus condition, might reflect an aspect of Turkish prosody. An acoustic analysis of Turkish is required to further explore this.

4.2.4 Gender differences

A remarkable finding with respect to the measures we discussed so far is that they were often modulated by gender differences in the two groups. These may be explained by two main factors. First, some differences could be culturally motivated. For instance, in some languages, the differences in pitch between men and women are larger than in other languages (e.g., Gussenhoven, 2005a). For Dutch, the difference in pitch range between women and men appears to be small (e.g., Haan, 2002). In our study, the differences in pitch between the male and female bilinguals were large, whereas the male and female L1 speakers of Dutch were more similar, possibly revealing a cultural difference between the Turkish-Dutch bilinguals the L1 speakers of Dutch. We also found that both male bilinguals and male Dutch L1 speakers employed larger falls on the object than all female speakers. This could possibly also be related to cultural or social factors. Certain pitch movements, such as lowering, are associated with self-confidence and masculinity (e.g., Gussenhoven, 2005a). Male speakers might for this reason employ larger falls in sentence-final position than female speakers do. More research is needed to investigate this issue.

Second, some differences between the Turkish-Dutch male and female bilinguals might be explained by differences in prestige and attitudes towards the languages. The male bilinguals were the only group of speakers who did not mark contrastive focus on the object with a larger and steeper fall compared to the other focus conditions. If this prosodic feature is not used to mark contrastive focus in Turkish, as suggested by Ipek (2011), then the male bilinguals possibly showed an effect of Turkish in their Dutch prosody, while the female bilinguals adopted the

Dutch feature in their language system. Given that Dutch is the prestige language in the Netherlands, this difference between the male and female bilinguals is consistent with the leading role that women often take in language change and their wish to behave conform the norms of the prestige variety (e.g., Labov, 2001; Simonet, 2011). A study on attitudes towards the varieties is needed to further explore this explanation.

4.2.5 Language dominance

Apart from gender, we did not find interactions between group of speakers (i.e., L1 speakers of Dutch and bilinguals) and other sociolinguistic variables, such as measures that might explain differences in language use. This might be attributed to the fact that the bilingual speakers were relatively homogeneous regarding their language use. Information from the sociolinguistic questionnaire and the BNT scores revealed that for all bilinguals Dutch was the dominant language. Yet, the bilinguals differed from the Dutch L1 speakers regarding several prosodic features, which can possibly be explained by effects of Turkish.

As discussed in the introduction, a vast body of studies indicates that language dominance is a more crucial factor for cross-linguistic effects than age of acquisition (e.g., Argyri & Sorace, 2007; Daller et al., 2011; Hohenstein et al., 2006; McCarthy et al., 2013; Montrul & Ionin, 2010; Serratrice, 2007). These studies have shown that the directionality of the transfer was from the dominant language to the weaker language, and not the other way around. Only a few studies suggest that even in early bilinguals the status of the L1 (the first that the child was exposed to) may still play an important role, and, as such, an earlier established, yet weaker language may still affect the dominant L2 in adult heritage speakers (e.g., Montrul, 2006; Queen, 2012; Van Meel et al., 2013, 2014). Our study provides new evidence that a dominant L2 that was acquired in early childhood may still show effects from the L1, at least with respect to prosody.

Finally, another question related to language dominance is whether the cross-linguistic effects are bi-directional, as has been demonstrated for highly proficient Dutch L2 learners of Greek (Mennen, 2004). An analysis of Turkish as spoken by the same bilinguals might answer this question. Given that our bilinguals were dominant in Dutch, an effect of Dutch on Turkish seems to be likely as well. Thus, although our findings suggest that language dominance is not the only factor in cross-linguistic effects, we do not exclude the possibility of an effect of language dominance in the other direction.

4.2.6 Explanations for L1 prosodic transfer

As discussed in the introduction, there are at least three possible scenarios to account for L1 transfer in the heritage speakers of this study: direct transfer, early childhood transfer, and indirect transfer. An interesting question is which of these scenarios can account for our findings. Importantly, the different scenarios are consistent with different findings and might to some extent be complementary. For example, the gender difference in pitch may be an instance of direct transfer, through co-activation of Turkish. This would correspond to Chapter 5, in which we find that Turkish heritage speakers co-activated Turkish during auditory processing in Dutch. It may also be an instance of indirect transfer, through accommodation via parents and peers (Romera & Elordieta, 2013). However, other findings related to pitch, such as the lack of declination in broad focus, may be better explained by early childhood transfer. In this scenario, the heritage speakers transferred the prosodic phrasing characteristics of Turkish to Dutch in early childhood, when Turkish was still their dominant language. In this way, heritage speakers introduced new prosodic characteristics to their variety of Dutch. Future research could test these scenarios in more detail by comparing the Dutch prosody of adult second-generation Turkish heritage speakers to that of young children and first-generation heritage speakers.

4.3 Conclusion

We have shown that the prosody of heritage speakers has different characteristics from that of speakers who are raised with one language. Whereas most previous studies on heritage speakers were concerned with effects of language dominance, we explored whether the weaker L1 may also affect the dominant L2. In fact, we argue that the prosodic differences between the L1 speakers of Dutch and the Turkish heritage speakers may be attributed to an effect from the heritage language on Dutch.

This study contributes to work on prosody in general. To our knowledge, it is the first study that considers both sentence-initial and sentence-final constituents in semi-spontaneous Dutch sentences in broad and contrastive focus, thereby adding to our knowledge of Dutch prosody. Moreover, while Peters et al. (2014) established prosodic differences across several varieties of West Germanic that are spoken in different areas, the present study adds a new variety to the list. The speakers of this variety have a different language background than was considered before, because their L1 is Turkish. The bilinguals' prosody was most different from Dutch L1 speakers regarding peak range. While the L1 speakers of Dutch showed declination in broad focus, the bilinguals did not. This might be attributed to an effect from Turkish, in which declination in the prenuclear area does not occur (e.g., Ipek, 2015; Kamalı, 2011). The Turkish-Dutch bilinguals also differed from the L1 speakers of Dutch regarding various other aspects, such as f0 movements and duration. Moreover, the difference in pitch between male and female speakers was larger for the Turkish-Dutch bilinguals than for the L1 speakers of Dutch, which may be linked to a cultural difference. The findings suggest that heritage speakers, who are highly proficient in the language of the society, may still be sensitive to prosodic aspects from their heritage language. This interaction between the weaker L1 and dominant L2 adds valuable information to our understanding of the bilingual mind.

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Appendix A. Information about the participants

BNT scores, language proficiency ratings, and information on the bilinguals' language use.

Table 12. Means and standard deviations of *Turkish and Dutch BNT scores for all female and male participants.*

Gender	Turkish BNT (bilinguals)	Dutch BNT (bilinguals)	Dutch BNT (control group)
Female	84	103	133
	97	115	110
	69	91	138
	79	82	143
Male	53	65	142
	60	113	135
	76	112	144
	65	119	149
Mean	**72.88**	**100**	**136.75**
SD	**14.1**	**19.04**	**11.97**

Note: The maximum score was 162.

Table 13. S*elf-reported language proficiency ratings (means and standard deviations) for all participants.*

	Mean (SD) Turkish (bilinguals)	Mean (SD) Dutch (bilinguals)	Mean (SD) Dutch (control group)
Speaking	4.38 (0.74)	4.88 (0.35)	4.5 (0.53)
Listening	4.75 (0.46)	4.88 (0.35)	4.62 (0.52)
Writing	4.25 (1.04)	4.62 (0.52)	4.25 (0.71)
Reading	4 (0.76)	4.88 (0.35)	4.38 (0.52)
Pronunciation	4.25 (0.71)	4.75 (0.46)	4.5 (0.53)
Mean	**4.33**	**4.8**	**4.45**
SD	**0.58**	**0.34**	**0.48**

Note: A score of 1 refers to 'not good at all', a score of 5 to 'very good'.

Table 14. *Bilinguals' statements about language use in Turkish and Dutch.*

	Mean Turkish	Mean Dutch
I like to speak this language.	4.9	5
I feel certain when I speak this language.	3.9	4.5
I think it is important to speak this language well.	4.6	4.9
I think it is important that my children speak this language.	4.6	4.9
Mean	**4.5**	**4.8**

Note: A score of 1 refers to 'disagree', a score of 5 to 'agree'

Table 15. ***Bilinguals' answers to questions about Turkish versus Dutch language use.***

Question	Mean
Which language do you speak at home?	2.9
Which language do you speak with your spouse?	2.7
Which language do you speak with your children?	2.8
Which language do you speak with other relatives in the Netherlands, like uncles, aunts and cousins?	2.4
Which language do you speak with friends and acquaintances?	2.9
Which language do you speak in the neighborhood?	4.1
Which language do you speak at work?	3.9
Which language do you speak in the mosque?	1.7
Which language do you speak when you tell a story or joke?	3.5
Mean	**3**

Note: A score of 1 refers to 'only Turkish', a score of 5 to 'only Dutch'

Appendix B. N, means, and standard deviations for all measurements in section 3

Table 16. ***N, means and standard deviations in semitones for the minimum before the peak on the object***.

Measure	Condition	Gender	N	Mean	SD
Minimum before the peak	Broad	F	127	10.07	3.17
		M	138	5.02	4.58
	Contr.S	F	143	8.52	3.83
		M	150	1.51	2.86
	Contr.O	F	148	10.63	3.58
		M	144	5.35	4.13

Table 17. ***N, means and standard deviations in semitones for f0 movements on the subject.***

Measure	Condition	Gender	N	Mean	SD
Slope rise	Broad	both	255	2.27	1.56
	Contr.S	both	313	2.28	2.07
	Contr.O	both	283	1.87	1.80
Minimum after the peak	Broad	F	137	13.51	2.91
		M	118	6.19	3.41
	Contr.S	F	161	10.60	3.45
		M	151	3.34	4.27
	Contr.O	F	147	12.80	3.06
		M	137	4.91	3.41
Fall	Broad	both	254	2.36	1.53
	Contr.S	both	312	5.35	2.84
	Contr.O	both	284	1.88	1.46
Slope fall	Broad	both	253	1.97	1.30
	Contr.S	both	312	2.65	1.32
	Contr.O	both	284	1.78	1.40

Table 18. ***N, means and standard deviations in ms for peak location on the subject.***

Measure	Condition	N	Mean	SD
Peak location	Broad	256	30.79	74.52
	Contr.S	313	-31.47	62.46
	Contr.O	284	37.27	79.73

Table 19. ***N, means and standard deviations in ms for duration measurements.***

Measure	Condition	N	Mean	SD
Duration of the stressed syllable of the subject	Broad	259	211.58	61.56
	Contr.S	318	201.91	57.82
	Contr.O	291	197.55	53.46

Total duration of the subject	Broad	259	420.11	95.75
	Contr.S	318	418.82	85.17
	Contr.O	291	377.17	82.94
Relative duration of the subject	Broad	259	51.02	12.05
	Contr.S	291	49.09	13.37
	Contr.O	318	53.25	12.46
Duration of the stressed syllable of the object	Broad	266	214.65	53.41
	Contr.S	293	211.04	53.56
	Contr.O	292	217.81	55.50
Total duration of the object	Broad	266	470.02	101.24
	Contr.S	293	456.32	94.11
	Contr.O	292	480.65	93.08
Relative duration difference	Broad	213	4.05	14.31
	Contr.S	281	2.80	14.66
	Contr.O	261	7.74	14.45

Table 20. ***N, means and standard deviations in semitones for f0 movements on the subject.***

Measure	Condition	Group	Gender	N	Mean	SD
Minimum before peak	Broad	Turkish-Dutch	F	66	12.11	2.60
		Dutch control	F	72	10.90	2.47
		Turkish-Dutch	M	60	3.26	2.84
		Dutch control	M	59	5.37	4.34
	Contr.S	Turkish-Dutch	F	76	14.18	3.18
		Dutch control	F	86	10.87	2.19
		Turkish-Dutch	M	69	5.05	2.81
		Dutch control	M	82	6.29	4.34
	Contr.O	Turkish-Dutch	F	67	12.25	2.87
		Dutch control	F	80	10.18	2.15
		Turkish-Dutch	M	62	3.09	2.78
		Dutch control	M	75	4.09	4.20
Rise	Broad	Turkish-Dutch	both	125	3.58	2.61
		Dutch control	both	131	4.99	3.09
	Contr.S	Turkish-Dutch	both	145	2.33	2.07
		Dutch control	both	168	4.06	3.42
	Contr.O	Turkish-Dutch	both	129	2.93	2.25
		Dutch control	both	155	3.72	2.54
Peak	Broad	Turkish-Dutch	F	65	16.01	3.18
		Dutch control	F	72	15.19	2.41
		Turkish-Dutch	M	60	6.67	3.36
		Dutch control	M	59	11.22	5.07
	Contr.S	Turkish-Dutch	F	76	16.42	3.35
		Dutch control	F	86	14.42	2.52
		Turkish-Dutch	M	69	7.48	2.72
		Dutch control	M	82	10.88	5.77
	Contr.O	Turkish-Dutch	F	67	15.27	3.43

		Dutch control	F	80	13.80	2.58
		Turkish-Dutch	M	62	5.92	3.34
		Dutch control	M	75	7.91	3.59

Table 21 ***N, means and standard deviations in semitones for f0 movements on the object.***

Measure	Condition	Group	Gender	N	Mean	SD
Rise	Broad	Turkish-Dutch	both	118	1.27	1.49
		Dutch control	both	145	1.22	2.12
	Contr.S	Turkish-Dutch	both	135	0.74	0.97
		Dutch control	both	157	0.69	0.90
	Contr.O	Turkish-Dutch	both	131	1.37	1.79
		Dutch control	both	160	2.18	2.86
Peak	Broad	Turkish-Dutch	F	56	13.10	3.04
		Dutch control	F	71	9.10	2.43
		Turkish-Dutch	M	62	5.49	2.85
		Dutch control	M	74	7.78	6.58
	Contr.S	Turkish-Dutch	F	68	11.09	3.21
		Dutch control	F	75	7.54	3.39
		Turkish-Dutch	M	67	1.58	1.93
		Dutch control	M	82	2.81	3.29
	Contr.O	Turkish-Dutch	F	67	14.23	3.19
		Dutch control	F	80	9.57	2.25
		Turkish-Dutch	M	64	5.76	2.57
		Dutch control	M	80	9.80	6.12
Fall	Broad	Turkish-Dutch	F	56	4.28	1.87
		Dutch control	F	71	3.89	3.11
		Turkish-Dutch	M	61	7.21	3.67
		Dutch control	M	73	7.79	4.33
	Contr.S	Turkish-Dutch	F	68	2.39	1.54
		Dutch control	F	75	2.63	2.26
		Turkish-Dutch	M	67	3.03	1.83
		Dutch control	M	82	2.77	1.32
	Contr.O	Turkish-Dutch	F	67	5.71	2.01
		Dutch control	F	79	4.22	3.27
		Turkish-Dutch	M	64	6.98	2.96
		Dutch control	M	80	9.56	4.24
Fall slope	Broad	Turkish-Dutch	F	56	1.83	0.89
		Dutch control	F	71	1.98	1.19
		Turkish-Dutch	M	61	2.94	1.39
		Dutch control	M	73	3.22	1.79
	Contr.S	Turkish-Dutch	F	68	1.42	1.31
		Dutch control	F	75	1.84	1.30
		Turkish-Dutch	M	67	1.43	0.96
		Dutch control	M	82	1.30	0.65
	Contr.O	Turkish-Dutch	F	67	2.23	0.77

		Dutch control	F	79	2.26	1.33
		Turkish-Dutch	M	64	2.95	1.27
		Dutch control	M	80	4.07	1.85

Table 22. ***N, means and standard deviations in semitones for peak range.***

Measure	Condition	Group	Gender	N	Mean	SD
Peak range	Broad	Turkish-Dutch	F	46	2.62	2.00
		Dutch control	F	62	6.36	1.98
		Turkish-Dutch	M	53	1.11	3.13
		Dutch control	M	63	2.55	2.89
	Contr.S	Turkish-Dutch	F	64	5.16	2.84
		Dutch control	F	72	7.33	3.59
		Turkish-Dutch	M	63	6.09	2.54
		Dutch control	M	82	8.07	3.02
	Contr.O	Turkish-Dutch	F	55	1.10	2.19
		Dutch control	F	72	4.56	2.35
		Turkish-Dutch	M	58	0.55	3.32
		Dutch control	M	73	-2.24	3.50

Table 23. ***N, means and standard deviations in ms for peak location on the object.***

Measure	Condition	Group	N	Mean	SD
Peak location	Broad	Turkish-Dutch	118	-108.81	68.55
		Dutch control	145	-124.60	60.85
	Contr.S	Turkish-Dutch	135	-117.76	64.47
		Dutch control	157	-115.37	59.00
	Contr.O	Turkish-Dutch	131	-114.98	65.51
		Dutch control	160	-107.93	64.00

Table 24. ***N, means and standard deviations in ms for total duration difference.***

Measure	Condition	Group	N	Mean	SD
Total duration subject - total duration object	Broad	Turkish-Dutch	100	-66.84	154.88
		Dutch control	113	-46.81	110.83
	Contr.S	Turkish-Dutch	129	-61.49	118.98
		Dutch control	152	-23.38	105.00
	Contr.O	Turkish-Dutch	116	-99.66	127.41
		Dutch control	145	-101.36	103.38

Appendix C. Examples of the production task

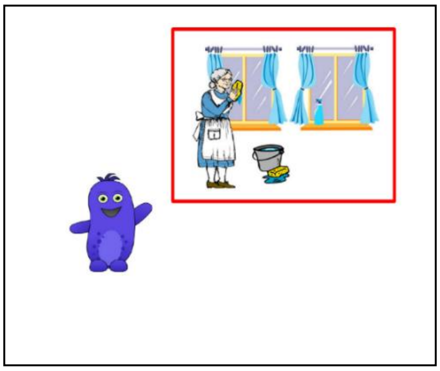

Fig. 14. Example of a context for BROAD. Q (asked by the animated figure): *Wat gebeurt er?,* ‘What is happening?’ A: *De oma wast de ramen,* ‘The grandmother is washing the windows.’

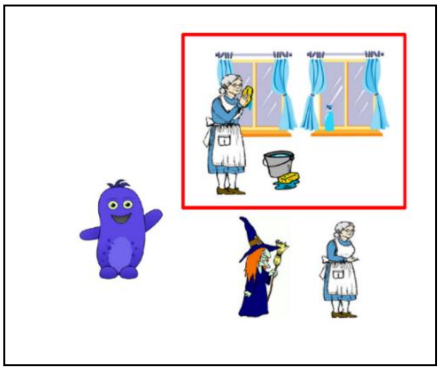

Fig. 15. Example of a context for CONTR.S. Q (asked by the animated figure): *Wast de heks de ramen?,* ‘Is the witch washing the windows?’ A: Nee, d*e oma wast de ramen,* ‘No, the grandmother is washing the windows.’

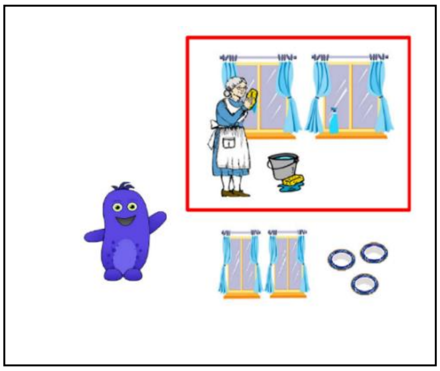

Fig. 16. Example of a context for CONTR.O. Q (asked by the animated figure): *Wast de oma de borden?,* ‘Is the grandmother washing the plates?’ A: Nee, d*e oma wast de ramen,* ‘No, the grandmother is washing the windows.’

Appendix D. Overview of target sentences included in the analysis

Table 25. ***Overview of the 24 target question-answer pairs in 3 focus conditions***

Nr	BROAD	CONTR. S	CONTR. O
1.	Q: Wat gebeurt er? A: De jongen aait de honden.	Q: Aait het meisje de honden? A: Nee, de jongen aait de honden.	Q: Aait de jongen de konijnen? A: Nee, de jongen aait de honden.
2.	Q: Wat gebeurt er? A: De jongen eet de aardbeien.	Q: Eet de opa de aardbeien? A: Nee, de jongen eet de aardbeien.	Q: Eet de jongen de kersen? A: Nee, de jongen eet de aardbeien.
3.	Q: Wat gebeurt er? A: De oma wast de ramen.	Q: Wast de heks de ramen? A: Nee, de oma wast de ramen.	Q: Wast de oma de borden? A: Nee, de oma wast de ramen.
4.	Q: Wat gebeurt er? A: De oma strijkt de zakdoek.	Q: Strijkt de koningin de zakdoek? A: Nee, de oma strijkt de zakdoek.	Q: Strijkt de oma de handdoek? A: Nee, de oma strijkt de zakdoek.
5.	Q: Wat gebeurt er? A: De vader wast de honden.	Q: Wast de zanger de honden? A: Nee, de vader wast de honden.	Q: Wast de vader de schapen? A: Nee, de vader wast de honden.
6.	Q: Wat gebeurt er? A: De oma loopt naar de windmolen.	Q: Loopt het meisje naar de windmolen? A: Nee, de oma loopt naar de windmolen.	Q: Loopt de oma naar de vuurtoren? A: Nee, de oma loopt naar de windmolen.
7.	Q: Wat gebeurt er? A: Het lammetje ruikt aan de bloemen.	Q: Ruikt het aapje aan de bloemen? A: Nee, het lammetje ruikt aan de bloemen.	Q: Ruikt het lammetje aan de koekjes? A: Nee, het lammetje ruikt aan de bloemen.
8.	Q: Wat gebeurt er? A: De jongen schopt tegen de emmer.	Q: Schopt de prinses tegen de emmer? A: Nee, de jongen schopt tegen de emmer.	Q: Schopt de jongen tegen de tas? A: Nee, de jongen schopt tegen de emmer.
9.	Q: Wat gebeurt er? A: De adelaar landt op het eiland.	Q: Landt de reiger op het eiland? A: Nee, de adelaar landt op het eiland.	Q: Landt de adelaar op de berg? A: Nee, de adelaar landt op het eiland.
10.	Q: Wat gebeurt er? A: De leraar wijst naar de bloemkool.	Q: Wijst de ober naar de bloemkool? A: Nee, de leraar wijst naar de bloemkool.	Q: Wijst de leraar naar de appel? A: Nee, de leraar wijst naar de bloemkool.

11.	Q: Wat gebeurt er? A: Het lammetje loopt naar het zwembad.	Q: Loopt het aapje naar het zwembad? A: Nee, het lammetje loopt naar het zwembad.	Q: Loopt het lammetje naar de handdoek? A: Nee, het lammetje loopt naar het zwembad.
12.	Q: Wat gebeurt er? A: De vlinder vliegt naar de wereld.	Q: A: Nee, de vlinder vliegt naar de wereld.	Q: A: Nee, de vlinder vliegt naar de wereld.
13.	Q: Wat gebeurt er? A: De moeder praat tegen de vader.	Q: Praat de koningin tegen de vader? A: Nee, de moeder praat tegen de vader.	Q: Praat de moeder tegen de opa? A: Nee, de moeder praat tegen de vader.
14.	Q: Wat gebeurt er? A: De koning staat op de toren.	Q: Staat de tovenaar op de toren? A: Nee, de koning staat op de toren.	Q: Staat de koning op de stoel? A: Nee, de koning staat op de toren.
15.	Q: Wat gebeurt er? A: De walvis zwemt naar de bellen.	Q: Zwemt het zeepaardje nar de bellen? A: Nee, de walvis zwemt naar de bellen.	Q: Zwemt de walvis naar de borden? A: Nee, de walvis zwemt naar de bellen.
16.	Q: Wat gebeurt er? A: De olifant geeft een appel aan het lammetje.	Q: Geeft het aapje een appel aan het lammetje? A: Nee, de olifant geeft een appel aan het lammetje.	Q: Geeft de olifant een appel aan de kat? A: Nee, de olifant geeft een appel aan het lammetje.
17.	Q: Wat gebeurt er? A: De vader geeft bloemen aan de moeder.	Q: Geeft de peuter bloemen aan de moeder? A: Nee, de vader geeft bloemen aan de moeder.	Q: Geeft de vader bloemen aan de koningin? A: Nee, de vader geeft bloemen aan de moeder.
18.	Q: Wat gebeurt er? A: De moeder geeft druiven aan de jongen.	Q: Geeft de prinses druiven aan de jongen? A: Nee, de moeder geeft druiven aan de jongen.	Q: Geeft de moeder druiven aan het meisje? A: Nee, de moeder geeft druiven aan de jongen.
19.	Q: Wat gebeurt er? A: De koning geeft een zwaard aan de ridder.	Q: Geeft de opa een zwaard aan de ridder? A: Nee, de koning geeft een zwaard aan de ridder.	Q: Geeft de koning een zwaard aan de tovenaar? A: Nee, de koning geeft een zwaard aan de ridder.

20.	Q: Wat gebeurt er? A: De leraar leest een boek voor aan de kinderen.	Q: Leest de verpleegster een boek voor aan de kinderen? A: Nee, de leraar leest een boek voor aan de kinderen.	Q: Leest de leraar een boek voor aan de muizen? A: Nee, de leraar leest een boek voor aan de kinderen.
21.	Q: Wat gebeurt er? A: De walvis zingt een liedje voor de haaien.	Q: Zingt de kikker een liedje voor de haaien? A: Nee, de walvis zingt een liedje voor de haaien.	Q: Zingt de walvis een liedje voor de goudvissen? A: Nee, de walvis zingt een liedje voor de haaien.
22.	Q: Wat gebeurt er? A: De jongen schrijft een brief aan de koning.	Q: Schrijft de ober een liedje aan de koning? A: Nee, de jongen schrijft een brief aan de koning.	Q: Schrijft de jongen een brief aan de zanger? A: Nee, de jongen schrijft een brief aan de koning.
23.	Q: Wat gebeurt er? A: De ridder zingt een liedje voor de leraar.	Q: Zingt het meisje een liedje voor de leraar? A: Nee, de ridder zingt een liedje voor de leraar.	Q: Zingt de ridder een liedje voor de clown? A: Nee, de ridder zingt een liedje voor de leraar.
24.	Q: Wat gebeurt er? A: De vader zingt een liedje voor de kinderen.	Q: Zingt de zanger een liedje voor de kinderen? A: Nee, de vader zingt een liedje voor de kinderen.	Q: Zingt de vader een liedje voor de katten? A: Nee, de vader zingt een liedje voor de kinderen.

Chapter 4

Focus in Dutch reading:

An eye-tracking experiment with heritage speakers of Turkish

Abstract

This study examines whether heritage speakers of Turkish in the Netherlands interpret focus in written Dutch sentences differently from L1 speakers of Dutch (controls). Where most previous studies examined effects from the dominant L2 on the heritage language, we investigated whether there are effects from the weaker heritage language on the dominant L2. Dutch and Turkish differ in focus marking. Dutch primarily uses prosody to encode focus, whereas Turkish uses prosody and syntax, with a preverbal area for focused information and a postverbal area for background information. In written sentences no explicit prosody is available, which possibly enhances the role of syntactic cues in interpreting focus. An eye-tracking experiment suggests that, unlike the controls, the bilinguals associate the preverbal area with focus and the postverbal area with background information. These findings are in line with transfer from the weaker L1 to the dominant L2 at the syntax-discourse interface.

Based on: Van Rijswijk, R., Muntendam, A., & Dijkstra, T. (2016). Focus in Dutch reading: An eye-tracking experiment with heritage speakers of Turkish. Manuscript submitted for publication.

1. Introduction

To understand a sentence, one must determine its information structure: What does it contain as background information and what as the new and important information? Speakers and writers facilitate this process for listeners and readers by highlighting the important information of their discourse. To do so, several strategies exist across languages. Languages like English rely mostly on prosody, while other languages use syntactic means to express information structure (i.e., changes in word order, such as fronting), and/or encode important information morphologically (i.e., through the use of an affix). These cross-linguistic differences raise the question of how bilinguals who speak two languages that differ in this respect determine the information structure of a sentence. Do bilinguals exclusively use cues of the target language or do they also pay attention to cues from the other language? The second possibility may lead to difficulties in language processing and to non-native interpretations in listening and reading. Various studies have revealed that bilinguals have difficulties in interpreting information structure, that is, at the syntax-discourse interface (e.g., Montrul, 2011; Sorace, 2011).

Our study examines the on-line processing of focus in Dutch written sentences by second-generation heritage speakers of Turkish in the Netherlands and a control group of L1 speakers of Dutch. Focus usually refers to the new, important information in the sentence (Gussenhoven, 2007; Jackendoff, 1972), and is expressed differently in Turkish and Dutch. Second-generation heritage speakers are a special type of bilinguals, because, although they acquired their heritage language as their first language (L1), they are dominant in their second language (L2), which is the language of the society in which they were born (e.g., Benmamoun, Montrul, & Polinsky, 2013a). Whereas most studies on heritage speakers concentrate on how heritage languages are affected by the dominant L2 (e.g., Montrul, 2008; Silva-Corvalán, 2008), we investigate whether the weaker heritage language (Turkish) affects on-line processing in the dominant L2 (Dutch) at the syntax-discourse interface.

The paper is organized as follows. To set the stage for studying on-line processing of focus in Dutch written sentences by Turkish heritage speakers, we first discuss previous studies that have investigated bilinguals' difficulties at the syntax-discourse interface. In section 1.2, we describe empirical studies that have demonstrated the importance of focus for language processing in speech and reading comprehension. We subsequently describe focus marking in Dutch and Turkish (section 1.3). In section 1.4, we zoom in on Turkish heritage speakers in the Netherlands, and describe what we know about their Turkish and Dutch language use regarding focus marking. We then turn to our eye-tracking experiment, discussing the characteristics of the participants and the methodology in section 2, and the results in section 3. Section 4 discusses our findings and the theoretical implications in the light of our research question.

1.1 Bilinguals' difficulties at the syntax-discourse interface

Production tasks and grammaticality judgments

Numerous studies on language production and comprehension indicate that bilinguals experience difficulties at the syntax-discourse interface (e.g., Montrul, 2011; Sorace, 2011). For example, in production and acceptability judgment tasks, bilingual speakers of a null subject language, like Italian, and a non-null subject language, like English, produce and accept more overt pronouns in the null subject language than control groups of L1 speakers (Belletti, Bennati, & Sorace, 2007; Sorace & Filiaci, 2006). Moreover, bilinguals interpret these pronouns differently from L1 speakers. For example, the Italian pronominal subject *lei*, 'she' can be expressed or dropped (1) (Sorace & Filiaci, 2006, p. 352).

(1) La mamma dà un bacio alla figlia mentre lei/*pro* si mette il cappotto.
'The mother gives a kiss to the daughter while she/*pro* wears the coat.'

Sorace and Filiaci showed that L1 speakers of Italian preferred *lei* to refer back to *la figlia*, 'the daughter', in this way interpreting the pronoun as introducing a new subject in the subordinate clause. The near-native English learners of Italian, however, more often than the control group chose the option in which the pronoun referred back to the subject of the main clause (*la mamma,* 'the mother'). Thus, they interpreted the pronoun in such a way that *la mamma*, 'the mother' continued to be the subject in the subordinate clause (i.e., topic continuity).

Other studies on the use of pronouns by English-Italian bilinguals, such as Serratrice, Sorace, and Paoli (2004) and Sorace, Serratrice, Filiaci, and Baldo (2009), concern children. These studies demonstrated two important points. First, transfer only occurs within the limits of the syntactic structure, hence without syntactic violations. Second, a comparison between English-Italian and Spanish-Italian children showed that differences with monolingual children cannot solely be explained by cross-linguistic differences. Specifically, both Spanish and Italian are null subject languages, but Sorace et al. (2009) found that Spanish-Italian children, similar to English-Italian children, accepted overt pronominal subjects in Italian more often than monolingual children. Therefore, the authors suggest that both cross-linguistic differences and a delay in language acquisition play a role in bilinguals' acceptability of overt subject pronouns. That is, given that monolingual children in principle show the same acceptance pattern, sufficient language exposure is required to attain a native-like level in the use of pronouns.

Beside pronouns, studies examined focus structure, e.g., in Greek-English bilinguals (Argyri & Sorace, 2007). In Greek, a relatively free word order language, preverbal subjects are associated with what the authors call narrow contrastive focus (2), whereas postverbal subjects indicate wider non-contrastive focus (i.e., focus on the verb and subject) (3) (Argyri & Sorace, p. 84).

(2) a. Pios tilefonise, o Janis i o Kostas?
'Who phoned, Janis or Kostas?'
b. [o Janis]$_{\text{FOCUS}}$ tilefonise.
[the Janis-NOM]$_{\text{FOCUS}}$ phoned-3SG.
'Janis phoned.'

(3) a. Ti ejine to molivi tis Marias?
'What happened to Maria's pencil?'
b. [to pire o Petros]$_{\text{FOCUS}}$
[it-CL took-3SG the Petros-NOM]$_{\text{FOCUS}}$
'Petros took it.'

In English, word order is usually SVO, irrespective of focus structure. In Argyri and Sorace, English-dominant bilingual children produced and accepted preverbal subjects in wider non-contrastive focus contexts more often than Greek monolinguals. Importantly, Greek-dominant bilinguals behaved like Greek monolinguals. Thus, bilinguals showed transfer from English to Greek when English was the dominant language, but not when it was the weaker language. Furthermore, there was an influence from English in Greek, but not vice versa: All bilinguals behaved like the L1 speakers of English in all English tasks. This one-directionality of transfer can be explained by differences in Greek and English word order. While Greek has two options for the location of the subject, depending on the pragmatic context, in English the subject is always placed before the verb. Difficulties at the syntax-discourse interface may be explained in terms of optionality (e.g., Sorace, 2000). If a language has several possibilities, e.g., for the position of the subject, and the "correct" option depends on the discourse, this may lead to (processing) difficulties, even in near-native bilinguals.

On-line processing

Other bilingual studies have examined on-line processing at the syntax-discourse interface. Regarding subject pronouns, Roberts, Gullberg, and Indefrey (2008) compared off-line interpretations and eye-movements of proficient learners of Dutch who had Turkish, a null subject language, or German, a non-null subject language like Dutch, as their L1. In (4) (Roberts et al., p. 336), the Turkish learners interpreted *hij*, 'he' as containing contrastive information, thus referring back to Hans. This interpretation is compatible with their L1. L1 speakers of Dutch and the German learners, on the other hand, interpreted *hij,* ‘he’ as referring back to Peter (topic continuity).

(4) Peter en Hans zitten in het kantoor. Terwijl Peter aan het werk is, eet hij een boterham.
‘Peter and Hans are in the office. While Peter is working, he is eating a sandwich.’

Nonetheless, both German and Turkish learners had longer fixations than the Dutch control group, reflecting on-line processing difficulties. These findings together show that differences between L1 and L2 at the syntax-discourse interface affect bilinguals’ interpretations and that connecting linguistic structure and discourse is difficult for bilinguals more generally. Similarly, Sorace (2011) discusses that, beside cross-linguistic differences, general processing difficulties in bilinguals may play an important role at the syntax-discourse interface.

Concerning focus structure, Hopp (2009) investigated the on-line processing of discourse-related scrambling in German by advanced and near-native learners of German whose L1 was Russian, English, or Dutch. Scrambling refers to the fronting of objects before other constituents, such as subjects, in non-initial positions in the sentence, which is possible in specific pragmatic contexts in German. In (5), the object *den Vater*, ‘the father’ is placed before the subject, leading to focus on the subject *der Onkel*, ‘the uncle’ (Hopp, 2009, p. 467).

(5) a. Wer hat den Vater geschlagen?
‘Wo beat the father?’
b. Ich glaube, dass den Vater der ONKEL geschlagen hat.
‘I believe that the uncle beat the father.’

The scrambling in (5) is felicitous, because the preceding question led to focus on the subject. If the object was in focus, scrambling would be infelicitous.

The L1s of the participants differed regarding scrambling. Whereas Russian is similar to German, in English scrambling is ungrammatical. In Dutch, scrambling is possible, but it has a different meaning than in German and Russian. While scrambled objects in German and Russian are unfocused, scrambled objects in Dutch are in contrastive focus. The question-answer pair in (5) would thus be infelicitous in Dutch. Comparison of the three groups of learners indicated that the Russian and near-native English learners of German showed native-like processing of scrambling in German, but the advanced and near-native Dutch learners did not show processing differences regarding felicitous and infelicitous scrambling. Thus, when the same structure has multiple, discourse-related interpretations in different languages (i.e., in Dutch and German), this is more difficult than when there is only one option available (i.e., English has no option, German has one). Next, we consider whether the role of optionality has been examined in transfer from the weaker L1 to the dominant L2 in heritage speakers.

Transfer from the weaker to the dominant language in heritage speakers

The studies described above involve several types of bilinguals, such as L2 learners and simultaneous bilinguals. Differently from most other bilinguals, the L2 of heritage speakers is often the dominant language, and the L1, which is commonly not the school language, is subject to incomplete acquisition or attrition (e.g., Benmamoun et al., 2013a). Research on heritage speakers mostly concerns how the heritage language is affected by the stronger L2. A less frequently posed question is to what extent the weaker, yet first language may affect the L2. Studies that looked at both directions have demonstrated transfer from the dominant language to the weaker language, but not vice versa (Argyri & Sorace, 2007, for the syntax-discourse interface; Daller, Treffers-Daller, & Furman, 2011; Hohenstein, Eisenberg, & Naigles, 2006, for conceptualization patterns of motion events; Montrul & Ionin, 2010, for morpho-syntax). Furthermore, Serratrice (2007) found no transfer from the non-dominant language (English) in bilingual English-Italian children, regarding the use of subject pronouns. These findings suggest that transfer from the weaker to the dominant language is not very common in heritage speakers. Yet, other studies on heritage speakers suggest that the dominant L2 may be affected by the L1 (e.g., Blom & Baayen, 2013, for morpho-syntactic features in the Dutch of child heritage speakers of Chinese; Queen, 2012, for the German prosody of Turkish heritage speakers; Van Meel, Hinskens, & Van Hout, 2013, 2014, for phoneme distributions in the Dutch of Turkish heritage speakers). Together, these studies indicate that L1 transfer is possible when the L1 is the weaker language, but whether this also holds for the syntax-discourse interface is unclear.

Regarding the syntax-discourse interface, Roberts et al. (2008) is, to our knowledge, the only study that showed L1 transfer in the heritage speakers' L2. However, it is uncertain whether Dutch was the dominant language for all these bilinguals, because the Turkish heritage speakers in this study varied greatly in age of first exposure to Dutch (ranging from 4 to 41 years, with a mean age of 19.9). The researchers considered them L2 learners of Dutch, comparable to the German L2 learners of Dutch, who learned Dutch in adulthood and were matched to the Turkish group regarding L2 proficiency. The Turkish-Dutch bilinguals in our study, by contrast, are all dominant in Dutch. In section 1.4, we consider how these bilinguals mark focus, but we first discuss the importance of focus for general language processing (section 1.2) and describe focus marking in Dutch and Turkish (section 1.3).

1.2 Focus structure in language processing

Various studies have demonstrated the importance of focus for speech and reading comprehension. Research in the auditory domain revealed that focused information is detected faster than unfocused information and that sentence comprehension is facilitated by the recognition of focus (Cutler & Foss, 1977; Cutler & Fodor, 1979). Furthermore, this research showed that prosody usually helps to define the focus structure of a sentence in speech comprehension (Cutler, Dahan, & Van Donselaar, 1997). EEG-experiments further examined the importance of focus and prosody for speech comprehension (Dimitrova, 2012; Heim & Alter, 2006; Magne et al., 2005; Toepel, Pannekamp, & Alter, 2007) and revealed processing difficulties when new information is deaccented or given information accented. For instance, Dimitrova

(2012) found late positivities after inappropriately accented words and inappropriately unaccented words in Dutch spoken sentences, reflecting difficulties in understanding sentences with prosodic mismatches.

While in speech comprehension prosody helps to determine the focus, in written sentences no explicit prosody is available. Yet, studies on reading demonstrate that focus plays a role in detecting (in)correct information, such as the "Moses illusion" (e.g., Erickson & Mattson, 1981). The original Moses illusion refers to the situation in which participants answered the question: "How many animals of each kind did Moses take on the ark?" without realizing that it was not Moses, but Noah who took animals on the ark. The *wh*-phrase in this question elicits focus on the animals, moving the attention away from Moses. Additionally, Bredart and Modolo (1988) showed, using a sentence verification task with cleft constructions (i.e., "It was Moses who…"), that statements with the incorrect information in focus (through the cleft construction) more often led to detection of inconsistencies than when the incorrect information was not focused. Other studies on written sentences revealed that focused information is memorized better (Birch & Garnsey, 1995; Osaka, Nishizaki, Komori, & Osaka, 2002). An eye-tracking study found that focused words have longer reading times than unfocused words, indicating that readers pay more attention to focused information (Birch & Rayner, 1997).

Summarizing, prosody and focus are crucial for speech comprehension, and focus is also important for reading, in which prosody is not explicitly present. The relation between focus and prosody in spoken discourse raises the question of what the role of prosody is in reading. Several studies have claimed that readers assign prosody to what they silently read, i.e., the implicit prosody hypothesis (e.g., Ashby & Clifton, 2005; Fodor, 1998). Moreover, studies indicate a positive relationship between prosodic proficiency (i.e., the ability to correctly assign prosody to sentences) and reading comprehension. For instance, Miller and Schwanenflugel (2006) found that children who used more pitch changes while reading aloud understood the text better. Veenendaal, Groen, and Verhoeven (2014) found that, besides reading aloud prosody, proficiency in speech prosody (as elicited in a story-telling task) had a positive effect on reading comprehension. Whalley and Hansen (2006) demonstrated that children with a poorer performance on accent placement in a reiterative speech task performed poorer on reading comprehension than children with a better prosodic proficiency (see also Holliman, Wood, & Sheehy, 2010a, b). Similarly, prosodic sensitivity appears to be highly predictive of reading proficiency in children with developmental dyslexia (e.g., Mundy & Carroll, 2012), again emphasizing the importance of prosody for reading.

The relationship between implicit prosody and focus structure for reading has been investigated in adult L1 speakers of German with an EEG-experiment (Stolterfoht, Friederici, Alter, & Steube, 2007). This experiment showed two separate ERP-correlates, one related to focus structure (a positive-going waveform around 350-1300 ms) and the other to implicit prosody (a negativity around 450-650 ms). This indicated that both accent placement and defining focus structure are crucial, related processes in silent reading.

1.3 Focus in Dutch and Turkish

Dutch and Turkish use different linguistic cues to mark focus. Similar to English, Dutch expresses differences in focus structure prosodically. The basic word order in Dutch main clauses (without adverb) is SVO (Bouma, 2008). In broad focus sentences, the nuclear accent (i.e., the final accent in the sentence; underlined in the examples) falls on the rightmost constituent (6) (Gussenhoven, 1984).

(6) Het kind valt uit de <u>boom</u>.
‘The child falls down from the <u>tree</u>.’

An example of contrastive focus is given in (7). The prepositional object *boom*, ‘tree’ is contrasted with *dak*, ‘roof’. Similar to (6), the nuclear accent is located on *boom*:

(7) Het kind valt uit de <u>boom,</u> niet van het dak.
‘The child falls down from the <u>tree</u>, not from the roof.’

When the subject is in contrastive focus, the nuclear accent is located on *kind*, 'child', without a change in word order (8).

(8) Het kind valt uit de boom, niet de kat.
'The child falls down from the tree, not the cat.'

In Turkish, both prosody and word order are used in focus marking (İşsever, 2003; Özge & Bozsahin, 2010). Turkish basic word order is SOV, but other orders are possible. In broad focus sentences with SOV order, the nuclear accent falls on the preverbal constituent, *ağaçtan,* 'from the tree' in (9) (İşsever, 2003, p. 1047):

(9)	Bir çocuk	ağaçtan	düşmüş.
	a child	tree-ABL	fall-PERF
	'A child fell down from the tree.'		

As in Dutch, focused constituents are accented. The nuclear accent on *ağaçtan,* 'from the tree' in (9) can also be interpreted as contrastive focus on this constituent (in the appropriate context), without any change in word order. Furthermore, it is possible to shift the nuclear accent from the immediately preverbal constituent to the sentence-initial constituent *bir çocuk,* 'a child', signaling contrastive focus on the subject (10):

(10)	Bir çocuk	ağaçtan	düşmüş.
	a child	tree-ABL	fall-PERF
	'A child fell down from the tree.'		

Contrary to Dutch, in Turkish focused words are located before the verb, whereas the postverbal region is reserved for given information (İşsever, 2003; Özge & Bozsahin, 2010). Accents on elements after the verb are not allowed: In (11), *ağaçtan,* 'from the tree', which appears after the verb, is deaccented to indicate that it is unfocused background information. *Bir çocuk,* ‘a child’, carries the nuclear accent and receives narrow (contrastive) focus.

(11) Bir çocuk düşmüş ağaçtan.
a child fall-PERF tree-PERF
‘A child fell down from the tree.’

In sum, both languages use prosody to encode focus, but while in Dutch broad focus sentences the nuclear accent falls on the rightmost constituent, in Turkish broad focus sentences the nuclear accent is located on the constituent that immediately precedes the verb. Moreover, Turkish distinguishes syntactically and prosodically between a preverbal area for accented, focused information, and a postverbal area for deaccented, given information, whereas Dutch does not.

We now turn to Turkish heritage speakers in the Netherlands, and describe what we know about their language use regarding focus marking.

1.4 Heritage speakers of Turkish in the Netherlands

Language production studies examined how Turkish heritage speakers in the Netherlands use word order to mark focus. Doğruöz and Backus (2007, 2009) considered word order in Turkish. Because SVO order in Turkish is a grammatical option in certain pragmatic contexts, and the default word order in Dutch main clauses, Doğruöz and Backus (2007) expected to find this word order more frequently in Turkish spoken in the Netherlands than in Turkish spoken in Turkey, due to transfer from Dutch. However, no differences were found, although other cues (which are not described here) suggested a gradual language change.

Similarly, concerning Dutch as spoken by heritage speakers of Turkish, Chapter 3 revealed prosodic differences between the heritage speakers and L1 speakers of Dutch, which could possibly be explained by an effect of Turkish, but they did not find differences in word order.

Thus, these two studies on Turkish heritage speakers in the Netherlands did not show cross-linguistic effects regarding word order in Turkish and Dutch, indicating that these bilinguals have knowledge of the syntactic constraints of their languages. Whereas these studies concerned language production, we examined reading in Dutch and tested the bilinguals' competence at the syntax-discourse interface when explicit prosody is not available. Importantly, the findings by Doğruöz and Backus (2007, 2009) suggest that the heritage speakers were well aware of the relation between focus structure and word order in Turkish and thus that L1 attrition does not play a role here. This makes L1 transfer to the L2 Dutch a possible scenario.

1.5 The present study

We explored whether heritage speakers of Turkish interpret focus structure in written Dutch differently from L1 speakers of Dutch, possibly due to an effect of their weaker heritage language. While in speech prosody is explicitly present (i.e., provided by the speaker), in written language the reader has to (implicitly) determine the prosodic structure of a sentence. Other cues, such as word order, are therefore more important during reading to understand the focus structure of a sentence. As explained above, Turkish and Dutch both use prosody to mark focus, but only Turkish has clear syntactic cues. Therefore, the question arises whether Turkish-Dutch bilinguals and L1 speakers of Dutch cope differently with the absence of explicit prosody in written Dutch sentences. Our eye-tracking experiment investigated whether the association in Turkish with the preverbal position for new and contrastive information is active in Turkish-Dutch bilinguals while they are reading in Dutch, even though Dutch is their dominant language.

2. Method

2.1 Participants

Twenty-five Turkish-Dutch bilinguals (14 male; mean age: 23.5, ranging from 18 to 33 years) and a control group of 24 native speakers of Dutch (5 male; mean age: 25.3, range: 18-44 years) participated in the experiment. The groups were comparable in educational level: The participants in both groups varied to the same extent from being a university student to having finished intermediate vocational education (see

Appendix A). Twenty-four of the bilinguals were born in the Netherlands; the other participant was born in Turkey and moved to the Netherlands when he was 1.5 years old. All participants in the control group were born in the Netherlands. Prior to the experiment, all participants completed a sociolinguistic questionnaire about their language background, language use, and self-reported language proficiency ratings in Dutch and Turkish. Independent t-tests revealed no significant differences between the bilinguals and the controls regarding the self-reported proficiency ratings for Dutch (Table 1). However, regarding differences between the bilinguals' proficiency in Turkish and Dutch, paired t-tests showed that the bilinguals reported to be significantly better at reading ($t(24) = 4.04$, $p < .001$) and writing ($t(24) = 2.98$, $p < .01$) in Dutch than in Turkish. There were no significant differences between their self-rated proficiency in Turkish and Dutch for speaking, listening, and pronunciation.

Table 1. ***Means self-reported language proficiency ratings (and standard deviations) for all participants.***

	Bilinguals Mean Turkish	Mean Dutch	Controls Mean Dutch
Speaking	4.16 (0.94)	4.36 (0.64)	4.67 (0.87)
Listening	4.88 (0.33)	4.80 (0.5)	4.67 (0.87)
Writing	3.72 (1.1)	4.44 (0.65)	4.46 (1.02)
Reading	4.20 (0.91)	4.92 (0.28)	4.63 (0.93)
Pronunciation	4.04 (0.79)	4.36 (0.64)	4.67 (0.87)
Mean	**4.20**	**4.58**	**4.62**

Note: A score of 1 refers to 'not good at all' and a score of 5 to 'very good'.

The participants also performed the Boston Naming Test (BNT) (Kaplan, Goodglass, Weintraub, Segal, & Van Loon-Vervoorn, 2001) in Dutch and Turkish. This test was used to get an objective indication of the participants' proficiency in both languages. An independent t-test revealed that the difference in Dutch BNT score between the bilinguals and controls was significant ($t(40.66) = 7.60$, $p < .0001$), with higher scores for the controls (Table 2). Moreover, a paired t-test showed that the bilinguals had significantly higher scores on the Dutch than on the Turkish BNT ($t(24) = 11.16$, $p < .0001$).

Table 2. ***Turkish and Dutch BNT scores for all participants.***

	Bilinguals Turkish BNT	Dutch BNT	Controls Dutch BNT
Mean score	73.84	107.44	134.08
SD	12.76	14.75	9.28

Note: The maximum score was 162.

To assess their reading speed, the participants read two short texts in Dutch and Turkish after the experiment (c.f., Bultena, Dijkstra, & Van Hell, 2014; Libben & Titone, 2009). The first text in each language was used to adjust to the intended language to avoid an effect of potential switching costs on reading times. All texts were followed by a comprehension question. The Dutch and Turkish texts were comparable in length and difficulty, and the order of the languages was counterbalanced. The participants were instructed to read the texts and to answer the question that appeared after reading the text. Eye-movements were recorded to determine the average fixation duration per word. An independent t-test revealed that the difference in average fixation duration per word of the Dutch text between the bilinguals and controls was not significant ($t(33.23) = 1.04$, $p > .05$) (Table 3). For the Turkish-Dutch bilinguals, the average fixation durations per word were longer for Turkish than for Dutch (410 ms vs. 288 ms). However, a direct comparison between the languages is not possible because of the agglutinative nature of Turkish: Words in Turkish are generally longer than in Dutch due to their morphological complexity, causing longer reading times.

Table 3. ***Turkish and Dutch average fixation durations per word and standard deviations for all participants, in ms.***

	Bilinguals Turkish text	Dutch text	Controls Dutch text
Average fixation duration per word	410	288	314
SD	134	54	110

2.2 Stimulus materials

The stimuli for the reading experiment were sentences followed by contrastive ellipsis involving a subject (S) or prepositional phrase (PP), modeled after Stolterfoht et al. (2007). In their EEG-experiment, Stolterfoht et al. used contrastive ellipsis (Carlson, 2002; Drubig, 1994) in German sentences to distinguish between the process of determining focus structure on the one hand, and implicit accent placement on the other. As Dutch is similar to German concerning the nuclear accent placement in focus marking, it was likely that L1 speakers of Dutch would process focus in written Dutch similarly to L1 speakers of German, whereas we made different predictions for the Turkish-Dutch bilinguals.

Example (12) illustrates contrastive ellipsis in Dutch:

(12) De barman rookt zijn sigaretten in het steegje, niet in het zaaltje waar dat verboden is.
'The barkeeper smokes cigarettes in the alleyway, not in the party room in which it is prohibited.'

The main clause in (12) (i.e., the part until the comma) has a broad focus interpretation. The sentences appeared without a context, so all information in the sentence was new and the nuclear accent was located on the rightmost constituent, which was the PP. The main clause was followed by a contrastive ellipsis construction that disambiguated the focus structure of the sentence. This disambiguating phrase consisted of the word *niet*, 'not', followed by an alternative for either S or PP in the main clause. The word *niet*, 'not' changed the focus structure from broad to contrastive focus. The alternative that followed *niet*, 'not' indicated the position of the contrastive focus. In (12), the alternative is a PP, leading to contrastive focus on the PP *in het steegje*, 'in the alleyway'. Following Stolterfoht et al. (2007), we predicted that, for L1 speakers of Dutch, this would lead to a revision of the focus structure (from broad to narrow contrastive focus). However, there would not be a revision of the implicit prosody, given that the location of the nuclear accent did not change: The nuclear accent fell on the PP in both broad and contrastive focus. This was different for contrastive focus on S (13). The disambiguating phrase in (13) indicates contrastive focus on the subject *de barman*, 'the barkeeper'. Here, L1 speakers of Dutch would both have a focus revision (from broad to contrastive focus on S in the main clause), and a revision of the implicit prosody. Specifically, the nuclear accent shifted in this case from PP to S.

(13) De barman rookt zijn sigaretten in het steegje, niet de tiener die niet rookt.
‘The barkeeper smokes cigarettes in the alleyway, not the teenager who does not smoke.’

Let us now turn to the predictions for the bilinguals. If Turkish-Dutch bilinguals made use of Turkish word order cues while reading Dutch, we predicted that the revision processes would differ from those of the controls. Given that in Turkish broad focus sentences the nuclear accent falls on the preverbal constituent, contrastive S would lead to fewer processing difficulties than contrastive PP. The postverbal region in Turkish is associated with unaccented, given information, and therefore the bilinguals might not expect contrastive focus on the PP. Thus, an effect of Turkish would be reflected in the bilinguals if they showed more difficulties with contrastive focus on the final word in the main clause (the PP) than with contrastive focus on the preverbal subject, whereas the L1 speakers of Dutch showed the opposite pattern.

The processing of sentences like (12) and (13) was compared to that of control sentences, which were similar, but included the focus particle *enkel,* ‘only’. In these sentences no revisions were expected, because *enkel,* ‘only’ indicated the focus structure of the main clause (Stolterfoht et al., 2007), see (14) and (15). By comparing ambiguous and non-ambiguous sentences, we can rule out the possibility of confounding factors. For example, length differences in the disambiguating phrase (i.e., two words for contrastive S and three words for contrastive PP) might lead to differences in reading times.

(14) *Enkel* de barman rookt zijn sigaretten in het steegje, niet de tiener die niet rookt.
‘*Only* the barkeeper smokes cigarettes in the alleyway, not the teenager who does not smoke.’

(15) De barman rookt zijn sigaretten *enkel* in het steegje, niet in het zaaltje waar dat verboden is.

‘The barkeeper smokes his cigarettes *only* in the alleyway, not in the party room in which it is prohibited.’

In sum, there were four experimental conditions. The sentences in the first condition were ambiguous and involved contrastive ellipsis on S (ambiguous S). The sentences in the second condition were unambiguous: They included *enkel*, ‘only’ before S, and also involved contrastive S (non-ambiguous S). The sentences in the third condition were ambiguous and had contrastive ellipsis on PP (ambiguous PP). Finally, the sentences in the fourth condition were unambiguous (i.e., with *enkel*, ‘only’ before the prepositional phrase), and involved contrastive PP (non-ambiguous PP). The relative difficulty that the participants had with the disambiguating phrase (i.e., the difference between the ambiguous and non-ambiguous counterparts) would reflect which constituent (S or PP) they expected to be in contrastive focus.

There were two differences between Stolterfoht et al.’s sentences and our Dutch sentences. First, Stolterfoht et al. used subjects and direct objects, whereas we used subjects and prepositional objects. Unlike German, Dutch does not have case marking, and the NP in the contrastive ellipsis could either refer to the subject or the object. To avoid this issue, we used prepositional phrases instead of direct objects. The presence or absence of a preposition in the disambiguating phrase helped the reader to infer the grammatical function of the constituent in contrastive focus, without relying on semantic information. Second, all disambiguating phrases were followed by a short subordinate clause to disentangle general wrap-up effects from reanalysis of the preceding sentence (Rayner, Kambe & Duffy, 2000).

All target words in the disambiguating phrase consisted of two syllables, with stress on the first syllable. The target words were non-cognates in Turkish and Dutch, because cognate status might affect processing (e.g., Bultena et al., 2014). All target words were matched for word frequency using the SUBTLEX-NL database on Dutch film and television subtitles (Keuleers, Brysbaert, & New, 2010). Finally, half of the subjects in the stimuli were human agents and half were animals, adding more variation to the lexical items.

2.3 Pretest

A pretest of the materials was conducted to (a) verify that the focus particle *enkel*, 'only' helped to disambiguate the sentences, and (b) investigate whether Turkish-Dutch bilinguals showed a preference for a preverbal contrast over a clause-final contrast in an off-line task. We created an electronic survey in Dutch using NETQ (NETQ Internet Surveys), with the sentences described above. The respondents were asked to complete the disambiguating phrase by choosing one of two options: (A) a subject or (B) a prepositional phrase. This resulted in ambiguous (16), non-ambiguous S (with *enkel*, 'only' before S), and non-ambiguous PP (with *enkel*, 'only' before PP) sentences. The order of options A and B was counterbalanced.

(16) De barman rookt zijn sigaretten in het steegje, niet…
'The barkeeper smokes his cigarettes in the alleyway, not…'
A. de tiener.
'the teenager.'
B. in het zaaltje.
'in the party room.'

We created two lists, with 96 sentences each: 40 ambiguous, 20 non-ambiguous S, 20 non-ambiguous PP, and 16 distractor sentences (20%). These lists contained the same 40 ambiguous sentences, but different non-ambiguous sentences. Thus, each respondent saw 20 (out of 40) non-ambiguous S sentences and 20 (out of 40) non-ambiguous PP sentences, so that each respondent saw one ambiguous and one non-ambiguous version (either S or PP) of a sentence. There were minimally 20 different sentences in between the two versions of a sentence. The distractors had the same structure with a subject, verb, object, and prepositional phrase, but contained different lexical items with varying numbers of syllables and varying stress positions. Moreover, they were followed by a subordinate clause without *niet*, 'not' (17).

(17) De miljonair drinkt dure wijn in het restaurant, waar…
'The millionaire is drinking expensive wine in the restaurant, where…'

A. hij vaak komt.
'he often comes'.

B. hij nooit komt.
'he never comes.'

We predicted that if *enkel*, 'only', helped to disambiguate the focus structure, the respondents would choose S in non-ambiguous S sentences, and PP in non-ambiguous PP sentences. For the ambiguous sentences, the controls would select PP more often than S. If the bilinguals had a preference for a preverbal contrast, they would select S in the ambiguous sentences more often than controls.

2.4 Results of the pretest

Twenty Turkish-Dutch bilinguals and a control group of 21 L1 speakers of Dutch completed the task. Of these respondents, two Turkish-Dutch bilinguals and one L1 speaker of Dutch were excluded from the analysis because they always chose a contrast with PP, even when *enkel*, 'only', preceded S. The mean age was 24 in both groups, and the education level varied to the same extent in both groups.

Regarding the non-ambiguous sentences, both groups of respondents selected the option that contrasted with the constituent that was preceded by the focus particle *enkel*, 'only', more often than the other option (Fig. 1), indicating that this particle helped to determine the focus structure. For the ambiguous sentences, both groups of respondents selected the PP more often than the S to complete the sentence. Thus, both groups preferred contrastive focus on the PP. However, a χ^2 test revealed that the bilinguals selected the subject significantly more often than the controls ($\chi^2(1) = 74.43$, $p < .0001$).

In sum, *enkel*, 'only', helped to disambiguate focus structure, and there was a difference between the bilinguals and controls regarding the ambiguous sentences. Specifically, the bilinguals preferred contrastive S (in preverbal position) more often than the controls in our off-line task.

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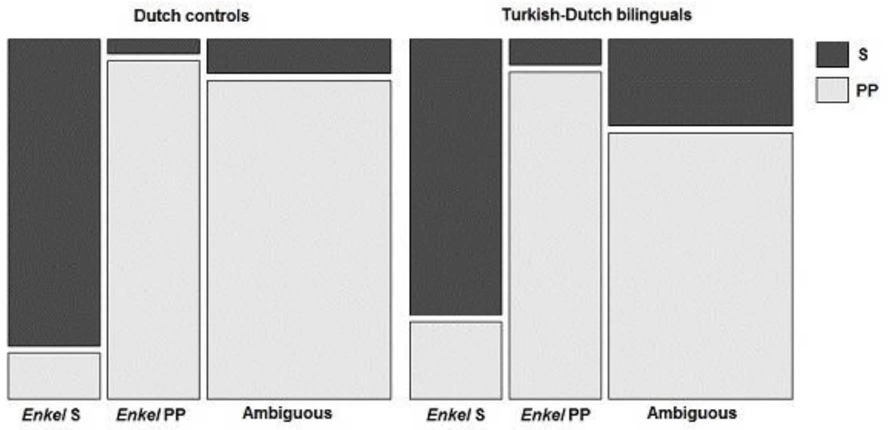

Fig 1. Mosaic plots of proportions of the choice for subject (S) and prepositional phrase (PP) in three conditions (non-ambiguous S, non-ambiguous PP, and ambiguous), by the Dutch controls and the Turkish-Dutch bilinguals.

2.5 Design of the eye-tracking experiment

The experimental stimuli were 80 sentences * 4 conditions (ambiguous S, ambiguous PP, non-ambiguous S, and non-ambiguous PP), resulting in a total of 320 sentences (see (12)-(15) above). Each participant was shown one version of all sentences, so that they were presented 80 experimental sentences (20 sentences per condition). This resulted in four different lists of the materials. Furthermore, each list contained 80 distractor sentences, which were similar to the distractors in the pretest (see (17)). In this way, half of the material had a true broad focus reading. As in the experimental sentences, half of the subjects in the distractor sentences were human, and half were animals. The sentences included five different prepositions. One (*in*, ‘in’) occurred in 60 sentences in each list, whereas the other four (*van*, ‘from’, *voor*, ‘for’, *bij*, ‘at’, and *op*, ‘on’) occurred in 25 sentences each.

Comprehension questions followed after 30% of the trials and were randomly distributed over the experiment. Half of the questions required the answer ‘yes’, and the other half ‘no’. The comprehension questions encouraged the participants to read the sentences carefully.

The 160 trials were preceded by a practice block of 12 sentences. The four lists had different pseudo-randomized orders, resulting in a different order of the materials for each participant. No more than three experimental sentences were presented in succession without a distractor in between, and no more than three distractors occurred after each other without being separated by an experimental sentence. Furthermore, no more than two experimental sentences in the same condition were presented in succession.

2.6 Procedure

Participants performed the experiment individually on a Dell Precision T3600 computer running on Windows 7, and a 22-inch Dell screen with a resolution of 1680 x 1050 pixels and a refresh rate of 60 Hz. The experiment was conducted in Presentation® software (Version 16.3, www.neurobs.com). Eye-movements were recorded with the SMI RED 500 eye-tracker at a sampling rate of 500 Hz. The distance between the participant's head and the computer screen was 70 cm.

Sentences were left-aligned in a light gray 20 pts. Lucida Console font; the background color was black. One character (12 pixels wide) subtended to 0.28 degrees of visual angle. Prior to the task, a standard nine-point calibration was performed.

A fixation cross was presented for 1500 ms at a fixed position on the left side of the screen before each trial to indicate the location of the first word of the sentence. Participants were asked to focus on the cross before the sentence appeared. Furthermore, they were instructed to read at their normal pace and to click a button when they finished reading the sentence. Each block of 40 trials was followed by a short break. The total duration of the task was approximately 30 minutes, depending on the participants' reading pace.

3. Results

Sentences with fewer than 7 fixations, due to track loss or skipping, were removed (0.83% of the dataset). Because longer fixation durations on the disambiguating part of the sentence and regressions indicate reinterpretation (Rayner, 1998), the following three dependent variables were examined: total fixation durations on the disambiguating phrase, number of regressions on S in the main clause, and number of regressions on PP in the main clause. Regressions were considered re-fixations after the first fixation on the disambiguating phrase. The ambiguous conditions were compared to their non-ambiguous counterparts, in which no revision occurred.

3.1 Total fixation durations on the disambiguating phrase

We fitted a linear mixed-effects model for the log-transformed fixation durations on the disambiguating phrase, using the *lmer* function of the lmerTest package (Kuznetsova, Brockhoff, & Bojesen Christensen, 2014) in R (R Core Team, 2014). Prior to model building, fixation durations with a standard deviation of larger than 2.5 were removed (2.13% of the total dataset). The random factors in the model were ‘Subject’ and ‘Stimulus’. The model included the three-way interaction between Contrast (S and PP), Ambiguity (‘Ambiguous’ and ‘Non-ambiguous’), and Group (‘Dutch’ (controls) and ‘Turkish’ (bilinguals)) as its fixed effects. The average fixation time per word of the reading test in Dutch was also added as a predictor, because it improved the model fit, which was tested with the *anova* function in R. Other factors that might be relevant, such as Age, Gender, Education, List, Accuracy on the comprehension questions, and the BNT scores and proficiency ratings for Dutch were also examined. For instance, variables like Age and Gender might inform us about possible differences between younger and older, and female and male participants, which can possibly be explained by variation in Dutch and Turkish language use. However, these factors were not included in the final model, because they did not lead to a better fit.

The two groups did not differ regarding the non-ambiguous conditions, but showed divergent patterns in the ambiguous conditions (Table 4; Figure 2). As explained in section 2, the comparison between ambiguous and non-ambiguous sentences is important to determine the relative difficulty that both groups of participants experienced with S and PP sentences. Therefore, we were interested in the three-way interaction between Contrast, Ambiguity, and Group. This three-way interaction was significant (Table 4).

To gain more insight in the precise nature of the three-way interaction, we conducted an additional analysis. We created four subsets of the data: Controls contrastive S (including all ambiguous and non-ambiguous S sentences by the Dutch L1 speakers), Bilinguals contrastive S (including all ambiguous and non-ambiguous S sentences by the Turkish-Dutch bilinguals), Controls contrastive PP (including all ambiguous and non-ambiguous PP sentences by the Dutch L1 speakers), and Bilinguals contrastive PP (including all ambiguous and non-ambiguous PP sentences by the Turkish-Dutch bilinguals). Within these subsets, we conducted models with 'Subject' and 'Stimulus' as the random effects, and Ambiguity as the fixed factor. Ambiguity had a significant effect in the subsets Controls contrastive S (β= -0.12040 , t (149.09) = -3.71, $p < .001$) and Bilinguals contrastive PP (β= -0.11309 , t (155.47) = -3.36, $p < .001$). On the other hand, Ambiguity did not have a significant effect in the subsets Controls contrastive PP (β= -0.05303, t (159.54) = -1.72, $p > .05$) and Bilinguals contrastive S (β= -0.06078 , t (149.82) = -1.77 , $p > .05$). This indicates that the controls had significantly more difficulty with ambiguous contrastive S sentences (mean: 579 ms) than with their non-ambiguous equivalents (mean: 530 ms), and hence that they needed the focus particle enkel, "only" to dissolve the focus structure. Regarding the contrastive PP sentences, there was no significant difference between ambiguous (mean: 614 ms) and non-ambiguous sentences (mean: 583 ms). Thus, even when the focus particle was absent, they expected contrastive focus on the PP. The bilinguals, in contrast, showed the opposite pattern. Regarding the contrastive S sentences, they did not show a significant difference between the ambiguous (mean: 542 ms) and non-ambiguous sentences (mean: 518), reflecting a preference for contrasts on the S. For contrastive PP, on the other hand, the bilinguals showed significantly more difficulty with the ambiguous sentences (mean: 654 ms) than with the non-ambiguous sentences (mean: 589 ms), indicating that contrastive focus on the

PP was unexpected. This opposite pattern between the controls and bilinguals can also be seen in Figure 2.

The bilinguals had more difficulties with contrastive PP in general, as revealed by the interaction between Contrast and Group: Whereas they showed shorter total fixation durations on the disambiguating phrase than the controls when S was in contrastive focus, they fixated longer than the controls on the disambiguating phrase when PP was in contrastive focus, regardless of whether the preceding sentence was ambiguous or not. However, as the three-way interaction shows, the difference was the largest in the ambiguous condition. Finally, the positive β-coefficient of the Dutch reading measure indicates that longer average fixation durations per word in the Dutch text co-occurred with longer total fixation durations on the disambiguating phrase (for both groups).

Table 4. ***Effects on log-transformed total fixation durations on the disambiguating phrase.***

Fixed effect	β	*t* (df)	*p*
Contrast (intercept: PP)	-0.06489	-1.980 (846)	< .05*
Ambiguity (intercept: Ambiguous)	-0.05176	-1.586 (836)	*ns*
Group (intercept: Dutch)	0.07913	1.111 (60)	*ns*
Dutch reading measure	0.001266	3.236 (46)	< .01**
Contrast*Ambiguous	-0.06849	-1.479 (843)	*ns*
Contrast*Group	-0.1124	-2.721 (3387)	< .01**
Ambiguous*Group	-0.05997	-1.452 (3385)	*ns*
Contrast*Ambiguous*Group	0.1183	2.026 (3388)	< .05*

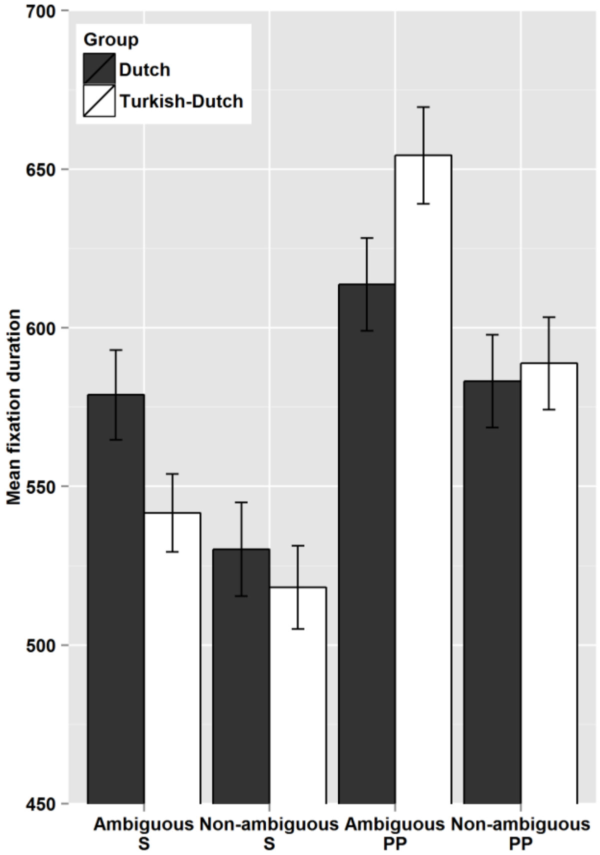

Fig. 2. Total fixation durations on the disambiguating phrase in the four conditions (Ambiguous S, Non-ambiguous S, Ambiguous PP, Non-ambiguous PP) for the Dutch controls and the Turkish-Dutch bilinguals, in ms.

3.2 Number of regressions on the subject

For the number of regressions on S in the main clause, we used the *glmer* function of the lmerTest package (Kuznetsova, Brockhoff, & Bojesen Christensen, 2014) in R (R Core Team, 2014) to perform mixed-effects logistic regression. Data points with a standard deviation of larger than 2.5 were excluded from the data set (2.16% of the data) prior to model building. The random factors were 'Subject' and 'Stimulus'. The model included Contrast (S and PP), Ambiguity ('Ambiguous' and 'Non-ambiguous'), Number of regressions on PP, and Age as its fixed effects, because these predictors led to a better fit according to the *anova* function. Group or interactions with Group did not yield any significant effects and did not lead to an improved model fit, nor did the other variables listed in section 3.1.

Although the proportions in Figure 3 indicate that the bilinguals made more regressions to S than the controls, this difference between the groups was not significant (Table 5). The significant effect of Contrast, on the other hand, indicates that there were generally more regressions to S when S was in contrastive focus (bilinguals: 23% for ambiguous sentences and 23% for non-ambiguous sentences; controls: 19% for ambiguous sentences and 21% for non-ambiguous sentences) than when the PP was in contrastive focus (bilinguals: 21% for ambiguous sentences and 19% for non-ambiguous sentences; controls: 19.75% for ambiguous sentences and 19% for non-ambiguous sentences). Furthermore, there was a positive correlation between regressions on PP and regressions on S, i.e., more regressions on PP led to more regressions on S. Finally, the positive β-coefficient of Age indicates that older participants made significantly more regressions than younger participants.

Table 5. ***Effects of number of regressions on the subject.***

Fixed effect	β	*z*	*p*
Contrast (intercept: PP)	0.12807	2.367	< .05
Ambiguity (intercept: Ambiguous)	0.10169	1.881	*ns*
N regressions on PP	0.34458	13.439	< . 001
Age	0.04529	2.762	<.01

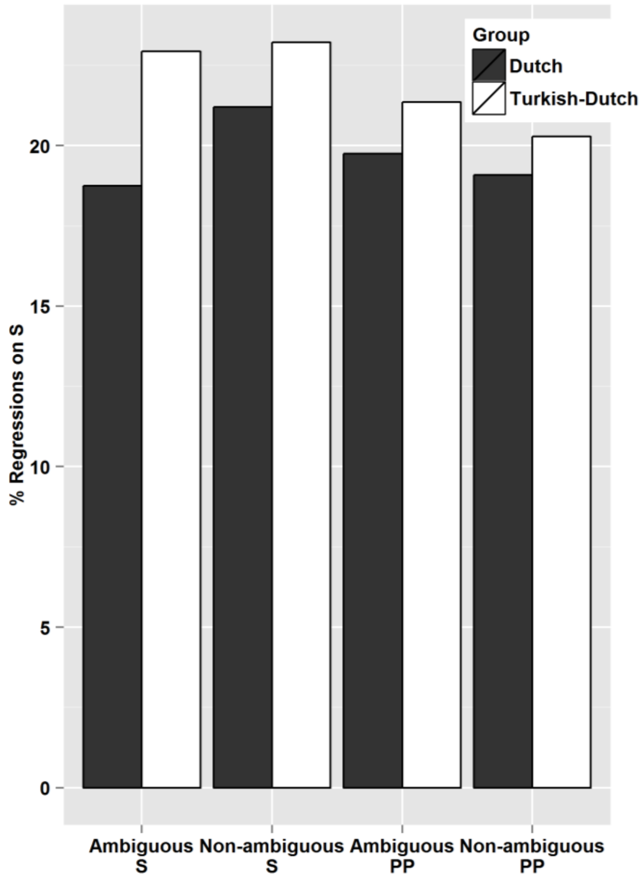

Fig 3. Proportions of number of regressions on the subject relative to the total number of fixations on the subject, in the four conditions (ambiguous S, non-ambiguous S, ambiguous PP, and non-ambiguous PP) for the Dutch controls and the Turkish-Dutch bilinguals.

3.3 Number of regressions on the prepositional phrase

Mixed-effects logistic regression was performed to examine the number of regressions on PP in the main clause. Data removal constituted 2.11% of the data due to standard deviations that were larger than 2.5. The fixed effects in the model were Contrast (S and PP), Ambiguity (‘Ambiguous’ and ‘Non-ambiguous’), Number of regressions on S, and the Dutch BNT scores, because the *anova* function indicated that these predictors improved the model. Group, interactions with Group, and the inclusion of other variables (described above) did not lead to significant effects or a better model.

Although there were no significant differences between the bilinguals and the controls, there were significant effects of both experimental conditions (Table 6; Figure 4). The negative β-coefficient of Contrast shows that contrastive PP generally led to more regressions on PP (bilinguals: 18% for ambiguous sentences and 15% for non-ambiguous sentences; controls: 19% for ambiguous sentences and 15% for non-ambiguous sentences) than contrastive S (bilinguals: 15% for ambiguous sentences and 16% for non-ambiguous sentences; controls: 15% for ambiguous sentences and 14% for non-ambiguous sentences). This corresponds to the findings above for regressions on S, where contrastive S was associated with more regressions than contrastive PP. Furthermore, the negative β-coefficient of Ambiguity indicates that there were more regressions when the sentence was ambiguous with respect to its focus structure, suggesting that regressions may reflect reanalysis processes in the participants of the present study. However, this appears to be limited to regressions on PP, because we did not find an effect of Ambiguity for regressions on S. Moreover, there were no differences between the bilinguals and the controls. Finally, there was a significant effect of the Dutch BNT scores: The higher the participants' proficiency in Dutch vocabulary, the higher the number of regressions.

Table 6. ***Effects of number of regressions on the prepositional phrase.***

Fixed effect	β	*z*	*p*
Contrast (intercept: PP)	-0.21886	-3.577	< .001
Ambiguity (intercept: Ambiguous)	-0.14899	-2.446	< .05
N regressions on PP	0.32880	12.212	< . 001
Dutch BNT	0.21301	1.998	< .05

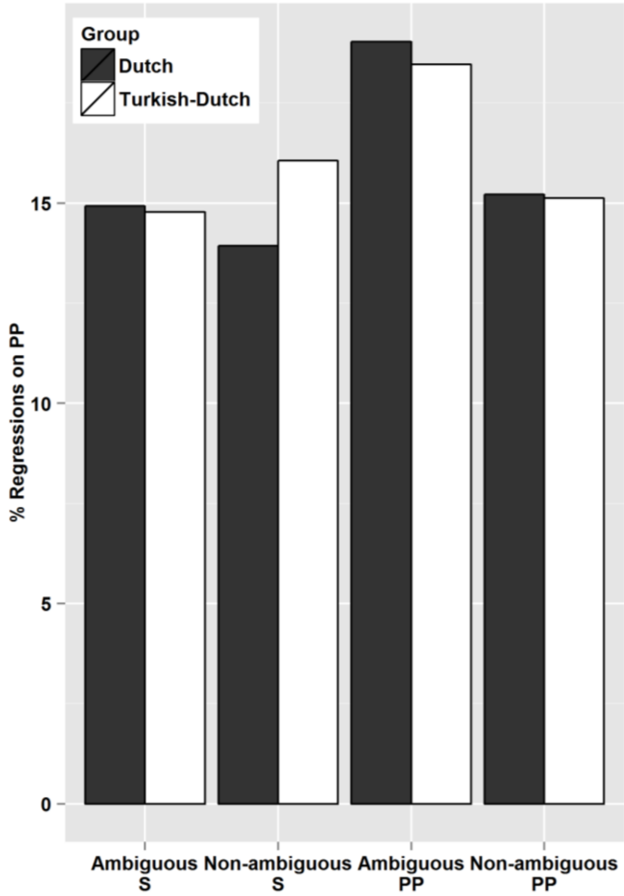

Fig 4. Proportions of number of regressions on the prepositional phrase relative to the total number of fixations on the PP, in the four conditions (ambiguous S, non-ambiguous S, ambiguous PP, non-ambiguous PP) for the Dutch controls and the Turkish-Dutch bilinguals.

4. Discussion and conclusion

We used eye-tracking to examine whether Turkish heritage speakers process ambiguous focus structures in written sentences in their dominant L2 (Dutch) differently from L1 speakers of Dutch, possibly due to an effect of Turkish. We hypothesized that, if the Turkish-Dutch bilinguals showed an effect of Turkish, the largest difference between the bilinguals and controls would occur in sentences with contrastive PP. Because in Turkish accented, focused information is not allowed after the verb, bilinguals would be more likely to interpret the PP as background information. In Dutch, the final accent is commonly placed on the rightmost constituent, leading to a broad focus interpretation. Contrastive PP would therefore lead to only a focus revision for L1 speakers of Dutch (from broad to contrastive focus), whereas both a focus and a prosodic revision would occur for bilinguals. We expected to find the opposite pattern for the ambiguous sentences with contrastive S: The contrastive ellipsis would lead to only a focus revision (from broad to contrastive focus) for the bilinguals, whereas both a focus and a prosodic revision would take place for the controls.

Although the number of regressions did not reflect any differences, the total fixation durations on the disambiguating phrase showed differences between the bilinguals and controls. As predicted, controls had longer processing times for ambiguous contrastive S than for ambiguous contrastive PP when compared to their non-ambiguous counterparts, whereas bilinguals showed the opposite: less difficulty with ambiguous contrastive S than controls, and more difficulty with ambiguous contrastive PP, again when compared to their non-ambiguous counterparts. Notably, our pretest of the ambiguous sentences with a comparable group of Turkish-Dutch bilinguals and controls indicated that bilinguals preferred a contrast with the preverbal subject more often than controls. Our findings in both the off-line and on-line task follow the predictions that we made based on an effect of Turkish. The findings can therefore be explained by an effect of the weaker L1 on the dominant L2 at the syntax-discourse interface. The longer fixation durations on the disambiguating phrase for contrastive PP suggest that bilinguals, unlike controls, did not associate a contrast with this clause-final constituent, but rather interpreted this position as background information.

An alternative explanation for the findings might be related to general processing difficulties in bilinguals (e.g., Sorace, 2011). This account is not very likely for the present study, because it is unclear how general processing difficulties can explain our findings. In particular, the bilinguals encountered more difficulties with contrastive PP than with contrastive S, whereas the L1 speakers of Dutch showed the reverse. These findings correspond to the specific predictions we made based on their L1 (i.e., Dutch for the control group and Turkish for the bilinguals). Moreover, both groups of participants patterned together regarding the processing of non-ambiguous focus structures. To examine the potential effect of general processing difficulties in interpreting focus structures, the findings might be compared to a different group of L2 speakers of Dutch, whose L1 resembles Dutch regarding focus marking. For an example of a study comparing bilingual groups and revealing both general processing difficulties and L1 transfer, see Roberts et al. (2008).

Likewise, the explanation offered by Sorace et al. (2009), that difficulties at the syntax-discourse interface may also arise due to insufficient language exposure, cannot account for our data, although it may be a valid explanation for other groups of bilinguals. First, Dutch is the dominant language of the adult bilinguals in our study, to which they have had more exposure than to Turkish. Second, the findings in Sorace et al. (2009) concern acceptability patterns, whereas our findings are related to focus structural interpretations. As stated above, these findings are in line with the specific predictions that we made based on Turkish, and are qualitatively different from the interpretations of the Dutch L1 speakers.

Our findings have implications for theories on bilingualism, involving language dominance, language modality, optionality at the syntax-discourse interface, reading comprehension, and predictive processing. First, our findings inform us about the role of language dominance in bilinguals. Most previous studies only found transfer from the dominant to the weaker language, suggesting a crucial role for language dominance (Argyri & Sorace, 2007; Daller et al., 2011; Montrul & Ionin, 2010; Serratrice, 2007). The bilinguals in our study were second-generation heritage speakers of Turkish. Their self-rated language proficiency and vocabulary scores show that Dutch was their dominant language. Specifically, the bilinguals rated themselves to be significantly better at reading and writing in Dutch than in Turkish (section 2.1), which may be explained in part by the fact that Dutch is the school language. Because our study concerns reading in Dutch, our findings are in line with transfer from the weaker L1 to the dominant L2 at the syntax-discourse interface, contrary to Argyri and Sorace (2007) and Serratrice (2007), who claimed that exposure to the weaker language was possibly not sufficient in their participants to cause transfer to the dominant language. There are considerable differences between the bilinguals in our study and the bilingual children in Argyri and Sorace and in Serratrice concerning language exposure. First, the Italian-English bilinguals in Serratrice were relatively balanced in their languages, as most of them lived in Italy, but received education in their non-dominant language, English. By contrast, the bilinguals of our study mainly received education in Dutch, the language of the society, enhancing their dominance in this language. Yet, only our findings correspond to transfer from the non-dominant language to the dominant language. Perhaps the more balanced bilinguals in Serratrice, who received more comparable amounts of input in both their languages than the less balanced bilinguals in our study, were better able to separate their two linguistic systems.

Another difference in language exposure between these studies concerns the parents' language use. All bilinguals in Serratrice and all Greek-dominant bilinguals in Argyri and Sorace had only one parent with a different L1 than the language of the society, which mostly led to the one-parent one-language strategy. The parents of our bilinguals were all born in Turkey. Most participants indicated that their parents only spoke Turkish to them, and some indicated that they spoke Turkish and Dutch. Thus, the home language of our bilinguals was predominantly the heritage language. This difference might explain why our findings are in line with an effect of the weaker L1 on the dominant L2, whereas Serratrice's and Argyri and Sorace's findings are not. Our bilinguals had more exposure to their L1 in early childhood than other bilinguals, leading to a firm foundation in this language, but received more exposure to the L2 than the L1 after this short (though important) period. Our study thus seems to uncover the strength of an L1 acquired in early childhood, against an L2 prevalent in adulthood. This corresponds with some other studies concerning L1 transfer in heritage speakers at different linguistic levels (e.g., Blom & Baayen, 2013; Van Meel et al., 2013, 2014).

As a second theoretical implication, our findings indicate that difficulties at the syntax-discourse interface are not necessarily visible in all modalities (i.e., speaking and reading): A production experiment on focus marking in Dutch involving the same type of Turkish-Dutch bilinguals as in the current study showed no word order changes to mark focus (Chapter 3). This indicates that the bilinguals had knowledge of the grammatical constraints of Dutch word order. Moreover, they had prosody at their disposal to mark focus. In the written sentences of the present study, however, the absence of explicit prosody led to optionality, because both the preverbal subject and the clause-final prepositional object could be in (contrastive) focus. This optionality might explain why on-line processing while reading revealed difficulties in the bilinguals.

Third, our study is in agreement with previous studies in which optionality explained bilinguals' difficulties at the syntax-discourse interface (e.g., Hopp, 2009; Roberts et al., 2008; Sorace, 2000). This optionality is, for example, related to the overt expression or drop of pronouns (Montrul, 2011; Sorace & Filiaci, 2006), or to word order differences (e.g., Argyri & Sorace, 2007). In particular, Argyri and Sorace found transfer from English to Greek word order, but not vice versa, which they explained in terms of optionality: Whereas in English there is only one position for the subject, in Greek this position depends on the discourse. Because of the high proportion of preverbal subjects in English, the English-dominant bilinguals extended this option to pragmatically inappropriate contexts in Greek. These bilinguals were thus not able to make the appropriate connection between word order and discourse. In our study, optionality may have arisen from differences between Dutch and Turkish regarding the position of focused constituents, in the absence of explicit prosody. In this scenario, the bilinguals were not able to make the same connections between sentence position and discourse as L1 speakers of Dutch, possibly due to the availability of syntactic cues from Turkish. The study thus further demonstrates that the syntax-discourse interface is a difficult domain for bilinguals.

Fourth, the finding that Turkish-Dutch bilinguals in our study determined focus in Dutch differently from L1 speakers of Dutch points towards potential difficulties regarding general reading comprehension in Turkish-Dutch bilinguals, because determining the focus structure of a sentence is important for comprehension (Birch & Rayner, 1997; Osaka et al., 2002). In fact, research on reading comprehension in children has revealed that Turkish-Dutch bilingual children lag behind their L1 Dutch speaking peers (Droop & Verhoeven, 2003; Statistics Netherlands, 2014). Further research is needed to explore whether this delay in reading comprehension may be explained by difficulties in interpreting focus and L1 transfer. For instance, research might examine the effect of enhancing bilingual children's metalinguistic awareness concerning the differences in focus marking between Turkish and Dutch, through explicit instruction.

Fifth, our study suggests that bilinguals do not only experience processing difficulties due to having two languages, but that they even make specific predictions based on cues from their L1. Studies on predictive processing in bilinguals generally show that bilinguals are slower in formulating predictions or are not capable of making predictions at all, partly because they activate more information during processing than monolinguals (e.g., Kaan, 2014). Moreover, it has been shown that anticipatory ability improves with increasing language proficiency (e.g., Dussias et al., 2013). We found predictive behavior in highly proficient bilinguals, who appeared to revise their predictions of the focus structure. However, their predictions differed from those by L1 speakers of Dutch.

Our study could be extended using different methodologies and participants. Regarding methodology, our eye-tracking method did not distinguish between the underlying processes of accent placement and defining focus structure, which were revealed for German in the EEG-experiment by Stolterfoht et al. (2007). A future EEG-study could investigate the ERP-correlates of these underlying processes. This would clarify whether the bilinguals in our study (implicitly) placed the nuclear accent on the preverbal constituent when they interpreted sentences as broad focus sentences, or whether the differences in interpretation can be accounted for in terms of the association between the preverbal position for (contrastive) focus, and the postverbal position for unaccented background information. As a second methodological point, the present experimental paradigm could be adapted to test whether the heritage speakers only experience reading difficulties at the syntax-discourse interface, or whether purely syntactic structures are equally problematic. This would give us more insight in the relative complexity of the syntax-discourse interface (e.g., Sorace, 2011).

Concerning participants, the comparison between Turkish-Dutch bilinguals and L1 speakers of Dutch allowed us to reveal differences in interpretations, but future research should include L1 speakers of Turkish in Turkey to explore the on-line processing of focus in Turkish. In addition, future research could examine how Turkish heritage speakers process focus in Turkish to determine to what extent transfer plays a role in the other direction as well.

In conclusion, our aim was to examine the on-line processing of focus in written Dutch by second-generation heritage speakers of Turkish in the Netherlands and L1 speakers of Dutch, to improve our understanding of the interaction between the languages of heritage speakers. The differences in interpretations between bilinguals and controls suggest that bilinguals relied on word order cues from their L1 to determine focus structure. Specifically, we tentatively argue that the association in Turkish with the preverbal position for contrastive focus and the postverbal position for background information played a role in determining focus structure in Dutch. Heritage speakers, who are highly proficient in their L2, seemingly exhibited L1 transfer in the on-line processing in the L2 at the syntax-discourse interface. Moreover, our study concerns reading, the language modality in which these bilinguals were particularly dominant in their L2. As such, our study reveals the strength of an L1 that was only prevalent in early childhood, and clarifies how interpreting focus comes about in the special situation that a weaker L1 is processed in the context of a dominant L2.

Acknowledgments
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Appendix A. Information about the participants

Table 7. ***Overview of the educational level and profession of the Turkish-Dutch bilinguals.***

Participant	Highest education achieved	Profession
1	Intermediate Vocational Education	Student Higher Professional Education
2	Secondary Education	University student
3	Intermediate Vocational Education	Media designer
4	Secondary Education	University student
5	University	Unemployed
6	Higher Professional Education	Team manager
7	Higher Professional Education	Physiotherapist
8	Higher Professional Education	Educator
9	Secondary Education	University student
10	University (Bachelor)	University student
11	Intermediate Vocational Education	Student Higher Professional Education

Table 8. ***Overview of the educational level and profession of the Dutch controls.***

Participant	Highest education achieved	Profession
1	Intermediate Vocational Education	Actress in musicals
2	Higher Professional Education	Coach for persons with impairment
3	Higher Professional Education	Coach for persons with impairment
4	Intermediate Vocational Education	Doctor’s receptionist
5	Higher Professional Education	History teacher at secondary school
6	Higher Professional Education	Assistant real estate agent
7	Intermediate Vocational Education	Housewife
8	Secondary education	University student
9	Secondary education	University student
10	Secondary education	University student
11	Secondary education	University student

12	Intermediate Vocational Education	Project administrato r
13	Secondary Education	Student Higher Professional Education
14	Higher Professional Education	Student
15	Secondary Education	Student Higher Professional Education
16	Intermediate Vocational Education	Student Higher Professional Education
17	Higher Professional Education	Financial coordinator
18	Secondary Education	University student
19	Secondary Education	University student
20	Secondary Education	University student
21	Higher Professional Education	University student
22	Secondary Education	University student
23	University (Bachelor)	University student
24	Higher Professional Education	University student
25	Secondary Education	University student

12	Secondary education	University student
13	University (Bachelor)	University student
14	Secondary education	Student
15	Higher Professional Education	Social worker
16	Secondary Education	University student
17	Higher Professional Education	Greengrocer
18	Secondary education	University student
19	Secondary education	University student
20	University (Bachelor)	University student
21	Secondary education	University student
22	Secondary education	University student
23	Intermediate Vocational Education	Student Higher Professional Education
24	University (Bachelor)	University student

Appendix B. Overview of experimental stimuli

Table 9. ***Experimental stimuli in the four conditions: Ambiguous S, Ambiguous PP, Non-ambiguous S, and Non-ambiguous PP.***

Nr	Condition	Contrastive focus on subject	Contrastive focus on PP
1.	Ambiguous	De zanger viert zijn verjaardag in de schouwburg, niet de dichter die zo bekend is.	De zanger viert zijn verjaardag in de schouwburg, niet in de stamkroeg die zo klein is.
	Non-ambiguous	*Enkel* de zanger viert zijn verjaardag in de schouwburg, niet de dichter die zo bekend is.	De zanger viert zijn verjaardag *enkel* in de schouwburg, niet in de stamkroeg die zo klein is.
2.	Ambiguous	De danser doet zijn oefeningen in de kelder, niet de drummer die zo bekend is.	De danser doet zijn oefeningen in de kelder, niet in de keuken die zo klein is.
	Non-ambiguous	*Enkel* de danser doet zijn oefeningen in de kelder, niet de drummer die zo bekend is.	De danser doet zijn oefeningen *enkel* in de kelder, niet in de keuken die zo klein is.
3.	Ambiguous	De jongen eet groente van de moestuin, niet de vader die er niet van houdt.	De jongen eet groente van de moestuin, niet van de winkel waar niets vers is.
	Non-ambiguous	*Enkel* de jongen eet groente van de moestuin, niet de vader die er niet van houdt.	De jongen eet groente *enkel* van de moestuin, niet van de winkel waar niets vers is.
4.	Ambiguous	De moeder bestelt bloemen voor de uitvaart, niet de tante die niet meegaat.	De moeder bestelt bloemen voor de uitvaart, niet voor de bruiloft die volgende week is.
	Non-ambiguous	*Enkel* de moeder bestelt bloemen voor de uitvaart, niet de tante die niet meegaat.	De moeder bestelt bloemen *enkel* voor de uitvaart, niet voor de bruiloft die volgende week is.
5.	Ambiguous	De dokter houdt spreekuur in de ochtend, niet de tandarts die druk is.	De dokter houdt spreekuur in de ochtend, niet in de middag die volgepland is.
	Non-ambiguous	*Enkel* de dokter houdt spreekuur in de ochtend, niet de tandarts die druk is.	De dokter houdt spreekuur *enkel* in de ochtend, niet in de middag die volgepland is.
6.	Ambiguous	De barman rookt zijn sigaretten in het steegje, niet de tiener die niet rookt.	De barman rookt zijn sigaretten in het steegje, niet in het zaaltje waar dat verboden is.

	Non-ambiguous	*Enkel* de barman rookt zijn sigaretten in het steegje, niet de tiener die niet rookt.	De barman rookt zijn sigaretten *enkel* in het steegje, niet in het zaaltje waar dat verboden is.
7.	Ambiguous	De zwerver zoekt voedsel in het vuilnis, niet de oma die langsloopt.	De zwerver zoekt voedsel in het vuilnis, niet in het eethuis waar hij niet welkom is.
	Non-ambiguous	*Enkel* de zwerver zoekt voedsel in het vuilnis, niet de oma die langsloopt.	De zwerver zoekt voedsel *enkel* in het vuilnis, niet in het eethuis waar hij niet welkom is.
8.	Ambiguous	De tuinman eet zijn boterhammen in de voortuin, niet de werkster die binnen blijft.	De tuinman eet zijn boterhammen in de voortuin, niet in de woning waar hij nooit komt.
	Non-ambiguous	*Enkel* de tuinman eet zijn boterhammen in de voortuin, niet de werkster die binnen blijft.	De tuinman eet zijn boterhammen *enkel* in de voortuin, niet in de woning waar hij nooit komt.
9.	Ambiguous	De peuter speelt verstoppertje op de speelplaats, niet de juffrouw die toekijkt.	De peuter speelt verstoppertje op de speelplaats, niet op de zolder waar hij nooit komt.
	Non-ambiguous	*Enkel* de peuter speelt verstoppertje op de speelplaats, niet de juffrouw die toekijkt.	De peuter speelt verstoppertje *enkel* op de speelplaats, niet op de zolder waar hij nooit komt.
10.	Ambiguous	De chef-kok koopt zijn meel bij de marktkraam, niet de bakker die de beste kwaliteit wil.	De chef-kok koopt zijn meel bij de marktkraam, niet bij de molen waar alles duur is.
	Non-ambiguous	*Enkel* de chef-kok koopt zijn meel bij de marktkraam, niet de bakker die de beste kwaliteit wil.	De chef-kok koopt zijn meel *enkel* bij de marktkraam, niet bij de molen waar alles duur is.
11.	Ambiguous	De ober serveert cocktails in het strandhuis, niet de gastvrouw die het druk heeft.	De ober serveert cocktails in het strandhuis, niet in het zwembad dat ernaast ligt.
	Non-ambiguous	*Enkel* de ober serveert cocktails in het strandhuis, niet de gastvrouw die het druk heeft.	De ober serveert cocktails *enkel* in het strandhuis, niet in het zwembad dat ernaast ligt.
12.	Ambiguous	De rechter heeft nachtmerries van de moordzaak, niet de dader die gewetenloos is.	De rechter heeft nachtmerries van de moordzaak, niet van de bankroof die gisteren plaatsvond.

	Non-ambiguous	*Enkel* de rechter heeft nachtmerries van de moordzaak, niet de dader die gewetenloos is.	De rechter heeft nachtmerries *enkel* van de moordzaak, niet van de bankroof die gisteren plaatsvond.
13.	Ambiguous	De weerman voorspelt slecht weer voor de badplaats, niet de fietser die optimistisch is.	De weerman voorspelt slecht weer voor de badplaats, niet voor de hoofdstad waar het zonnig is.
	Non-ambiguous	*Enkel* de weerman voorspelt slecht weer voor de badplaats, niet de fietser die optimistisch is.	De weerman voorspelt slecht weer *enkel* voor de badplaats, niet voor de hoofdstad waar het zonnig is.
14.	Ambiguous	De huisbaas zet zijn afwas in de gootsteen, niet de huurder die er nooit is.	De huisbaas zet zijn afwas in de gootsteen, niet in de emmer die ervoor bedoeld is.
	Non-ambiguous	*Enkel* de huisbaas zet zijn afwas in de gootsteen, niet de huurder die er nooit is.	De huisbaas zet zijn afwas *enkel* in de gootsteen, niet in de emmer die ervoor bedoeld is.
15.	Ambiguous	De zwemmer leest de krant voor de training, niet de schaatser die zich opwarmt.	De zwemmer leest de krant voor de training, niet voor de wedstrijd die hem zenuwachtig maakt.
	Non-ambiguous	*Enkel* de zwemmer leest de krant voor de training, niet de schaatser die zich opwarmt.	De zwemmer leest de krant *enkel* voor de training, niet voor de wedstrijd die hem zenuwachtig maakt.
16.	Ambiguous	De puber stopt zijn boeken in de rugzak, niet de leraar die toekijkt.	De puber stopt zijn boeken in de rugzak, niet in de koffer die ernaast staat.
	Non-ambiguous	*Enkel* de puber stopt zijn boeken in de rugzak, niet de leraar die toekijkt.	De puber stopt zijn boeken *enkel* in de rugzak, niet in de koffer die ernaast staat.
17.	Ambiguous	De kapper sluit de zaak op de maandag, niet de slager die veel klanten heeft.	De kapper sluit de zaak op de maandag, niet op de vrijdag die altijd druk is.
	Non-ambiguous	*Enkel* de kapper sluit de zaak op de maandag, niet de slager die veel klanten heeft.	De kapper sluit de zaak *enkel* op de maandag, niet op de vrijdag die altijd druk is.
18.	Ambiguous	De kleuter heeft plezier van de glijbaan, niet de oppas die volwassen is.	De kleuter heeft plezier van de glijbaan, niet van de schommel die hij saai vindt.
	Non-ambiguous	*Enkel* de kleuter heeft plezier van de glijbaan, niet de oppas die volwassen is.	De kleuter heeft plezier *enkel* van de glijbaan, niet van de schommel die hij saai vindt.

19.	Ambiguous	De popster toont zijn verdriet in het filmpje, niet de schrijver die blij kijkt.	De popster toont zijn verdriet in het filmpje, niet in het tijdschrift waarin een interview staat.
	Non-ambiguous	*Enkel* de popster toont zijn verdriet in het filmpje, niet de schrijver die blij kijkt.	De popster toont zijn verdriet *enkel* in het filmpje, niet in het tijdschrift waarin een interview staat.
20.	Ambiguous	De opa werpt zijn hengel van de roeiboot, niet de visser die toekijkt.	De opa werpt zijn hengel van de roeiboot, niet van de oever waar het drassig is.
	Non-ambiguous	*Enkel* de opa werpt zijn hengel van de roeiboot, niet de visser die toekijkt.	De opa werpt zijn hengel *enkel* van de roeiboot, niet van de oever waar het drassig is.
21.	Ambiguous	Het katje slaat zijn klauwen in de deurmat, niet het hondje dat rondrent.	Het katje slaat zijn klauwen in de deurmat, niet in de deken die nieuw is.
	Non-ambiguous	*Enkel* het katje slaat zijn klauwen in de deurmat, niet het hondje dat rondrent.	Het katje slaat zijn klauwen *enkel* in de deurmat, niet in de deken die nieuw is.
22.	Ambiguous	De pony eet haver in de hooischuur, niet de kater die op muizen jaagt.	De pony eet haver in de hooischuur, niet in de weide waar het drassig is.
	Non-ambiguous	*Enkel* de pony eet haver in de hooischuur, niet de kater die op muizen jaagt.	De pony eet haver *enkel* in de hooischuur, niet in de weide waar het drassig is.
23.	Ambiguous	Het schaapje doet een dutje in de hooiberg, niet het varken dat rondloopt.	Het schaapje doet een dutje in de hooiberg, niet in de modder die haar vies maakt.
	Non-ambiguous	*Enkel* het schaapje doet een dutje in de hooiberg, niet het varken dat rondloopt.	Het schaapje doet een dutje *enkel* in de hooiberg, niet in de modder die haar vies maakt.
24.	Ambiguous	De hamster maakt een holletje in de aarde, niet de ezel die in de stal staat.	De hamster maakt een holletje in de aarde, niet in de boomstam die rot is.
	Non-ambiguous	*Enkel* de hamster maakt een holletje in de aarde, niet de ezel die in de stal staat.	De hamster maakt een holletje *enkel* in de aarde, niet in de boomstam die rot is.
25.	Ambiguous	De zeemeeuw zoekt zijn voedsel bij de woonwijk, niet de arend die mensen schuwt.	De zeemeeuw zoekt zijn voedsel bij de woonwijk, niet bij de haven waar meer meeuwen zijn.
	Non-ambiguous	*Enkel* de zeemeeuw zoekt zijn voedsel bij de woonwijk, niet de arend die mensen schuwt.	De zeemeeuw zoekt zijn voedsel *enkel* bij de woonwijk, niet bij de haven waar meer meeuwen zijn.

26.	Ambiguous	De lama zoekt zijn voedsel op de vlakte, niet de neushoorn die slaapt.	De lama zoekt zijn voedsel op de vlakte, niet op de heuvel waar niets groeit.
	Non-ambiguous	*Enkel* de lama zoekt zijn voedsel op de vlakte, niet de neushoorn die slaapt.	De lama zoekt zijn voedsel *enkel* op de vlakte, niet op de heuvel waar niets groeit.
27.	Ambiguous	De hommel bestuift bloemen in de lente, niet de vlinder die de nectar eet.	De hommel bestuift bloemen in de lente, niet in de winter die koud is.
	Non-ambiguous	*Enkel* de hommel bestuift bloemen in de lente, niet de vlinder die de nectar eet.	De hommel bestuift bloemen *enkel* in de lente, niet in de winter die koud is.
28.	Ambiguous	Het leeuwtje zoekt beschutting voor de regen, niet het aapje dat rondspringt.	Het leeuwtje zoekt beschutting voor de regen, niet voor de vrieskou die hij niet erg vindt.
	Non-ambiguous	*Enkel* het leeuwtje zoekt beschutting voor de regen, niet het aapje dat rondspringt.	Het leeuwtje zoekt beschutting *enkel* voor de regen, niet voor de vrieskou die hij niet erg vindt.
29.	Ambiguous	De egel zoekt zijn voedsel in het donker, niet de eekhoorn die dan slaapt.	De egel zoekt zijn voedsel in het donker, niet in het daglicht als hij slaapt.
	Non-ambiguous	*Enkel* de egel zoekt zijn voedsel in het donker, niet de eekhoorn die dan slaapt.	De egel zoekt zijn voedsel *enkel* in het donker, niet in het daglicht als hij slaapt.
30.	Ambiguous	De naaktslak legt eitjes bij het hutje, niet de kikker die wil zwemmen.	De naaktslak legt eitjes bij het hutje, niet bij het bospad waar mensen lopen.
	Non-ambiguous	*Enkel* de naaktslak legt eitjes bij het hutje, niet de kikker die wil zwemmen.	De naaktslak legt eitjes *enkel* bij het hutje, niet bij het bospad waar mensen lopen.
31.	Ambiguous	De luiaard heeft zijn leefgebied in het oerwoud, niet de walvis die in de oceaan leeft.	De luiaard heeft zijn leefgebied in het oerwoud, niet in het parkje hier om de hoek.
	Non-ambiguous	*Enkel* de luiaard heeft zijn leefgebied in het oerwoud, niet de walvis die in de oceaan leeft.	De luiaard heeft zijn leefgebied *enkel* in het oerwoud, niet in het parkje hier om de hoek.
32.	Ambiguous	De bromvlieg cirkelt rondjes bij de fruittaart, niet de vogel die rondhupt.	De bromvlieg cirkelt rondjes bij de fruittaart, niet bij de witlof die bitter is.
	Non-ambiguous	*Enkel* de bromvlieg cirkelt rondjes bij de fruittaart, niet de vogel die rondhupt.	De bromvlieg cirkelt rondjes *enkel* bij de fruittaart, niet bij de witlof die bitter is.

33.	Ambiguous	Het renpaard rent rondjes in de hitte, niet het veulen dat stilstaat.	Het renpaard rent rondjes in de hitte, niet in de schaduw die verkoelend is.
	Non-ambiguous	*Enkel* het renpaard rent rondjes in de hitte, niet het veulen dat stilstaat.	Het renpaard rent rondjes *enkel* in de hitte, niet in de schaduw die verkoelend is.
34.	Ambiguous	De adder heeft zijn schuilplek bij de vijver, niet de vleermuis die vaak ondersteboven hangt.	De adder heeft zijn schuilplek bij de vijver, niet bij de snelweg waar hij zich niet waagt.
	Non-ambiguous	*Enkel* de adder heeft zijn schuilplek bij de vijver, niet de vleermuis die vaak ondersteboven hangt.	De adder heeft zijn schuilplek *enkel* bij de vijver, niet bij de snelweg waar hij zich niet waagt.
35.	Ambiguous	De puppy krijgt aandacht op de zondag, niet de goudvis die in zijn kom zwemt.	De puppy krijgt aandacht op de zondag, niet op de woensdag als iedereen druk is.
	Non-ambiguous	*Enkel* de puppy krijgt aandacht op de zondag, niet de goudvis die in zijn kom zwemt.	De puppy krijgt aandacht *enkel* op de zondag, niet op de woensdag als iedereen druk is.
36.	Ambiguous	De bever bouwt zijn burcht in het water, niet de schildpad die ligt te zonnen.	De bever bouwt zijn burcht in het water, niet in het maïsveld waar hij niet komt.
	Non-ambiguous	*Enkel* de bever bouwt zijn burcht in het water, niet de schildpad die ligt te zonnen.	De bever bouwt zijn burcht *enkel* in het water, niet in het maïsveld waar hij niet komt.
37.	Ambiguous	De zebra vertoont zijn kunstjes bij het circus, niet de tijger die gevaarlijk is.	De zebra vertoont zijn kunstjes bij het circus, niet bij het pretpark dat drukbezocht is.
	Non-ambiguous	*Enkel* de zebra vertoont zijn kunstjes bij het circus, niet de tijger die gevaarlijk is.	De zebra vertoont zijn kunstjes *enkel* bij het circus, niet bij het pretpark dat drukbezocht is.
38.	Ambiguous	De kruisspin zoekt onderdak in de herfst, niet de reiger die sterk is.	De kruisspin zoekt onderdak in de herfst, niet in de zomer als het warm is.
	Non-ambiguous	*Enkel* de kruisspin zoekt onderdak in de herfst, niet de reiger die sterk is.	De kruisspin zoekt onderdak *enkel* in de herfst, niet in de zomer als het warm is.
39.	Ambiguous	De buldog doet zijn behoefte op het pleintje, niet de poedel die netjes is.	De buldog doet zijn behoefte op het pleintje, niet op het grasveld zoals het hoort.

	Non-ambiguous	*Enkel* de buldog doet zijn behoefte op het pleintje, niet de poedel die netjes is.	De buldog doet zijn behoefte *enkel* op het pleintje, niet op het grasveld zoals het hoort.
40.	Ambiguous	De pinguïn heeft zijn leefgebied op de zuidpool, niet de ijsbeer die daar niet voorkomt.	De pinguïn heeft zijn leefgebied op de zuidpool, niet op de noordpool waar hij niet voorkomt.
	Non-ambiguous	*Enkel* de pinguïn heeft zijn leefgebied op de zuidpool, niet de ijsbeer die daar niet voorkomt.	De pinguïn heeft zijn leefgebied *enkel* op de zuidpool, niet op de noordpool waar hij niet voorkomt.
41.	Ambiguous	De danser doet zijn show in de disco, niet de dichter die verlegen is.	De danser doet zijn show in de disco, niet in de stamkroeg die vol is.
	Non-ambiguous	*Enkel* de danser doet zijn show in de disco, niet de dichter die verlegen is.	De danser doet zijn show *enkel* in de disco, niet in de stamkroeg die vol is.
42.	Ambiguous	De dochter zingt liedjes in de voortuin, niet de oma die niet durft.	De dochter zingt liedjes in de voortuin, niet in de keuken waar niemand haar hoort.
	Non-ambiguous	*Enkel* de dochter zingt liedjes in de voortuin, niet de oma die niet durft.	De dochter zingt liedjes *enkel* in de voortuin, niet in de keuken waar niemand haar hoort.
43.	Ambiguous	De barman heeft stress in de avond, niet de leraar die overdag werkt.	De barman heeft stress in de avond, niet in de middag die rustig is.
	Non-ambiguous	*Enkel* de barman heeft stress in de avond, niet de leraar die overdag werkt.	De barman heeft stress *enkel* in de avond, niet in de middag die rustig is.
44.	Ambiguous	De vader toont zijn foto’s van de jungle, niet de opa die niet graag reist.	De vader toont zijn foto’s van de jungle, niet van de zuidpool waar hij ook is geweest.
	Non-ambiguous	*Enkel* de vader toont zijn foto’s van de jungle, niet de opa die niet graag reist.	De vader toont zijn foto’s *enkel* van de jungle, niet van de zuidpool waar hij ook is geweest.
45.	Ambiguous	De moeder heeft vrij op de dinsdag, niet de tiener die naar school moet.	De moeder heeft vrij op de dinsdag, niet op de woensdag die altijd druk is.
	Non-ambiguous	*Enkel* de moeder heeft vrij op de dinsdag, niet de tiener die naar school moet.	De moeder heeft vrij *enkel* op de dinsdag, niet op de woensdag die altijd druk is.
46.	Ambiguous	De koning geeft een speech op de bruiloft, niet de zanger die bekend is.	De koning geeft een speech op de bruiloft, niet op de uitvaart waar iedereen verdrietig is.

	Non-ambiguous	*Enkel* de koning geeft een speech op de bruiloft, niet de zanger die bekend is.	De koning geeft een speech *enkel* op de bruiloft, niet op de uitvaart waar iedereen verdrietig is.
47.	Ambiguous	De tante verzamelt wijn voor de kelder, niet de jongen die geen wijn drinkt.	De tante verzamelt wijn voor de kelder, niet voor de zolder waar geen wijnrekken staan.
	Non-ambiguous	*Enkel* de tante verzamelt wijn voor de kelder, niet de jongen die dapper is.	De tante verzamelt wijn *enkel* voor de kelder, niet voor de zolder waar geen wijnrekken staan.
48.	Ambiguous	De baby krijgt huilbuien in het water, niet de kleuter die graag zwemt.	De baby krijgt huilbuien in het water, niet in het donker dat hem rustig maakt.
	Non-ambiguous	*Enkel* de baby krijgt huilbuien in het water, niet de kleuter die graag zwemt.	De baby krijgt huilbuien *enkel* in het water, niet in het donker dat hem rustig maakt.
49.	Ambiguous	De chef-kok neemt pauze in het steegje, niet de ober die te druk is.	De chef-kok neemt pauze in het steegje, niet in het strandhuis waar de gasten zijn.
	Non-ambiguous	*Enkel* de chef-kok neemt pauze in het steegje, niet de ober die te druk is.	De chef-kok neemt pauze *enkel* in het steegje, niet in het strandhuis waar de gasten zijn.
50.	Ambiguous	De sporter bekent schuld in de drugszaak, niet de schrijver die ook verdacht werd.	De sporter bekent schuld in de drugszaak, niet in de moordzaak waar hij ook verdachte is.
	Non-ambiguous	*Enkel* de sporter bekent schuld in de drugszaak, niet de schrijver die ook verdacht werd.	De sporter bekent schuld *enkel* in de drugszaak, niet in de moordzaak waar hij ook verdachte is.
51.	Ambiguous	De kapper neemt vakantie in de badplaats, niet de tandarts die te druk is.	De kapper neemt vakantie in de badplaats, niet in de hoofdstad waar het benauwd is.
	Non-ambiguous	*Enkel* de kapper neemt vakantie in de badplaats, niet de tandarts die te druk is.	De kapper neemt vakantie *enkel* in de badplaats, niet in de hoofdstad waar het benauwd is.
52.	Ambiguous	De juffrouw verwijdert de graffiti van de tafel, niet de dader die opgepakt is.	De juffrouw verwijdert de graffiti van de tafel, niet van de boomstam die ondergeklad is.
	Non-ambiguous	*Enkel* de juffrouw verwijdert de graffiti van de tafel, niet de dader die opgepakt is.	De juffrouw verwijdert de graffiti *enkel* van de tafel, niet

			van de boomstam die ondergeklad is.
53.	Ambiguous	De huurder bewaart zijn eten in de koelkast, niet de huisbaas die nooit thuis is.	De huurder bewaart zijn eten in de koelkast, niet in de vriezer die niet goed werkt.
	Non-ambiguous	*Enkel* de huurder bewaart zijn eten in de koelkast, niet de huisbaas die nooit thuis is.	De huurder bewaart zijn eten *enkel* in de koelkast, niet in de vriezer die niet goed werkt.
54.	Ambiguous	De puber heeft plezier in het zwembad, niet de peuter die zich verveelt.	De puber heeft plezier in het zwembad, niet in het pretpark dat saai is.
	Non-ambiguous	*Enkel* de puber heeft plezier in het zwembad, niet de peuter die zich verveelt.	De puber heeft plezier *enkel* in het zwembad, niet in het pretpark dat saai is.
55.	Ambiguous	De schaatser heeft plezier in de vrieskou, niet de fietser die dan binnen blijft.	De schaatser heeft plezier in de vrieskou, niet in de regen waardoor het ijs smelt.
	Non-ambiguous	*Enkel* de schaatser heeft plezier in de vrieskou, niet de fietser die dan binnen blijft.	De schaatser heeft plezier *enkel* in de vrieskou, niet in de regen waardoor het ijs smelt.
56.	Ambiguous	De zwemmer neemt een duik van de duikplank, niet de werkster die toekijkt.	De zwemmer neemt een duik van de duikplank, niet van de glijbaan die glad is.
	Non-ambiguous	*Enkel* de zwemmer neemt een duik van de duikplank, niet de werkster die toekijkt.	De zwemmer neemt een duik *enkel* van de duikplank, niet van de glijbaan die glad is.
57.	Ambiguous	De slager maakt winst in de winkel, niet de visser die liever op de markt staat.	De slager maakt winst in de winkel, niet in de marktkraam die hij ook heeft.
	Non-ambiguous	*Enkel* de slager maakt winst in de winkel, niet de visser die liever op de markt staat.	De slager maakt winst *enkel* in de winkel, niet in de marktkraam die hij ook heeft.
58.	Ambiguous	De dokter heeft vrij op de zondag, niet de bakker die druk is.	De dokter heeft vrij op de zondag, niet op de vrijdag die druk is.
	Non-ambiguous	*Enkel* de dokter heeft vrij op de zondag, niet de bakker die druk is.	De dokter heeft vrij *enkel* op de zondag, niet op de vrijdag die druk is.
59.	Ambiguous	De drummer stopt de spullen in de koffer, niet de gastvrouw die druk rondloopt.	De drummer stopt de spullen in de koffer, niet in de rugzak die hij draagt.
	Non-ambiguous	*Enkel* de drummer stopt de spullen in de koffer, niet de gastvrouw die druk rondloopt.	De drummer stopt de spullen *enkel* in de koffer, niet in de rugzak die hij draagt.

60.	Ambiguous	De popster spuit heroïne bij de haven, niet de zwerver die geen geld heeft.	De popster spuit heroïne bij de haven, niet bij de woonwijk waar kinderen spelen.
	Non-ambiguous	*Enkel* de popster spuit heroïne bij de haven, niet de zwerver die geen geld heeft.	De popster spuit heroïne *enkel* bij de haven, niet bij de woonwijk waar kinderen spelen.
61.	Ambiguous	Het geitje huppelt rondjes in de weide, niet het katje dat bang is.	Het geitje huppelt rondjes in de weide, niet in de modder die haar vies maakt.
	Non-ambiguous	*Enkel* het geitje huppelt rondjes in de weide, niet het katje dat bang is.	Het geitje huppelt rondjes *enkel* in de weide, niet in de modder die haar vies maakt.
62.	Ambiguous	Het renpaard krijgt slaap van de hitte, niet het schaapje dat onvermoeibaar is.	Het renpaard krijgt slaap van de hitte, niet van de wedstrijd waarvoor hij getraind was.
	Non-ambiguous	*Enkel* het renpaard krijgt slaap van de hitte, niet het schaapje dat onvermoeibaar is.	Het renpaard krijgt slaap *enkel* van de hitte, niet van de wedstrijd waarvoor hij getraind was.
63.	Ambiguous	De vogel heeft honger in de winter, niet de poedel die eten krijgt.	De vogel heeft honger in de winter, niet in de zomer als er volop voedsel is.
	Non-ambiguous	*Enkel* de vogel heeft honger in de winter, niet de poedel die eten krijgt.	De vogel heeft honger *enkel* in de winter, niet in de zomer als er volop voedsel is.
64.	Ambiguous	De naaktslak eet het onkruid bij de moestuin, niet de kikker die insecten eet.	De naaktslak eet het onkruid bij de moestuin, niet bij de vijver waar niets lekkers groeit.
	Non-ambiguous	*Enkel* de naaktslak eet het onkruid bij de moestuin, niet de kikker die insecten eet.	De naaktslak eet het onkruid *enkel* bij de moestuin, niet bij de vijver waar niets lekkers groeit.
65.	Ambiguous	De reiger eet zijn prooi bij het meertje, niet de egel die rondsnuffelt.	De reiger eet zijn prooi bij het meertje, niet bij het eethuis waar mensen zijn.
	Non-ambiguous	*Enkel* de reiger eet zijn prooi bij het meertje, niet de egel die in de struiken snuffelt.	De reiger eet zijn prooi *enkel* bij het meertje, niet bij het eethuis waar mensen zijn.
66.	Ambiguous	De puppy doet zijn behoefte op de stoeprand, niet de kater die een kattenbak heeft.	De puppy doet zijn behoefte op de stoeprand, niet op de deurmat zoals gisteren.
	Non-ambiguous	*Enkel* de puppy doet zijn behoefte op de stoeprand, niet	De puppy doet zijn behoefte *enkel* op de stoeprand, niet op de deurmat zoals gisteren.

		de kater die een kattenbak heeft.	
67.	Ambiguous	De eekhoorn heeft zijn paartijd in het voorjaar, niet de vleermuis die later paart.	De eekhoorn heeft zijn paartijd in het voorjaar, niet in het najaar net voor het koud wordt.
	Non-ambiguous	*Enkel* de eekhoorn heeft zijn paartijd in het voorjaar, niet de vleermuis die later paart.	De eekhoorn heeft zijn paartijd *enkel* in het voorjaar, niet in het najaar net voor het koud wordt.
68.	Ambiguous	De panda neemt happen van de bamboe, niet de tijger die carnivoor is.	De panda neemt happen van de bamboe, niet van de witlof die bitter is.
	Non-ambiguous	*Enkel* de panda neemt happen van de bamboe, niet de tijger die carnivoor is.	De panda neemt happen *enkel* van de bamboe, niet van de witlof die bitter is.
69.	Ambiguous	De zebra rent rondjes in het parkje, niet de ezel die lui is.	De zebra rent rondjes in het parkje, niet in het hutje dat te klein is.
	Non-ambiguous	*Enkel* de zebra rent rondjes in het parkje, niet de ezel die lui is.	De zebra rent rondjes *enkel* in het parkje, niet in het hutje dat te klein is.
70.	Ambiguous	De hamster zoekt zijn voedsel bij het maïsveld, niet de schildpad die bij zee leeft.	De hamster zoekt zijn voedsel bij het maïsveld, niet bij het hutje waar niets is.
	Non-ambiguous	*Enkel* de hamster zoekt zijn voedsel bij het maïsveld, niet de schildpad die bij zee leeft.	De hamster zoekt zijn voedsel *enkel* bij het maïsveld, niet bij het hutje waar niets is.
71.	Ambiguous	De pinguïn neemt een duik van de ijsplaat, niet de walvis die onder water blijft.	De pinguïn neemt een duik van de ijsplaat, niet van de oever verderop.
	Non-ambiguous	*Enkel* de pinguïn neemt een duik van de ijsplaat, niet de walvis die onder water blijft.	De pinguïn neemt een duik *enkel* van de ijsplaat, niet van de oever verderop.
72.	Ambiguous	Het aapje maakt muziek voor het circus, niet het leeuwtje dat geen kunstjes kan.	Het aapje maakt muziek voor het circus, niet voor het filmpje dat online staat.
	Non-ambiguous	*Enkel* het aapje maakt muziek voor het circus, niet het leeuwtje dat geen kunstjes kan.	Het aapje maakt muziek *enkel* voor het circus, niet voor het filmpje dat online staat.
73.	Ambiguous	De adder doodt zijn prooien op het grasveld, niet de neushoorn die minder geluk heeft.	De adder doodt zijn prooien op het grasveld, niet op het bospad waar mensen lopen.

	Non-ambiguous	*Enkel* de adder doodt zijn prooien op het grasveld, niet de neushoorn die minder geluk heeft.	De adder doodt zijn prooien *enkel* op het grasveld, niet op het bospad waar mensen lopen.
74.	Ambiguous	Het ratje bouwt zijn nestje van de deken, niet het hondje dat in de mand slaapt.	Het ratje bouwt zijn nestje van de deken, niet van de aarde die vochtig is.
	Non-ambiguous	*Enkel* het ratje bouwt zijn nestje van de deken, niet het hondje dat in de mand slaapt.	Het ratje bouwt zijn nestje *enkel* van de deken, niet van de aarde die vochtig is.
75.	Ambiguous	Het kalfje krijgt melk bij de hooischuur, niet het veulen dat buiten speelt.	Het kalfje krijgt melk bij de hooischuur, niet bij de woning waar hij niet komt.
	Non-ambiguous	*Enkel* het kalfje krijgt melk bij de hooischuur, niet het veulen dat buiten speelt.	Het kalfje krijgt melk *enkel* bij de hooischuur, niet bij de woning waar hij niet komt.
76.	Ambiguous	Het kuiken zoekt zaadjes in het daglicht, niet het varken dat slaapt.	Het kuiken zoekt zaadjes in het daglicht, niet in het donker als hij niks ziet.
	Non-ambiguous	*Enkel* het kuiken zoekt zaadjes in het daglicht, niet het varken dat slaapt.	Het kuiken zoekt zaadjes *enkel* in het daglicht, niet in het donker als hij niks ziet.
77.	Ambiguous	De kruisspin legt haar eitjes in de bloempot, niet de hommel die wegvliegt.	De kruisspin legt haar eitjes in de bloempot, niet in de emmer die leeg is.
	Non-ambiguous	*Enkel* de kruisspin legt haar eitjes in de bloempot, niet de hommel die wegvliegt.	De kruisspin legt haar eitjes *enkel* in de bloempot, niet in de emmer die leeg is.
78.	Ambiguous	De poolvos verstopt zijn voedsel op de heuvel, niet de ijsbeer die het meteen opschrokt.	De poolvos verstopt zijn voedsel op de heuvel, niet op de vlakte waar niets groeit.
	Non-ambiguous	*Enkel* de poolvos verstopt zijn voedsel op de heuvel, niet de ijsbeer die het meteen opschrokt.	De poolvos verstopt zijn voedsel *enkel* op de heuvel, niet op de vlakte waar niets groeit.
79.	Ambiguous	De bromvlieg cirkelt rondjes bij het vuilnis, niet de vlinder die rondfladdert.	De bromvlieg cirkelt rondjes bij het vuilnis, niet bij het pleintje dat schoon is.
	Non-ambiguous	*Enkel* de bromvlieg cirkelt rondjes bij het vuilnis, niet de vlinder die rondfladdert.	De bromvlieg cirkelt rondjes *enkel* bij het vuilnis, niet bij het pleintje dat schoon is.
80.	Ambiguous	De buldog krijgt een bad in de badkuip, niet de goudvis die in zijn kom blijft.	De buldog krijgt een bad in de badkuip, niet in de gootsteen die te klein is.

	Non-ambiguous	*Enkel* de buldog krijgt een bad in de badkuip, niet de goudvis die in zijn kom blijft.	De buldog krijgt een bad *enkel* in de badkuip, niet in de gootsteen die te klein is.

Table 10. *Distractors.*

Nr	Sentence
1.	Het hert eet de rozen in het plantsoen, waar natuurlijk niemand echt blij mee is.
2.	De miljonair drinkt dure wijn in het restaurant, maar hij vindt het nergens naar smaken.
3.	De dochter neemt een slokje van de whisky, maar spuugt het vervolgens proestend uit.
4.	De bruid zet haar handtekening bij de ceremonie, waarna iedereen begint te klappen en te juichen.
5.	Het model showt de kleding op de catwalk, en iedereen begint te klappen en te joelen.
6.	De gorilla maakt een huisje van bamboe, waar hij erg blij mee lijkt te zijn.
7.	De haas neemt de benen voor de jager, die hij door het geritsel goed hoort naderen.
8.	De koe neemt happen van het gras, en loeit hard omdat hij tevreden is.
9.	De mug zuigt bloed van mensen, wat muggebulten veroorzaakt die heel erg jeuken.
10.	De presentator toont een video op de televisie, waardoor bijna iedereen heel hard moet lachen.
11.	De geit heeft een goed leven op de boerderij, waar hij veel ruimte heeft en eten krijgt.
12.	De voetbalvrouw koopt dure schoenen voor het gala, waar veel beroemde en rijke mensen komen.
13.	De prinses onderdrukt een gaap bij de première, maar gelukkig is er niemand die het ziet.
14.	De actrice draagt veel make-up in de serie, maar bijna iedereen herkent haar toch wel.
15.	De nieuwslezer doet verslag van de aanval, en doet zijn best om serieus te kijken.
16.	De premier houdt een toespraak op de dinsdag, en zo te horen maakt hij zich zorgen.
17.	De dj draait leuke muziek in de disco, en beweegt zelf de hele tijd mee.
18.	De kip legt een ei in de stal, waar het helaas vergeten wordt.
19.	De olifant doet een dutje bij de struiken, en zijn luide gesnurk is door iedereen te horen.
20.	De wesp irriteert het meisje bij het diner, maar ze is dapper en eet gewoon door.
21.	De uil eet zijn prooi op de ijsplaat, die begint te smelten door de felle zon.

22.	De krokodil vormt een gevaar voor de toeristen, maar die blijven veilig op grote afstand.
23.	De fotograaf schiet plaatjes voor de talkshow, waar hij zonder moeite veel geld mee verdient.
24.	De politie arresteert de verdachte in de drugszaak, en neemt hem mee naar de auto.
25.	De voetballer drinkt champagne in de badkuip, genietend van de overwinning die hij behaald heeft.
26.	De crimineel leest boeken in de gevangenis, waardoor hij zich iets minder verveelt.
27.	De papegaai vertelt verhaaltjes voor de kinderen, die erg hard om het dier moeten lachen.
28.	De rups neemt hapjes van de broccoli, waardoor het er aangevreten uit ziet.
29.	De baby pakt de bal op de stoeprand, maar valt tot iedereens schrik bijna om.
30.	Het kuiken piept geluidjes van de honger, en gaat waggelend op zoek naar voedsel.
31.	De panda maakt geluidjes voor de camera, en draait zich dan verlegen om.
32.	Het kalfje speelt verstoppertje bij de boerderij, wat iedereen heel onrustig maakt.
33.	De koning houdt een toespraak voor het volk, dat aandachtig luistert naar zijn woorden.
34.	Het kabinet sluit een akkoord voor volgend jaar, wat een van de moeizaamste overleggen ooit was.
35.	Het ratje houdt de wacht bij de koelkast, waar hij graag naar binnen wil.
36.	De koningin draagt een mantelpakje op het gala, wat haar tot iedereens verbazing erg goed staat.
37.	De voetbalvrouw geeft een interview op de radio, waarbij ze voor het eerst erg openhartig is.
38.	De fotograaf maakt foto's bij de ceremonie, die officieel maar erg emotioneel verloopt.
39.	Het kabinet houdt een debat in de ochtend, wat tot iedereens ergernis erg lang duurt.
40.	De cheeta beschermt haar jong voor de hyena's, die hongerig en daarom gevaarlijk zijn.
41.	De wolf is bang voor de jager, die met zijn geweer door het woud sluipt.
42.	De dromedaris draagt de bagage van de toeristen, wat voor hen erg comfortabel is.
43.	De kangoeroe draagt haar jong in haar buidel, want daar is het veilig en lekker warm.
44.	De giraffe voelt angst voor de mensen, en blijft ver weg van het hek.
45.	De sporter eet een banaan voor de marathon, en begeeft zich dan rustig naar de start.
46.	De miljonair koopt een villa bij het dorp, en verhuist meteen om meer rust te krijgen.

47.	De man drinkt wijn bij het diner, en eet genietend zijn buikje rond.
48.	De bruid neemt een hapje van de fruittaart, en gaat dan dansen met de bruidegom.
49.	Het model voelt zich niet lekker van de honger, en valt tot iedereens schrik flauw.
50.	De gorilla neemt happen van de broccoli, en begint dan op zijn borst te slaan.
51.	Het konijn heeft een voorkeur voor het gras, wat lekker mals en zacht is.
52.	De koe baart een jong op de hooiberg, en likt hem liefdevol schoon.
53.	De presentator maakt een grapje in de talkshow, waardoor iedereen hard moet lachen.
54.	De prinses krijgt biefstuk op de maandag, wat haar lievelingseten is.
55.	De actrice draagt een dure jurk bij de première, waardoor iedereen haar aandacht schenkt.
56.	De vos zoekt een schuilplaats voor de avond, zodat hij rustig kan gaan slapen.
57.	De nieuwslezer maakt een verspreking op het journaal, die bijna iedereen erg pijnlijk vindt.
58.	De premier legt zijn besluit uit voor de Tweede Kamer, wat uiteindelijk tot meer begrip leidt.
59.	De dj haalt een grapje uit op de radio, wat door niemand echt gewaardeerd wordt.
60.	De kip legt eieren op de speelplaats, waar ze helaas erg kwetsbaar zijn.
61.	De olifant draagt een hoedje voor de camera, wat hij zelf eigenlijk maar vervelend vindt.
62.	De wesp spuit gif in zijn slachtoffer, wat pijnlijk is en zelfs dodelijk kan zijn.
63.	De tuinman harkt de blaadjes in het plantsoen, en zweetdruppeltjes lopen over zijn gezicht.
64.	De politie arresteert de hooligans voor het restaurant, en neemt ze mee voor het te laat is.
65.	De weerman heeft hoofdpijn van de whisky, waar hij gisternacht veel van gedronken heeft.
66.	De pony trekt de kar voor de stal, wat een zwaar en vervelend klusje is.
67.	De kameel maakt tochten in de woestijn, waarbij hij nauwelijks hoeft te drinken.
68.	De zeemeeuw steelt eten van de kinderen, en vliegt vervolgens snel weg.
69.	De lama spuwt speeksel bij zijn aanval, wat erg stinkt en de vijand afschrikt.
70.	De luiaard vindt een plekje bij de struiken, waar hij lekker kan eten en slapen.
71.	De bever bouwt een dam in de rivier, zodat hij controle heeft over de stroming.
72.	De ballerina geeft een optreden in de schouwburg, en is nog nooit zo zenuwachtig geweest.
73.	De dolfijn speelt de hoofdrol in de serie, en iedereen vindt hem erg schattig.

74.	De krokodil houdt de wacht bij de roeiboot, maar zwemt weg als hij mensen ziet naderen.
75.	De rechter bekijkt een documentaire in de bioscoop, wat hem eindelijk doet ontspannen.
76.	De voetballer zoekt de bal voor de training, maar vindt hem pas na lange tijd.
77.	De crimineel zoekt een schuilplaats in de woestijn, waar hij uiteindelijk een tragische dood sterft.
78.	De kangoeroe zoekt de verkoeling van het meertje, wat hem goed doet met dit weer.
79.	De papegaai leert scheldwoorden van de televisie, die erg lelijk en brutaal klinken.
80.	De giraffe steekt zijn kop in de bloempot, maar die blijkt helaas leeg te zijn.

Chapter 5

The role of stress position in bilingual auditory word recognition: Cognate processing in Turkish and Dutch

Abstract
This study examined the effect of word stress position on bilingual auditory cognate processing. Turkish-Dutch early bilinguals who are dominant in their L2 (Dutch), performed an auditory lexical decision task in Turkish or Dutch. While Dutch has variable word stress, with a tendency for penultimate stress, in Turkish stress is predictable and usually falls on the ultimate syllable. This difference leads to word stress congruence in Turkish-Dutch cognates (Turkish *baLON* versus Dutch *ballon,* 'balloon') or word stress incongruence (Turkish *moTOR* versus Dutch *MOtor,* 'motor'). Differences in processing between cognates with congruent and incongruent stress provide support for the view that cognates have separate, though linked representations (e.g., Peeters, Dijkstra, & Grainger, 2013). Whereas we observed some cognate facilitation effects in Dutch, we found cognate inhibition in Turkish. Furthermore, RT and EEG results indicated no advantage of congruent vs. incongruent stress position, but the bilinguals processed cognates with ultimate stress faster than matched cognates with penultimate stress in both languages. This suggests that any contribution of stress congruence to cognate processing must be dependent on stress position.

Based on: Muntendam, A., Van Rijswijk, R., & Dijkstra, T. (2016). The role of stress position in bilingual auditory word recognition: Cognate processing in Turkish and Dutch.

1. Introduction

A comparison of the vocabularies of major European languages reveals that there are thousands of translation equivalents with orthographic or phonological form overlap in various language combinations (Schepens, Dijkstra, & Grootjen, 2012; Schepens, Dijkstra, Grootjen, & Van Heuven, 2013). Examples of such cognate words are *tomato* - *tomaat* in English and Dutch (Dijkstra, Grainger, & Van Heuven, 1999), and *gat* – *gato,* 'cat' in Catalan and Spanish (Costa, Caramazza, & Sebastián-Gallés, 2000). Even in language pairs from different families, there are often many cognates, e.g., *gitar* – *gitaar*, 'guitar' in Turkish and Dutch.

Research has shown that when a bilingual processes a cognate in one language, its equivalent in the other language is co-activated. Such co-activation often results in a faster word recognition process relative to other words, especially in the L2. This finding is known as the cognate facilitation effect (e.g., Dijkstra, Miwa, Brummelhuis, Sappelli, & Baayen, 2010; Midgley, Holcomb, & Grainger, 2011; Peeters, Dijkstra, & Grainger, 2013; Van Hell & Dijkstra, 2002; Voga & Grainger, 2007).

Surprisingly, almost all cognate studies concern word recognition in the visual rather than the auditory domain. However, there are at least two aspects of auditory cognate processing that make it of interest to researchers. First, a crucial difference between visually and auditorily presented cognates is that subphonemic differences are only present in the latter. That is, although two translation equivalents may be called cognates in terms of their segmental overlap, they may still be different in subphonemic characteristics due to differences in sound repertoires of the languages involved and due to differences in grapheme-to-phoneme correspondences. For instance, the English word *camera* is a cognate with the Dutch word *camera*, but the first vowel /a/ is pronounced as /æ/ in English and as /a/ in Dutch. Importantly, the language-specific sounds of a cognate might reduce or even prevent co-activation of the cognate member from the other language. In other words, when the spoken English word *camera* is activated, its Dutch counterpart *camera* might be de-activated due to the phonological mismatch between the two words. This raises the question whether cognate effects occur in auditory word recognition.

Second, two auditory cognate members may be similar in phonological form and meaning, but different in their allocation of word stress. For instance, in Turkish, *dokTOR* ('doctor') bears ultimate stress, while its Dutch equivalent *DOKter* has penultimate (i.e., prefinal) stress. What are the consequences of such incongruencies for cognate processing in Turkish-Dutch bilinguals?

In spite of the many studies on cognates, as far as we know, no studies have considered auditory cognate processing and the role of stress congruence yet. The present study aims to fill in these two gaps in our knowledge. First, we will examine whether a cognate facilitation effect arises in bilingual auditory word recognition. More specifically, to investigate the time-course of co-activation of the two cognate readings in detail, we collected both behavioral and electrophysiological data. Second, we will examine whether any observed cognate facilitation effect is affected by word stress congruence in Dutch and Turkish. If that is the case, this has consequences for how cognates are represented in the mental lexicon of the bilingual.

Our study is innovative from a third perspective as well. Most previous studies, both visual and auditory, have focused on late bilinguals, such as students, who are dominant in their L1 (e.g., Van Hell & Tanner, 2012). However, our study will consider Turkish-Dutch early bilinguals who acquired both languages from a young age. More specifically, these heritage speakers of Turkish are dominant in their L2, Dutch, although they acquired both languages in their early childhood. The difference in language dominance in these bilinguals, as compared to late bilinguals, allows us to assess cross-linguistic cognate effects in two directions: from L1 Turkish to currently dominant L2 Dutch and vice versa.

To set the stage for our study, we first consider how cognate effects might depend on modality (visual or auditory). Subsequently, we review studies on the monolingual and bilingual processing of word stress, and analyze word stress differences in Turkish and Dutch cognates. This is followed by a more detailed description of the special type of bilinguals in this study, namely heritage speakers. Finally, we formulate the research questions and hypotheses driving the study.

1.1 Bilingual visual versus auditory word recognition

Although cognates are translation equivalents with form overlap, they differ in the degrees of their semantic (S), orthographic (O), and phonological (P) overlap (Dijkstra et al., 1999). Depending on the overlap of codes, cognates can be roughly classified as SOP, SO, and SP (Dijkstra et al., 1999). Dijkstra et al. (2010) have demonstrated that even when cognates are presented visually, their phonological form in both languages is also activated and plays a role in item identification. It has been suggested (Dijkstra et al., 2010; Van Assche, Drieghe, Duyck, Welvaert, & Hartsuiker, 2011, pp. 99 and 101) that the more phonologically similar a cognate across two languages is, the faster its recognition is (but see Dijkstra et al., 1999, for a different finding).

The large majority of cognate studies, collecting RT and EEG data, have focused on the visual domain (e.g., Dijkstra et al., 2010; Midgley, Holcomb, & Grainger, 2011; Peeters, Dijkstra, & Grainger, 2013; Van Hell & Dijkstra, 2002; Voga & Grainger, 2007). The findings of these studies indicate that cognate representations in both languages are activated even in the context of only one language, and thus that lexical access is thoroughly language-nonselective. Dijkstra et al. (2010; also see Voga & Grainger, 2007) have proposed that the representation of cognates in the lexicon consists of two similar but non-identical morphemic representations that are linked to a (nearly) shared semantic representation. Figure 1 illustrates this for the Dutch-Turkish cognate 'taxi'.

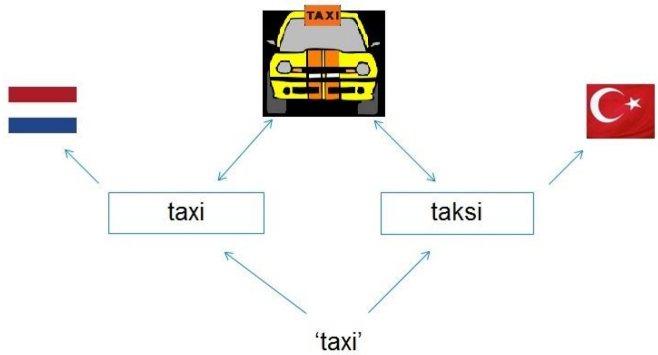


Fig. 1. The representation of the -Dutch-Turkish cognate 'taxi': two similar, but non-identical morphemic representations that are linked to a (largely) shared semantic representation.

This proposal has been supported by several studies (see Dijkstra, 2009, for a review) and it appears to hold even for orthographically identical cognates (Mulder, Schreuder, & Dijkstra, 2012; Peeters et al., 2013).

An interesting and, to our knowledge, rather unexplored issue is whether the same kind of representation can be assumed to underlie the processing of auditory cognates. The different properties of the visual and auditory modalities might lead to differences in processing. When the words from the different languages of the bilingual are represented in terms of one and the same script (as was the case in many studies), language-specific item properties only become visible in terms of sublexical orthotactic characteristics (see, for example, Van Kesteren, Dijkstra, & De Smedt, 2012). However, in the auditory domain the differences between languages are more salient, not only due to phonotactic properties but also due to sub-phonemic cues that are highly language-specific. For instance, even though English and Dutch are related languages, they both have phonemes and allophones that do not occur in the other language (e.g., /æ/ in English and /r/ in Dutch). Bilingual listeners might use these cues to efficiently retrieve words: By hearing almost immediately to which language the word belongs, they would in principle be able to restrict lexical access to this language, instead of activating words from the other language as well. However, available evidence suggests that they do not do so, resulting in, for instance, cross-linguistic competition effects in the case of interlingual cohort members (Marian & Spivey, 2003) and interlingual homophones (Lagrou, Hartsuiker, & Duyck, 2011; Schulpen, Dijkstra, Schriefers, & Hasper, 2003).

Remarkably, very few auditory lexical decision studies have considered this issue for cognates. One exception is Blumenfeld and Marian (2005, 2007), who showed that the auditory presentation of cognates led to co-activation of the other language in late German-English bilinguals. They observed an auditory cognate facilitation effect, which suggests that the type of cognate representation proposed for visual processing might also be valid for the auditory modality. Specifically, two phonological form representations would be linked to a largely shared semantic representation. During processing, the two form representations would be co-activated, resulting in resonance between codes and thus faster auditory word recognition than in the case of non-cognates.

The present study will investigate whether such a cognate facilitation effect arises in auditory word recognition. As a related issue, we will examine the role of word stress position in the recognition of cognates. The auditory processing of word stress is described in the next section.

1.2 Auditory processing of word stress

Little is known about the role of word stress position in the auditory recognition of cognates. Previous studies that examined the auditory processing of word stress were concerned with cross-linguistic differences in the perception of stress position in non-cognate words (e.g., Domahs, Genc, Knaus, Wiese, & Kabak, 2013; Domahs, Wiese, Bornkessel-Schlesewsky, & Schlesewsky, 2008; Dupoux, Peperkamp, & Sebastián-Gallés, 2001; Knaus, Wiese, & Janßen, 2007; Molczanow, Domahs, Knaus, & Wiese, 2013; Peperkamp, Vendelin, & Dupoux, 2010). These studies indicate that perception of word stress largely depends on whether the language concerned is a free-stress or fixed-stress language (Cutler, 2008; Van Donselaar, Koster, & Cutler, 2005). Free-stress languages such as English, Dutch, and Spanish have different syllable positions for word stress, depending on factors such as syllable weight and morphology. In fixed-stress languages, on the other hand, stress always falls on the same syllable position. For instance, in French and Turkish the final syllable is stressed. The assumption is that in free-stress languages stress is stored with the lexical representation, whereas in fixed-stress languages this is not required, given its predictability (e.g., Domahs et al., 2013; Gussenhoven & Jacobs, 2011; Peperkamp et al., 2010). This is supported by the finding that speakers of a fixed-stress language are, unlike speakers of a free-stress language, not able to perceive differences in stress position in non-words. That is, they are said to be “stress deaf” (see, e.g., Dupoux et al., 2001; Peperkamp et al., 2010).

Speakers of free-stress languages, on the other hand, tend to use word stress information to solve the competition between activated candidates during word processing (e.g., Cutler & Van Donselaar, 2001; Reinisch, Jesse, & McQueen, 2010;

Van Donselaar, Koster, & Cutler, 2005). Furthermore, studies on Dutch have shown that there is a bias for initial stress, not only due to the statistical distribution in Dutch, but also due to use of signal information (e.g., Reinisch et al., 2010). That is, presence of stress on the first syllable leads to disambiguation in a very early stage, because listeners know at the moment of perceiving stress on the first syllable that there is initial stress, cancelling out all candidates with non-initial stress. Absence of stress on the first syllable, on the other hand, does not automatically lead to the conclusion that the other syllable is stressed. This is because alternative scenarios are possible as well, such as word stress reduction by the speaker, or disturbed perception by the hearer. This explanation holds in particular for experiments in which words are presented in isolation, because there is no previous context to compare prominence of the first syllable to (e.g., Van Heuven & Menert, 1996). In other words, presence of initial stress leads to faster constraining of candidates than the absence of initial stress, as in the latter case more competitors remain activated.

Other studies considered differences between correct and incorrect stress placement in existing words (e.g., Domahs et al., 2013; Domahs et al., 2008; Knaus et al., 2007; Molczanow et al., 2013). Domahs et al. (2013) presented ERP evidence in support of the theoretical view that ultimate stress in Turkish is predictable. Turkish is a fixed-stress language, with some exceptions. When words with ultimate stress were pronounced as words bearing penultimate stress, this violation led to a P300 effect, an EEG marker that has been linked to the detection of incorrect stress placement. However, when words with penultimate stress were pronounced as words bearing ultimate stress, this violation did not yield a P300 effect, but an N400 effect, which is thought to reflect difficulties in lexical-semantic integration. The authors concluded that speakers of Turkish are only “stress deaf” while they process words with predictable stress. Their findings may point towards the co-existence, in one language, of a phonological rule for predictable stress on the one hand, and lexically encoded stress on the other.

1.3 Word stress differences in Turkish and Dutch

In Turkish word stress is (mostly) predictable, and words that do not have ultimate stress are exceptions. Such words are mostly loan words and foreign proper names (Inkelas & Orgun, 2003). In contrast, Dutch is a free-stress language, which has, like English, a tendency for stress on the first syllable in two-syllabic words (i.e., penultimate stress; Van Donselaar et al., 2005). With this contrasting combination of languages in Turkish-Dutch bilinguals, we examined whether the cognate facilitation effect depends on word stress congruence in the two languages. If that is the case, word stress would somehow need to be incorporated in the representation of cognates in the bilingual mental lexicon. Because our Turkish-Dutch bilinguals were 'special' in the sense that they were heritage speakers, we will characterize them in more detail before turning to our research questions.

1.4 Heritage speakers of Turkish in the Netherlands

The participants of the present study were Turkish-Dutch bilinguals from the second generation of Turkish immigrants who arrived in the Netherlands in the 1960s. Bilinguals who speak their immigrant language as an L1 and the majority language of the new society as an L2 are also referred to as *heritage speakers* (e.g., Benmamoun, Montrul, & Polinsky, 2013a). Heritage speakers are different from late bilinguals (i.e., the participants in most studies on cognate processing), because the L2 of heritage speakers is often their dominant language. This also holds for heritage speakers of Turkish in the Netherlands: Although the language maintenance of Turkish in the Turkish community is high, second and third generation heritage speakers of Turkish report Dutch to be their dominant language (e.g., Doğruoz & Backus, 2007; Extra, Yağmur, & Van der Avoird, 2004). Previous research on late bilinguals has revealed that the dominant L1 is more activated than the L2 during word processing (e.g., Blumfeld & Marian, 2005, 2007), but we know relatively little about how heritage speakers process words. Particularly, because the decreasing use of the L1 in heritage speakers generally leads to slower word recognition in that language (e.g., Köpke & Schmid, 2004; Montrul & Foote, 2014; Schmid & Köpke, 2009), the question arises whether this language is still activated and influential while heritage speakers hear words in their dominant L2. Our study addresses this question by comparing auditory cognate processing in our heritage speakers' L1 and L2.

1.5 The present study

The differences in stress assignment in Turkish and Dutch alluded to above make it possible to manipulate stress position congruence in the two languages for cognate words. The cognates in the present study were either congruent with penultimate stress (Turkish *TEnis* versus Dutch *TEnnis,* 'tennis'), congruent with ultimate stress (Turkish *giTAR* versus Dutch *giTAAR*, 'guitar'), or incongruent with ultimate stress in Turkish and penultimate stress in Dutch (Turkish *dokTOR* versus Dutch *DOKter*, 'doctor'). It was not possible to find enough items to fill the fourth category, that is, incongruent stress with penultimate stress in Turkish and ultimate stress in Dutch, because words with penultimate stress in Turkish are exceptions, and the Dutch equivalents generally have penultimate stress as well.

We investigated the effect of word stress congruence in L1 and L2 to clarify how stress assignment relates to lexical retrieval. Heritage speakers of Turkish performed an auditory lexical decision task in one of their languages. In the study we addressed three questions: (1) Is there evidence for a processing difference between cognates and non-cognates in bilingual auditory word recognition in Turkish and Dutch?; (2) What is the effect of stress position in the two languages on the bilingual processing of cognates?; and (3) Do similar effects occur while processing in the weaker L1 Turkish and in the dominant L2 Dutch?

With respect to the first question, we expected cognates to be processed faster than non-cognates in the L2 (Dutch). This prediction is based on the general findings in the visual modality (e.g., Dijkstra et al., 2010). Concerning the L1, a cognate effect has been found less often. It has been suggested that only when the L2 is strong enough, a cognate facilitation effect would arise in the L1 as well (Van Hell & Dijkstra, 2002). Because both Turkish and Dutch are relatively well established in our group of participants, a cognate facilitation effect might also be expected for the L1 Turkish. Interestingly, however, given that the dominant language of our participants is the L2, the opposite prediction with respect to the L1 and L2 could also be motivated: In our participant group, the cognate effect might be stronger for the L1 than for the L2 (e.g., Blumenfeld & Marian, 2005, 2007).

To obtain detailed information on the underlying mechanisms, in the present study we did not only measure reaction times (RTs), but also ERPs, by focusing on the N400 component, which is related to ease of lexical-semantic integration (e.g., Hauk & Pulvermüller, 2004). Together with faster RTs for cognates than for non-cognates, we predicted less negative N400s for cognates than for non-cognates, as shown by previous studies (e.g., Midgley et al., 2011; Peeters et al., 2013).

Concerning the position of word stress in Turkish-Dutch cognates, we predicted the following. Assuming the existence of separate representations for the two cognate readings (as proposed by Peeters et al., 2013), we proposed that the congruence or incongruence of word stress does play a role in the auditory cognate recognition. As a consequence, we expected to find a larger cognate facilitation effect (i.e., faster RTs and less negative N400s) in the stress congruent than in the incongruent condition for L2 target words. This expectation is based on the assumption that there would be more overlap between cognate members that are congruent in stress position. If, however, the Turkish-Dutch bilinguals that participated in our study appear to be "stress deaf" (e.g., Domahs et al., 2013; Peperkamp et al., 2010), we might not find any differences between the congruent and incongruent conditions. Furthermore**,** in the L1 Turkish lexical decision task, penultimate stress in both cognates (e.g., Turkish *TEnis* and Dutch *TEnnis,* 'tennis') might be expected to lead to a reduced cognate facilitation effect, because in this condition word stress in Turkish is lexical and not predictable. This situation is more similar to Dutch and might therefore lead to relatively more competition from the L2. In comparison, in the L2 Dutch lexical decision task, we predicted that ultimate stress in both cognates (e.g., Turkish *giTAR* and Dutch *giTAAR*, 'guitar') would lead to a larger cognate facilitation effect than in the other conditions: Although Dutch has the tendency to stress the first syllable of words, in the condition in which both cognates have ultimate stress, the Dutch cognates employ a Turkish-like stress pattern and will therefore be recognized faster.

2. Method

2.1 Participants

The participants of the Dutch task were 20 Turkish-Dutch bilinguals (15 female; mean age: 21.9 years, ranging from 19 to 26 years), who were second-generation heritage speakers of Turkish in the Netherlands. At the time of the study six of the participants were university students, eleven were students at a school for higher professional education, one was a student at a school for intermediate vocational education, and the two remaining participants were not students at the time of the study. One of them had finished higher professional education, and the other had finished secondary school.

The participants of the Turkish task were 19 Turkish-Dutch bilinguals (13 female; mean age: 21.3 years, ranging from 18 to 26 years old). The data of two other participants were discarded (see Section 2.3). Regarding education, at the time of the study six participants were university students, seven were students at a school for higher professional education, three were students at a school for intermediate vocational education, and the three remaining participants were not going to school at the time of the study. One of them had finished higher professional education and the other two had finished secondary school (see Appendix A).

Prior to the experimental sessions, the participants filled out a digital sociolinguistic background questionnaire (NetQ Internet Surveys), which included questions on their age of acquisition of Turkish and Dutch, their language dominance, the frequency and domains of use of Turkish and Dutch, their knowledge of other languages besides Turkish and Dutch, their educational level, and their family background. The participant groups for the Dutch study and the Turkish study were highly similar. The participants for both studies were born in the Netherlands, and their parents were born in Turkey. All participants acquired Turkish as a first language at home; some learned Dutch simultaneously with Turkish at home, whereas others learned Dutch when they entered preschool or school. The majority of the participants considered Dutch to be their dominant language.

In the questionnaire, the participants were also asked to indicate their proficiency in speaking, listening, writing, reading and pronunciation in Dutch and Turkish on a scale from 1 ('not good at all') to 5 ('very good'). The participants reported a relatively high level of proficiency in both languages (Tables 1 and 2). For the Turkish-Dutch bilinguals who participated in the Dutch study, paired t-tests revealed significantly higher proficiency ratings for Dutch than Turkish for speaking ($t(19) = 3.27$, $p = .004$), listening ($t(19) = 2.35$, $p = .030$), writing ($t(19) = 3.32$, $p = .004$), reading ($t(19) = 3.56$, $p = .002$), and pronunciation ($t(19) = 3.11$, $p = .006$). For the Turkish-Dutch bilinguals who participated in the Turkish study, paired t-tests revealed significantly higher proficiency ratings for Dutch than Turkish for speaking ($t(18) = 2.48$, $p = .023$), writing ($t(18) = 3.14$, $p = .006$), reading ($t(18) = 4.14$, $p = .0006$), and pronunciation ($t(18) = 3.08$, $p = .007$). There was no significant difference for listening ($t(18) = 1.37$, $p = .187$).

Table 1. ***Means of the self-reported language proficiency ratings (and standard deviations) for the participants of the Dutch task.***

	Turkish	**Dutch**
Speaking	4 (1.08)	4.60 (0.94)
Listening	4.40 (0.99)	4.70 (0.92)
Writing	3.75 (1.16)	4.40 (1.0)
Reading	3.90 (1.17)	4.70 (0.92)
Pronunciation	3.95 (1.19)	4.60 (0.94)
Mean	**4.0**	**4.60**

Note: A score of 1 refers to 'not good at all', and a score of 5 to 'very good'.

Table 2. ***Means of the self-reported language proficiency ratings (and standard deviations) for the participants of the Turkish task.***

	Turkish	**Dutch**
Speaking	4 (0.82)	4.58 (0.61)
Listening	4.58 (0.61)	4.74 (0.56)
Writing	3.47 (1.22)	4.37 (0.76)
Reading	3.58 (1.07)	4.58 (0.84)
Pronunciation	4.05 (0.78)	4.68 (0.48)
Mean	**3.94**	**4.59**

Note: A score of 1 refers to 'not good at all', and a score of 5 to 'very good'.

At the end of the experimental sessions, the participants completed the Boston Naming Test (BNT) (Kaplan, Goodglass, Weintraub, Segal, & Van Loon-Vervoorn,

2001) in Dutch and Turkish (Table 3). This test was used, in addition to the language proficiency ratings, to measure the participants' proficiency in the two languages. The order of the languages (Turkish-Dutch or Dutch-Turkish) was counterbalanced among the participants. A paired t-test revealed significantly higher scores for the Dutch BNT than for the Turkish BNT ($t(18)=8.35$, $p < .0001$) for the bilinguals who participated in the Dutch study. Similarly, a paired t-test revealed significantly higher scores for the Dutch BNT than for the Turkish BNT ($t(17)=10.40$, $p < .0001$) for the bilinguals who participated in the Turkish study.

Together, the findings from the sociolinguistic questionnaire, the language proficiency ratings and the BNT show that the participants' first language is Turkish, but that their dominant language is Dutch.

Table 3. ***Mean scores and standard deviations of the Turkish and Dutch Boston Naming Test for the participants of the Dutch study and the Turkish study.***

	Turkish BNT	**Dutch BNT**
Dutch study	67.35 (15.60)	107.42 (14.94)
Turkish study	66.33 (17.35)	105.83 (19.94)

Note: The maximum score was 162.

Participants with a high proficiency in French were excluded from the study, because the materials contained words that also occurred in French but had different stress patterns in French and Turkish. Two participants of the Dutch study were left-handed, but only one of them was included in the EEG analysis.

2.2 Stimulus materials

The materials for the lexical decision tasks consisted of two-syllable items in three stress conditions. The first condition (ULT ULT) consisted of cognates with ultimate stress in both Turkish and Dutch, e.g., Turkish *giTAR*, 'guitar' and Dutch *giTAAR*, 'guitar'. The second condition (PEN PEN) consisted of cognates that had penultimate stress in both languages, e.g., Turkish *TEnis*, 'tennis' and Dutch *TEnnis*, 'tennis'. The cognates in these two conditions thus had congruent stress in Turkish and Dutch. The third condition (ULT PEN) consisted of cognates that had ultimate stress in Turkish but penultimate stress in Dutch, e.g., Turkish *tüNEL*, 'tunnel' and Dutch *TUnnel*, 'tunnel'.

The stress position of these cognates was thus incongruent across the two languages. Each condition contained 30 cognates, 30 control words (non-cognates), and 60 non-words (pronounceable pseudowords). That is, each task was comprised of 360 items in total. In addition, the tasks included a practice set consisting of 4 cognates, 5 control words, and 9 non-words.

The cognates for the Turkish task were selected from Turkish-Dutch dictionaries (Kiriş, 2006, 2009). The selection criteria for the cognates included stress location in English, word frequency, phonological similarity, and semantic similarity. Because it was expected that the participants had at least some proficiency in English in addition to Dutch and Turkish, cognates with incongruent stress patterns in Dutch and English were excluded to avoid an influence from English.

The cognates in the different conditions were matched for word frequency. The SUBTLEX-NL database (Keuleers, Brysbaert, & New, 2010), which is based on Dutch film and television subtitles, was used to get a rough estimation of word frequencies of the cognates and the Dutch control words. The SUBTLEX-NL database was chosen over other corpora because it is more similar to spoken language. Turkish word frequencies were calculated using Dave's (2012) corpus, which is based on Turkish subtitles from www.opensubtitles.org.

For both the Dutch task and the Turkish task, independent t-tests showed that the three cognate conditions were not significantly different ($p > .05$) from each other with respect to word frequency, based on Dave's corpus and the SUBTLEX-NL database (Tables 4 and 5). Moreover, the control conditions did not differ significantly ($p > .05$) from each other with respect to word frequency. In addition, the control and cognate conditions were not significantly different ($p > .05$). Because word frequencies might be different in the Turkish community in the Netherlands, subjective frequency ratings for Dutch and Turkish were included in the study (see below).

The duration of the cognates, control words, and non-words was also measured (Tables 4 and 5). For the Dutch task, independent t-tests revealed that the words (cognates and control words) were significantly longer than the non-words ($p < .001$). The cognates did not differ significantly in duration from the control words in the three stress conditions ($p > .05$). The cognates in the PEN PEN and ULT PEN conditions also did not differ significantly ($p > .05$). However, the cognates in the ULT ULT condition were significantly longer than those in the PEN PEN ($p = .017$) and the ULT PEN ($p = .044$) condition. The control words in the three stress conditions did not differ significantly from each other ($p > .05$).

Regarding the Turkish task, the words (cognates and control words) did not differ significantly in duration from the non-words in the three stress conditions ($p > .05$), based on independent t-tests. Moreover, there were no significant differences between the cognates and the control words in the three stress conditions ($p > .05$). Furthermore, the cognates in the three stress conditions did not differ significantly from each other ($p > .05$), and there were no significant differences between the control words in the three stress conditions ($p > .05$). Because in the Dutch task some of the conditions differed significantly from each other, duration was included as a factor in the regression model (see Section 3).

The number of phonemes of the cognates, control words, and non-words was also calculated (Tables 4 and 5). For the Dutch task, independent t-tests showed that the words (cognates and control words) and non-words did not differ significantly in regards to the number of phonemes ($p >.05$). However, the cognates in the ULT ULT condition contained significantly fewer phonemes than the control words in that stress condition ($p = .02$). No significant differences between the cognates and the control words were found for the other stress conditions ($p > .05$). Regarding the cognates, the items in the PEN PEN conditions contained significantly fewer phonemes than those in the ULT PEN condition ($p = .027$). The cognate conditions did not differ significantly from each other ($p >.05$). Moreover, the control words were not significantly different from each other ($p >.05$).

For the Turkish task, independent t-tests showed that with respect to the number of phonemes, the words (cognates and control words) and non-words in the PEN PEN and ULT ULT conditions did not differ significantly from each other ($p >.05$). However, the words in the ULT PEN condition consisted of significantly more phonemes than the non-words ($p = .005$). The cognates in the ULT ULT condition did not differ significantly from the control words in this stress condition ($p >.05$).

However, the cognates in the PEN PEN and the ULT PEN condition consisted of more phonemes than the control words in these stress conditions (p = .035 and p = .011, respectively). Regarding the cognates, the items in the ULT PEN condition had significantly more phonemes than those in the PEN PEN (p = .017) and ULT ULT (p = .04) conditions. The PEN PEN and ULT ULT conditions did not differ significantly from each other (p > .05). Similarly, the control words in the ULT PEN condition consisted of significantly more phonemes than those in the ULT ULT (p = .006) and PEN PEN (p = .001) conditions. There were no significant differences between the control words in the PEN PEN condition and those in the ULT ULT condition (p > .05).

To further assess various lexical properties of the test items in the Turkish and Dutch experiments, we performed an independent study in which we assessed the frequency, semantic similarity, and phonological similarity of the Turkish and Dutch stimulus materials. The order of the ratings was varied among participants.

In the subjective frequency rating task, the participants were asked to indicate how often they used (reading, writing, speaking, hearing) the word shown on the screen on a scale from 1 (‘absolutely never’) to 7 (‘very often’). In addition, the participants were asked to write down words that were unfamiliar to them. For each language, two lists were created with 45 cognates and 45 control words (non cognates) each. Thus, for both the Dutch and Turkish experiment, half of the participants rated the words in List 1 and the other half rated the words in List 2. The words were presented in a (pseudo-)random order, which was different for each participant.

In the semantic similarity rating task, two words appeared on a computer screen: a Dutch word (on the left) and a Turkish word (on the right). The participants were asked to indicate how similar the two words were in meaning on a scale from 1 (‘no similarity at all’) to 7 (‘perfect similarity’). The word pairs consisted of low similarity word pairs (e.g., Dutch *leegte,* ‘emptiness’ and Turkish *yağmur,* ‘rain’), middle similarity word pairs (e.g., Dutch *honing*, ‘honey’ and Turkish *arı*, ‘bee’) and cognate pairs. To ensure that the participants only paid attention to the meaning of the words, two pairs of words that had the same meaning, but were phonologically different, were included, e.g., Dutch *aardbei* and Turkish *çilek*, ‘strawberry’. The participants were asked to write down any words that were unfamiliar to them. Two lists were created with 45 cognate pairs, 15 middle similarity word pairs and 15 low similarity word pairs each. The lists were randomized and each participant received a different list.

In the phonological similarity rating, the participants were asked how similar two words that were presented auditorily were with respect to pronunciation, with 1 (‘no similarity at all’) and 7 (‘perfect similarity’). The word pairs consisted of low similarity word pairs (e.g., Dutch *brommer,* ‘moped’ and Turkish *omuz,* ‘shoulder’), middle similarity word pairs (e.g., Dutch *heelal,* ‘universe’ and Turkish *hilal,* ‘new moon’), and cognate pairs. In addition, two pairs of words that were phonologically similar but semantically different in the two languages (e.g., Dutch *tabak,* ‘tobacco’ and Turkish *tabak,* ‘plate’) were added to check that the participants only paid attention to the phonology of the words. As in the semantic similarity rating, two lists were created with 45 cognate pairs, 15 middle similarity word pairs, and 15 high similarity word pairs each. The lists were randomized and each participant received a unique list.

The words and non-words were recorded with a 23-year old bilingual Turkish-Dutch female, who was born in the Netherlands. All the materials were recorded with the same speaker to avoid differences between the recordings in the two languages. The recordings were made in a sound proof booth at 32-bits and 44 kHz.

2.3 Procedure and analysis

At the beginning of the session, the participants received instructions about the study and gave their informed consent. Prior to the lexical decision task, the participants received instructions on the screen in the language of the task. They were instructed to indicate whether a sequence of sounds was an existing word in Dutch or Turkish (depending on the language of the task) by pressing a button as quickly as possible (left = ‘no’, right = ‘yes’). A fixation point appeared on the screen for 200 ms, followed by a beep, which lasted 190 ms. The stimulus appeared 400 ms after the beep, and the participants had to react within 3000 ms. The intertrial interval was set at 1500 ms. The experiment was divided in 4 blocks, with 90 trials per block.

The stimuli were pseudo-randomized and each participant received a different list. Prior to the task, there was a practice session with 4 cognates, 5 control words, and 9 non- words. In total, the lexical decision task lasted approximately 25 minutes.

The response times were measured from the onset of the syllable. RTs lower than 500 ms and higher than 2000 ms (3.92% of the Dutch data, and 2.31% of the Turkish data) and incorrect responses (15.29% of the Dutch data, and 13.86% of Turkish data) were excluded from the analysis (Tables 6 and 7). The accuracy rates per condition are given in Tables 6 and 7, for Dutch and Turkish, respectively. Subsequently, the data from two participants of the Turkish task were discarded, because these participants had less than 70% correct responses. Furthermore, three items were discarded from the analysis of the Dutch task and the Turkish task. For both languages, two cognates in the PEN PEN condition (Turkish *korpus* - Dutch *corpus,* 'corpus', and Turkish *dogma* - Dutch *dogma,* 'dogma') were discarded. Moreover, the Dutch control word *respijt,* 'delay, notice' was excluded from the ULT ULT condition in the Dutch task, and the Turkish control word *kıymık,* 'splinter' was excluded from the ULT PEN condition in the Turkish task. The reaction time (RT) analysis is based on 3231 data points for Dutch, and 2787 data points for Turkish.

For the statistical analysis of the RT data, mixed-effects models were used with the lmerTest package (Kuznetsova, Brockhoff, & Bojesen Christensen, 2014) in R (R Core Team, 2014). Different models were compared with the *anova* function.

Table 4. ***Mean frequency, duration (in ms), and number of phonemes for the items in the Dutch lexical decision task. Standard deviations appear in parentheses.***

	Cognates			**Control words**			**Non-words**		
	PEN PEN	**ULT PEN**	**ULT ULT**	**PEN PEN**	**ULT PEN**	**ULT ULT**	**PEN PEN**	**ULT PEN**	**ULT ULT**
Frequency	2.14 (0.46)	2.15 (0.57)	2.11 (0.54)	2.17 (0.54)	2.18 (0.48)	2.14 (0.53)			
Duration	585 (78)	593 (81)	634 (72)	608 (95)	609 (85)	631 (58)	714 (89)	702 (92)	729 (64)
Number of phonemes	5.04 (0.96)	5.6 (0.93)	5.23 (0.63)	5.47 (0.78)	5.37 (0.85)	5.72 (0.92)	5.28 (0.83)	5.38 (0.64)	5.48 (0.7)

Note: Frequency is based on the Log10 frequency in SUBTLEX-NL (Keuleers, Brysbaert, & New, 2010).

Table 5. ***Mean frequency, duration (in ms) and number of phonemes for the items in the Turkish lexical decision task. Standard deviations appear in parentheses.***

	Cognates			Control words			Non-words		
	PEN PEN	ULT PEN	ULT ULT	PEN PEN	ULT PEN	ULT ULT	PEN PEN	ULT PEN	ULT ULT
Frequency				60 (183)	75 (214)	71 (182)			
Duration	714 (89)	705 (90)	714 (89)	691 (106)	700 (76)	706 (85)	711 (68)	722 (87)	701 (72)
Number of phonemes	4.96 (0.96)	5.57 (0.90)	5.13 (0.68)	4.53 (0.51)	5.03 (0.63)	5 (0.74)	4.88 (0.58)	4.93 (0.58)	4.97 (0.61)

Note: Turkish word frequencies are given in occurrences per million. They are based on a corpus of 32,981,882 words (Dave, 2012).

Table 6. ***Accuracy rates for the Dutch lexical decision task.***

	Cognates			Control words			Non-words		
	PEN PEN	ULT PEN	ULT ULT	PEN PEN	ULT PEN	ULT ULT	PEN PEN	ULT PEN	ULT ULT
Incorrect responses	118	87	95	107	104	137	152	130	171
Missing values	3	3	4	3	1	4	9	11	9
Correct responses	479	510	501	490	495	459	1039	1059	1020
Total	600	600	600	600	600	600	1200	1200	1200
% accurate	79.83	85	83.5	81.67	82.5	76.5	86.58	88.25	85

Note: Missing values are reaction times below 500 ms and higher than 2000 ms.

Table 7. ***Accuracy rates for the Turkish lexical decision task.***

	Cognates			Control words			Non-words		
	PEN PEN	ULT PEN	ULT ULT	PEN PEN	ULT PEN	ULT ULT	PEN PEN	ULT PEN	ULT ULT
Incorrect responses	163	98	118	167	102	83	92	111	114
Missing values	23	20	11	8	8	10	24	34	37
Correct responses	444	512	501	455	520	537	1144	1115	1109
Total	630	630	630	630	630	630	1260	1260	1260
% accurate	70.48	81.27	79.52	72.22	82.54	85.24	90.79	88.49	88.02

Note: Missing values are reaction times below 500 ms and higher than 2000 ms.

2.4 EEG recording

EEGs were recorded using 32 electrodes, with the TP electrode as ground. The reference electrode was placed at the right mastoid, and the EEGs were subsequently re-referenced to the average of the two mastoids. EOG electrodes were placed above and below the left eye, and to the side of the eyes to control for artifacts caused by eye-movements. The EOGs and EEGs were recorded at 500 Hz, with a high pass filter of .016 Hz. Furthermore a low-pass filter of 30 Hz was used offline.

Incorrect responses were excluded from the analyses, and trials with eye-movement artifacts were corrected with ICA (Independent Component Analysis) ocular correction. Segments with voltage changes of +/- 75 µV were also removed. In total, 7.42% of the Dutch data and 15.15% of the Turkish data were excluded from the analysis. Next, based on artifact rejection, data from five participants of the Dutch task, and six participants of the Turkish task were excluded. The analysis presented here is thus based on fifteen participants for each language, with a total of 2284 word trials and 2289 non-word trials for Dutch and 1899 word trials and 2108 non-word trials for Turkish. Grand averages were calculated from the onset of the stimulus till 1100 ms after the onset. A baseline of 200 ms before the onset of the stimulus was used.

For the statistical analysis, repeated-measures ANOVAs were used. Time windows were selected based on visual inspection. The factors included in the analysis were Word (‘yes’, ‘no’), Cognate (‘yes’, ‘no’), and Stress Condition (‘PEN PEN’, ‘ULT PEN’, and ‘ULT ULT’). The ANOVAs were computed at a subset of the midline electrodes (Fz, FCz, Cz, Pz), or the quadrants: left frontal (F3, FC1, FC5), right frontal (F4, FC2, FC6), left parietal (P3, CP1, CP5), or right parietal (P4, CP2, CP6).

3. Results

3.1 Rating studies

For Dutch, independent t-tests showed that the cognate conditions did not differ significantly from each other in subjective frequency ($p > .05$). Moreover, the control conditions did not differ significantly from each other ($p > .05$). Finally, there were no significant differences between the cognates and the control words ($p > .05$) (Table 8).

For the Turkish task, independent t-tests showed significantly different results for the cognates in the PEN PEN and the ULT PEN conditions ($p = .048$), with significantly higher ratings for the cognates in the ULT PEN condition than for those in the PEN PEN condition (Table 8). The frequency ratings for the other cognate conditions were not significantly different ($p > .05$). The control conditions did not differ significantly from each other ($p > .05$). For the ULT ULT condition, the cognates and the control words differed significantly from each other ($p = .006$), with higher ratings for the control words (Table 8). For the other conditions, there were no significant differences between the cognates and the control words ($p > .05$) (Table 8). Because there was a discrepancy between frequency ratings based on the corpora and the subjective frequency ratings, subjective frequency was added as a factor in the regression model (see Section 2.2).

For semantic similarity, all the cognates were rated as highly similar. For both tasks, there were no significant differences between the stress conditions ($p > .05$) (Table 8). Similarly, the cognates were phonologically very similar. There were no significant differences between the stress conditions ($p > .05$) in Dutch and Turkish (Table 8).

Table 8. ***Mean subjective frequency rating, semantic similarity rating, and phonological similarity rating of the items in the three stress conditions in the Dutch task and the Turkish task. Standard deviations appear in parentheses.***

		Dutch task			**Turkish task**		
		PEN PEN	**ULT PEN**	**ULT ULT**	**PEN PEN**	**ULT PEN**	**ULT ULT**
Subjective frequency	Cognates	3.93 (1.13)	4.42 (1.24)	4.35 (1.13)	3.62 (1.07)	4.2 (1.12)	3.92 (1.02)
	Control words	4.29 (1.51)	3.82 (1.44)	3.92 (1.45)	4.11 (1.69)	4.39 (1.46)	4.82 (1.38)
Semantic similarity	Cognates	6.76 (0.53)	6.72 (0.57)	6.34 (1.04)	6.82 (0.39)	6.77 (0.77)	6.56 (0.83)
Phonological similarity	Cognates	5.93 (0.80)	5.96 (0.60)	6.12 (0.91)	5.92 (0.87)	5.86 (0.61)	6.11 (0.83)

Note: in the frequency rating, 1 = ‘absolutely never’ and 7 = ‘very often’. In the semantic similarity and the phonological similarity ratings, 1 = ‘no similarity at all’ and 7 = ‘perfect similarity’.

3.2 Reaction times

3.2.1 Dutch lexical decision task

In the ULT ULT and ULT PEN conditions in Dutch, the responses to cognates were significantly faster than those to control words (p = .0005, and p = .0001, respectively), that is, there was a cognate facilitation effect in these two stress conditions. However, there was no cognate facilitation in the PEN PEN condition. In the PEN PEN condition, the responses to the control words were slightly faster, but the difference between cognates and control words in this condition did not reach significance (Table 9).

For the statistical analysis of the RT data, we used mixed-effects regression modeling with the lmerTest package (Kuznetsova, Brockhoff, & Bojesen Christensen, 2014) in R (R Core Team, 2014). We fitted different models, which we compared with the *anova* function in R. A new factor 'residual Cognate Status' (Cognate-r) was created, of which the contributions of duration and subjective frequency were taken out. The variables Cognate and Cognate-r were highly correlated (r = .994). For the Dutch analysis, the random factors were Subject and Item. Random slopes were added for Subjective Frequency to account for variation in responses to different items (Barr, Levy, Scheepers, & Tily, 2013). The fixed effects were Cognate-r ('yes', 'no'), Stress Condition ('PEN PEN', 'ULT PEN', and 'ULT ULT'), Subjective Frequency, Duration, and BNT score for Turkish (Table 10).

Subjective Frequency and Duration were added to the model, because it was hypothesized that they might have an effect on cognate processing and because there were some significant differences between the stress conditions with respect to these factors (see Section 2.2). The BNT score for Turkish was also added, because we hypothesized that language proficiency could have an effect. Other factors, such as language proficiency ratings in Turkish and Dutch and the BNT score for Dutch did not lead to an improved fit of the model, as tested with the *anova* function in R. That is, these factors did not explain the data better.

There was a significant effect of Subjective Frequency and Duration (p < .001): Items with a lower subjective frequency and a longer duration were processed slower. Moreover, there was a significant interaction between Cognate-r and Stress Condition. Post-hoc analyses showed that there were significant differences between the PEN PEN and ULT PEN conditions (p = .035), and between the PEN PEN and ULT ULT conditions (p = .032), indicating a cognate facilitation effect for the ULT PEN and the ULT ULT conditions, but not for the PEN PEN condition. This is a striking finding, because the PEN PEN condition has congruent stress across the two languages. The items in this condition have typical stress in Dutch, but atypical stress in Turkish.

The items in the ULT PEN condition also have penultimate stress in Dutch, yet the results were different from those of the PEN PEN condition.[6] We will come back to this in the discussion. The ULT PEN and the ULT ULT conditions, which have typical ultimate stress in Turkish, were more similar in RT: There was no significant difference between these stress conditions. Interestingly, the inclusion of the factor BNT scores for Turkish improved the model: Lower scores on the BNT in Turkish were associated with longer RTs in Dutch. However, this factor did not have a significant effect within the model.

[6] Because Duration and Number of Phonemes could not be completely matched across stress conditions (see Section 2.2), we analyzed a subset of the data consisting of 26 items per condition and 2831 data points in total. The new stress conditions were matched on all relevant dimensions. The results of this analysis showed the same pattern as the analysis based on 3231 items, with significantly faster responses to cognates than to control words in the ULT PEN and ULT ULT conditions (p = < .001 and p = .001, respectively). In the PEN PEN condition, responses to cognates were 21 milliseconds slower than to control words, but the difference between cognates and control words was not significant in this stress condition. The random factors in the regression analysis were Subject and Item, and a slope was added for Subjective Frequency. The fixed factors were Cognate-r, Stress Condition, Subjective Frequency, Duration, and Turkish BNT. There were significant effects of Subjective Frequency ($p < .001$) and Duration ($p < .001$), and an interaction between Cognate-r and Stress Condition. Specifically, there was a significant difference between the ULT ULT and the PEN PEN conditions (p = .039). As in the main analysis based on 3231 data points, the difference between the ULT PEN and the ULT ULT conditions was not significant (p = .783). Unlike in the main analysis based on 3231 data points, however, the difference between the PEN PEN and the ULT PEN conditions did not reach significance (p = .072). The effect of the Turkish BNT scores was not significant (p = .078). In sum, the analysis of a subset of the data, in which the conditions were matched for the relevant factors, largely supports the analysis reported in the main text.

Table 9. ***Reaction times (means and standard deviations, in milliseconds) for the Dutch lexical decision task.***

	PEN PEN	ULT PEN	ULT ULT
Cognates	940 (197)	870 (190)	907 (205)
Control words	925 (223)	932 (223)	957 (223)

Table 10. ***Effects on reaction times in the Dutch lexical decision task.***

Fixed effect	*β*	*t* (df)	*p*
Cognate-r	27.85275	1.163 (154.42)	.247
StressConditionUP (Intercept: StressConditionPP)	-21.36907	-1.284 (152.46)	.201
StressConditionUU (Intercept: StressConditionPP)	-12.84978	-0.755 (154)	.451
Subjective frequency	-39.06424	-6.835 (106.23)	< .001 ***
Duration	0.71719	8.121 (157.21)	< .001 ***
BNT Turkish	-2.24816	-1.863 (17.76)	.079
Cognate-r * StressConditionUP	-71.22475	-2.126 (152.96)	.035 *
Cognate-r * StressConditionUU	-72.83980	-2.162 (154.20)	.032 *

3.2.2. Turkish lexical decision task

Overall, the RTs in the Turkish task were longer than in the Dutch task, indicating slower processing in Turkish than in Dutch, which is the participants' dominant language. Moreover, in all stress conditions, cognates were processed slower than control words, as is evident from the longer RTs for cognates (Table 11). The difference between control words and cognates was significant in the three stress conditions ($p < .001$ for the PEN PEN condition, $p = .002$ for the ULT PEN condition, and $p = .006$ for the ULT ULT condition).

Given that the results for the two conditions with ultimate stress in Turkish (ULT PEN and ULT ULT) were similar, a factor Ultimate Stress in Turkish ('yes', 'no') combining the conditions ULT PEN and ULT ULT was created. This factor explained the data better than the variable Stress Condition ('PEN PEN', 'ULT PEN', and 'ULT ULT'), as determined by the *anova* function in R. As for the Dutch analysis, a new variable Cognate-r was created, from which variation in subjective frequency and duration was taken out. This new variable was strongly correlated with the variable Cognate (r = .961).

The random effects for the mixed effects model were Subject and Item. Random slopes were added for Cognate-r ('yes', 'no'), Ultimate Stress in Turkish ('yes', 'no'), and Subjective Frequency, to control for variation among items and subjects. The fixed effects for the model were Cognate-r ('yes', 'no'), Ultimate Stress in Turkish ('yes', 'no'), Subjective Frequency, Duration, and Self-rated proficiency for Listening in Turkish.

The results showed significant effects of Subjective Frequency (p < .001) and Duration (p < .001) (Table 12). As in the Dutch task, items with a lower subjective frequency and a longer duration led to longer RTs. The results did not show an effect of Cognate-r, but there was a significant effect of Ultimate Stress in Turkish (p = .018). That is, words with ultimate stress in Turkish (ULT PEN and ULT ULT) were processed faster than words with penultimate stress in Turkish (PEN PEN). Interestingly, ultimate stress is the typical stress pattern for words in Turkish, indicating that typical stress facilitates processing. Finally, there was a significant effect of Self-rated proficiency for Listening in Turkish (p = .001). That is, participants with a lower proficiency rating for listening in Turkish had longer RTs.[7]

[7] Given that Number of Phonemes and Subjective Frequency were not perfectly matched across conditions (see Section 2.2 and Section 3.1), we did an additional analysis involving a subset of 26 items per condition. This analysis was based on 2514 data points. The patterns of the RT data were similar to the original data reported in the main text. That is, RTs for the cognates were longer than those for the control words in the three stress conditions. The difference between cognates and controls was significant for the PEN PEN condition (p < .001) and the ULT PEN condition (p = .002), but not for the ULT ULT condition (p = .195). The random factors of the mixed-effects model were Subject and Item. Random slopes were added for Cognate-r, Ultimate Stress in Turkish, and Subjective Frequency. The fixed effects were Cognate-r, Ultimate Stress in Turkish, Subjective Frequency, Duration, and Listening in Turkish. The newly created variable Cognate-r was strongly correlated with Cognate (r = .972). There was no significant effect of Cognate-r, but there were significant effects of Ultimate Stress in Turkish (p = .038), Subjective Frequency (p < .001), Duration (p < .001), and Listening proficiency in Turkish (p < .001). This analysis of a subset of the data largely supports the analysis reported in the main text, which is based on 2787 items.

Table 11. ***Reaction times (means and standard deviations, in milliseconds) for the Turkish lexical decision task.***

	PEN PEN	ULT PEN	ULT ULT
Cognates	1135 (271)	1076 (280)	1065 (263)
Control words	1046 (228)	1027 (216)	1021 (238)

Table 12. ***Effects on reaction times in the Turkish lexical decision task.***

Fixed effect	***β***	***t* (df)**	***p***
Cognate-r	30.47584	1.501 (46.24)	.140
Ultimate stress in Turkish	-38.61297	-2.392 (138.71)	.018 *
Subjective frequency	-48.51962	-7.404 (67.01)	< .001 ***
Duration	0.55664	7.006 (165.33)	< .001 ***
Turkish listening	-127.40942	-3.888 (17.04)	.001 **
Cognate * Ultimate stress	-29.17838	-0.904 (164.14)	.367

3.2.3 Summary

For the Dutch task, a cognate facilitation effect was found for ULT PEN and ULT ULT, but not for PEN PEN. Cognates with non-typical stress in Turkish seem to interfere with processing, whereas the cognates with typical stress in Turkish seem to facilitate processing. For the Turkish task, the RTs in general were longer than in Dutch, indicating slower processing in Turkish, which is the participants' non-dominant language. Furthermore, no evidence for a cognate facilitation effect was found for Turkish; rather there seemed to be interference from Dutch, especially in the PEN PEN condition, which has typical stress in Dutch, but non-typical stress in Turkish. For the Turkish task, a significant effect was found for stress position. It thus seems that stress position has an important effect on processing. We come back to this in the next section.

3.3 ERP results

3.3.1. Dutch lexical decision task

Words versus non-words

For the EEG analysis contrasting words versus non-words, a time window between 500 and 900 ms was selected. A repeated-measures ANOVA with the factor Word (‘yes’ or ‘no’) revealed a significantly larger N400 for non-words than for words at both the midline and quadrant electrodes (Table 13 and Figure 2), indicating more semantic integration difficulties for non-words than for words.

Table 13. ***ANOVA results of mean amplitudes for words versus non-words.***

Time window	**Quadrants**	**Midline electrodes**
500-900 ms	$F(1,14) = 53.52$, $p < .0001$	$F(1,14) = 51.96$, $p < .0001$

Cognates versus control words

For cognates versus control words, a time window between 500 and 700 ms was selected. A repeated-measures ANOVA with the factor Cognate (‘yes’ or ‘no’) revealed a significantly larger N400 for control words than for cognates (see Table 14 and Figure 3) at both the midline and quadrant electrodes. Because of the significant interaction between Electrode Site and Cognate for the Quadrants electrodes, we conducted pair-wise comparisons, which revealed that the effect was only significant at the right parietal and left parietal electrodes (Table 15). The smaller N400 for cognates than for control words is interpreted as a cognate facilitation effect in Dutch.

Table 14. ***ANOVA results of mean amplitudes for cognates versus control words.***

Time window	Quadrants	Midline electrodes
500-700 ms	F(1,14) = 6.81, $p < .05$ Electrode Site * Cognate: F(3,42) = 5.85, $p < .01$	F(1,14) = 4.96, $p < .05$

Table 15. ***Posthoc test: pair-wise comparisons (Bonferroni corrected) for cognates versus control words regarding the quadrant electrodes.***

Time window	Right frontal	Left frontal	Right parietal	Left parietal
500-700 ms	F(1,14) = 5.03, $p = .042$	F(1,14) = 0.67, $p = .427$	F(1,14) = 12.49, $p = .003$ *	F(1,14) = 8.32, $p = .012$ *

Note: Applying Bonferroni correction, the level of significance is adapted to $p < .0125$

Stress position within cognates

For cognates with PEN PEN, ULT PEN, or ULT ULT stress, a time window between 450 and 800 ms was selected. A repeated-measures ANOVA with the factor Stress Condition (‘PEN PEN’, ‘ULT PEN’, or ‘ULT ULT’) revealed significant effects at both the midline and quadrant electrodes (Table 16 and Figure 4). However, pair-wise comparisons revealed that the effect was only significant at the quadrant electrodes. At these electrodes, there were significant differences between the three stress conditions, with the largest N400 for the PEN PEN condition, followed by the ULT PEN condition. The ULT ULT condition yielded the smallest N400, indicating fewer semantic integration difficulties for this condition, which has congruent stress across the two languages. Interestingly, the other congruent stress condition (PEN PEN) resulted in a larger N400, which is not in line with our hypothesis. Note that these results are in line with the results of the RT data, which also showed a different effect for the PEN PEN condition. In particular, the RT data showed cognate facilitation for ULT ULT and ULT PEN, but not for PEN PEN.

Table 16. ***ANOVA results of mean amplitudes for Stress position within cognates.***

Time window	Quadrants	Midline electrodes
450-800 ms	F(2,28) = 4.40, $p < .05$	F(2,28) = 4.46, $p < .05$
	Pair-wise comparisons:	Pair-wise comparisons:
	PEN PEN vs ULT PEN: $p < .02$	PEN PEN vs ULT PEN: $p > .05$
	PEN PEN vs ULT ULT: $p < .0001$	PEN PEN vs ULT ULT: $p > .05$
	ULT PEN vs ULT ULT: $p < .05$	ULT PEN vs ULT ULT: $p > .05$

Note: P-values for pair-wise comparisons of the three levels of Stress Position are Bonferroni-corrected by means of the pair-wise t-test function in R.

Stress position within control words

For control words with PEN PEN, ULT PEN, or ULT ULT stress (that is, penultimate stress for the first two stress conditions, and ultimate stress for the latter stress condition), a time window between 400 and 600 ms was selected. A repeated-measures ANOVA with the factor Stress Position ('PEN PEN', 'ULT PEN', or 'ULT ULT') revealed significant effects at both the midline and quadrant electrodes (Table 17 and Figure 5). Pair-wise comparisons revealed that, for all electrode sites, the N400 was significantly larger for both conditions with penultimate stress (PEN PEN and ULT PEN) than for the condition with ultimate stress (ULT ULT). This finding also points towards an effect of stress position.

Table 17. ***ANOVA results of mean amplitudes for Stress Position within control words.***

Time window	Quadrants	Midline electrodes
400-600 ms	F(2,28) = 6.54, $p < .01$	F(2,28) = 7.09, $p < .01$
	Pair-wise comparisons:	Pair-wise comparisons:
	PEN PEN vs ULT PEN: $p > .05$	PEN PEN vs ULT PEN: $p > .05$
	PEN PEN vs ULT ULT: $p < .0001$	PEN PEN vs ULT ULT: $p < .05$
	ULT PEN vs ULT ULT: $p < .0001$	ULT PEN vs ULT ULT: $p < .01$

Fig. 2. Grand averages of ERPs for words versus non-words (Dutch task). Negative is ploted upwards. The non-words (solid line) show a larger N400 than the words (dashed line) at all electrode sites.

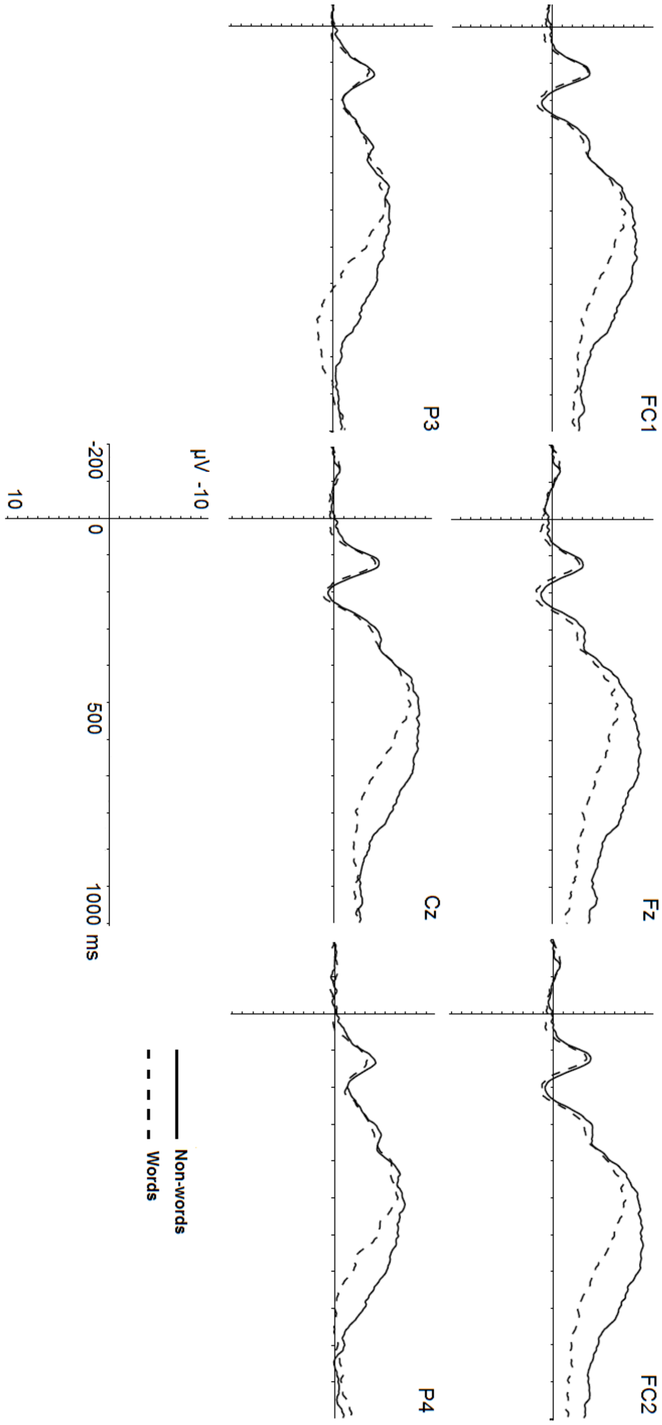


Fig. 3. Grand averages of ERPs for cognates versus control words (Dutch task). Negative is plotted upwards. The control words (solid line) show a larger N400 than the cognates (dashed line) at the Midline electrodes (Fz and Cz) and at the left parietal (P3) and right parietal (P4) Quadrant electrodes.

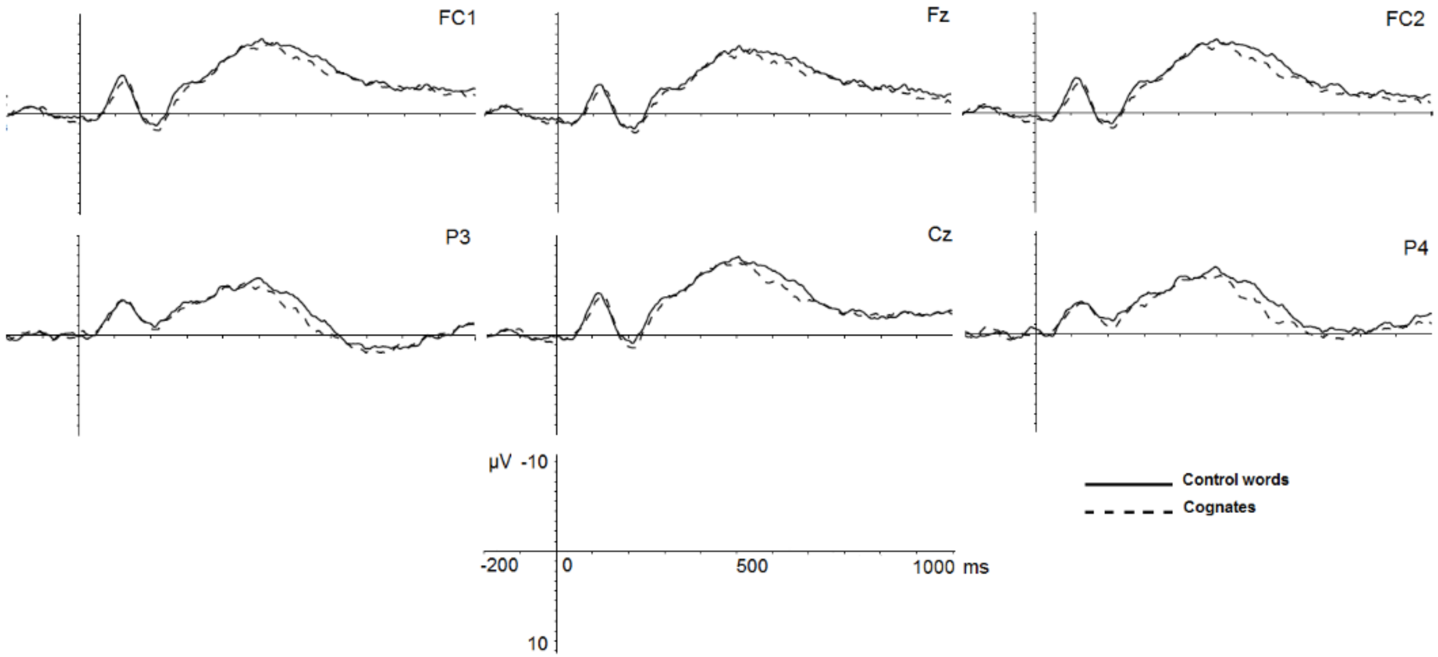


Fig. 4. Grand averages of ERPs for the three stress conditions within cognates (Dutch task). Negative is plotted upwards. The PEN PEN condition (solid line) shows the largest N400, followed by the ULT PEN condition (dashed line); ULT ULT (dotted line) shows the smallest N400. The differences are only significant at the Quadrant electrodes (FC1, FC2, P3, and P4), not at the Midline electrodes (Fz and Cz).

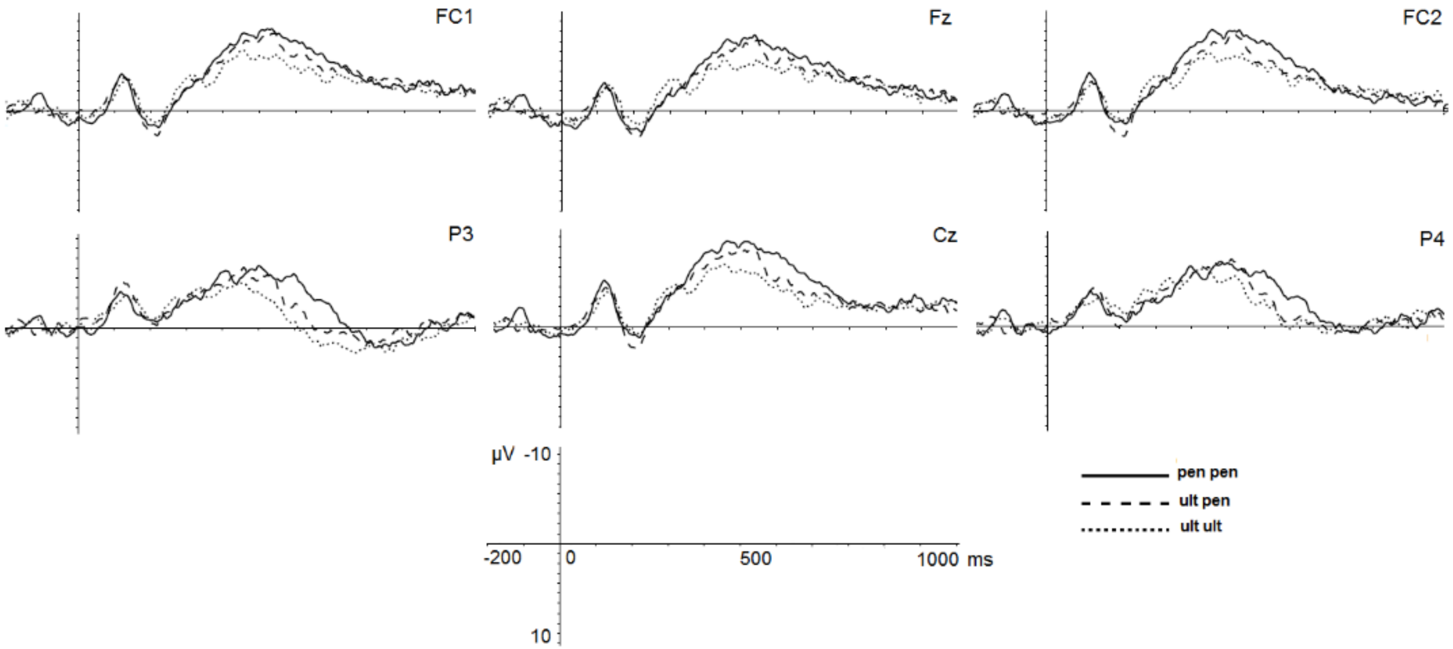
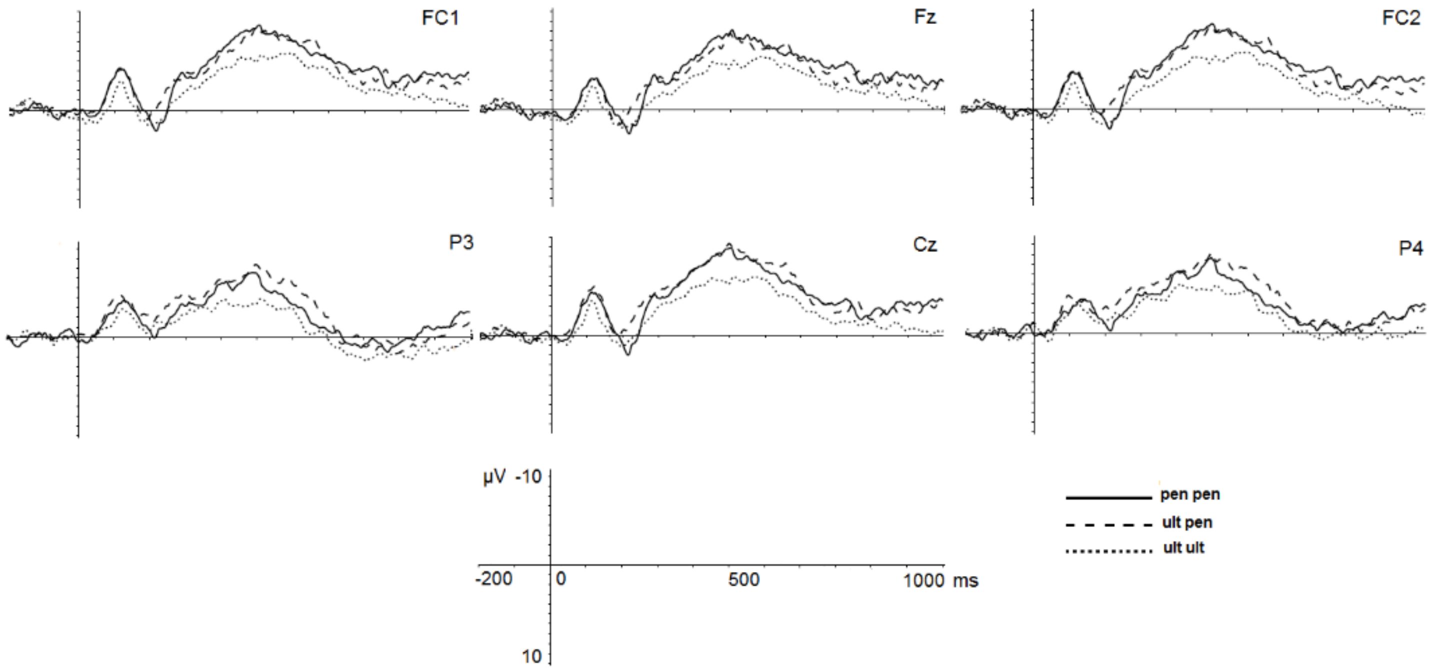


Fig. 5. Grand averages of ERPs for the three stress conditions within the control words (Dutch task). Negative is plotted upwards. For all electrode sites, the PEN PEN (solid line) and ULT PEN conditions (dashed line) (i.e., the words with penultimate stress in Dutch), show a larger N400 than the ULT ULT condition (dotted line) (i.e., the only words with ultimate stress in Dutch).



3.3.2. Turkish

Words versus non-words

To analyze the EEG data for Turkish words versus non-words, a time window between 500 and 900 ms was selected. Similar to the Dutch task, the repeated-measures ANOVA with the factor Word ('yes' or 'no') revealed a significantly larger N400 for non-words than for words at both the midline and quadrant electrodes (Table 18 and Figure 6).

Table 18. ***ANOVA results of mean amplitudes for words versus non-words.***

Time window	Quadrants	Midline electrodes
500-900 ms	$F(1,14) = 14.44$, $p < .01$	$F(1,14) = 15.94$, $p < .01$

Cognates versus control words

For cognates versus control words, time windows between 500 and 700 ms and between 500 and 900 ms were selected. Unlike for the Dutch task, repeated-measures ANOVAs with the factor Cognate ('yes' or 'no') revealed that there were no significant differences between cognates and control words in the Turkish task. Recall that the RT data did not show a cognate facilitation effect for Turkish (the non-dominant language) either. Rather, processing of cognates was slower than that of control words.

Stress position within cognates

For cognates with PEN PEN, ULT PEN, or ULT ULT stress, a time window between 300 and 500 ms was selected. A repeated-measures ANOVA with the factor Stress position ('PEN PEN', 'ULT PEN', or 'ULT ULT') revealed significant effects at the quadrant electrodes, but not at the midline electrodes (Table 19 and Figure 7). At the quadrant electrodes, there were significant differences between the three stress conditions, with a larger N400 for the PEN PEN condition than for the other two conditions. The ULT PEN and ULT ULT conditions did not significantly differ from each other. Although PEN PEN is a congruent stress condition, it is the only condition with penultimate stress in Turkish. This atypical stress pattern in Turkish seems to have an effect on processing.

Table 19. ***ANOVA results of mean amplitudes for Stress position within cognates.***

Time window	Quadrants	Midline electrodes
300-500 ms	F(2,28) = 3.66, $p < .05$ Pair-wise comparisons: PEN PEN vs ULT PEN: $p < .0001$ PEN PEN vs ULT ULT: $p < .001$ ULT PEN vs ULT ULT: $p > .05$	F(2,28) = 2.19, $p > .05$

Stress position within control words

For control words with PEN PEN, ULT PEN, or ULT ULT stress (that is, penultimate stress for the first stress condition, and ultimate stress for the latter two stress conditions), a time window between 300 and 700 ms was selected. However, a repeated-measures ANOVA with the factor Stress Position (‘PEN PEN’, ‘ULT PEN’, or ‘ULT ULT’) revealed that there were no significant differences between the stress conditions at both the midline and quadrant electrodes.

Fig. 6. Grand averages of ERPs for words versus non-words (Turkish task). Negative is plotted upwards. The non-words (solid line) show a larger N400 than the words (dashed line).

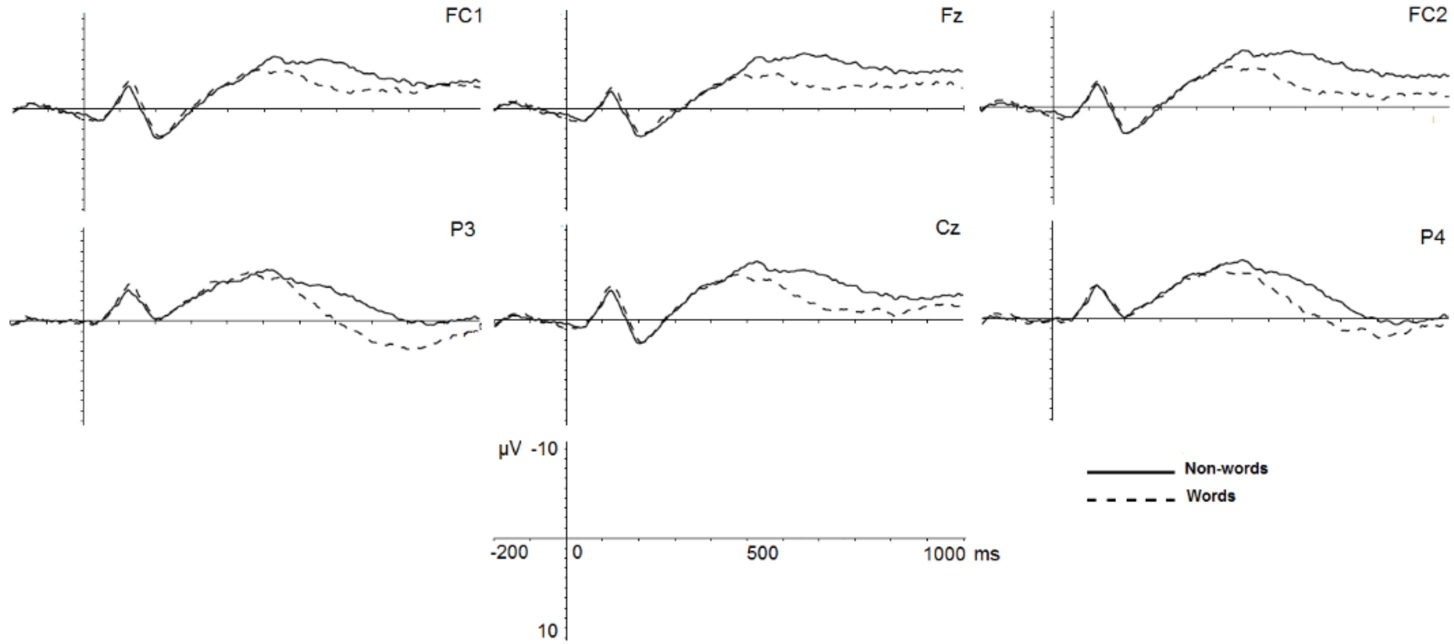
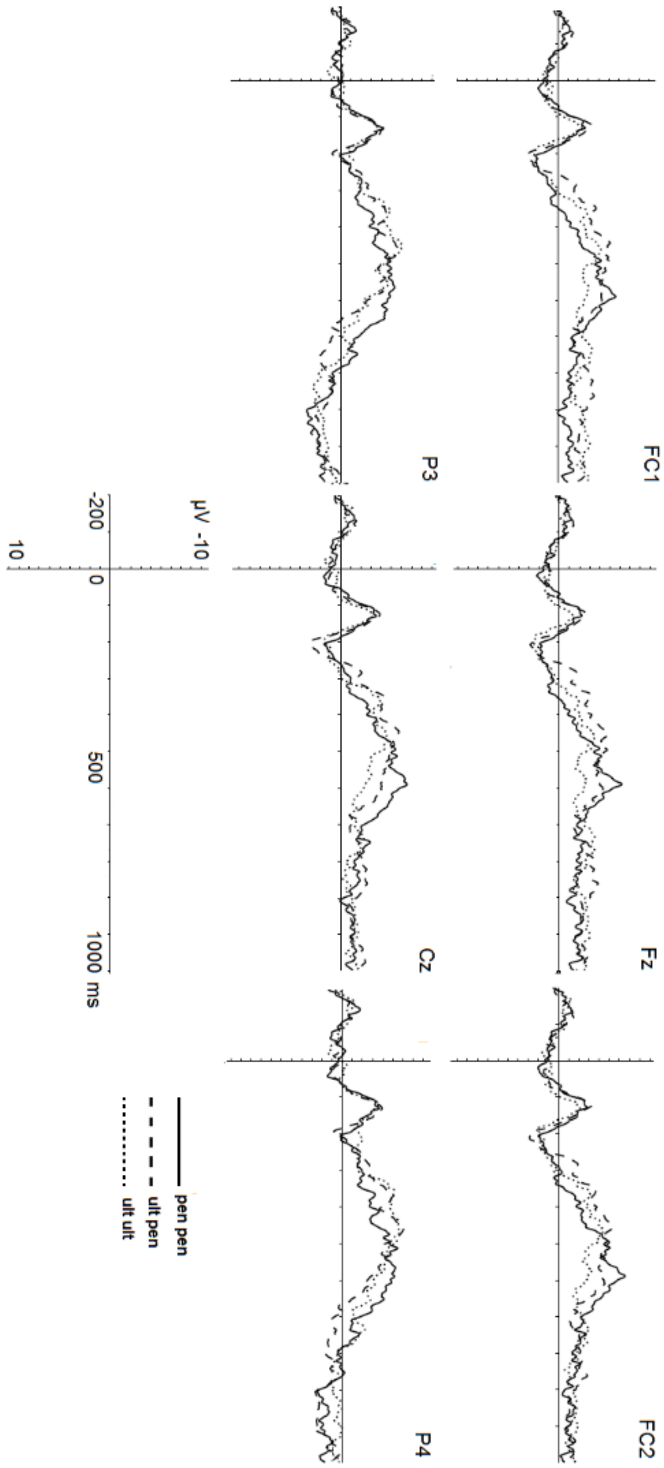


Fig. 7. Grand averages of ERPs for the three stress conditions within cognates (Turkish task). Negative is plotted upwards. The PEN PEN condition (solid line) shows a larger N400 than the ULT PEN (dashed line) and ULT ULT (dotted line) conditions. These differences are only significant at the Quadrant electrodes (FC1, FC2, P3, and P4), not at the Midline electrodes (Fz and Cz).



4. Discussion

This study examined the role of word stress position in bilingual auditory processing of Turkish-Dutch cognates, in Turkish and Dutch. The experiments addressed the following three questions: (1) Is there evidence for a processing difference between cognates and non-cognates in bilingual auditory word recognition?; (2) What is the effect of stress position in the two languages on the bilingual processing of cognates?; and (3) Do similar effects occur while processing in the weaker L1 Turkish and while processing in the dominant L2 Dutch? We answer these questions in the following sections. Because the third question is related to the first two questions, we address question (3) while answering questions (1) and (2).

4.1 Is there evidence for a processing difference between cognates and non-cognates in bilingual auditory word recognition?

In the present study on bilingual auditory word recognition with Dutch heritage speakers of Turkish, we did indeed obtain different results for cognates and non-cognates. Cognate effects arose in both Turkish and Dutch, but the direction of the effect (facilitation or inhibition) was different for the two languages. Specifically, for Dutch, the RTs revealed cognate facilitation for ULT PEN and ULT ULT conditions. This cognate facilitation was further supported by the EEG data, with a larger N400 for control words than for cognates, indicating smaller lexical-semantic integration difficulties for cognates than for control words. By contrast, in Turkish, the RTs indicated cognate inhibition in all conditions. The non-significant difference between the N400 for cognates and control words was not in support of a cognate effect.

These findings are to some extent similar and to some extent different from those in visual studies with unbalanced, late bilinguals. With respect to the L2, our findings of facilitation correspond to those in the earlier studies (e.g., Dijkstra et al., 2010; Peeters et al., 2013; Voga & Grainger, 2007). With respect to the L1, however, we observed cognate inhibition effects, while many bilingual studies reported null-effects for cognates in the L1. How can we explain this difference in results across studies?

Let us first consider the theoretical account proposed by earlier studies for how bilinguals process visually presented cognates (e.g., Dijkstra & Van Heuven, 2002; Dijkstra et al., 2010; Voga & Grainger, 2007). According to this account, when a cognate from one language is visually presented, it activates a cognate word form representation in both languages, together with other word candidates that resemble the input to some extent. The speed and degree of activation of the candidates in each language depend on several factors, such as language dominance, word frequency, and segmental overlap between representations. The cognate results reported in the literature indicate that more segmental overlap between input and word candidate leads to more lexical activation, irrespective of language membership, while the presence of co-occurring segmental differences does not 'switch off' all activation of a non-target language cognate member. Subsequently, the activated representations of the cognates spread activation to their shared semantic representation. This representation is more strongly activated for cognates than for non-cognates, because in the case of cognates two lexical items contribute to the activation of the shared semantic representation. Next, the activated semantic representation sends feedback to the orthographic (or phonological) level, which leads to additional activation of the cognate forms in both languages. Finally, the lexical representation in the target language is selected for recognition when its activation surpasses a critical threshold. The language membership of an activated word candidate is available in the language nodes linked to the activated cognate forms in both languages.

Because in unbalanced late bilinguals the strong L1 cognate is activated before and to a larger extent than the weaker L2 cognate, the orthographic-semantic resonance results in a cognate facilitation effect for L2 targets. In general, a null-effect is found for L1 targets, because the L1 cognate target is recognized so early that its less activated L2 counterpart contributes relatively little activation to linked representations (e.g., Dijkstra et al., 2010; Peeters et al., 2013; Voga & Grainger, 2007).

When we apply this account to the present data, our finding of L2 inhibition effects in heritage speakers is puzzling. For these speakers, proficiency in both languages should be relatively high, but if there then is more co-activation between the L1 and L2, why did we not observe cognate *facilitation* effects in the L2 (as predicted in the introduction)?

It turns out that the processing account for the visual modality discussed above can account for the earlier and present result patterns, if one additional assumption is made: The language membership of a word is checked sequentially in the order L1 - L2 in any case a representation is highly activated, and because this check takes time, it may slow down responding.

This assumption, pertaining to the task demands of monolingual and bilingual lexical decision, is not new. It has already been proposed by Dupoux and Mehler (1992) that, although co-activation of candidates in word recognition is a parallel process, subsequent selection and decision processes may be sequential.

In the (visual) studies with unbalanced late bilinguals, the L1 cognate representation is relatively strong and its L2 counterpart relatively weak. Take for instance the case of Dutch-English late bilinguals. When the target language is the L2 (English), a negative language check for the active L1 (Dutch) word is quickly made, while activation in the word recognition system continues to be spread to the L2 (English). This results in the observed cognate facilitation effects for the L2 (English). The L1 check takes time, but this is compensated by longer-lasting spreading activation from the strong L1 to the weak L2. When the target language in the task is the L1 (Dutch), the response can be given before sufficient L2 (English) activation arises, which would make a language check for English necessary. This results in null-effects for cognates versus non-cognates.

In our study with heritage speakers, there are two relatively active cognate representations. When the target language in the task is the L2 (Dutch), the L1 (Turkish) is checked before the L2 (Dutch) and the activated L1 (Turkish) representation is rejected, while activation spreading to the L2 (Dutch) proceeds. As before, this results in cognate facilitation. When the target language is the L1 (Turkish), however, the check of the L1 is followed by a check of the L2 (Dutch), because Dutch is highly activated because it is the heritage speakers' dominant language. As a consequence, this sequential checking process results in cognate inhibition effects. The time-consuming double language check in the case of L1 targets cannot be fully compensated by the relative high frequency of the cognates in the L2.

The double check and slower RTs for L1 Turkish might also be a consequence of insecurity on the part of the Turkish-Dutch participants about the origin of the presented cognates. After the experiment, some participants reported that sometimes they were not sure whether a Turkish cognate was a real word in Turkish or whether they used it because of Dutch. Further support for the important role of the L1 in our participant group comes from the fact that the model fit of the Dutch RT pattern improved when the Turkish BNT scores were added to the model. In other words, an increased vocabulary knowledge of Turkish to a certain extent accounts for word processing in Dutch.

In line with our theoretical account, we note that cognate inhibition effects in late bilinguals have been found when the co-activation of the L2 was affected by experimental manipulation. For instance, Dijkstra, Van Hell, and Brenders (2014) observed cognate inhibition effects for Dutch L2 learners of English when presented with a Dutch cognate that was preceded by an English sentence. Whereas in Dijkstra et al. (2014) activation of the L2 was enhanced only temporarily, in the heritage speakers of our study, the degree of resting level activation is always higher in the dominant L2 than in the L1.

In all, the combination of visual and auditory studies suggests that not language dominance, but the status of the L1 (i.e., the language that was acquired first) plays a primary role in bilingual word recognition. Thus, although the L2 Dutch was the dominant language in the participants of this study, co-activation of the L1 led to cognate facilitation.

4.2 What is the effect of stress position in the two languages on the bilingual processing of cognates?

Beside cognate effects, we observed effects of word stress position. In the Dutch task, the RTs indicated cognate facilitation for ULT PEN and ULT ULT, but not for PEN PEN. Moreover, the EEG data showed the least negative N400 for ULT ULT, and the most negative N400 for PEN PEN. The ULT PEN condition was in between, hence it was more negative than ULT ULT, but less negative than PEN PEN. Likewise, in the Turkish task, we found cognate inhibition for all conditions, but more inhibition for PEN PEN than for ULT PEN and ULT ULT. Again, the most negative N400 was found for PEN PEN. If a more negative N400 can be interpreted as evidence of more cognitive effort in lexical semantic integration, this implies, in line with the RT data, more problems with the PEN PEN condition, in both Turkish and Dutch. This seems somewhat unexpected, because we predicted that cognates with congruent stress would lead to more cognate facilitation than cognates with incongruent stress, under the assumption that stress congruence leads to larger overlap between representations in both languages. Yet, the two congruent stress conditions (i.e., PEN PEN and ULT ULT) differed more from each other than from the only incongruent condition. To explain these results, we need to make two observations. First, beside differences in the presence of subphonemic cues as described in the introduction, we have to consider another essential difference between visual and auditory word recognition. Whereas a visually presented word comes in as a whole, the processing of an auditorily presented word is sequential and goes through the word from left (onset) to right (offset). That is, with the onset of the first phoneme, the process of word recognition starts. As discussed in the introduction, this greatly impacts the activation of competing candidates. For instance, as soon as the listener perceives word stress on the first syllable, candidates that carry non-initial stress can be reduced in activation or even ruled out (e.g., Reinisch et al., 2010). The second observation relates to the differences in word stress position in the cognates of this study. Not only did the cognates differ regarding stress congruence across Turkish and Dutch, but there were also differences in stress position within one language. Assuming that the number of competing candidates depends on the position of stress (e.g., Reinisch et al., 2010), cognates with penultimate stress in Dutch (i.e., PEN PEN and ULT PEN) cannot be directly compared to cognates with ultimate stress (i.e., ULT ULT). Likewise, in Turkish, the direct comparison between cognates with ultimate stress (i.e., ULT PEN and ULT ULT) is possible, but comparing these cognates to cognates with penultimate stress (i.e., PEN PEN) is less adequate.

In Dutch, we found a more negative N400 for PEN PEN than for ULT PEN. Following Reinisch et al., (2010) we assume that processing words with penultimate stress leads to the removal of competing candidates with ultimate stress as soon as the word stress on the first syllable is perceived. However, the cognate facilitation effect that we found for ULT PEN indicates that there was co-activation of the Turkish cognate to strengthen the semantic representation, in spite of stress incongruence. In other words, although the co-activation of the Turkish cognate with ultimate stress was reduced in an early stage, it was sufficiently activated to contribute to the strong activation of the shared semantic representation. This indicates that information about segmental overlap and stress congruence are used in different ways. The difference between PEN PEN and ULT PEN shows that stress incongruence did not significantly change the degree of activation of the shared semantic representation, but at the same time it shortened the competition time between candidates. This resulted in cognate facilitation for ULT PEN, but not for PEN PEN.

In addition, the co-activation of the Turkish equivalent with penultimate stress in the PEN PEN condition may have slowed down target selection, because penultimate stress is non-typical stress in Turkish. In fact, some studies on visual word recognition suggest that words with typical stress are processed more easily than words with non-typical stress (e.g., Arciuli & Cupples, 2006; Colombo, 1991). Moreover, the EEG study by Domahs et al. (2013) showed that Turkish L1 speakers in Turkey only detected incorrectly stressed words when stress was placed on non-typical position, i.e., not when it was placed on the ultimate syllable. The authors explained these findings by a “stress deafness” to ultimate stress, because it is predictable stress. If the Turkish heritage speakers in our study are similar to Turkish L1 speakers in Turkey in this respect, and, consequently, process words with ultimate stress differently from words with penultimate stress, it might explain why the co-activation of the Turkish equivalent with penultimate stress led to different results from the co-activation of words with ultimate stress. Specifically, target selection for PEN PEN was slower than for ULT PEN, because penultimate stress is non-typical stress and requires more time. For this reason, the PEN PEN condition resulted in insufficient facilitation to 'beat' initial cross-linguistic competition. For ULT PEN, there was less initial competition, because the overlap in representations was smaller than for the congruent conditions. At the same time, there was facilitation, due to the co-activation of the Turkish equivalent, which had ultimate stress and accelerated the lexical decision process.

Regarding ULT ULT, there was more initial competition, because candidates with penultimate stress were only cancelled out as soon as stress on the second syllable was perceived. However, there was a strong activation of the shared semantic representation due to the large overlap between the Dutch and Turkish cognate. This facilitation was even more enhanced because the co-activated Turkish equivalent had ultimate stress, which is typical stress in Turkish. This facilitation 'beat' the competition that was initially caused by the relatively late cue for word stress position (i.e., on the second syllable).

The findings for the Turkish task can be accounted for in the same way, even though the RT data revealed cognate inhibition effects for all conditions. As before, the PEN PEN condition, which was the only condition with penultimate stress in Turkish, led to more inhibition of the RTs than the other two conditions. In addition, we observed the most negative N400 for the PEN PEN condition.

Again, the amount of competing candidates was reduced earlier in time (i.e., when perceiving stress on the first syllable) for cognates with penultimate stress (PEN PEN) than for cognates with ultimate stress (ULT ULT and ULT PEN). However, the PEN PEN condition led to the co-activation of the Dutch cognate with penultimate stress, and because Dutch was the dominant language, this co-activation was relatively strong. When compared to the activation of the Turkish cognate candidate, the co-activation of Dutch cognates with penultimate stress was even stronger than the co-activation of Dutch cognates with ultimate stress, because penultimate stress is more typical for Dutch, and non-typical for Turkish. Thus, the initial competition in the PEN PEN condition was relatively long. Moreover, the strong co-activation of Dutch slowed down the target selection process, because in spite of the strong co-activation of the L2 , information about the slower L1 was required for target selection, leading to a double language check. Summarizing, the initial long competition together with the delay during target selection explain the relatively large cognate inhibition effect for PEN PEN in Turkish.

For ULT PEN and ULT ULT, we found similar cognate inhibition effects in terms of RTs and similar sizes of the N400 component. The initial competition was solved earlier for ULT PEN than for ULT ULT, due to the stress incongruence. At the same time, the stress congruence in ULT ULT, and hence the somewhat higher co-activation of the Dutch cognate in this condition, led to a higher activation of the shared semantic representation than in ULT PEN. In other words, the initially longer competition versus the larger cognate facilitation in ULT ULT yielded comparable results as the initially shorter competition versus less cognate facilitation in ULT PEN. Eventually, due to the competition between the highly activated L2 and slower L1 during target word selection, both conditions led to cognate inhibition.

4.3 Implications for theories on bilingual word processing

Our findings have important consequences for theories on bilingual word processing. First, we found that the visual and auditory modality are similar in terms of co-activation of the other language in bilingual cognate processing. Second, theories about bilingual processing should take the important function of the L1 (check) into account, even when the L1 is not the dominant language. Third, our study has shown that the differences between penultimate and ultimate stress in bilingual auditory word recognition cannot be explained by a word-initial stress bias, as proposed, e.g., by Reinisch et al. (2010) and Van Heuven & Menert (1996). According to these studies, non-cognates with initial stress are recognized earlier, because the presence of word stress on the initial syllable immediately reduces the competition of candidates with non-initial stress. In our study, by contrast, cognates with penultimate stress led to more processing difficulties than cognates with ultimate stress, in spite of the earlier reduction of competing candidates in the case of penultimate stress. Therefore, our findings suggest that word stress incongruence does play a role in competition between activated candidates, but that it does not constrain the strong activation of the shared semantic representation of cognates. Thus, word stress incongruence leads to the reduction of competing candidates, but may still lead to cognate facilitation, because the semantic representation is more strongly activated than in the case of non-cognates. Moreover, cross-linguistic differences between languages in terms of word stress position should also be taken into account to explain bilingual auditory word recognition, as cognates with ultimate stress (i.e., predictable stress in Turkish) were processed faster in this study than cognates with penultimate stress.

Fourth, models about word recognition should incorporate the role of word stress. Examples of such models are the BIA+ model (e.g., Dijkstra & Van Heuven, 2002; Dijkstra et al., 2010), BLINCS (Li, 2013), WEAVER (Roelofs, 1997), or the CDP++ model (Perry, Ziegler, & Zorzi, 2010). These models could be improved by testing the role of word stress in computational models. A first attempt to include word stress in computer simulations is already being made (Kyparissiadis, Pitchford, Ledgeway, & Van Heuven, 2015).

5. Conclusion

To conclude, we have demonstrated that L1 status, language dominance, stress congruence, and stress position all affect auditory cognate processing in Turkish and Dutch. First, cognate facilitation arose while processing in the L2, due to co-activation of the L1. In this respect, the Turkish heritage speakers resembled late bilinguals. Second, co-activation of the dominant L2 while processing in the L1 led to cognate inhibition effects. Third, stress congruence led to initial competition between candidates, whereas, fourth, word stress position determined whether this competition could be overruled by cognate facilitation. Specifically, cognates with typical Turkish stress were processed faster than cognates with non-typical Turkish stress. Our study has yielded novel insights into the factors that influence auditory bilingual word recognition. We have demonstrated that auditory cognate processing resembles visual word recognition to a certain extent, but L1 status, language dominance, and stress position should be taken into account to improve existing models on bilingual word recognition.

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Appendix A

Table 20. ***Overview of the educational level and profession of the participants of the Dutch experiment.***

Participant	**Highest education achieved**	**Current level of education**	**Profession**
1	Higher professional education	n/a	Dutch teacher
2	University	University	Student
3	Higher professional education	Higher professional education	Student
4	Intermediate vocational education	Higher professional education	Student
5	Intermediate vocational education	University	Student
6	Intermediate vocational education	Intermediate vocational education	Fitter
7	Intermediate vocational education	Higher professional education	Student
8	Secondary school	n/a	-
9	Secondary school	University	Student
10	Secondary school	University	Student
11	Intermediate vocational education	Higher professional education	Student
12	Secondary school	Higher professional education	-
13	Secondary school	Higher professional education	Employee in coffeeshop
14	Secondary school	Higher professional education	Student
15	University	University	Student
16	Intermediate vocational education	Higher professional education	-
17	Intermediate vocational education	Higher professional education	Medical assistant
18	Secondary school	University	Student
19	Secondary school	Higher professional education	Marketing and sales
20	Secondary school	Higher professional education	Student

Table 21. ***Overview of the educational level and profession of the participants of the Turkish experiment.***

Participant	Highest education achieved	Current level of education	Profession
1	Secondary school	n/a	-
2	Secondary school	University	Student
3	Secondary school	n/a	-
4	Secondary school	University	Student
5	Secondary school	University	Student
6	Intermediate vocational education	Intermediate vocational education	-
7	Intermediate vocational education	Higher professional education	Medical assistant
8	Intermediate vocational education	Higher professional education	Business IT & Management
9	Secondary school	University	Student
10	Secondary school	Higher professional education	-
11	Intermediate vocational education	Higher professional education	Student
12	Higher professional education	University	Student
13	Higher professional education	Higher professional education	Student
14	Intermediate vocational education	Intermediate vocational education	Hair dresser
15	Higher professional education	Higher professional education	Student
16	Higher professional education	n/a	Coordinator Finances
17	Secondary school	Higher professional education	Sales manager
18	Secondary school	University	Student
19	Intermediate vocational education	Intermediate vocational education	Beautician

Table 22. ***Stimulus materials for the Dutch experiment.***

Cognates			**Control words**		
PEN PEN	**ULT PEN**	**ULT ULT**	**PEN PEN**	**ULT PEN**	**ULT ULT**
bingo	album[%]	alarm	anker	akker[-]	abuis
‘bingo’	‘album’	‘alarm’	‘anchor’	‘field’	‘mistake, error’
cocktail	asfalt	ballet	bende	appel[-]	banaan
‘cocktail’	‘asphalt’	‘ballet’	‘gang’	‘apple’	‘banana’
cola	atlas	ballon	bever	beving	beschuit[%]
‘coke’	‘atlas’	‘balloon’	‘beaver’	‘trembling’	‘rusk’
coma[%]	campus	beton	blunder[+]	bloesem	beslag
‘coma’	‘campus’	‘concrete’	‘gaffe’	‘blossom’	‘batter, mounting’
corpus*[%]	disco	boeket	dienaar[+%]	bodem	boerin
‘corpus’	‘disco’	‘bouquet’	‘servant’	‘bottom, floor, soil’	‘farmer’s wife’
dogma*[%]	dokter	boetiek	drukte[%]	borrel	brancard
‘dogma’	‘doctor’	‘boutique’	‘rush, bustle’	‘drink’	‘stretcher’
firma	factor	buffet	eenling[+]	dreiging	cadeau
‘firm’	‘factor’	‘buffet’	‘individual’	‘threat’	‘present, gift’
gala	jury	chauffeur	emmer	droogte[%]	excuus
‘gala’	‘jury’	‘driver’	‘bucket’	‘dryness’	‘excuse’
gangster	kermis	cliché	gilde	druppel[-]	fornuis[%]
‘gangster’	‘fair’	‘cliche’	‘guild, corporation’	‘drop’	‘stove’
kassa	krater	croissant	groente	eland	gebak
‘cash register’	‘crater’	‘croissant’	‘vegetable’	‘moose’	‘pastry, cake’
kosmos	marmer	dictee	hinde[+]	ezel[-]	gehoor
‘cosmos’	‘marble’	‘dictate, dictation’	‘hind, doe’	‘donkey’	‘hearing’
masker	menthol	gitaar	jager[%]	gordel	gelaat
‘mask’	‘menthol’	‘guitar’	‘hunter’	‘belt’	‘face’
metro	mixer[%]	hotel[%]	kachel	hanger[-]	gelid
‘metro, subway’	‘mixer’	‘hotel’	‘stove’	‘(coat-)hanger’	‘joint, rank’
nylon	motor	kanaal	keuring	haven	gerucht
‘nylon’	‘engine, motor’	‘canal, channel’	‘examination, inspection’	‘harbor, port’	‘rumor’
poker	panter	masseur	kikker	heimwee	gezeur
‘poker’	‘panther’	‘masseur’	‘frog’	‘homesickness’	‘bother, twaddle’
prisma	pinguïn	matroos	korting[+]	kapper[-]	gordijn

‘prism, prisma’	‘penguin’	‘sailor’	‘reduction’	‘hair dresser’	‘curtain’
radar	pizza	pion	leegte^{+}	ketter	harpoen
‘radar’	‘pizza’	‘pawn’	‘emptiness’	‘heretic’	‘harpoon’
route	plastic	profiel$^{\%}$	leerling$^{\%}$	knuppel^{-}	kabaal
‘route'	‘plastic’	‘profile’	‘pupil, student’	‘cudgel, stick’	‘racket, row’
soda	pudding	raket	liefde^{+}	lepel$^{-\%}$	kalkoen
‘soda, sparkling water’	‘pudding’	‘rocket’	‘love’	‘spoon’	‘turkey’
spectrum	python	rapport	mantel	monster	lantaarn
‘spectrum’	‘python’	‘report’	‘coat’	‘monster’	‘lantern’
tango	robot	regime	modder	nevel	patat
‘tango’	‘robot’	‘regime, diet’	‘mud’	‘haze’	‘French fries’
tempo	standaard	revanche$^{\%}$	oorsprong^{+}	oven	respijt*$^{\%}$
‘pace’	‘standard, norm’	‘revenge’	‘origin’	‘oven’	‘notice, delay’
tennis$^{\%}$	taxi$^{\%}$	roman	slager	pauze^{-}	scharnier
‘tennis’	‘cab, taxi’	‘novel’	‘butcher’	‘break’	‘hinge’
veto	tonic	salon	slungel	schakel	verbond
‘veto’	‘tonic (water)’	‘hall, living room, saloon’	‘lout, gawk’	‘link’	‘alliance’
villa	tractor	soufflé	speeksel	spetter	verdrag
‘villa’	‘tractor’	‘souffle’	‘saliva’	‘splash’	‘treaty, pact’
virus	t-shirt$^{\%}$	stagiair$^{\%}$	staking	spijker$^{\%}$	verdriet
‘virus’	‘t-shirt’	‘trainee, intern’	‘strike’	‘nail’	‘sorrow’
visum	tunnel	taboe	tante	splinter	verlies
‘visa’	‘tunnel’	‘taboo’	‘aunt’	‘splinter’	‘loss’
whisky	voetbal	techniek	vleugel^{+}	vlakte	vermaak
‘whiskey’	‘soccer, football’	‘technique’	‘wing’	‘plain, level’	‘amusement, entertainment’
wodka	yoga	tyfoon	wimpel	vlinder$^{\%}$	vervolg
‘vodka’	‘yoga’	‘typhoon’	‘pennant, streamer’	‘butterfly’	‘continuation’
zombie	zebra	vulkaan	wissel	zenuw	voogdij$^{\%}$
‘zombie’	‘zebra’	‘volcano’	‘switch’	‘nerve’	‘custody’

Notes: Items marked with an asterisk were excluded from the RT analysis. Items marked with $^{+}$ were in the ULT PEN condition in the RT analysis, but in the PEN PEN condition in the EEG analysis. Conversely, items marked with - were in the ULT PEN condition in the RT analysis, but in the PEN PEN condition in the EEG analysis. Items marked with % were excluded from the RT analysis of a subset of the data (see footnote 6).

Table 23. ***Stimulus materials for the Turkish experiment.***

Cognates			**Control words**		
PEN PEN	**ULT PEN**	**ULT ULT**	**PEN PEN**	**ULT PEN**	**ULT ULT**
bingo%	albüm	alarm	abla	adam%	ada
'bingo'	'album'	'alarm'	'big sister'	'man'	'island'
kokteyl	asfalt	bale	amca	barış	akşam%
'cocktail'	'asphalt'	'ballet'	'uncle'	'peace'	'evening'
kola	atlas	balon	anne	bodrum	ayna%
'coke'	'atlas'	'balloon'	'mother'	'basement'	'mirror'
koma	kampus	beton	banyo	bölge	bayan
'coma'	'campus'	'concrete'	'bath, bathroom'	'region, area'	'woman'
korpus*%	disko%	buket	çanta	çamur	bina
'corpus'	'disco'	'bouquet'	'case, bag'	'mud'	'building'
dogma*%	doktor	butik	çapa	çivi	çekiç
'dogma'	'doctor'	'boutique'	'anchor'	'nail'	'hammer'
firma	faktör	büfe	çete	damla%	cephe
'firm'	'factor'	'buffet'	'gang'	'drop, bead'	'front, side'
gala	jüri	şoför	çıta	dişler	dikkat
'gala'	'jury'	'driver'	'lath, stick'	'teeth'	'care, attention'
gangster	kermes	klişe	filo%	dünya	dolgu
'gangster'	'fair'	'cliche'	'fleet'	'world'	'filling'
kasa	krater	krosan	hala	duygu	dükkân
'cash register'	'crater'	'croissant'	'paternal aunt'	'feeling, emotion'	'shop'
kozmos	mermer	dikte%	kanca	duyma	hardal
'cosmos'	'marble'	'dictate, dictation'	'hook'	'hearing, audition'	'mustard'
maske	mentol	gitar	kışla	elma	kalem
'mask'	'menthol'	'guitar'	'barracks, military post'	'apple'	'pen'
metro	mikser	otel	kukla	fincan	kaplan
'metro, subway'	'mixer'	'hotel'	'puppet'	'cup'	'tiger'
naylon	motor%	kanal	olta%	haydut	kaşık%
'nylon'	'engine, motor'	'canal, channel'	'fishing rod'	'bandit'	'spoon'

poker	panter	masör	palto	kasap	kazan
‘poker’	‘panther’	‘masseur’	‘coat’	‘butcher’	‘boiler, kettle, vessel’
prizma	penguen	matros[%]	pide	keder	koza
‘prism, prisma’	‘penguin’	‘sailor’	‘round and flat bread’	‘sorrow’	‘cocoon’
radar	pizza	piyon	ranza	kıyma	kunduz
‘radar’	‘pizza’	‘pawn’	‘bunk bed’	‘minced meat’	‘beaver’
rota	plastik	profil	salya[%]	kıymık*[%]	mutfak[%]
‘route’	‘plastic’	‘profile’	‘saliva’	‘splinter’	‘kitchen’
soda	puding	raket	sedye	kova	namaz
‘soda, sparkling water’	‘pudding’	‘rocket’	‘stretcher’	‘bucket’	‘prayer’
spektrum[%]	piton[%]	rapor	soba	maymun	omuz
‘spectrum’	‘python’	‘report’	‘stove’	‘monkey’	‘shoulder’
tango	robot	rejim	sopa	midye	öykü
‘tango’	‘robot’	‘regime, diet’	‘bat, stick’	‘mussel’	‘tale, narrative’
tempo	standart[%]	rövanş	tarla	mühlet	perde
‘pace’	‘standard, norm’	‘revenge’	‘field’	‘notice, delay’	‘curtain’
tenis	taksi	roman	tenya[%]	önem[%]	sabır
‘tennis’	‘cab, taxi’	‘novel’	‘tapeworm’	‘importance, significance’	‘patience’
veto	tonik	salon	teyze	sabah	sargı
‘veto’	‘tonic (water)’	‘hall, living room, saloon’	‘maternal aunt’	‘morning’	‘dressing, bandage’
villa	traktör	sufle[%]	tuğla	tayın	seçim
‘villa’	‘tractor’	‘souffle’	‘brick’	‘ration’	‘election’
virus	tisört	stajyer	turna	tüfek	sevgi
‘virus’	‘t-shirt’	‘trainee, intern’	‘crane’	‘rifle’	‘love’
vize	tünel	tabu	vida	yağmur	şiddet
‘visa’	‘tunnel’	‘taboo’	‘screw’	‘rain’	‘violence’
viski	futbol	teknik	yayla	yakut	tavşan
‘whiskey’	‘soccer, football’	‘technique’	‘highland’	‘ruby’	‘rabbit’
votka	yoga	tayfun[%]	yenge	zehir	tehdit
‘vodka’	‘yoga’	‘typhoon’	‘aunt-in-law’	‘poison’	‘threat, danger’

zombi ‘zombie’	zebra ‘zebra’	volkan ‘volcano’	zımba ‘stapler’	zihin ‘mind’	zeytin ‘olive’

Note: The items marked with an asterisk were excluded from the RT analysis. Items marked with % were excluded from the RT analysis of a subset of the data (see footnote 7).

Chapter 6

Discussion and conclusion

1. Discussion

This thesis examined whether a weaker first language (L1) affects the dominant second language (L2) in second-generation adult heritage speakers of Turkish in the Netherlands. This central question was investigated by answering the following sub-questions: Which characteristics define typical heritage speakers and how can we describe their L1 and their L2 (Chapter 2)?; How do Turkish heritage speakers (prosodically) mark focus while speaking in Dutch (Chapter 3)?; How do Turkish heritage speakers interpret focus while reading in Dutch (Chapter 4)?; and: How do Turkish heritage speakers process Turkish-Dutch cognates with varying word stress positions while listening in Turkish and Dutch (Chapter 5)?

To address these questions, this concluding chapter is structured as follows. First, we briefly summarize Chapters 2 to 5, with a focus on the main findings of these associated experimental studies. We discuss these findings in light of the research questions, and elaborate on how the findings contribute to our understanding of the bilingual mind. We subsequently turn to methodological issues that need to be taken into account, practical implications of the thesis work, directions for future research, and finally, the conclusion.

1.1 Heritage speakers: the strength of a weaker L1

The goals in the *literature review* of **Chapter 2** were to characterize heritage speakers, their L1, and their L2, and to argue how studying the dominant L2 in heritage speakers can inform us about the bilingual system in a different way than studying other types of bilinguals. Heritage speakers are (a) unbalanced bilinguals who acquired their L1 in childhood and still have some knowledge of that language, and they are (b) dominant in their L2 in adulthood (Benmamoun, Montrul, & Polinsky, 2013a).

Current definitions of heritage speakers include many bilinguals who differ considerably in sociolinguistic aspects, such as early simultaneous bilinguals from mixed marriages, or L1 speakers of indigenous languages, such as Quechua-Spanish bilinguals. We argue that typical second-generation heritage speakers are characterized by three additional core characteristics: (c) Their L1 is an immigrant language; (d) they have not reached ultimate L1 attainment; and (e) they have received no or limited formal education in L1 in early childhood. The combination of these criteria exclude L1 speakers of indigenous languages, because indigenous languages are not immigrant languages, and they exclude early simultaneous bilinguals who reached ultimate attainment in their L1 and/or received sufficient formal education in their L1.

Second-generation heritage speakers are a special type of bilinguals, because while they learned two languages in early childhood, the heritage language is the first, but not the dominant language, in adulthood. For our Turkish-Dutch participants, exposure to the heritage language was maximal in the first years of development, because both parents, who were born in Turkey (except for two participants who had one parent who was a second-generation heritage speaker), predominantly spoke Turkish to them (see Appendix A). The second language took over after this first, important period, and gradually became the dominant language. The status of the heritage language as the L1 raises important questions about the stability of a language system that was acquired first, taking into account that acquisition of the L2 followed relatively early. Many studies have shown that the L1 in heritage speakers is affected by the dominant L2, but to what extent can the weaker L1 still affect the dominant L2 in adult heritage speakers? Most linguistic research suggests that early bilinguals do not encounter many difficulties in their L2, especially when it is the dominant language (e.g., Argyri & Sorace, 2007; Daller, Treffers-Daller, & Furman, 2011; Hohenstein, Eisenberg, & Naigles, 2006; Meisel, 2007, 2008, 2013; Montrul & Ionin, 2010; Schlyter, 1993), but the present thesis questions this assumption. In fact, Chapters 3 to 5 suggest that the strength of a weaker L1 may still be visible in the dominant L2. Because bilinguals' performance may differ across tasks and modalities (e.g., Altenberg & Vago, 2004; Bowles, 2011; Muysken, 2013c), we used a combination of research techniques to gain a better understanding of the bilingual mind. The following sections discuss what our findings tell us about the bilingual language system, involving prosody, the syntax-discourse interface, and word stress in the mental lexicon.

1.2 Prosody within the sentence

By means of a *production task,* **Chapter 3** examined whether the Dutch prosody of Turkish heritage speakers in the Netherlands differs from that of Dutch L1 speakers, and whether observed differences could be attributed to an effect of Turkish. Dutch and Turkish mark focus in different ways, which makes Turkish heritage speakers an interesting group for testing effects from the weaker heritage language on the dominant L2, Dutch. Importantly, Dutch primarily uses prosody to encode focus, whereas Turkish uses prosody and syntax, with a sharp distinction between a preverbal area for accented, focused information, and a postverbal area for deaccented background information. Our experiment elicited semi-spontaneous sentences in broad and contrastive focus. The analysis included f0 movements, peak alignment, and duration. Although both participant groups (i.e., Turkish heritage speakers and Dutch L1 speakers) used prosody to mark focus (e.g., time-compressed f0 movements for contrastive focus), there were also differences between the groups. Most remarkably, the L1 speakers of Dutch showed declination in broad focus sentences, which is typical for Dutch (e.g., Chen, 2007; Gussenhoven, 2005a), but, in contrast to Dutch L1 speakers, the bilinguals remained at the same pitch level throughout the sentence. These results are in line with expectations based on Turkish, because Ipek (2015) and Kamalı (2011) also noted a limited pitch range in the prenuclear area in Turkish. In addition, we found differences between the Turkish heritage speakers and Dutch L1 speakers regarding other f0 movements and duration measures. These differences might also be explained by effects from Turkish, although more research is needed to further clarify the prosodic characteristics of Turkish. Furthermore, we found a gender difference for pitch that was larger in the heritage speakers than in the Dutch L1 speakers. Specifically, female heritage speakers had a higher pitch than female L1 speakers of Dutch, and male heritage speakers had a lower pitch than male

L1 speakers of Dutch. As pitch differences between male and female speakers are larger in some languages than in other languages, this finding might be explained by a cultural difference between the Turkish heritage speakers and Dutch L1 speakers.

In sum, Chapter 3 shows that the Dutch prosody of Turkish heritage speakers has different characteristics from that of Dutch L1 speakers, some of which can be explained by effects of Turkish. What do these findings tell us about the underlying bilingual language system? It should be kept in mind that the bilinguals in this thesis acquired both their L1 and L2 from an early age. Given their high L2 proficiency, it follows naturally that effects from the L1 are not omnipresent. So how can we explain L1 transfer in the prosodic system of the L2, whereas we did not find, for example, any word order differences?

A first explanation is that the prosodic domain may be more vulnerable than (narrow) syntax. As was discussed in Chapter 2 for heritage languages, (narrow) syntax is a relatively stable domain (e.g., Håkansson, 1995; Montrul, 2005, 2008), but for phonetics the findings are somewhat more divergent. Although various studies have demonstrated that phonetic knowledge is well preserved in heritage speakers (e.g., Au, Oh, Knightly, Jun, & Moro, 2008; Bowers, Mattys, & Gage, 2009; Chang, Haynes, Yao, & Rhodes, 2008, 2009; Saadah, 2011), other studies revealed difficulties at the phonetic level (e.g., Godson, 2003, 2004; McCarthy, Evans, & Mahon, 2013), even in highly proficient heritage speakers (e.g., Kupisch, Lein, Barton, Schröder, Stangen, & Stoehr, 2014). The latter findings are in line with findings from other types of bilinguals and contact linguistics, revealing that, unlike narrow syntax, phonological elements are commonly affected (e.g., Thomason, 2001, 2008), including prosodic features (e.g., Bullock, 2009; Colantoni & Gurlekian, 2004; McGory, 1997; Mennen, 2004, Queen, 2012; Simonet, 2008; Van Rijswijk & Muntendam, 2014). Thus, our study confirms that prosody is a vulnerable domain for cross-linguistic effects in heritage speakers.

A second explanation for L1 transfer in the prosodic domain relates to the early establishment of prosodic knowledge in the L1. The development of prosodic knowledge is one of the first steps in L1 acquisition. Crucially, prosody plays an important role in identifying word and sentence boundaries required for the segmentation of the speech stream into words (e.g., Christophe, Gout, Peperkamp, & Morgan, 2003). Research has shown that 6- and 9-months-old infants are already capable of perceiving prosodic phrase boundaries in their language (e.g., Gerken, Jusczyk, & Mandel, 1994; Gout, Christophe, & Morgan, 2004; Soderstrom, Seidl, Nelson, & Jusczyk, 2003). In addition, the study by Christophe, Nespor, Guasti, and Van Ooyen (2003) suggests that prosodic knowledge guides the L1 acquisition of word order. Particularly, due to phonetic manipulations of the utterances in this study, no phonemic information was available. In this way, the study showed that French infants between 2 to 3 months old were able to distinguish French sentences from Turkish sentences purely based on the prosodic structure of the sentence. Thus, the infants were able to hear that the Turkish sentences were marked with sentence prominence on the left side, whereas the French sentences were marked with sentence prominence on the right side. Because this difference in the location of sentence prominence corresponds to word order differences across languages (e.g., Nespor, Shukla, Van de Vijver, Avesani, Schraudolf, & Donati, 2008), the authors argue that the perception of this prosodic feature might explain why infants are already aware of L1-specific word order constraints at an early stage in L1 acquisition (e.g., Gervain, Nespor, Mazuka, Horie, & Mehler, 2008).

The importance of prosody for L1 acquisition, and hence the fact that it is one of the first linguistic systems to be acquired, suggests that at least a part of it is relatively stable in the L1. This claim is supported by the studies mentioned above, revealing that some phonetic knowledge is well preserved in heritage speakers (e.g, Au et al., 2008). In addition, studies have demonstrated that simultaneous bilinguals show more L1 attrition than early sequential bilinguals (e.g., Montrul, 2008), suggesting that having a firm basis in the L1 protects against linguistic loss, at least to some extent. Because the heritage speakers in this thesis were predominantly exposed to Turkish in the first stage of life, which was quickly followed by a switch to Dutch, they may have developed a firm L1 basis regarding prosodic knowledge. This firm basis might explain why it has left some traces in the prosodic system of the L2, which is known to be a vulnerable domain for bilinguals and L2 learners. This account is especially plausible for the finding for declination. Declination is directly related to prosodic phrasing (see Chapter 3), the focus of the above mentioned studies on infants.

A third explanation of L1 prosodic effects in the L2 involves the multifunctional character of prosody. That is, prosody not only conveys linguistic information, but it also reserves some space to tell the hearer about gender, emotions, and identity (e.g., Kehrein, 2002; Mozziconacci, 2002). This prosodic variation can be freely used without hindering communication between speaker and hearer. For example, we found a larger difference in pitch between male and female heritage speakers than between male and female Dutch L1 speakers. This difference can be attributed to a cultural difference. Likewise, other prosodic differences between heritage speakers and Dutch L1 speakers may also be used, perhaps even unconsciously, to mark the heritage speakers' identity. Thus, it may be a way of distinguishing themselves from L1 speakers of Dutch. Although other linguistic levels can also be used to serve this goal (e.g., Nortier & Dorleijn, 2008), the advantage of prosody is that it reveals both paralinguistic and linguistic information at the same time in a subtle way, without disturbing communication.

1.3 Syntax-discourse interface

Using *eye-tracking*, the reading experiment in **Chapter 4** explored whether Turkish heritage speakers interpret focus in written Dutch sentences differently from Dutch L1 speakers. By presenting written sentences, we examined what happens when no explicit prosody is available, because the absence of prosody would possibly enhance the role of syntactic cues in interpreting focus. The production experiment in Chapter 3 reports prosodic differences, but we observed that the heritage speakers did not use differences in word order to mark focus. This indicates that the heritage speakers were aware of the syntactic rules of Dutch, and were able to only use prosody for focus marking, similar to Dutch L1 speakers. In Turkish, however, word order does play a role in focus marking. Interestingly, Doğruöz and Backus (2007, 2009) found no word order differences related to focus marking in the Turkish of heritage speakers in the Netherlands, as compared to the Turkish spoken in Turkey. This finding suggests that Dutch has not affected Turkish (yet) at the syntax-discourse interface. To examine effects in the opposite direction, we created an experimental situation in which prosody was absent, forcing the heritage speakers to use word order cues to dissolve the ambiguous focus structure. In Turkish, sentence prominence is located on the left side of the sentence, and the postverbal area is associated with unfocused background information. Therefore, we predicted that, if the heritage speakers showed an effect of Turkish in interpreting focus in Dutch, they would have a preference for the preverbal subject over the postverbal prepositional phrase for the location of contrastive focus. This would be different from Dutch L1 speakers, because although Dutch does not have clear word order cues to mark focus, (prosodic) sentence prominence is often located on the right side of the sentence. In fact, our eye-tracking experiment revealed that the bilinguals had longer fixation times (reflecting reinterpretation; Rayner, 1998) when contrastive focus fell on the postverbal constituent than when it fell on the preverbal constituent, whereas the Dutch L1 speakers showed the opposite pattern. This suggests that, in line with Turkish, the heritage speakers associated left-located, preverbal constituents with contrastive focus, whereas L1 speakers of Dutch had a preference for right-located, sentence-final constituents to be in contrastive focus. These findings are in line with transfer from the weaker L1 to the dominant L2 at the syntax-discourse interface. The findings are remarkable, because they concern reading, in which the heritage speakers indicated to be specifically more proficient in Dutch than in Turkish.

A large body of research has shown that even highly proficient bilinguals tend to have difficulties with the syntax-discourse interface, due to optionality (e.g., Hopp, 2009; Roberts, Gullberg, & Indefrey, 2008; Sorace, 2000). Yet, previous studies on the syntax-discourse interface did not find effects from the weaker language on the dominant language (e.g., Argyri & Sorace, 2007; Serratrice, 2007), except for studies on L1 speakers of indigenous languages, in which the languages have been in contact for several centuries (e.g., Muntendam, 2009, 2013). The fact that Chapter 4 revealed L1 effects on the dominant L2 at the syntax-discourse interface might be explained by differences in language exposure between the bilinguals in this thesis and the bilingual children in Argyri and Sorace (2007) and Serratrice (2007). That is, the bilinguals in the previous studies might have been more balanced bilinguals, because they received relatively equal amounts of input in both languages from an early age. Specifically, most bilingual children in Argyri and Sorace and Serratrice were raised with the one-parent one-language strategy. The Turkish heritage speakers in our study, on the other hand, indicated that their parents mostly spoke Turkish to them. Consequently, they received predominantly Turkish input in the initial phase of childhood, after which a gradual shift towards Dutch took place as soon as the heritage speakers entered (pre-)school.

Another possible explanation, which is related to this difference in language exposure over time, lies in the connection between the syntax-discourse interface and prosody. As described in the previous section, there may be a tight link between the location of sentence prominence and word order constraints (e.g., Christophe et al., 2003). The findings on 3-months-old French infants by Christophe et al. (2003) suggest that Turkish heritage speakers acquired the location of prosodic sentence prominence in Turkish very early. However, contrary to Turkish, in Dutch main clauses, sentence prominence is located on the right side of the sentence. Although a replication of Christophe et al. with infants of Turkish heritage speakers in the Netherlands is required to test whether they behave like the French infants, the early acquisition of the location of sentence prominence in the L1 might explain why Turkish heritage speakers interpret focus in written Dutch differently from Dutch L1 speakers. Interestingly, for the Greek-English bilinguals in Argyri and Sorace (2007) and the Italian-English bilinguals in Serratrice (2007), there was no contrast in the location of prosodic prominence between their languages, as these languages are all similar to Dutch in this respect (Christophe et al., 2003; Nespor et al., 2008).

1.4 Prosody within the word: the mental lexicon and word stress

The *lexical decision tasks* in **Chapter 5**, measuring both RT and EEG data, examined the role of word stress position in how heritage speakers of Turkish auditorily process Turkish-Dutch cognates, in both Turkish and Dutch. In this way, the experiments could explore (a) cognate processing in auditory word recognition and (b) the effect of congruent versus incongruent stress position. In addition, the study explored the role of language dominance versus L1 status, as most previous studies on cognate processing concerned late bilinguals who were dominant in their L1.

For bilingual visual word recognition, it has been shown that the presentation of a cognate leads to the activation of the cognate forms in both languages, together with other candidates that resemble the input to some extent (e.g., Dijkstra & Van Heuven, 2002; Dijkstra et al., 2010). These activated representations of the cognates together lead to a strong activation of the shared semantic representation. Subsequently, the semantic representation feeds back to the orthographic (or phonological) level, and this leads to higher activation of both cognate forms, which are tagged according to the language they belong to. Because bilinguals know in which language to respond (for example, due to the instructions of the task), they check if activated lexical representations belong to that language. Taking the strong activation of the shared semantic representation into account, the total process involving lexical activation, target selection, and language-specific lexical decision is faster for cognates than for non-cognates. The resulting difference in response time between cognates and non-cognates is known as the cognate facilitation effect.

With respect to auditory bilingual word recognition, we observed cognate facilitation effects for bilingual processing in the dominant language (L2 Dutch), but slower processing of cognates than of non-cognates in the weaker first acquired language (L1 Turkish). This pattern indicates that, after initial parallel co-activation of lexical candidates, words from the L1 Turkish may be checked first during the preparation of the lexical decision. For cognates, when Dutch is the target language in the task at hand, spreading activation in the mental lexicon continues while this first check on L1 Turkish fails. After the next check on L2 Dutch succeeds, this leads to a faster response to cognates relative to non-cognates. Thus, although the L2 Dutch is the dominant language (which is also evident from the overall faster reaction times in the Dutch task), the L1 Turkish can still assist Dutch word recognition, leading to cognate facilitation. In contrast, for cognate processing in the L1 Turkish, following the L1 Turkish check, the dominant L2 Dutch necessitates a second time-consuming language membership check because Dutch is so strongly activated. The double

Turkish - Dutch check in this situation, when Turkish is the target language, induces inhibition effects for cognates relative to non-cognates.

Thus, similar to Dijkstra, Van Hell, and Brenders (2014), activation of the L2 is strong enough for it to be considered in the lexical decision process for L1 targets, but responding is delayed, due to the double language check. Another factor playing a role here may involve participant insecurity during decision making. After the experiment, some participants expressed their doubts about whether a particular Turkish cognate was a real word in Turkish or not, and this doubt might be reflected in the reaction times. An anecdote from a heritage speaker who participated in the production task in Chapter 3 further supports this explanation. The distractor pictures in the production task in Chapter 3 contained some cognate items. In one of the pictures, a zebra was displayed. One of the participants had difficulties to find the right word for 'zebra'. In the end, he said: "I am going to use the word 'zebra' now, but I know that there is another word for it in Turkish. You will see, if you interview my little brother next week, he will be using 'zebra' without even thinking of the other word. Of course, this is an influence from Dutch." However, in reality, no other word for 'zebra' is listed in Turkish dictionaries. This anecdote nicely illustrates that heritage speakers may have doubts about whether a word is truly Turkish or whether they use it due to an effect of their dominant L2.

In addition to cognate effects, the experiments showed effects of word stress position. For the Dutch task, cognate facilitation effects were found for the ULT PEN (Turkish *dokTOR* versus Dutch *DOKter*, 'doctor') and ULT ULT (Turkish *giTAR* versus Dutch *giTAAR,* 'guitar') conditions, but not for the PEN PEN (Turkish *TEnis* versus Dutch *TEnnis,* 'tennis') condition. Moreover, the EEG data showed the smallest N400 for the ULT ULT condition, and the largest N400 for the PEN PEN condition,. Thus, both RT and EEG data indicate that the PEN PEN condition was the most difficult condition. Moreover, the RT and EEG data of the Turkish task also revealed more difficulties with PEN PEN than with the other two conditions. At first glance, this seems a surprising finding, because we expected that particularly cognates with congruent stress would lead to cognate facilitation, as the total amount of overlap between representations in both languages is larger (i.e., such cognates combine segmental overlap with stress congruence). Yet, the two congruent stress conditions differed more from each other than from the incongruent condition. These findings can only be explained when we take the sequential character of auditory processing into account (i.e., competition between word candidates starts as soon as the onset of the first phoneme is perceived; e.g., Reinisch, Jesse, & McQueen, 2010), as well as the difference between penultimate and ultimate stress. This indicates that the initial competition between form candidates also depends on stress congruence. Thus, although stress congruence leads to more overlap between representations and thus cognate facilitation, the initial competition, which is larger for congruent than for incongruent stress position, plays a role as well. Moreover, cognates with ultimate stress were processed faster than cognates with penultimate stress. This may be related to the fact that L1 speakers of Turkish process words with predictable, ultimate stress differently from words with non-predictable stress (Domahs, Genc, Knaus, Wiese, & Kabak, 2013), and evidence from the visual modality suggesting that words with typical stress are processed more easily than words with non-typical stress (e.g., Arciuli & Cupples, 2006; Colombo, 1991).

In sum, Chapter 5 has shown that language dominance, the status of the L1, and stress position all have an impact on auditory word processing in the heritage speakers in this thesis. Regarding language dominance, processing was found to be slower in the weaker L1 than in the dominant L2, and processing in the L1 yielded cognate inhibition effects. With respect to the status of the L1, the findings revealed that the heritage speakers were like late bilinguals, because cognate facilitation effects only occurred while processing in the L2. This suggests that it is not necessarily the dominant language, but rather the first language that is considered first during the selection/decision stage that is required in lexical decision. During processing in the L1, on the other hand, the strong co-activation of the dominant language Dutch slows down the selection/decision process, because language membership information for the Dutch cognate counterpart must be taken into account (e.g., Dijkstra et al., 2014).

Another aspect of the findings in which we see an effect of the L1 relates to the differences in word stress position. In both languages, cognates with ultimate stress led to faster processing than cognates with penultimate stress. Turkish has a stress rule, assigning ultimate stress to all words with few exceptions (Inkelas & Orgun, 2003), whereas in Dutch there is a tendency for penultimate stress (Van Donselaar, Koster, & Cutler, 2005). Our findings might thus be explained by an effect of the Turkish stress rule, even while participants were processing in Dutch.

1.5 Implications for theories and models of the bilingual language system

The findings in this thesis reveal that the dominant L2 (Dutch) of adult second-generation heritage speakers differs in several respects from the Dutch spoken by L1 speakers, and that the auditory word recognition process is affected by L2 dominance as well as by the status of the L1. Importantly, we found both quantitative and qualitative effects between languages in this thesis. In Chapter 5, for example, the observed faster overall reaction times for Dutch than for Turkish form a quantitative indication of a language dominance effect. Furthermore, the differences in reaction times and size of the N400 component across conditions are quantitative in nature as well. We found these quantitative differences within the group of bilinguals that participated in the experiments in Chapter 5. By comparing heritage speakers to Dutch L1 speakers, in Chapter 3, we found several quantitative differences with respect to prosodic features. In addition, we explain the lack of declination in the heritage speakers as a qualitative difference. Moreover, in Chapter 4, the similar findings for reading speed revealed no quantitative differences between Dutch L1 speakers and Turkish heritage speakers. In contrast, we found a qualitative difference between both groups of participants in terms of their interpretation of focus structure. Thus, having Turkish as an L1 leads to both quantitative and qualitative effects in the L2 Dutch.

In spite of this notable list of effects, the Turkish heritage speakers' high proficiency in Dutch should be taken into account, indicating that L1 effects are not present across the board. Rather, the strength of the weaker L1 seems to manifest itself in stable aspects that are developed earliest during L1 acquisition, and/or that are vulnerable in the L2. These aspects are related to prosody: prosodic sentence prominence and word stress rules. This might well explain why we found transfer from the weaker L1 to the dominant L2, whereas most previous studies on heritage speakers did not (but see e.g., Cuza, Pérez-Leroux, & Sánchez, 2013; Montrul, 2006;

Queen, 2012; Van Meel, Hinskens, & Van Hout, 2013, 2014). The input that the bilinguals in this thesis received was predominantly Turkish in the initial phase of childhood, followed by a gradual shift towards Dutch. This allowed the bilinguals to firmly establish these aspects of their L1. It is therefore not surprising that these are the aspects that are transferred to the L2, and it might explain why other types of early bilinguals, who received more input in both languages from an early age, do not show transfer from the weaker to the dominant language (e.g., Argyri & Sorace, 2007; Serratrice, 2007).

What do these findings tell us about the underlying language system? Recent models of the (bilingual) language system state that language is dynamic. Examples of such models are the Dynamic Systems Theory (e.g., De Bot, Lowie, & Verspoor, 2007; De Bot, 2008) and the Unified Competition Model (e.g., MacWhinney, 2005a, 2005b). Furthermore, some models explicitly state that some aspects of language are more stable than others, which is in line with our findings (e.g., Ullman, 2001, 2004). Specifically, Ullman’s mental model of lexicon and grammar, which is referred to as the declarative/procedural model, assumes a sharp distinction between the lexicon on the one hand and grammar on the other. This assumption is based on a vast body of psycholinguistic and neurolinguistic studies. According to the model, language is located in brain areas that also subserve other cognitive functions. Acquisition and use of L1 grammar and rules of the language, including phonological rules, take place using procedural memory, which is associated with the acquisition of implicit skills, such as driving and cycling. The acquisition and use of the L1 lexicon, on the other hand, occurs using declarative memory. Beside the lexicon, certain irregularities of the language, such as irregular morphology and lexical stress, are also stored in declarative memory. Declarative memory is characterized by fast learning, whereas procedural memory is characterized by gradual learning. The relations in the latter are rigid and inflexible (thus, rule-like), whereas declarative memory is more dynamic. In L2 acquisition, a shift takes place towards declarative memory, and thus both words and rules are stored in declarative memory. Importantly, these rules differ from L1 rules that are stored in procedural memory, partly because the latter type is often (but not necessarily) implicitly learned. Grammatical rules stored in declarative memory, on the other hand, are more often learned consciously (i.e., explicitly). The shift from reliance on procedural memory towards declarative memory is explained by the process of attenuation of procedural memory: Estrogen levels increase around puberty, which enhances declarative memory, and this possibly makes the use of the procedural memory more difficult. Studies suggest that there is some tendency to a critical period for procedural memory, whereas functions of declarative memory improve with age (and subsequently decline in early adulthood). For this reason, age of exposure has a larger effect on grammar than on lexicon. In other words, the later L2 acquisition starts, the more the learner has to rely on declarative memory. Yet, age of exposure is not the only factor in the dependence on declarative versus procedural memory; practice in the L2 also plays a role. Thus, the more L2 exposure, the more use of procedural memory, even in bilinguals who learned the L2 at a later age (Ullman, 2001, 2004). Because the Turkish heritage speakers in this thesis learned both languages at a young age, are dominant in their L2, and still showed effects from the L1 on the L2, the difference between L1 and L2 regarding the dependence on procedural and declarative memory appears to be relevant even in these early bilinguals. That is, architectural aspects that are acquired early, such as phonological rules and syntactic phrasing, show their traces in speaking and processing in the L2, whereas the bilingual mental lexicon reflects its dynamic nature by effects of more frequent word use in the L2, resulting in higher levels of lexical competition. In all, the findings from this thesis form coherent and converging evidence in support of several of the assumptions in the declarative/procedural model.

1.6 Methodological issues

It is now time to discuss two important methodological aspects related to this research: its generalizability of the findings to other populations of heritage speakers, and the use of the term (L1) transfer as a terminological notion.

First, it must be considered whether the present findings on Turkish heritage speakers can be extended to other populations of heritage speakers. In Chapter 2, a number of sociolinguistic factors were described to explain possible variation in linguistic outcomes within heritage speakers: age of onset of acquisition of the L2, status of the heritage language in the host society, language use of the parents, and domains and network in which heritage speakers use their L1. Some of these factors relate to language maintenance. As described previously, the Turkish community in the Netherlands is known for its high language maintenance. The fact that the heritage speakers' parents were all born in Turkey and predominantly spoke Turkish to their children may largely explain the strength of the L1, and hence its effects on the L2. We do not even need to leave the Netherlands to find another group of heritage speakers with a much lower language maintenance: the Moroccan community (e.g., Scheele, 2010). Comparisons between Turkish heritage speakers in the Netherlands and other heritage speakers with lower proficiency in their L1 are of course necessary to establish how 'strong' exactly the weaker L1 needs to be to be able to affect the dominant L2.

Second, there is a terminological question to be considered: Did we truly demonstrate L1 transfer in this thesis? In Chapters 1 and 2, we described transfer as the reproduction of a pattern from one language into another (e.g., Daller et al., 2011; Haugen, 1950). In this thesis, transfer is viewed as a mechanism that describes the linguistic behavior in the L2 (as compared to L1 speakers of the variety) affected by the linguistic system of the weaker L1.

Although we can explain at least part of the findings by L1 transfer, we cannot completely exclude other explanations. For example, consider our finding of the heritage speakers' Turkish-like interpretation of focus in written Dutch in Chapter 4. To distinguish the explanation in terms of L1 transfer from alternative explanations, it will be necessary to compare the reading behavior of these heritage speakers to that of a different group of similar bilinguals. Crucially, these bilinguals should be comparable to Turkish heritage speakers in the Netherlands in all (sociolinguistic) aspects, except for the difference in focus marking between Dutch and the heritage language: The two languages should mark focus in precisely the same way, unlike Dutch and Turkish. If such an ideal comparison would reveal that this second bilingual group shows the same behavior as the L1 speakers of Dutch, and hence behavior different from the heritage speakers of Turkish, we could exclude the possibility that the difference between the Turkish heritage speakers and Dutch L1 speakers in this thesis is not caused by, for example, processing difficulties in bilinguals (e.g., Roberts et al., 2008). However, finding a different bilingual group that is perfectly comparable to the heritage speakers in this thesis, with the only difference that focus is marked in the same way in the heritage languages as in Dutch, is easier said than done, and perhaps even impossible. Moreover, we made predictions on the basis of the L1 of the participants. Both the heritage speakers and the Dutch L1 speakers behaved differently from each other and conform these predictions. Therefore, L1 transfer seems to be a valid explanation for the processing differences between Dutch L1 speakers and Turkish heritage speakers.

1.7 Practical implications and directions for future research

In contrast to many previous studies on L1 transfer in heritage speakers, we consistently found that the L2 was affected by the weaker L1. That is, the strength of the L1 seems to explain specific differences between the Dutch of Turkish adult heritage speakers and the Dutch of L1 speakers. Thus, we established an interaction between certain aspects of the weaker L1 and dominant L2 of adult heritage speakers. Importantly, as mentioned in Chapters 1 and 2, second- and third-generation heritage children experience language delays at school (e.g., Collier, 1995; Droop & Verhoeven, 2003; Scheele, 2010; Statistics Netherlands, 2014). The findings in this thesis, particularly regarding the interpretation of focus in written sentences, might account for at least a part of this delay. The importance of focus structure for reading comprehension has widely been demonstrated in the literature (e.g., Birch & Garnsey, 1995; Birch & Rayner, 1997; Bredart & Modolo, 1988). Difficulties with determining the focus of a sentence might therefore contribute to general reading comprehension difficulties. Therefore, the next step for linguistic research should be to explore L1 transfer in the L2 of heritage children. Importantly, our findings for adults reveal a certain persistence of cross-linguistic effects through life. Therefore, L1 transfer of this type in children cannot be (solely) explained in terms of a delay in L2 acquisition, but would rather suggest that children are at risk to never overcome these difficulties. Future research should examine how cross-linguistic transfer could lead to language delays at school, for example in reading comprehension, and, subsequently, to investigate how education can be improved to avoid this type of transfer. Specifically, information structure and sentence prominence are topics that are usually not covered in the curriculum of Dutch primary schools, and hence Turkish heritage children are not told that, in contrast to Turkish, the important information is more often located on the right side of Dutch sentences than on the left side. The question whether heritage children would benefit from this kind of instruction is worthwhile investigating.

2. Conclusion

We have demonstrated that the way in which Turkish heritage speakers in the Netherlands speak, read, and listen in their dominant L2 Dutch is affected by the weaker L1 Turkish. Whereas most previous studies on linguistic transfer attributed an important role to language dominance, we showed that transfer can also occur in the other direction (i.e., from the weaker L1 Turkish to the dominant L2 Dutch), due to the special status that the L1 has. These findings have theoretical implications for theories about bilingualism, involving the stability of certain aspects of the L1 and the vulnerability of domains in the L2. Specifically, aspects of language that are acquired first, such as phonological rules and syntactic phrasing, seem to be stable in the L1, but vulnerable in the L2. By contrast, the bilingual mental lexicon is more affected by language dominance, although a special function is still attributed to the non-dominant L1 during the selection/decision stage. Furthermore, our findings suggest that differences regarding language exposure in early bilinguals play a role in the directionality of cross-linguistic effects, because predominant L1 exposure (as compared to dual L1 and L2 exposure) in the first period of language development increases the stability, or strength, of the L1.

More practical implications of the findings are related to the language delays that heritage children experience at school. The present thesis provides evidence that even adult heritage speakers experience L1 effects in their dominant L2, suggesting that a part of the delays in migrant children may be explained in terms of L1 transfer. Therefore, it might be more important to pay attention to structural differences between the L1 and L2 than has previously been assumed.

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Appendix A. Information about the heritage speakers of Turkish

In total, 70 second-generation heritage speakers of Turkish participated in the studies in this thesis. Of these participants, 44 were female and 26 male. The mean age of the participants was 23.23 years, ranging from 18 to 37 years. Some of the heritage speakers participated in more than one study. All participants filled out a detailed sociolinguistic background questionnaire, including questions about language use and proficiency. Furthermore, 60 participants performed the Boston Naming Test (BNT; Kaplan, Goodglass, Weintraub, Segal, & Van Loon-Vervoorn, 2001) in both Turkish and Dutch to obtain an objective measure of their vocabulary knowledge. The information from the questionnaire and BNT are given below.

Country of birth. All participants were born in the Netherlands, except for one male (who arrived in the Netherlands when he was 1.5 years old and who participated in the experiment in Chapter 4) and one female (who arrived in the Netherlands when she was 4 years old and who participated in the offline questionnaire in Chapter 4).

Parents' country of birth. All participants' parents were born in Turkey, with the exception of two participants, who indicated that their mothers were born in the Netherlands. The mothers' parents were also born in Turkey.

Education level. Figure 1 shows the highest education level achieved (left) and, when applicable, the current education level (right). The heritage speakers in this thesis came from different educational backgrounds, varying from individuals who only finished secondary education (although most in this group are still students), to participants who graduated from university. An independent t-test revealed that the means of male and female participants did not significantly differ from each other regarding education level (t (58.28) = -0.64, p > .05).

Age of acquisition of Dutch. The leftmost chart in Figure 2 shows that most heritage speakers (38 participants) started to learn Dutch when they were 4 years old, whereas some indicated that they learned Dutch from birth, simultaneously with Turkish.

Turkish language classes. The middle chart in Figure 2 shows that most heritage speakers have had Turkish language classes. As mentioned above, before 2004, primary schools offered Turkish language classes for a few hours per week, in addition to the main curriculum.

Code-switching. The participants were also asked to indicate whether they mixed their two languages. The rightmost chart in Figure 2 shows that the majority of the participants indicated that they often code-switch.

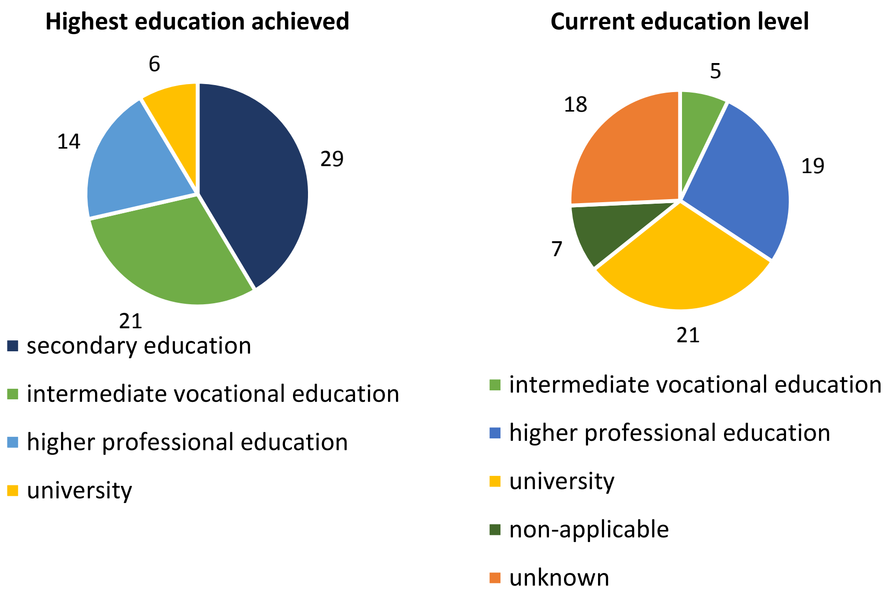

Fig. 1. Highest achieved and current education level. The numbers in the graphs represent the number of participants, with a total number of 70.

Fig. 2. Age of acquisition of Dutch, Turkish language classes, and code-switching. The numbers in the graphs represent the number of participants, with a total number

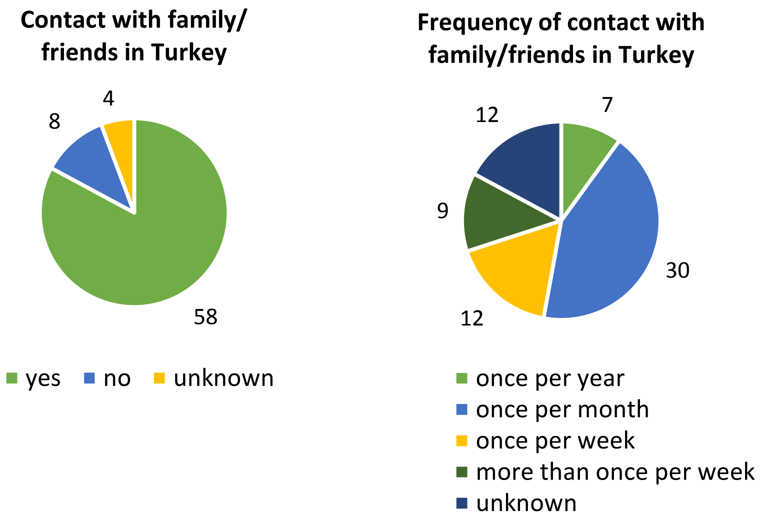

Fig. 3. (Frequency of) Contact with family and friends in Turkey. The numbers in the graphs represent the number of participants, with a total number of 70.

Contact with family and friends in Turkey. Most participants indicated that they still have regular contact with family and friends in Turkey, often once per month or even more frequently.

Language use with parents and siblings. Figure 4 shows that most participants indicated that they only speak Turkish with their father and mother, followed by a combination of Turkish and Dutch. Regarding language use with brothers and sisters, most participants indicated that they speak both Turkish and Dutch with their siblings.

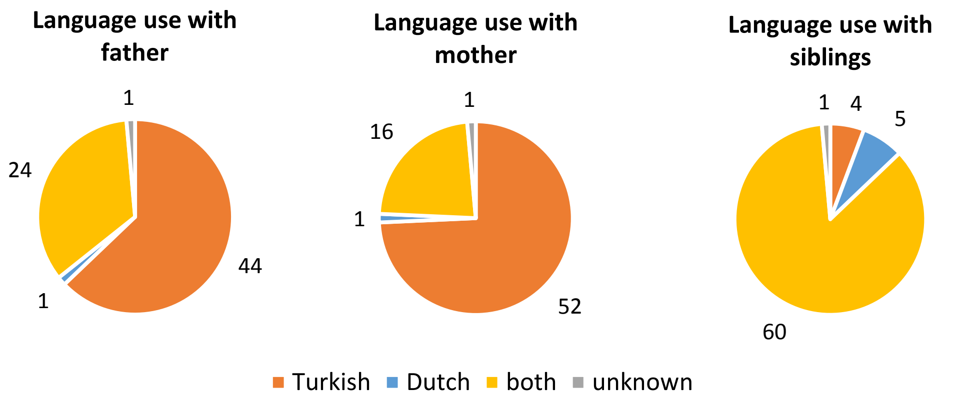

Fig. 4. Language use with father, mother, and siblings. The numbers in the graphs represent the number of participants, with a total number of 70.

Language use with other family members in the Netherlands. The leftmost chart in Figure 5 illustrates that most heritage speakers predominantly speak Turkish to other family m embers in the Netherlands, followed by both Turkish and Dutch.

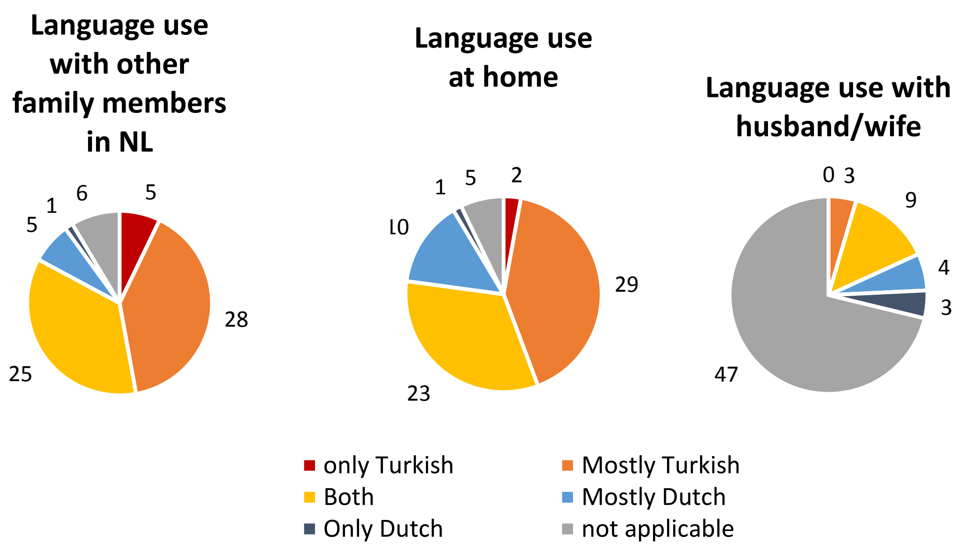

Fig. 5. Language use with other family members in the Netherlands, at home, and with spouse. The numbers in the graphs represent the number of participants, with a total number of 70.

Language use at home. Likewise, the middle chart in Figure 5 shows that the majority of heritage speakers indicated that they mostly speak Turkish at home: There was only one heritage speaker (who was 32 years old) who indicated that she only spoke Dutch at home.

Language use with spouse. Although most participants were not married at the time of testing, the rightmost chart in Figure 5 shows that married participants used both languages or even had a preference for Dutch language use, rather than maintaining Turkish.

Language use in the mosque. Figure 6 clearly shows a preference for Turkish in the mosque.

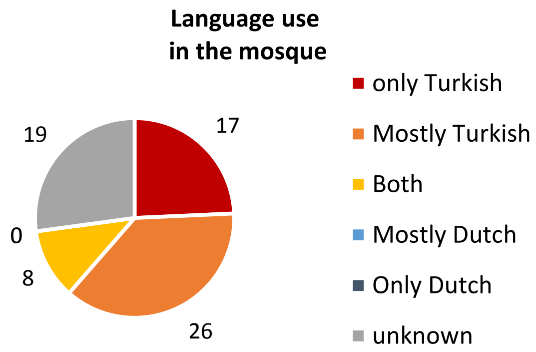

Fig. 6. Language use in the mosque. The numbers in the graph represent the number of participants, with a total number of 70.

Language use with friends/acquaintances, in the neighborhood, and at work. Whereas there was a preference for Turkish language use with family and in the mosque, Figure 7 shows that there is a shift towards Dutch when the participants speak with friends, in the neighborhood, and at work.

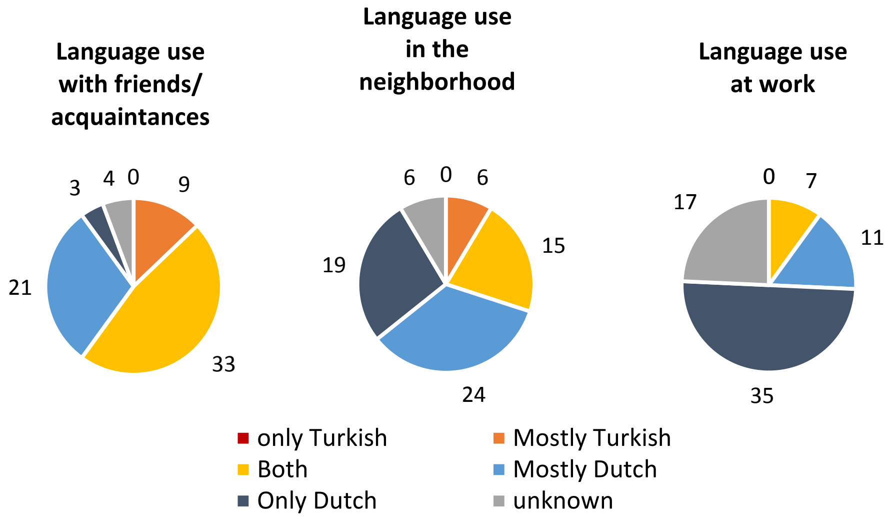

Fig. 7. Language use with friends/acquaintances, in the neighborhood, and at work. The numbers in the graphs represent the number of participants, with a total number of 70.

Language use during various activities. Figures 8, 9, and 10 show that whereas there is a preference for Turkish when listening to music and to the radio, both languages are preferred when watching television and telling a story or joke, and Dutch is preferred when reading a book, newspaper, or magazine, or when using the internet.

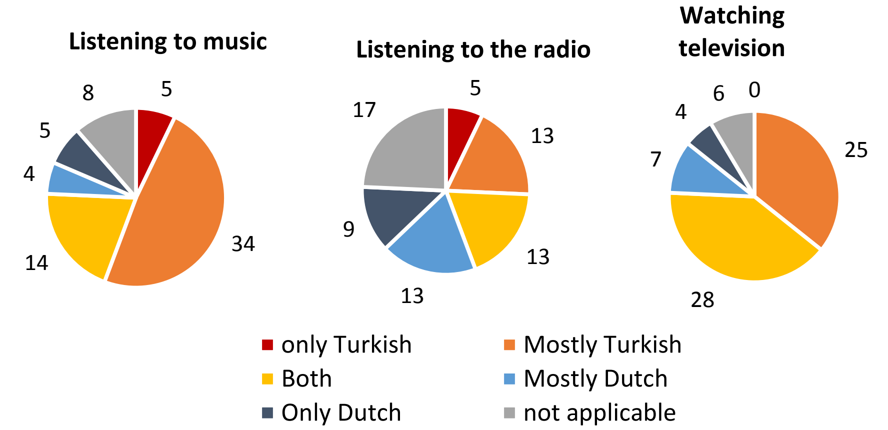

Fig. 8. Language use when listening to music, listening to the radio, and watching television. The numbers in the graphs represent the number of participants, with a total number of 70.

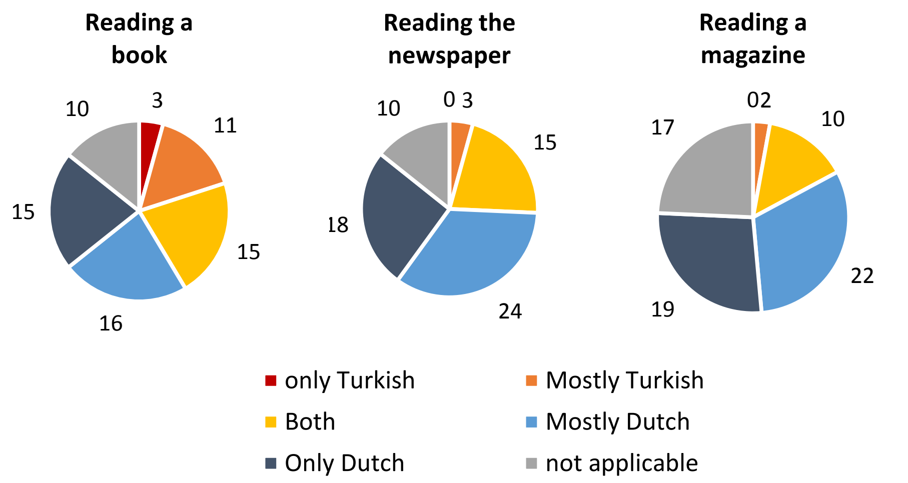

Fig. 9. Language use when reading a book, reading the newspaper, and reading a magazine. The numbers in the graphs represent the number of participants, with a total number of 70.

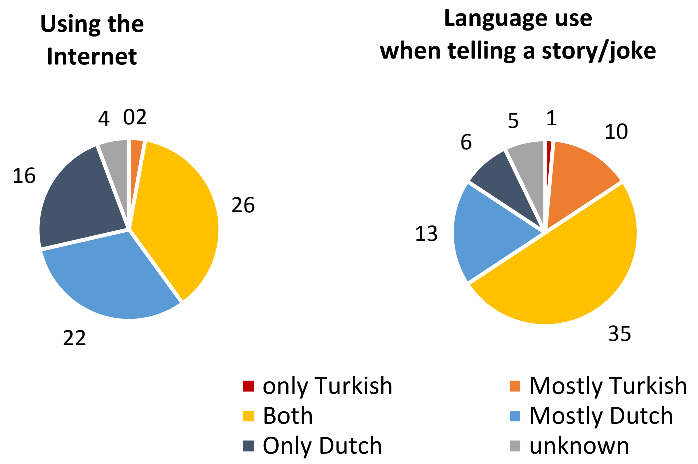

Fig. 10. Language use when using the Internet and when telling a story/joke. The numbers in the graphs represent the number of participants, with a total number of 70.

Language proficiency ratings. For both languages, the heritage speakers were asked to rate their proficiency for speaking, listening, writing, reading, and pronunciation on a scale from 1 ('not good at all') to 5 ('very good'). Figure 11 shows that the heritage speakers rated their Dutch proficiency better than their Turkish proficiency. Paired t-tests revealed significantly higher scores for Dutch than for Turkish regarding speaking (t (125.85) = 3.28, $p < .01$), writing (t (118.43) = 4.32, $p < .0001$), reading (t (117.78) = 5.78, $p < .0001$), and pronunciation (t (126.35) = 3.95, $p < .001$).

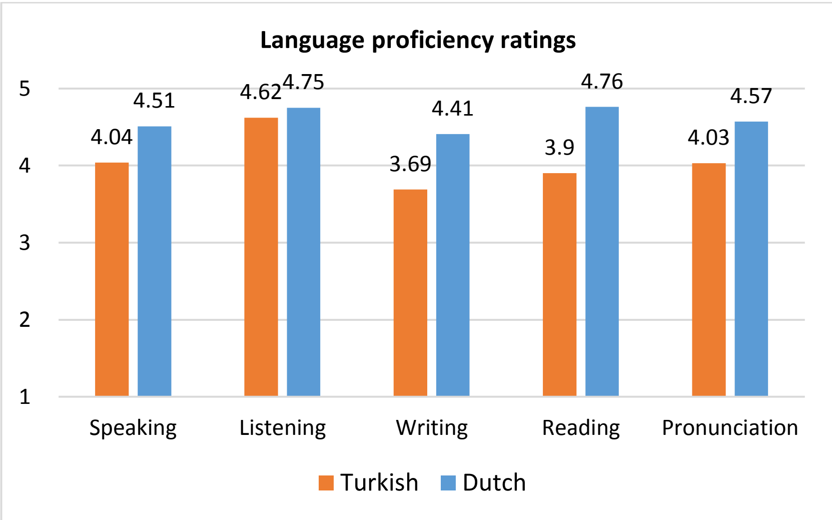

Fig. 11. Self-reported language proficiency ratings in Turkish and Dutch. A score of 1 refers to ‘not good at all’, a score of 5 to ‘very good’.

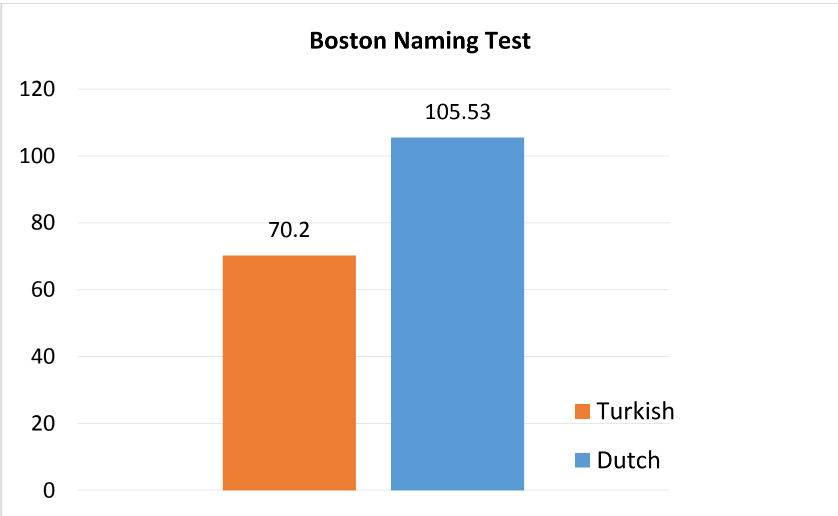

Fig. 12. Scores of the Boston Naming Test for Turkish and Dutch. The maximum score was 162.

Boston Naming Test (BNT). Of all participating heritage speakers, 60 performed the BNT (Kaplan, Goodglass, Weintraub, Segal, & Van Loon-Vervoorn, 2001) in both Turkish and Dutch to get an objective measure of their vocabulary knowledge. A paired t-test revealed significantly higher scores for Dutch than for Turkish (t (59) = -15.5491, p < .0001); see Fig. 12.

To summarize, the data from the sociolinguistic questionnaire and BNT reveal a characterization of the heritage speakers in this thesis that is in line with general descriptions of the Turkish community in the Netherlands (e.g., Backus, 2004). On the one hand, the preference for Turkish in certain domains, such as with the family and in the mosque, illustrates the high language maintenance of Turkish. On the other hand, the shift towards Dutch in other domains, such as with friends, in the neighborhood, at work, and while reading, and the higher proficiency (ratings) for Dutch than for Turkish, reflect that Dutch was the bilinguals' dominant language.

Nederlandse samenvatting

Migratie is iets van alle tijden. Zo zijn er in de jaren zestig van de vorige eeuw veel Turken en Marokkanen naar Nederland gekomen, aanvankelijk om tijdelijk als gastarbeider te werken, maar later om zich met hun gezinnen definitief in Nederland te vestigen. Op dit moment, in 2015 en 2016, heeft Europa te maken met grote aantallen Syrische vluchtelingen op zoek naar een nieuw, veilig thuis. Bij migratie hoort vanzelfsprekend het contact tussen verschillende culturen en talen, met als gevolg meertaligheid en taalverandering. Veel van de immigranten in Nederland spreken een andere taal dan de taal van hun nieuwe samenleving, en moeten dus een nieuwe taal leren.

De kinderen van immigranten worden *heritage speakers* van de tweede generatie genoemd. Deze heritage speakers erven hun eerste taal (T1), de heritage taal, van hun ouders, maar ze worden geboren en grootgebracht in een maatschappij waarin een andere taal het dagelijks leven beheerst. Deze tweede taal (T2) is meestal de dominante taal van volwassen heritage speakers. Het leren van de T2 begint al op jonge leeftijd, vaak wanneer de kinderen tussen twee en vier jaar oud zijn. Bovendien is de T2 de taal die ze verder ontwikkelen op school, vaak in tegenstelling tot de T1. Daardoor vormt de heritage taal de dominante taal in de eerste levensjaren, maar vindt er al snel een verschuiving plaats naar de T2.

De volwassen Turkse Nederlanders van wie de taal in dit proefschrift onderzocht is, zijn ook tweede generatie heritage speakers. Zij zijn dan ook dominant in hun T2: Nederlands. Een interessante vraag is in hoeverre hun Nederlands toch nog beïnvloed wordt door het Turks. Taalwetenschappelijk onderzoek heeft aangetoond dat de richting van invloed van de ene op de andere taal vaak van taaldominantie afhangt. Dat wil zeggen dat de dominante taal van tweetaligen vaak een invloed heeft op de zwakkere taal, terwijl invloed in de tegenovergestelde richting minder vaak voorkomt. Daarnaast nemen veel taalwetenschappers aan dat tweetaligen die al op zeer jonge leeftijd een T2 leren die bovendien de officiële taal is van de samenleving, deze taal perfect leren beheersen. Toch laten onderwijskundige studies tegelijkertijd zien dat tweetalige kinderen, met name heritage speakers, een taalachterstand hebben ten opzichte van leeftijdsgenootjes die met slechts één taal worden opgevoed. Om deze reden wordt in dit proefschrift onderzocht in hoeverre verschillen tussen het Nederlands van Turkse Nederlanders en van moedertaalsprekers van het Nederlands verklaard kunnen worden door een invloed van het Turks. Met andere woorden, wat is de kracht van de zwakkere eerste taal en hoe zien we die terug in de tweede taal?

Om deze hoofdvraag te beantwoorden hebben we talige aspecten bestudeerd waarin het Turks en Nederlands structureel van elkaar verschillen, en vervolgens onderzocht of er aanpassingen aan het Nederlands plaatsvinden die vanuit de Turkse aspecten verklaard zouden kunnen worden. De hoofdvraag kan verdeeld worden in de volgende deelvragen: Welke kenmerken definiëren typische heritage speakers en hoe kunnen we hun eerste en tweede taal beschrijven (Hoofdstuk 2)?; Hoe drukken Turkse heritage speakers focusstructuur uit terwijl ze Nederlands spreken (Hoofdstuk 3)?; Hoe interpreteren Turkse heritage speakers focusstructuur terwijl ze Nederlands lezen (Hoofdstuk 4)?; en: Hoe verwerken Turkse heritage speakers Turks-Nederlandse cognaten met variatie in klemtoonpositie terwijl ze luisteren naar Turks of Nederlands (Hoofdstuk 5)?

Hoofdstuk 2

Heritage speakers, hun eerste taal en hun tweede taal: op naar een nieuwe definitie.

In het *literatuuroverzicht* van Hoofdstuk 2 gaan we dieper in op de vraag hoe heritage speakers en hun talen gekarakteriseerd kunnen worden. We leggen uit waarom we heritage speakers definiëren als ongebalanceerde tweetaligen die (a) hun T1 in hun eerste jaren hebben verworven en nog steeds enige kennis van deze taal hebben; (b) dominant zijn in hun T2; (c) een immigrantentaal als T1 hebben; (d) hun T1 niet volledig verworven hebben; en (e) geen of weinig formeel onderwijs in hun T1 hebben genoten. Alleen als tweetaligen voldoen aan al deze criteria kunnen zij ons inziens heritage speakers genoemd worden.

Naast deze nieuwe definitie beargumenteren we waarom onderzoek naar de dominante T2 van heritage speakers ons andere informatie geeft over het systeem van tweetaligen dan de studie naar andere typen tweetaligen. Heritage speakers zijn een bijzonder soort tweetaligen, omdat de meeste andere tweetaligen, zoals moedertaalsprekers van het Nederlands die vanaf groep 7 van de basisschool Engels hebben geleerd, dominant zijn in hun T1. De status van de heritage taal als de T1 roept belangrijke vragen op over de stabiliteit van een eerst verworven taalsysteem waarbij het leren van de T2 relatief snel volgt. Met andere woorden, geldt voor heritage speakers ook dat de dominante taal voornamelijk de andere taal beïnvloedt, zoals veel onderzoek heeft aangetoond, of heeft die andere taal in heritage speakers een bepaalde kracht omdat het de eerst verworven taal is? Hoofdstukken 3 tot en met 5 beschrijven empirische studies die deze vraag proberen te beantwoorden.

Hoofdstuk 3

Het uitdrukken van focus in gesproken Nederlands door Turkse heritage speakers en moedertaalsprekers van het Nederlands.

De taalproductietaak in Hoofdstuk 3 heeft onderzocht in hoeverre de Nederlandse prosodie van Turkse heritage speakers verschilt van die van moedertaalsprekers van het Nederlands, en of geobserveerde verschillen verklaard kunnen worden door een invloed van het Turks. Prosodie verwijst naar variatie in toonhoogte (melodie), duur en tempo (ritme), en wordt ook wel de muziek van taal genoemd. In veel talen is een belangrijke functie van prosodie het uitdrukken van focusstructuur. De focus in de zin geeft simpel gezegd de belangrijkste informatie. Het Nederlands en Turks hebben verschillende manieren om focus aan te geven. Het Nederlands maakt voornamelijk gebruik van prosodie om de belangrijke informatie te accentueren. Het Turks gebruikt ook prosodie, maar daarnaast is er een essentiële rol weggelegd voor woordvolgorde. In het Turks komt alle belangrijke (dat wil zeggen, nieuwe en/of contrasterende) informatie vóór het werkwoord, terwijl na het werkwoord enkel informatie kan staan die al bekend was in de zinscontext. De informatie vóór het werkwoord wordt benadrukt door middel van prosodie, maar informatie na het werkwoord kan niet geaccentueerd worden.

Door middel van de productietaak in Hoofdstuk 3 hebben we semi-spontane opnames van zinnen (antwoorden op vragen) verzameld met drie soorten focusstructuur. Hoewel beide groepen sprekers (Turkse heritage speakers en moedertaalsprekers van het Nederlands) prosodie, en niet verschillen in woordvolgorde, gebruikten om focus uit te drukken, waren er ook verschillen tussen de groepen. Het meest opvallende was dat moedertaalsprekers van het Nederlands aan het einde van de zin hun toonhoogte verlaagden, wat typisch is voor het Nederlands en 'finaliteit' uitdrukt, terwijl de Turkse heritage speakers op dezelfde toonhoogte bleven. Dat komt overeen met toonhoogtekenmerken van het Turks, en kan daarom mogelijk verklaard worden door een invloed van het Turks. Naast enkele andere prosodische verschillen vonden we een verschil in toonhoogte dat afhankelijk was van het geslacht van de spreker. Terwijl mannelijke en vrouwelijke moedertaalsprekers van het Nederlands op ongeveer dezelfde toonhoogte spraken, was de toonhoogte van Turks-Nederlandse vrouwen veel hoger dan de toonhoogte van Turks-Nederlandse mannen. Omdat toonhoogteverschillen tussen mannen en vrouwen per taal en cultuur anders zijn, kunnen we dit resultaat waarschijnlijk zien als het gevolg van een cultureel verschil.

Hoofdstuk 4

Het interpreteren van focus in geschreven Nederlands door Turkse heritage speakers en moedertaalsprekers van het Nederlands.

Hoofdstuk 4 rapporteert een leesexperiment om te onderzoeken of Turkse heritage speakers op een andere manier focusstructuur interpreteren dan moedertaalsprekers van het Nederlands. Bij dit experiment werd gebruik gemaakt van eye-tracking, een techniek om oogbewegingen tijdens het lezen te meten. Uit Hoofdstuk 3 bleek al dat, ondanks de prosodische verschillen tussen beide groepen, Turkse heritage speakers geen woordvolgordeverschillen gebruiken om focus uit te drukken, zoals zij in het Turks wel doen. In hoeverre zouden zij informatie over woordvolgorde gebruiken om de focusstructuur te bepalen wanneer expliciete prosodie niet aanwezig is? Dit laatste is het geval tijdens het lezen: in geschreven zinnen kan geen gebruik gemaakt worden van expliciete prosodische cues om de focusstructuur te bepalen. Zoals boven beschreven, staat in het Turks de nieuwe, contrasterende informatie vóór het werkwoord, terwijl alles na het werkwoord geassocieerd wordt met reeds bekende achtergrondinformatie. Onze hypothese was dat de Turkse heritage speakers, als ze gebruik zouden maken van Turkse aanwijzingen over woordvolgorde, eerder zouden verwachten dat de nieuwe, contrasterende informatie zich aan het begin van de zin bevindt, dus vóór het werkwoord, dan na het werkwoord. Het Nederlands heeft minder duidelijke woordvolgorde-aanwijzingen voor focus, maar de nieuwe en/of contrasterende informatie bevindt zich in hoofdzinnen juist vaak na het werkwoord. Dit leidt tot tegenovergestelde interpretaties voor Turkse heritage speakers en moedertaalsprekers van het Nederlands.

Het eye-tracking leesexperiment van Hoofdstuk 4 was ontworpen om deze hypothese te testen. Het bleek inderdaad dat, net zoals in het Turks, de heritage speakers de informatie vóór het werkwoord associeerden met focus, terwijl de moedertaalsprekers van het Nederlands een voorkeur hadden voor focus na het werkwoord. Dit lijkt te bevestigen dat er een invloed is van de eerste taal (Turks) op de dominante taal (Nederlands) in het interpreteren van focus. Dit is een belangrijke bevinding, omdat veel onderzoek heeft aangetoond dat het correct bepalen van de focusstructuur essentieel is voor een goed leesbegrip. De resultaten van Hoofdstuk 4 zouden dus (deels) kunnen verklaren waarom veel Turkse heritage kinderen op de basisschool een achterstand ondervinden in leesvaardigheid in het Nederlands.

Hoofdstuk 5

De rol van klemtoonpositie in auditieve woordherkenning van Turks-Nederlandse cognaten.

De lexicale decisietaken van Hoofdstuk 5, waarbij zowel reactietijden als EEG-data werden verzameld, bestudeerden de rol van klemtoonpositie in de manier waarop Turkse heritage speakers in het Nederlands en Turks luisteren naar Turks-Nederlandse cognaten. Cognaten zijn woorden met een grote overlap in betekenis en vorm in twee (of meer) talen, zoals het Nederlandse ‘dokter’ en Turkse ‘doctor’, en het Nederlandse ‘gitaar’ en Turkse ‘gitar’. Tweetaligen herkennen cognaten vaak sneller dan niet-cognaten, omdat cognaten door hun vormoverlap in beide talen worden geactiveerd. Dit wordt ook wel cognaatfacilitatie genoemd. Mede door onderzoek naar cognaten is aangetoond dat in tweetaligen beide talen actief zijn, ook tijdens het uitvoeren van een taak waarbij slechts één van de twee talen wordt gebruikt. De andere taal wordt dan onderdrukt (inhibitie). Dit wijst erop dat tweetaligen niet twee gescheiden, maar één geïntegreerd mentaal lexicon hebben waarin alle woorden van hun talen opgeslagen zijn. Onderzoek heeft ook uitgewezen dat hoe groter de overlap is tussen twee cognaten, hoe sneller de herkenning ervan plaatsvindt. Wat echter nog heel weinig onderzocht is, is (a) auditieve cognaatverwerking (in tegenstelling tot het visuele domein), en (b) de bijdrage van (in)congruente klemtoonpositie aan de overlap tussen cognaten. Een congruente klemtoonpositie betekent dat de klemtoon op dezelfde lettergreep valt in beide talen (bijvoorbeeld Nederlands 'giTAAR' versus Turks 'giTAR'). Bij een incongruente klemtoonpositie verschilt de positie van de klemtoon tussen cognaten (bijvoorbeeld Nederlands 'DOKter' versus Turks 'docTOR'). Er is een wezenlijk verschil in klemtoonpositie tussen het Turks en Nederlands. Terwijl in het Turks klemtoon op de laatste lettergreep de regel is ('docTOR'), met slechts enkele uitzonderingen, varieert de klemtoonpositie in het Nederlands veel meer, hoewel er in woorden met twee lettergrepen een voorkeur bestaat voor de eerste lettergreep ('DOKter'). Ook kijkt dit hoofdstuk, net zoals de voorgaande hoofdstukken, naar de rol van taaldominantie versus de staat van de eerste taal, omdat de meeste cognaatonderzoeken over tweetaligen gaan die pas op latere leeftijd hun tweede taal leerden.

In lijn met onze verwachting vonden we ten eerste dat de Turkse heritage speakers sneller reageerden tijdens de Nederlandse lexicale decisietaak dan met de Turkse lexicale decisietaak. Dit past bij het feit dat het Nederlands hun dominante taal is. Ten tweede observeerden we cognaatfacilitatie wanneer de heritage speakers naar Nederlandse woorden luisterden. Wanneer de heritage speakers echter naar Turkse woorden luisterden, vonden we dat ze langzamer op cognaten reageerden dan op niet-cognaten. Dit suggereert dat de dominante taal (Nederlands), die ook geactiveerd werd wanneer de tweetaligen naar Turkse cognaten luisterden, zó actief was dat deze een snelle respons verhinderde. In het Nederlands hielp de activatie van het Turks de heritage speakers juist om cognaten sneller te herkennen dan niet-cognaten. In auditieve woordherkenning van cognaten blijkt dus zowel de zwakkere T1 als de dominante T2 van heritage speakers een cruciale rol te spelen, maar in tegengestelde richtingen. Dit verschilt van andere typen tweetaligen, voor wie vaak cognaatfacilitatie is gevonden tijdens woordherkenning in de niet-dominante T2, maar geen verschil tussen cognaten en niet-cognaten in de dominante T1.

Naast deze opmerkelijke cognaateffecten vonden we verschillen met betrekking tot klemtoonpositie. Cognaten met een congruente klemtoonpositie hadden tragere reactietijden, wat suggereert dat ze meer competitie ondervonden dan cognaten met een incongruente klemtoonpositie. Hoewel de overlap tussen de cognaten dus groter was dan bij niet-cognaten, zorgde deze overlap ook voor meer competitie tijdens de eerste fase van het woordherkenningsproces. Bovendien werden cognaten met klemtoon op de laatste lettergreep, de typische klemtoonpositie voor het Turks, sneller herkend dan cognaten met klemtoon op de eerste lettergreep, die niet typisch is voor het Turks, maar wel voor het Nederlands. Hier lijkt de regel over klemtoonpositie in het Turks dus ook van belang voor het luisteren naar zowel Nederlandse als Turkse woorden.

Conclusie

Dit proefschrift laat zien dat de manier waarop Turkse heritage speakers spreken, lezen en luisteren in hun dominante T2 (Nederlands) beïnvloed wordt door hun zwakkere T1 (Turks). Terwijl de meeste voorgaande studies invloed van de ene op de andere taal voornamelijk toedichtten aan taaldominantie, hebben wij aangetoond dat een zwakkere T1 ook de dominante T2 kan beïnvloeden, door de speciale status die de T1 heeft. Onze bevindingen hebben theoretische implicaties voor theorieën over meertaligheid, zoals de stabiliteit van bepaalde aspecten van de T1 en de kwetsbaarheid van aspecten in de T2. Talige aspecten die in de T1 als eerste worden verworven, zoals fonologische regels en de positie van belangrijke informatie, lijken stabiel te zijn in de T1, maar kwetsbaar in de T2. Daarentegen speelt taaldominantie een belangrijkere rol in de dynamiek van het tweetalige mentale lexicon, hoewel ook hier de status van de T1 benadrukt mag worden.

Onze uitkomsten suggereren dat verschillen in taalaanbod bij tweetaligen invloed hebben op de richting waarin taalinvloeden optreden. Met andere woorden, het feit dat de Turkse heritage speakers in hun eerste jaren voornamelijk Turks hoorden en gebruikten (in plaats van net zoveel Nederlands als Turks) biedt een verklaring voor de kracht van het Turks – naast een T2 die uiteindelijk domineert.

Meer praktische implicaties van onze bevindingen betreffen de taalachterstand die Turkse heritage speakers als kinderen ervaren op school. Ons onderzoek toont aan dat zelfs volwassen heritage speakers moeilijkheden ondervinden tijdens het lezen in hun dominante T2 door een invloed van hun T1. Dit betekent dat een deel van de taalachterstand van migrantenkinderen op school verklaard zou kunnen worden door een invloed van hun T1. Aandacht voor structurele verschillen tussen de eerste en tweede taal in zich ontwikkelende tweetalige kinderen is daarom mogelijk van een groter belang dan tot nu toe werd aangenomen.

Curriculum Vitae

Remy van Rijswijk (Nijmegen, the Netherlands, 1988), graduated in Linguistics (BA, MA cum laude) at Radboud University. In 2009, she spent six months of her Bachelor's at Université Paris Diderot in Paris, France. In 2010 and 2011, she conducted fieldwork for her Master's internship and thesis in the small community of Conchacalla, near Cusco, Peru. This project, which was supervised by Dr. Antje Muntendam, examined the influence of Quechua on the prosodic system of Andean Spanish. Remy's PhD project started in 2012. She currently works as an International Officer for Psychology and Artificial Intelligence at the Faculty of Social Sciences of Radboud University.