The effect of Non-native Input and Other External Factors on Bilingual Language Acquisition

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All who have ever written a dissertation of some sort know that it is no easy task. It requires discipline, planning, commitment and focus, among undoubtedly many other important characteristics. What helps, though, is if you have people around who support you and remind you that it is supposed to be, above all, fun. It also doesn't hurt to hear the phrase 'you can do it!' every once a while. Without these people this dissertation would most definitely not be here to read right now. A word of gratitude seems, then, the least I can do.

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1. Introduction

Everybody knows that exposure to a language is a necessary requirement to acquiring that language. One might also ask though if there are consequences if this exposure is in some way or another non-targetlike. If such is the case, language may not still be able to develop as it usually would. When referring to non-targetlike input one could think of an accent but also for instance of an incomplete grammatical system. In the Netherland, as in many other countries in the world, large numbers of bilingual language learners are exposed to such non-targetlike language input simply because their parents and other people in their environment are not native speakers of that language. Furthermore, in classroom second language (L2) acquisition, the educated language is often the teacher's second language as well, rather than their first. Since in both natural and explicit learning contexts language acquisition still takes place, we must infer that non-native input does not need to prevent language learning from taking place. However, on a more fine-grained level, whether non-native input may have a differential effect on the acquisition of an additional language when compared to native linguistic input is a different matter.

The Netherlands is an ideal testing ground because it has a rich immigrant history. Large immigrant numbers make it crucial to determine how language should be used to optimally support the linguistic, and as a result the more general, development of bilingual children. Both government and parents should be given ample information so as to guide their decisions about language policy and parenting, respectively. In the current society, migrants who come to live in the Netherlands are expected to learn to speak the language (Klis 2011). Multilingualism is generally discouraged, largely because its effects on linguistic development and the differences between monolingual language acquisition are not well understood. Therefore, migrant parents are often advised to speak Dutch to their children, even when it is not their native language (van den Bergh 2005, Rijksoverheid 2011, 4). In reality, it is not at all impossible to become a successful bilingual. The undifferentiated choice to always and only offer Dutch input may not be in the best interest of each individual language learning child. In the debate between linguists and politicians many questions remain that make it difficult to determine the best policy. Examining the role of non-native input on migrants' linguistic development may contribute to the debate and more clearly demark the path that governmental and educational institutions, as well as migrant parents should best follow.

For this study, I have chosen to examine Moroccan-Dutch bilingual children because there is a large Moroccan community in The Netherlands. The terms (Moroccan-Dutch) bilingual language acquisition and (Moroccan-Dutch) bilinguals will be used to describe this group of migrant children and the acquisition of languages by these migrant children. Although it is difficult to determine whether the majority language, Dutch, and the home language, either a Berber language or Moroccan Arabic, are in fact two first languages and not one first language and one second language, and it seems inaccurate to assume that most of these children are true simultaneous bilinguals, all children have grown up with both languages from an early age. Thus, the term bilingualism seems to best fit this group of learners. Differences in AoO are minimal, as nearly all children were exposed to Dutch from birth and otherwise from early childhood, and are therefore unlikely to affect the children's level of proficiency such that it decreases as AoO increases.

Intuitively, many seem to think that when children are exposed to much of this non-native input there is going to be a consequence for their acquisition of the language. The train of thought here is of course that if what the listener hears is not correct, that learner itself cannot be expected to acquire the language perfectly. Such reasoning is most often applied to phonological acquisition as a result of the observation that children in Moroccan and Turkish families are frequently perceived to have an accent. Although this could be an effect of transfer from their first language, it also seems possible that this is an effect of non-targetlike input, such that infants' output is a reflection of the speech sounds of their parents' non-native speech.

From a more linguistic point of view, L2 or bilingual learners who learn a language in a naturalistic setting have to rely primarily on positive evidence, that is, rely on the utterances that they are exposed to to determine what is grammatical in their target language. Negative evidence, i.e. explicit reveals that some construction is not grammatical, is very limited in any type of natural language acquisition. Therefore, children will generally interpret the output that they receive as constituting positive evidence. When this is different from the standard, such as non-native output is, children may assume incorrect conclusions about the target language. Note, however, that Chomsky (1965) was the first to emphasise that the Primary Linguistic Data available to language learners, at least in a naturalistic setting, are degenerate, that is, filled with incorrect usage and incomplete sentences. Thus, learners do seem to have a general capacity to overcome imperfect input. Although research has speculated about a potential effect of non-native input on linguistic development (e.g. Blom and Vasić 2011; Hulk and Cornips 2006, 2008), as of yet there is little empirical evidence to corroborate any of these suggestions.

There are three logical possibilities for a differential effect of non-native input on bilingual acquisition. First, non-native input could be equally supportive of bilingual language acquisition as standard, native input. Second, non-native input may support bilingual language acquisition, but to a lesser extent that native input does. Third, there may be a negative effect of non-native input such that correct acquisition of the community language is slowed down or even inhibited. There may be several factors that combine to cause different degrees of influence of non-native input on linguistic development, such as the proportion of non-native versus native input and the exact level of proficiency of non-native speakers providing linguistic output.

The suggestion that non-native input has an effect on bilingual language acquisition presupposed the more general claim that external differences between learners can lead to differential levels of proficiency. In other words, it assumes that there is a role to play for the environment in linguistic development. Previous research has indeed demonstrated considerable effects of environmental factors in a range of language learning contexts, including bilingual development (e.g. Paradis 2011, Place and Hoff 2011). Examples of such environmental factors are the length of exposure to the target-language (Gathercole 2007) and the socio-economic status (SES) of the language learning child's parents (e.g. Goldberg, Paradis and Crago 2008).

This study sets out to shed more light on non-targetlike input effects on bilingual language acquisition, but also, more generally, to find support for the notion that environmental variables effect bilingual development. By examining a range of different internal and external variables, including the amount of non-native input, this thesis hopes to provide a clear view the role that each plays in the linguistic development of Moroccan-Dutch bilingual children in The Netherlands. The first research question asks if there is an effect of external variables on the Dutch proficiency of Moroccan-Dutch bilingual children. Particular attention will be paid to the effect of non-native input. The second research question is therefore if the amount of non-native input affects bilingual language acquisition. Based on a still developing body of research demonstrating the influence of the environment on language acquisition (see Chapter 2.2), I make the hypothesis that external factors will be predictive of Dutch proficiency. Furthermore, based on a small selection of findings about language acquisition on the basis of non-native input, (see Chapter 2.3), I hypothesise that exposure to non-native input will lead to lower levels of proficiency than native input. Thus, a negative effect of non-native input on linguistic development is predicted. Note that the effect of non-native input on the final state of the target language, i.e. ultimate attainment, is not under investigation here, rather this study focusses on the development of language under these specific circumstances.

In answering the current research questions, I hope to contribute to the study of bilingual language acquisition and our understanding of the bilingual and early L2 acquisition process, but also to be able to make practical suggestions for all those who are interested or involved in bilingual language acquisition in The Netherlands. In addition, I hope that this research will allow me to make helpful recommendations to the bilingual community itself, particularly the bilingual community in The Netherlands. The effect of non-native input is of crucial importance for those parents who are raising their children in a country where their native language is not the majority language. Hopefully, the findings of this study will be of some help to them.

This thesis is organised as follows. Chapter 2 presents an overview of research findings demonstrating the significance of environmental factors in bilingual language acquisition, briefly discussing input quantity followed by input quality. Subsequently, it will list previous studies that present empirical data which either directly or indirectly provide information about an effect of non-native input on language acquisition. The chapter is concluded with a section containing research questions, hypotheses and predictions. Subsequently, Chapter 3 discusses the methodology of the current study, including participants, tasks and procedure. The results of this study are then presented in Chapter 4, followed by an extensive discussion of these results in Chapter 5. Finally, Chapter 6 contains the conclusions and discusses implications as well as limitations of the findings, and poses directions for future research.

2. Literature overview

2.1. Introduction

In child L2 and bilingual acquisition research, one important question is why some bilinguals successfully acquire two languages whereas others struggle. For many years, the main focus of this research has been on age effects, i.e. what effect Age of Onset (AoO) has on linguistic development and if there is a critical period for the native-like acquisition of a language (see e.g. Herschensohn 2007 for an overview). Over the years, a number of factors has been researched to explain learner differences, of which a few examples are motivation and learner strategies (e.g. Skehan 1991). Although factors accounting for individual differences have been studied extensively for monolingual and adult L2 acquisition, the same cannot be said for child L2 and bilingual acquisition research. Only more recently has attention been drawn towards the complex character of sequential and simultaneous bilingual language acquisition and how it provides a rich source for investigation. Moreover, little interest has been given to external or environmental factors. Instead, internal factors such as chronological age and transfer from the first language (L1) (Paradis 2011) have often been the focus of recent research. One particular facet of language acquisition that has deserved little attention, although not infrequently relevant in, mostly, bilingual and child L2 language acquisition is the influence of input provided by non-native speakers.

The combined sections of Chapter 2 present a detailed outline of existing literature that is relevant to researching the general effect of the environment and, specifically, the effects of non-native input on linguistic development. The following section discusses findings about quantity and quality of the linguistic environment, respectively, and their effect on bilingual and child L2 language development. Subsequently, section 2.3 will elaborate on one particular qualitative factor, namely non-native input. These sections will consider not only bilingual and early L2 acquisition contexts, but will also draw from research about monolingual L1, adult L2 and heritage language acquisition. The chapter is finished with a listing of this thesis' research questions, predictions and hypotheses. In this manner, this chapter will attempt to make clear how previous literature can inform us about a possible effect of non-native input on linguistic development and how the current study can expand our knowledge of the numerous facets which influence early second and bilingual language acquisition. It will also reveal the importance of a systematic study into the role of non-native input in bilingual language acquisition.

2.2. Environmental factors in bilingual language acquisition

Environmental factors can roughly be divided into effects of the quantity of the input and effects of the quality of the input. The former refers uniquely to any influence exerted by the amount of input received by an individual, whereas the latter can be split up into several different determinants of input quality, such as maternal level of education, amount of literacy activities and parental fluency. Research on individual differences between bilingual and L2 learners is complicated by the intricate interplay between the multitude of internal and external factors affecting the language acquisition process. It is not always clear which factor is crucial in explaining learner differences. It is, for instance, very difficult to disentangle age effects and effects of the quantity of input from each other (Unsworth et al. 2010) and also effects of quantity and quality (Scheele, Leseman and Mayo 2010; Cornips and Hulk 2006). However, a number of studies which have been able to demonstrate a clear predictive effect of several environmental variables.

2.2.1. Quantity of input

In child L2 and bilingual language acquisition, the input provided to the child has to be divided over at least two different languages, and this division is not always balanced. Several studies show that there is a positive correlation between input quantity and learners' level of proficiency for both morphosyntax (e.g. Gathercole 2007; Gathercole and Thomas 2003; Paradis 2009; Paradis 2011; Paradis, Nicoladis and Crago 2007; Paradis, Nicoladis, Crago, and Genesee 2011; Unsworth, Argyri , Cornips, Hulk, Sorace and Tsimpli 2010) and vocabulary (e.g. Paradis 2009; Paradis 2011; Pearson, Fernández, Lewedeg and Oller 1997; Vermeer, 2001).

Gathercole (2007) reveals more advanced morphosyntactic development for simultaneous bilingual children in the language that they had greater exposure to. More specifically, she observes that English-Spanish bilinguals living in Miami with the greatest amount of Spanish exposure, because only Spanish was spoken at home, outperform other bilinguals in detecting ungrammatical sentences. Children listened to both grammatical sentences and ungrammatical sentences with errors in Spanish gender, English mass/count nouns, and English and Spanish that-trace constructions and indicated if they thought the sentences to be correct. At a later age (grade 5), most differences disappear. Therefore, the author concludes that '[t]he more input a child has in a given language, the more likely s/he is to develop a given structure earlier' (Gathercole 232). In the same study, parallel results are reported for a group of English-Welsh bilinguals living in North Wales. Welsh-English bilinguals were also under investigation a study by Gathercole and Thomas (2003), who compared two groups of simultaneous bilinguals (English-dominant and Welsh-dominant) and sequential (L2 Welsh) bilinguals. In agreement with previous research, they find that the language to which children had been exposed most frequently and from birth, i.e. the language of the home, is generally the language in which children demonstrated the highest level of morphosyntactic proficiency, as measured by accuracy on grammatical gender-marking. Which language is spoken at school has a secondary effect on Welsh proficiency at later stages of the acquisition process. Both factors mirror differences in amount of exposure and the authors conclude that greater input quantity leads to greater proficiency. An effect of input quantity on morphosyntactic development was also demonstrated by Paradis, Nicoladis and Crago (2007), who studied French-English bilinguals and French monolinguals on their production of the past tense. Monolingual English data were used for comparison. Crucially, they found that although bilinguals lagged behind monolinguals overall, they performed as well as the bilinguals in their language of greater exposure on all but English irregular verbs. This result suggests that input quantity is a crucial factor in rate of acquisition. Similar results were obtained by Paradis, Nicoladis, Crago and Genesee (2010). Input quantity was also found to be a significant predictor of children's acquisition of gender in Unsworth, Argyri , Cornips, Hulk, Sorace and Tsimpli (2010). This study compares three groups of bilinguals, namely simultaneous bilinguals who were bilingual from birth, early successive bilinguals with an AoO between one and three years, and L2 children with an AoO between 4;0 and 10;0 years. This comparison reveals that when quantity of input to the 'second' language was measured cumulatively, this but not AoO significantly predicted L2 success, as measured by children's knowledge of grammatical gender.

Examining both morphosyntactic and lexical development, Paradis (2009) finds that bilingual children tested on vocabulary and grammar performed similar to monolinguals in the language which they spoke most at home, but below that level in the other language.

In another study by Paradis (2011), the lexical and morphological proficiency of child L2 English learners with a mean 20 months of exposure to English and the effect of several internal and external factors is examined. The author tested 169 children between the ages of 4;10 and 7;0 with varying first languages. Receptive vocabulary proficiency was established by the Peabody Picture Vocabulary Test (PPVT-III, Dunn and Dunn 1997), which required participants to match the correct image to a spoken word. The Test of Early Grammatical Impairment (TEGI, Rice and Wexler 2001) was used to measure children's accuracy with verbal morphology. A parental questionnaire called the Alberta Language Environment Questionnaire was used to establish a range of factors. Internal factors include AoO, phonological working memory, non-verbal IQ, transfer of morphosyntactic constructions from L1 to L2, and cognitive maturity as represented by chronological age. External factors considered are months of exposure to the L2, proportion of the L2 spoken at home, number of older siblings, the mother's L2 fluency, the mother's educational level and the richness of the L2 environment outside school. Results show that internal factors – language aptitude, chronological age and L1 typology – were more important than external ones, with language aptitude the best predictor. However, the length of exposure to English in months was significantly predictive of both vocabulary and morphosyntactic proficiency. An effect of an increase in the number of months of exposure reflects, at least in part, an effect of input quantity.

Several studies have researched the effect of input quantity on the lexical proficiency of bilingual learners. Pearson, Fernández, Lewedeg and Oller (1997) tested bilingual simultaneous Spanish-English bilingual children specifically on their lexical proficiency. These bilinguals differed in the amount of language input that they received. Scores from parent reports determining the active vocabulary knowledge of the bilingual children in both their languages were found to correlate significantly with the amount of time that children spent with speakers of the relevant language. Vermeer (2001) tested bilingual children on what he refers to as breadth of vocabulary, namely how many words they know, and also on depth of vocabulary, i.e. how well they know the words in their receptive vocabulary. Both measures were revealed to correlate with input quantity, as "a highly significant relation between the probability of knowing a word and the frequency of oral and written language input in primary education" (230) was observed. Finally, Thordardottir (2011) found a positive correlation between the rate of vocabulary learning and the amount of exposure in that language, as determined by detailed parental questionnaires. Both receptive and expressive lexical learning were measured using a set of standardised tests. The Montreal-based children were divided into groups receiving increasingly more exposure to English or French input. Results showed that when exposure to either English or French increased, lexical proficiency in that same language also improved.

This brief overview of literature reveals that there is sufficient evidence for an effect of input quantity on L2 learners' proficiency and specifically rate of acquisition in the lexical and morphosyntactic domain. The next section will review findings related to various factors that can be united under the term input quality and their effect on L2 proficiency.

2.2.2. Quality of input

Although sometimes difficult to demonstrate, several studies have shown that in addition to input quantity, the quality of the input is also a key factor in the shaping of linguistic development (e.g. Scheele et al. 2010; De Houwer 2007; Goldberg, Paradis and Crago 2008; Paradis in press; Place and Hoff 2011).

Scheele and colleagues establish that L1 and L2 proficiency in Moroccan-Dutch and Turkish-Dutch three-year-olds is related to L1 and L2 input at home. Differences in the amount of oral and literate L1 and L2 language activities, such as book reading, are found to predict L2 proficiency. Effects of SES were fully mediated by input. Similarly, in a lexical acquisition study by Goldberg, Paradis and Crago (2008), SES, specifically mother's level of education, emerges as a significant predictor of vocabulary development. Goldberg at al. claim that the consistency of this finding throughout a number of studies and the fact that SES even affects the language spoken outside of the home, suggests that factors associated with SES may be crucial to language acquisition, more so than the quantity of exposure.

De Houwer (2007) investigates parental input by relating the languages spoken by the parents at home to bilingual children's language use. She concludes that "the particular combination of how the two languages are used by the parents […] can account for differences in the children's minority language use" (420) and that although the majority language (Dutch) is always acquired, substantial exposure to the minority language is needed for this language to develop normally. Children in families where both parents spoke the minority language and at least one parent never used Dutch with the child were most proficient in the minority language.

Finally, two studies, Paradis (2011) and Place and Hoff (2011), have conducted a very extensive examination of a multitude of factors possibly affecting bilingual language acquisition. As described in the previous section, Paradis (2011) examines the effect of several environmental variables on linguistic proficiency of child L2 learners of English. Among these variables are some that concern the input quality, namely proportion of the L2 spoken at home, number of older siblings, the mother's L2 fluency, the mother's educational level and the richness of the L2 environment outside school. In addition to an effect of LoE and, thus, input quantity, the richness of the L2 environment outside school was also demonstrated to promote both morphosyntactic and lexical proficiency. Richness of the English environment was based on a combination of input from native speakers and otherwise high-quality input, e.g. from television.

Adopting a similar approach, Place and Hoff (2011) consider the effect of environmental factors on both the majority and minority language of two-year-old simultaneous Spanish-English bilinguals. All children had been exposed to both English and Spanish from birth, but the less frequently heard language only had to constitute 10% of their total amount of exposure in order to be considered for inclusion in the study. Parents spoke either native Spanish, native English or, the mothers only, were native Spanish-English bilingual. Language development was measured using the MacArthur-Bates inventories (CDI for English, IDHC for Spanish), which are caregiver-report instruments. These inventories measure active vocabulary size and grammatical complexity. To establish the quantity and quality of the children's input, parents also kept a language diary. The language diary entailed that once every eight days, the parent wrote down who had interacted with the child, in which language, during which activity and any other comments, in 30-minute blocks. Finally, parents' language proficiency in both languages was determined by self-evaluation on a 3-point scale. Place and Hoff considered an extensive range of internal and external factors in evaluating proficiency (for both languages): The percentage of exposure to the language, the number of single language conversational contexts, the number of single language conversational partners, the number of different speakers as sources of exposure, and the percentage of exposure from native speakers. They find that both quantity and quality of the input impact language proficiency. Results show that in the majority language several qualitative factors are predictive of language skills, namely the number of people with whom the child spoke only this language, the number of different speakers that spoke this language to the child, and the proportion of the input that was provided by native speakers. For the minority language, in addition to an effect of the quantity of the children's exposure to it on grammatical proficiency, the number of different contexts that they heard it spoken in affects both grammatical and lexical proficiency.

In general, then, these studies have illustrated that the language environment is of great importance to the development of a child's second or minority language. However, one generally under-researched factor in this line of research is the effect of non-native input on language development. The next section will present some theoretical and experimental findings on the effect of non-native input. It will deal with the questions why and how non-native input could be thought to affect language acquisition.

2.3. Non-native input

Very little research so far has attempted to discover if there is a differential effect of non-native input on child L2 or bilingual acquisition. This section will discuss the few studies that examine non-native input as a factor in linguistic development. In doing so, we will expand our view to other language acquisition contexts, including monolingual and heritage language acquisition. This also allows for a comparison between two conceptually different approached about the effect of non-native input. One idea is that it prevents target-like acquisition of a language, a second is that it will alter the target and this altered form is what is acquired. Although non-native input may not always have been the primary object of research, nonetheless, the data collected in these studies provide us with valuable information as to the specific nature of non-native input, how it is different from native input and how, therefore, the results of these two respective variants may differentially affect how the language acquisition process. This section will be concluded with a discussion of Place and Hoff (2011), which offers a structural measure of non-native versus native input.

Although Sorace (2005) examines the effect of non-native input on adult rather than child L2 acquisition (and attrited L1 speakers), I believe the results to be of certain significance for child L2 and bilingual acquisition as well. This study describes optionality, the occurrence where two forms that are grammatical in the L2 but of which only one is grammatical in the L1, are both used in the L1 with the result that one form used is ungrammatical. Sorace shows that English near-native L2 speakers of Italian use overt pronouns in many cases where a monolingual English speaker would use a null pronoun. To explain this optionality, Sorace points out both adult L2 learners and attrited L1 speakers have receive qualitatively different input compared to monolingual speakers. Specifically, L2 speakers may receive input from other L2 speakers, i.e. non-native input. Sorace proposes, then, that "these speakers' optionality is thereby reinforced by the optionality in the input" (Sorace 2005, 74). Thus, because the L2ers hear both the grammatical and the ungrammatical form, they deduce that the ungrammatical form is correct and start using it themselves. A similar process may be happening for the children in the current thesis.

Also relevant for the present study is research on heritage speakers, since their input is sometimes non-targetlike. Heritage speakers may be defined as individuals who learn to speak the language of their parents at home, but this language is not the majority language of the country that they live in (Valdés 2000). When the majority language becomes the child's dominant language, usually when s/he begins to attend school, before the minority language is fully acquired, we refer to the minority language as the heritage language (Valdés 2000). For the bilingual children in the Moroccan community in The Netherlands, not Dutch but Berber (or Moroccan Arabic) should be consider their heritage language. However, acquisition of a heritage language and acquisition of Dutch by the current participants are comparable due to the non-targetlike input which both receive.

In their research, Pires and Rothman (2009) attempt to explain why European Portuguese (EP) heritage speakers have full morphosyntactic and semantic competence of inflected infinitives, whereas Brazilian Portuguese (BP) heritage speakers lack this knowledge. To this goal, they compare EP heritage speakers and BP heritage speakers on their knowledge of inflected infinitives. Based on these data, they hypothesise that the difference can be attributed to qualitative differences in the two groups' input. Specifically, it is argued that inflected infinitives are no longer used in colloquial BP dialects, contrary to EP. Therefore, for EP-acquiring children, parental input may simply not contain inflected infinitives. More generally, Pires and Rothman therefore propose that if input is reduced, in the sense that certain elements are missing, these missing elements will not be acquired by the learner. They term this hypothesis missing-input competence divergence.

Supplementing Pires and Rothman, Domínguez (2009) presents an overview of the role of parental input in heritage speakers' linguistic development. She discusses results from a previous study (Domínguez 2008) on Spanish-English heritage speaker bilinguals whose parents, although native speakers of Spanish not exposed to English until after puberty (when they can be assumed to have obtained a steady-state Spanish grammar), had suffered from attrition. As a result, these children's primary L1 input as provided by their parents is different from the target, standard variety of Spanish that monolingual children are exposed to. Domínguez found that at least some of the errors made by Spanish-English heritage speakers are also observed in the parental speech of two attrited Spanish speaking parents. Therefore, she argues that it is possible that the 'errors' witnessed in heritage speakers bilinguals' speech are in fact a direct reflection of the non-targetlike input that they receive from their parents.

Translating these finding from heritage language research to the current thesis, the non-native input that Moroccan-Dutch bilingual children receive from their parents may also lack elements that standard, native input does contain. As a result, these children may not be able to acquire certain properties and demonstrate different levels of proficiency compared to monolingual Dutch learners.

Most situations in which children are provided with non-native input are L2 or bilingual learning contexts, mostly migrant children receiving input from their parents who were not themselves born in the country and do not natively speak the majority language. However, a few studies evaluate the effect of non-native input on monolingual first language acquisition. These findings are relevant to bilingual or early L2 acquisition as well, particularly if one assumes that both groups of learners have full access to innate language learning mechanisms and that, therefore, the basis for language acquisition is identical. Of course bilingual or early L2 acquisition is not the same as monolingual L1 acquisition times two, but the same language learning mechanism should be available for each of these learner groups.

In a series of studies, Newport and colleagues (Singleton and Newport 1994; Ross and Newport 1996) study the first language acquisition of a deaf boy receiving linguistic input under rare circumstances. He only receives signed input from his parents, who were both L2 learners of American Sign Language (ASL). Simon's ASL proficiency was measured by means of an elicited production test called the Verbs of Motion Production (VMP) test, in which the participant is instructed to describe a set of film segments. Each film elicited a specific verb to ensure that each of the different morpheme categories which exist in ASL were produced. The percentage of morphemes accurately produced by Simon was measured and compared to the performance of native child signers and both his parents. Newport et al. reveal with their studies that Simon had acquired almost all morphological properties of ASL to a similar degree as native signers of ASL, but on some aspects he fails to surpass his parents' non-native proficiency. Most interesting is Newport et al.'s discussion of those properties that Simon was not able to reach native-like proficiency on. It is suggested that these properties are among the most complex, also proving to be more difficult to acquire in first language acquisition, and, therefore, because these properties are also among the most problematic for Simon's parents, the input that Simon receives is more inconsistent compared to other parts of speech. It may be that the combination of these two factors, i.e. extremely inconsistent input for an already difficult linguistic property, prevents him from surpassing his parents' input. Thus, Newport et al. hypothesise, only when there is a sufficient degree of consistency in the input will the learner be able to achieve native-like attainment. When input is extremely inconsistent and the linguistic property is difficult and generally takes longer to acquire, it may be impossible to surpass the input.

Relating these findings to the participants in the present study, it is difficult to establish exactly how comparable the two learner groups and their learning process are. All children tested in this thesis were exposed to the target language from a very early age. Therefore, the innate language learning mechanisms available to Simon are likely to be available to this set of participants as well. However, it is important to remember that bilingual or early second language acquisition is not the same as monolingual language acquisition times two

(Grosjean, 1989). Therefore, it would go too far to claim that the linguistic development of the children in the current thesis is directly comparable to Simon's.

Newport et al. (1994, 1996) sketch a scenario similar to Sorace (2005), proposing that input provided by non-native speakers is fundamentally different from input offered by native speakers. Newport et al.'s L1 learning child, like Sorace's L2 learners, receives input that is inconsistent, presenting the child with unclear guidelines to the target of learning. The task of learning which option is the correct option in the target language complicates the learning task to such an extent that it may not under all circumstances be possible to acquire the target successfully.

Another study that investigates the role of parental input on linguistic development is by Paradis and Navarro (2003). One of the questions that these authors attempted to answer was if crosslinguistic influence from English on Spanish in a bilingual child could be explained by the input that s/he receives from her/his parents. Most previous research has looked at crosslinguistic influence as the result of an internal psycholinguistic process. Paradis and Navarro claim that bilingual children's parental input can be different from standard, native input, because the parents may have developed a contact variety of their native language or because they speak to their child in a language that is not their native language. Thus, they recognise non-native input as potentially influencing children's output, whilst also considering other factors. More generally, then, they claim that non-targetlike properties in bilingual children's speech could be the result of those same properties being present in the input. Paradis and Navarro examine subject realisation (null or overt) in Spanish by one Spanish-English bilingual child. Crucially, the child's mother speaks Spanish to her but is herself not a native speaker of Spanish. She does not speak standard Spanish, but uses a Panamanian variety with some Cuban influences. Paradis and Navarro find that, compared to standard, native speech, the mother's speech includes both a higher proportion of overt subjects (60% versus 40% in native Spanish) and a higher proportion of over subjects in what they call the low informativeness value context. Comparison of the bilingual child with two monolingual children reveals that the child produces more overt subjects in Spanish than the monolinguals. The connection between the non-standard input of the bilingual child and its output suggests that the non-native model of exposure may have exerted influence on the child's acquisition of subject realisation in Spanish. The authors conclude that it is possible that the child is following the linguistic behaviour of its parents. However, Paradis and Navarro state that they are unable to establish, based on these data, if the non-native input is indeed what causes the child's delay, or whether internal crosslinguistic transfer, or a combination of both is responsible.

Several studies make claims regarding non-native input in the acquisition of Dutch by minority groups in The Netherlands, such as the children in the current thesis. Consecutive studies by Cornips and Hulk (2006, 2008) seem to reveal, among other things, an effect of non-native input on child L2 acquisition of gender agreement in Dutch by learners from several minority groups. In their 2005 study, 14 bilinguals of different ages (between 3;0 and 10;5) and with different minority languages participated in a Dutch sentence completion task, designed to elicit nouns and their corresponding determiners. Subsequently, Cornips and Hulk (2006) investigate gender agreement in 13 bidialectal children, exposed to standard Dutch and a local dialect of Heerlen, which crucially has three genders instead of the two different genders in standard Dutch, with a similar sentence completion test. They find that the bilingual children perform worse than monolingual Dutch children and that they eventually fossilise. The bidialectal learners on the other hand actually achieve a target like grammar sooner than monolingual children. The bidialectal children's advantage over monolingual children can be explained by positive crosslinguistic influence from the Heerlen dialect on standard Dutch, due to structural, morphological overlap. However, the migrant children's performance cannot be explained by negative crosslinguistic influence as there is no such overlap. Therefore, Cornips and Hulk (2006, 2008) put forward several external factors that may have caused this difference. One of these factors is exposure to non-native input, which is more substantial for migrant children. Cornips and Hulk (2006) investigate this suggestion further by examining first generation (born outside the Netherlands) and second generation (born in the Netherlands to immigrant parents) migrants' use of determiners. Their findings are that first generation migrants, who learn Dutch as adults and are therefore non-native speakers, make similar errors as the bilingual children. Cornips and Hulk take this as an indication of gradual transfer of nonstandard linguistic properties from generation to generation. This finding is in line with the observations made by Pires and Rothman (2009) and Domínguez (2009) suggesting that specific elements of the parental input are adopted by children, including elements that are different from the standard or norm. Cornips and Hulk conclude that Turkish-Dutch children do acquire Dutch completely, but they acquire a non-standard 'ethnic' variety.

Following up on Hulk and Cornips (2006, 2008), Unsworth (2008) tests the effect of age of first exposure, input quantity and input quality on L2 English-Dutch children's and adult's proficiency with grammatical gender. In reaction to Hulk and Cornips' findings specifically, the author sets out to explore whether 'ethnic Dutch' input is really the cause of fossilisation in child L2ers. If this is the case, each of the child participants in Unsworth's study should become targetlike, since they are not likely to be exposed to this type of input. This is because, although they probably will come in contact with non-native speakers of Dutch, "for many if not most, this communication is likely to occur in English rather than Dutch" (372). Furthermore, differences in SES make it unlikely that L2 English-Dutch and L2 Turkish-Dutch children will have contact with each other. Unsworth's results revealed that most children overgeneralise *de* and so were not targetlike. However, crucially, the fact that some learners *were* found to be targetlike shows that "targetlike acquisition of grammatical gender as marked by the definite determiner is, in principle, possible by English-speaking children [...]" (387), which based on Cornips and Hulk's (2006, 2008) results is not the case for L2 Turkish-Dutch children. This observation suggests that for the Turkish-Dutch children non-native input may put additional constraints on their Dutch linguistic development.

Blom and Vasić (2011) investigate determiner-noun agreement in Dutch output of Turkish-Dutch children specifically. Like Hulk and Cornips (2006, 2008), she finds that lower levels of proficiency compared to monolingual Dutch children are more likely caused by external factors than by internal ones. With respect to determiner-noun pairs, Turkish-Dutch children's parents are reported to use what they call 'unreliable' input when speaking Dutch. That is, as a result of speaking a nonstandard variety of Dutch, they will use the correct agreement form less often than is witnessed in standard Dutch. Note however, that this claim is not based on experimental data. Nonetheless, Blom and Vasić claim that unreliable input, specifically the frequent (incorrect) use of the common definite determiner *de* with neuter nouns, explains L2 children's delay in determiner-noun agreement. The lack of an effect of word frequency and vocabulary size on accuracy with determiner-noun agreement in L2ers, which predict accuracy in monolingual Dutch learners, is interpreted as confirming their viewpoint. The claim made would be more substantial if the authors could provide a more detailed account of how unreliable input would affect the children's output and if they would support their statements with actual data concerning the amount and type of input that the children in their study are exposed to.

A possible effect of non-native input on the Dutch proficiency of two- to three-year-old Turkish-Dutch bilinguals was already suggested by Blom in a previous study (2010). Although this study focusses on effects of input quantity on the bilinguals' linguistic development, it also briefly considers a possible effect of input quality and social setting. Crucially, Blom finds that the bilingual child with the least exposure to Dutch has greater lexical diversity than bilinguals exposed to an average amount of Dutch input and even resembles children who primarily receive Dutch input. Interestingly, this child is different from the other children in the sample in that she lives in a neighbourhood with few migrant families. In addition, the child's family has befriended their Dutch neighbours and the child spent much time playing with the children of this family. In this case, then, it seem that a lack of quantity of input to Dutch was overridden by qualitatively enhanced input as compared to the other children, specifically native input compared to non-native input. However, as Blom herself indicates, this suggestion needs to be strengthened by future research.

Finally, the most direct and clear evidence for a differential effect of non-native input is provided by Place and Hoff (2011). As discussed above, Place and Hoff measured 29 two-year-old Spanish-English bilingual children's linguistic development in both languages. The participants' parents included both native and non-native speakers of Spanish and English, whose proficiency was established by means of self-evaluation. Place and Hoff consider the role of a range of environmental variables in morphosyntactic and lexical development, as measured by the MacArthur-Bates inventories. Of particular interest is their examination of the effect of the percentage of exposure from native speakers. Results, based on the language diaries kept by the children's parents, showed that for English, the majority language and thus analogous to the language of investigation in the present study (Dutch), input from native speakers significantly predicted language proficiency, with more input from native speakers resulting in a higher proficiency. Rephrased, this finding indicates that non-native input had a negative impact on language development. However, it does not reveal any information about the amount of non-native input or the specific quality that will cause such a negative effect. Therefore, what can be concluded from these findings is that "non-native input is *less* useful to language acquisition than native input" (Place and Hoff, 26; my emphasis).

This section has presented results of research into the influence of non-native input on bilingual language acquisition, as well as findings from a number of studies about first, (early) second and bilingual language acquisition under circumstances in which non-standard linguistic input seems to have some effect on linguistic development. What several of the studies above (Hulk and Cornips 2006, 2008; Paradis and Navarro 2003; Pires and Rothman 2009; Domínguez 2009) have in common is that each assumes that non-targetlike output is actually target-like, but that the target is not the standard target, i.e. children acquire what they hear, but what they hear is not the standard version of the language. The alternative set of explanations (Sorace 2005; Singleton and Newport 1994; Ross and Newport 1996) suggests that children's output does not become targetlike when the input is not rich or clear enough, i.e. that they become fossilised.

Before proceeding to the next section, it is important to highlight that previous literature has focussed on, though not exclusively so, grammatical learning. Any complete theory will also have to examine non-native input effects on vocabulary and phonology (pronunciation). The present study will investigate both grammatical and lexical proficiency. Furthermore, some of the studies discussed in this section have investigated language learning delays, i.e. linguistic development, whereas others make claims about fossilisation, i.e. ultimate attainment. It is important to remember that the two are not the same and that the present study will report on rate of acquisition only. The results of this thesis can thus only be indicative of (possibly temporary) differences in language proficiency in childhood but will not be able to make any claims about the final state of the target language.

2.4. Hypotheses and predictions

This thesis aims to contribute to the literature by presenting a structural account of the effect of environmental factors and non-native input specifically on linguistic development. Previous literature provides evidence for an effect of environmental variables, but strong findings for a predictive effect of non-native input are scarce. Most of the studies discussed in the previous section make claims or suggestions but fail to corroborate these with empirical data. The present study seeks to present empirical evidence for an effect of external factors and non-native input specifically on linguistic development. In addition, those studies discussed with respect to non-native input either use it as a post-hoc explanation of the findings (Cornips and Hulk 2006), or, those that do include it as a predictive factor, do not measure non-native input in any detailed fashion (Cornips and Hulk 2008, Unsworth 2008, Blom and Vasić 2011). My study will differ in this respect, as it will make use of an in-depth measure of the quantity and quality of non-native input, in addition to a range of other external and internal factors, in order to establish which of these factors have the strongest effect on linguistic development. This study is the result of a need to replicate Place and Hoff's results and also to look at different language combinations, particularly, as is the case in the Place and Hoff study, ones which have great societal relevance, i.e. language combinations observed in large bilingual communities.

To answer the first research question, I will investigate what role external variables play in the morphosyntactic and lexical development of Dutch in Moroccan-Dutch bilingual learners, compared with internal variables. The second research question asks specifically whether and if so, how these learner´s proficiency is affected by non-native input. Although the role of non-native input on language development is as of yet not clear, the popularity of environmental accounts of language acquisition and the increasing awareness that not only internal but also external factors are crucial to the linguistic development of bilingual learners make a potential effect of non-native input conceivable. In addition, as the previous sections have shown, initial research into the role of non-native input is suggestive of a differential effect when compared with standard, native input. Therefore, I predict, in general, that in accordance with previous literature environmental factors influence bilingual learners' linguistic success. The hypothesis is that variability in quantity and quality of input will lead to different levels of Dutch proficiency in Moroccan-Dutch bilingual primary school children, with a greater amount and a higher level of input generally yielding higher levels of lexical and morphosyntactic proficiency. Moreover, I make the specific prediction that there is an effect of non-native input on bilingual acquisition, such that it is less facilitative of bilingual acquisition than standard, native acquisition. Therefore, the second hypothesis is that non-native input will have a negative effect on the grammatical and lexical development of Dutch in Moroccan-Dutch bilingual learners such that their rate of acquisition is slowed down, as revealed by proficiency differences in childhood. In general, children who are frequently exposed to non-native input are hypothesised to demonstrate lower morphosyntactic and lexical proficiency than children receiving only or mostly input from native speakers of Dutch.

With respect to the second research question, I will take into account the possibility that amount, proportion and quality of the non-native input mediate an effect of non-native input. Research has shown that the amount of native, standard input is a significant predictor of linguistic development (as discussed in section 2.2.1, Gathercole 2007; Gathercole and Thomas 2003; Paradis 2009; Paradis 2011; Paradis, Nicoladis and Crago 2007; Paradis, Nicoladis, Crago, and Genesee 2011) and vocabulary (e.g. Paradis 2009; Paradis 2011; Pearson, Fernández, Lewedeg, and Oller 1997; Vermeer, 2001). This finding may well be extended to non-native input as well, predicting that the significance of an effect of non-native input is also dependant on the amount that is received by the child. However, the results in Place and Hoff (2011), measuring percentage of non-native input, suggest that it is not the absolute amount of non-native input that is crucial, but the relative proportion of exposure that comes from non-native as compared to native speakers. In addition, Newport et. al (Singleton and Newport 1994; Ross and Newport 1996) reveal that parts of language in which the input providers are relatively proficient (because these are relatively simple properties of the language) are better acquired by the language learning child than linguistic constructions which have been less successfully acquired by his sources of input. This indicates that the overall proficiency of non-native speakers, i.e. the quality of the non-native input, is relevant to learners' linguistic development.

An interesting question is which factor is more crucial to L2 children's linguistic development, the relative amount of non-native versus native input or the average quality. On the one hand, there may be circumstances in which a child receives consistent input of an average quality, i.e. all conversational partners have a similar level of linguistic proficiency which is somewhere between native and extremely poor, e.g. valued as 3 points on a scale of 0 to 5. On the other hand, children may receive some of their input from native speakers, scoring 5 points, and some from poor non-native speakers, scoring 1 point. Although the average input quality score of these children is identical, namely 3, the two acquisition settings may result in different developmental outcomes. Both the amount of non-native input, as the average quality of the input offered to the children in this study will be measured to evaluate their relative importance.

Having established the hypotheses and predictions, Chapter 3 will present the methodology of the current study, discussing participants, tasks and procedure.

2.5. Summary

This chapter has served to give an overview of those studies and findings most relevant to a discussion about the role of non-native input in bilingual and early second language acquisition, which is the primary focus of the current study.

It started by presenting relevant research into environmental factors in general and their importance in early child L2 acquisition. External factors, which can be divided into factors influencing the input quantity and those determining the child's input quality, have been proven to greatly influence language learners' acquisition rate end state, as total or cumulative amount of exposure are frequently among the predicting factors for L2 proficiency at different stages of the developmental path. The term input quality unites a set of environmental factors such as level of maternal education, presentation of oral and literate language activities and fluency of the parents. Although research is only just beginning to place the first pieces of the complicated puzzle that is input quality, evidence is accumulating that these factors are far more important to the linguistic development of language learners than previously thought by some.

The chapter continued by specifically examining the research on non-native or non-standard input on language development. Findings generally indicate that language acquisition under circumstances where children receive input that is somehow different from the norm (e.g. Standard Dutch) leads to different outcomes than when the learners' primary linguistic data are coming from native speakers. Non-native input, or a combination of native and non-native input, present the learner with what can be termed inconsistent or unreliable linguistic data, creating problems for the learner. Possibly, unreliable input causes the learner to have difficulty acquiring the correct forms of the language, or, alternatively, what the learner acquires may not be incomplete or faulty but simply a target different from the norm.

The present study aims to add to the literature on input quality and language acquisition and particularly to present more experimental data on the effects of non-native input on bilingual development. By considering a bilingual community which contains many non-native speakers of the community language, this study hopes to guide bilingual learners and those who provide them with input in their language choices and add to the linguistic debate about which external factors under which circumstances lead to optimal language acquisition. Chapter 3 will proceed to discuss the methodology of this study.

3. Methodology

3.1. Introduction

The present thesis will examine the linguistic proficiency and linguistic environment of a group of children from Moroccan families in The Netherlands. The combined sections comprising Chapter 3 discuss the participants, tasks and procedure of this study. By the end of this chapter, the reader should have a clear grasp of the methodology of this study to be able to understand the results which have emerged from it.

3.2. Participants

This section elaborates on the particular immigrant community in The Netherlands that is the focus of this study and their socio-economic background, as well as the Dutch migrant and education policy. The purpose is that the situation of L2 Moroccan-Dutch children in The Netherlands will become clear. Additionally, a section is devoted to give an account of the selection procedure and details of the L2 children participating in this study.

3.2.1. The Moroccan community in The Netherlands

The 1950s and 1960s mark the beginning of large-scale labour migration from Morocco (and Turkey) to the Netherlands, as a result of a need for low-skilled workers in the Netherlands and high unemployment rates in Morocco (Scheele 2010). The sole purpose of their migration was to make enough money to eventually be able to move back to Morocco (Backus 2004). However, many instead settled permanently in the Netherlands and brought over their families. A continuous increase of Moroccan immigrants was the result of a second generation of Moroccans living in the Netherlands mostly marrying spouses from Morocco (Scheele 2010).

To date, the largest proportion of the Moroccan population in the Netherlands still has low-paying jobs. There is an upward trend though, with second generation Moroccan migrants obtaining more high-income jobs than their parents (Gijsberts and Dagevos 2010). A large part of Moroccan migrants in the Netherlands lives in the city, mostly in those cities that they once moved to for work (Amsterdam, Rotterdam, Utrecht and The Hague). Within those areas, they are concentrated in specific neighbourhoods and these tend to be low SES neighbourhoods where there is a high immigrant density (Gijsberts and Dagevos 2010). Because migrants tend to move to those areas where the Moroccan community is already well represented, and Moroccan families, on average, raise more children than native Dutch families do, and because many Dutch natives move away from these areas (*Witte Vlucht:*

‘White Escape’), mixed and highly concentrated neighbourhoods are becoming increasingly numerous (Gijsberts and Dagevos 2010).

Many Moroccan immigrants have low levels of education. Even though younger generations are beginning to move closer towards native Dutch students in terms of level and duration of study, there remains a significant gap (Gijsberts and Dagevos 2010). Educational delays are particularly prominent in language development. Moroccan students leave primary school with a significantly lower language competence than native Dutch students (as measured by the Citotoets) (Gijsberts and Dagevos 2010, 63-64). From 1983, migrant children were allowed to receive education both in Dutch and in their native language and culture. However, this decision was withdrawn in 2004, when immigration policy shifted its approach from integration to assimilation and on the pretext that learning Dutch should have priority.

The current government’s policy focusses primarily on Dutch society, culture and values (Rijksoverheid 2011). Not the government but migrants themselves are expected to make sure that they integrate into Dutch society and part of this responsibility is that they learn to speak the language (Klis 2011). Although Dutch policy does not officially obligate parents to speak Dutch to their children and the necessity for such a method has long been under discussion, the advice for Moroccan parents to speak Dutch to their children at home is not at all unusual (van den Bergh 2005), and speaking Dutch instead of your native language is often seen and openly carried out as the best scenario by governmental institutions (Rijksoverheid 2011, 4). Earlier exposure to Dutch from the children’s parents should reduce language delays. It is maintained that the acquisition of the minority language is in conflict with the development of the majority language (Klis 2011). To encourage children’s acquisition of Dutch, the government wants to introduce obligatory Dutch language classes for non-native Dutch parents. In general, the emerging trend is that multilingualism is discouraged.

However, research on bilingual language acquisition clearly shows that children are very well capable of acquiring two languages without developing any serious handicaps, and that in fact, bilingualism’s can be beneficial for children’s development (e.g. Bialystok and Cummins 1991; Cummins 1979b). In addition, linguists have pointed out that research has shown that proper acquisition of the first language (L1) provides a better basis for the acquisition of a L2 (L2) (Cummins 1979a; Scheele 2010), indicating that it is no less important to speak Moroccan to children in Moroccan families. Thus, it is not always clear that Dutch migrant policy is in agreement with empirical findings on the linguistic development of children.

To summarise, this section has discussed the position of the Moroccan community in The Netherlands, and has demonstrated how Dutch policy deals with these communities, particularly with respect to language. The effect of non-native input is of particular importance in selecting the best strategy to promote the linguistic development of Moroccan-Dutch bilingual children. The next section will discuss the selection procedure and criteria of the Moroccan-Dutch families and give a detailed account of the characteristics of this group.

3.2.2. Participant profile and selection procedure

The participants in the current study are 33 bilingual Moroccan-Dutch children between the ages of 4;0 to 7;0 years old (mean = 5;19 years), all resident in The Netherlands at time of testing. Because the Moroccan immigrants who originally came to The Netherlands to work as 'guest workers' predominantly came from rural backgrounds in the North of Morocco, especially the Rif Mountains, Moroccan's in The Netherlands speak mostly Berber, the main vernacular in these areas. The languages spoken by the members of the participating families, apart from Dutch and any third languages, were defined by the parents as either Berber or Moroccan Arabic. In some homes, Standard Arabic or French were provided as a third language.

Children were recruited from 11 primary schools in The Netherlands, where Dutch is the language of communication. All participating schools are located in the Randstad, the largest urban conurbation in the Netherlands, including The Netherland's four largest cities, Amsterdam, The Hague, Rotterdam and Utrecht. Cities in which schools were contacted were selected on the basis of their percentage of Moroccan citizens; only cities in which 4-9% of the population is Moroccan-Dutch (as estimated for the year 2010) were considered for participation (see Appendix A for figure). Schools were contacted first by means of a (posted) letter and subsequently invited to participate in the study via telephone. The final collection of participating schools are located in Culemborg, Gouda, Woerden, Boskoop, Schoonhoven Utrecht and Zeist.

In The Netherlands, children attend primary school from age 4 (first grade) to, generally, age 12 (eighth grade). We targeted children of 4, 5 and 6 years old who were either in first or second grade at time of testing. Testing children in their early school years limits the chance that many of these children will have had a large amount of linguistic input outside the home situation yet. Testing older children would lead to more influence of the predominantly native Dutch input that children receive at school, and possibly minimise the possible effects of the input at home, which is the focus of this study. Testing children in their early school years thus increases the likeliness of finding an effect of non-native input if this exists. The Moroccan-Dutch population consists of first, second and third generation inhabitants. Thus, given that parents supposedly vary widely in their command of the Dutch language, we expect to find children in this population with a highly variable quantity and quality of Dutch input.

Most L2 Moroccan-Dutch children have received significant amounts of input in Dutch before attending primary school, since a considerable proportion of the parents are second generation and have grown up with Dutch either from early childhood. Many of them, therefore have to be considered bilingual in Berber (or Moroccan Arabic) and Dutch, and for most Dutch is even the dominant language, although all children have been exposed to at least one language spoken in Morocco from birth. Children's linguistic backgrounds varied with respect to the amount and proportion of Dutch input that they have received at time of testing, and crucially, the amount and proportion of Dutch input that was standard, native input. Furthermore, the quality of the non-native input, as reflected by the proficiency of the children's conversational partners, varied. All these factors were estimated with the use of a parental questionnaire (see below for more details).

The next section will present and discuss the tasks used to obtained information about children's level of Dutch proficiency and the details of their linguistic environment, including amount of non-native input.

3.3. Tasks: Child measures

The L2 Moroccan-Dutch children performed several tasks designed to measure varying aspects of their language proficiency. Table 1. presents all tasks, four for the children and two for the parents, and describes what they are designed to measure or elicit.

Table 1 – Child measures

Task	Target	Measures...
Frog Story (Picture Description Task)	Children	Morphosyntactic and lexical production, specifically verbal density, lexical diversity, rate of error-free utterances

TAK Sentence Comprehension Tasks	Children	Morphosyntactic comprehension
TAK Passive-Vocabulary-size Task	Children	Lexical production
Kaufmann Assessment Battery for Children Nonverbal Scale	Children	Working memory

3.3.1. Frog story – Morphosyntactic proficiency

Grammatical and lexical performance is measured by a task usually referred to as The Frog Story, which uses a narrative picture book called *Frog, where are you* (Mayer 1969). This book depicts the story of a boy who has a pet frog that one day escapes, upon which the boy and his dog go out to search for it. The children were first asked to look through the book to figure out the story. Subsequently, they were instructed to go through each individual picture explaining what happens in it to the experimenter, who could not see the pictures herself.

Lalleman (1986) has proposed that both complexity and accuracy need to be taken into account when measuring morphosyntactic proficiency. The present study will therefore make this distinction for morphosyntax, but also for lexical development. Thus, on the basis of the spontaneous speech segments, two measures of complexity and one of accuracy will be determined: Mean Length of Utterance (MLU) will measure morphosyntactic complexity, Malvern's D is computed to determine lexical complexity, and morphosyntactic and lexical accuracy is conveyed by rate of error-free utterances. Unsworth (2005, 2008) discusses all three of these measures extensively. In what follows, I will summarise the author's evaluation of these measures, and also explain the reasons for adopting a different proficiency measure to determine morphosyntactic complexity, namely MLU, in this thesis.

MLU was preferred over verbal density and two other commonly used measures of morphosyntactic accuracy: rate of subordination and rate of verbal utterances. First, I will discuss why the latter two measures were not selected for use in the present study, drawing from Unsworth (2005).

One alternative for MLU is rate of subordination (obtained by dividing the number of subordinate clauses by the total number of clauses) or the average number of subordinate clauses per T-unit (by dividing the total number of clauses by the by the total number of utterances).[1] A study by Hunt (1970, cited in Unsworth 2005) reveals that the latter measure is not a complete measure of morphosyntactic complexity, because it does not count all grammatically complex forms, for instance the gerund. Verhoeven and Vermeer (1989, cited in Unsworth 2005) find that rate of subordination is also not a valid measure, because it does not correlate with two syntactic measures in the TAK test (discussed below).

Another option for measuring L2 morphosyntactic proficiency is the rate of verbal utterances, which is computed by dividing the number of utterances containing verbs by the total number of utterances. Although this measure was found to be predictive of proficiency in L1 (e.g. Valian 1991; Deen 2002, cited in Unsworth 2005) and bilingual L1 (Belletti and Hamman 2000, cited in Unsworth 2005) children, use of this measure may be unsatisfactory for the present study because predictive effects were found for children much younger than those in the current study.

Verbal density is defined as the average number of finite and non-finite verbs per T-unit (Unsworth 2005, following Pica and Long 1986). The most important reason for using verbal density as a measure of morphosyntactic complexity is that it "captures complexity in a central aspect of grammatical development, that is the use of different verb forms" (Unsworth 185). It is, therefore, a more complete measure compared to rate of subordination because it includes both finite and non-finite clauses. An additional advantage of verbal density as a measure of morphosyntactic complexity is that non-targetlike use of verbs does not affect its effectiveness (Unsworth), as is the case for rate of subordination, rate of verbal utterances. Finally, contrary to MLU, verbal density "does not develop significantly as a function of age" (Unsworth, 186), so it is reliably indicative of proficiency rather than of age only.

The remainder of this section discusses MLU and why this measure is considered more suitable than verbal density for the purpose of the present study.

MLU is the most widely accepted measure of a child's stage in morphosyntactic development. This measure is easy to use and several studies have indicated its validity when measuring morphosyntactic proficiency in early stages of development (e.g. Rondal, Giotto, Bredart and Bachelet 1987; Blake, Quartaro and Onorati 1993, cited in Unsworth 2005). Although the validity of MLU beyond a value of 3 and therefore its value for determining

[1] A T-unit is defined as "one main clause plus whatever subordinate clause and noncausal expressions are attached to or embedded within it" (Hunt 1970, 14).

proficiency in older child learners has been questioned, still, in general, research seems to suggest that MLU does continue to develop in children of 6 years and older (Chabon, Kent-Udolf and Egolf 1982, Loban 1967, Hunt 1970, cited in Unsworth 205). Moreover, MLU was preferred over verbal density in the current study because it was more easily computed. The program used to analyse the productive data gathered in the Frog Story is able, via a simple command, to extract MLU, but not verbal density. Given the scope of this thesis, the manual computation of verbal density compared to the simple and time-efficient task of extracting MLU from the speech corpus has directed the choice for MLU as the most suitable measure of morphosyntactic accuracy for the current study. A primary critique on MLU as a measure of linguistic proficiency is its possible linearity with age. However, analysis of the data revealed that there is no significant correlation between MLU and the children's age at the time of testing.

Having considered several options, MLU was ultimately chosen as the best measurement of morphosyntactic complexity for the current study.

3.3.2. Frog Story – Lexical proficiency

Lexical complexity or, synonymously, lexical diversity or lexical richness was measured with Malvern's D. The measure D was developed by Malvern et al. (2004) as a better alternative for a traditional measure of lexical diversity called Type/Token Ratio (TTR), which is simply calculated by dividing the number of types (V) by the number of tokens (N) in a sample, i.e. V / N. A third measure which was considered for the purpose of this study is the absolute number of different words used in a sample. A final alternative is Guiraud's Index, or 'the Indice the Richesse', which differs from TTR in that the number of types are divided by the square root of the number of tokens rather than the plain number of tokens, i.e. V / √ N. The next section will discuss each of these measures, providing advantages and disadvantages, and explain why Malvern's D was preferred over the other three.

TTR has been a measure of lexical diversity frequently used in linguistic research over the years. However, one substantial disadvantage of this measure is that it is affected by sample size, with an increase in tokens in a sample resulting in a lower ratio (Richards 1987, cited in Unsworth). The reason for this is that as a person's length of speech increases, fewer new words become available for use and more (frequently used) words are repeated.

Another possibility is measuring the absolute number of different words used in a sample. The reason that this measure is also considered unsuitable is that, again, the amount of utterances found to be required, 200 (Verhoeven and Vermeer 1989, cited in Unsworth 2005), is not achieved for all participants in the present study.

Guiraud's Index aims to solve the problem with sample size by taking the root of the number of tokens rather than the plain number of tokens in a transcript. The purpose of the root in this equation is to artificially diminish the relative increase of tokens over types as sample size increases, because the difference between, for instance 9 and 25 is bigger than the difference between the root of 9 (3) and the root of 25 (5). However, although the effect of sample size is decreased by this means, Guiraud's index is like TTR correlated with sample size, only there is a positive correlation instead of a negative one. Additionally, Guiraud's Index requires a minimal sample size of approximately 250 tokens (Richards 1987, cited in Unsworth 2005). Although most of the transcripts used in the current study meet this requirement, 9 of the 33 transcripts (27%) falls below this cut-off.

A recent alternative to TTR is Malvern's D, which combines a mathematical model with empirical data of the lexicon in a set of transcripts. The measure determines the lexical diversity in a transcript based on what is called the TTR versus token curve, which shows the relative decrease of types as opposed to tokens as the speech sample progresses. That is, every speaker's transcript will produce a curve that begins with a 1:1 ratio between types and tokens and demonstrates an upward line which becomes increasingly less steep as the total number of tokens, i.e. the sample size, increases. Although different speakers will produce different exact values of TTR, the trend of the curve will be the same for each one. This predictability was used to develop a mathematical model, such that the TTR is corrected for the progressive decline of types in a transcript. This measure, then, has some distinct advantages over Guiraud's Index and other measures of lexical diversity, primarily that it is not affected in any way by sample size and nonetheless allows for all data in a transcript to be used (McKee, Malvern and Richards 2000, 3).

Considering the points mentioned, Malvern's D is preferred over Type/Token Ratio, absolute number of words and Guiraud's index for use in the present study.

As the final component of Dutch proficiency, accuracy needs to be measured, which is achieved by computing the rate of error-free utterances. Highly proficient children are expected to make relatively less errors than low proficient children. Number of errors is considered an unsatisfactory measure because some children will produce more utterances than others, therefore likely producing more errors as well. Furthermore, both number and proportion of errors "implicitly assume[…] linear development in language acquisition and this has been found to not always be the case" (Unsworth, 195). Therefore, rate of error-free utterances is selected as the measurement of morphosyntactic and lexical accuracy in this study. This measure has been improved on by specifying extensively what constitutes an error and how these errors may best be counted in a sample (see appendix B for all specifications and examples).

3.3.3. Taaltoest Allochtone Kinderen

In addition to the Frog Story, two subcomponents of a standardised test called the *Taaltoets Allochtone Kinderen* (TAK, 'Language Test for Migrant Children') (Verhoeven and Vermeer 1986) were used to determine the children's morphosyntactic and lexical productive proficiency. The TAK measures several aspects of children's oral capacities in Dutch. Although the test can also be used for native speaking Dutch children, it is specifically designed for children who speak Dutch as their L2. This section will discuss the measures used for assessing these capacities.

The two *Zinsbegriptaken* ('Sentence Comprehension tasks') from the TAK measure grammatical competence. The first task tests children's understanding of function words and comprises 42 items existing of words that express quantity, spatial words, pronouns and conjunctions. The second task also consists of 42 items and assesses the participants' understanding of patterns that indicate relations between words and sentences. These tasks are originally administered by use of a test book containing pictures of objects/individuals or actions, but the most recent version of the TAK also contains a CD which allows for several of the TAK's tasks to be elicited digitally. To enforce uniformity of testing and eliminate possibilities for errors imaginable for human elicitation, all TAK measures used in this research were offered to the children in digital form on a laptop. For each of the two tasks, children listened to a female voice who instructed them on the task. This instruction was provided during two training items. During each, three pictures were displayed on the screen and the laptop voice pronounces a question or request. The child's task is to look carefully at the pictures and by clicking on one of the pictures match the correct picture to the question or request. An example question, selected from the first task, is: *Welke poes zit voor de mand?* ("Which cat is sitting in front of the basket?"). Pictures portray a cat sitting in the basket, behind the basket and in front of the basket. The number of correct items per task determines the child's score and thus proficiency. Each correct item is worth one point and with 84 items in total the maximum score is 84.

Receptive vocabulary knowledge will be measured with the *Passieve-woordenschattaak* ('Receptive vocabulary task') from the TAK. Similar to the sentence comprehension tasks, for each item the laptop screen displays a set of four pictures and a single word is played through the laptop speakers. Words can be nouns or verbs and vary in difficulty from for instance ‘writing’ (*schrijven*) to ‘hinge‘ (*scharnier*). Children are instructed and trained with two practise items to click on the picture that best matches the word. As with the sentence comprehension tasks, the proficiency indication of the child will follow from the number of correct choices (between 0 and 96).

3.3.4. Kaufman Assessment Battery

A final task for the children will serve to determine their working memory capacity. Working memory is included in the proficiency measure because it has been suggested that working memory capacity predicts L2 proficiency (e.g. Gathercole 1993; Miyake and Friedman 1998). The reasoning is that greater working memory capacity means a bigger online processing capacity, which will allow for more information to pass on to long term memory (Juffs 2007). Testing for working memory will allow me to rule out the possibility that individual differences are due to differences in working memory capacity.

In selecting a measure of working memory, it had to be taken into account that the participants in the present study are very young and therefore cannot yet read. Since most working memory tasks test working memory on the basis of written stimuli such as digits or novel words, the bulk of available tasks was not suitable for this study. However, the Kaufman Assessment Battery for Children (Kaufman, Lichtenberger, Fletcher-Janzen and Kaufman, N.L. 2005) offers a special nonverbal index in addition to the main scales that the test is comprised of. This standardised test battery is designed to assess cognitive development, of which working memory is one component. The KABC-II consists of five main scales (Short Term Memory, Visual Processing, Long Term Storage and Retrieval, and Fluid Reasoning). The Hand Movements task was selected form the nonverbal scale because it can be administered and performed through gestures and therefore require no literacy ability, and can be used with young children age three and up. In the Hand Movement Task, the child is instructed to repeat the experimenter in making a sequence of taps on a table using different handshapes (Kaufman, Lichtenberger, Flectcher-Janzen and Kaufman 2005, 18), for example tapping the table twice while making a fist. The number of correctly imitated sequences indicate the child’s working memory capacity.

3.4. Tasks: Parental questionnaires

One of the parents of each child was interviewed to obtain linguistic and background information about her/his child, and particularly about the Dutch input quantity and quality.

This was achieved by means of two parental questionnaires, which are presented schematically in Table 2 and further explained in the sections below.

Table 2 – Parental questionnaires

Task	Target	Measures...
UBILEC questionnaire	Parents	Children's language background and use, specifically input quality
ALDEQ questionnaire	Parents	Children's L1 Moroccan proficiency

3.4.1. UBILEC Parental Questionnaire

The Utrecht Bilingual Language Exposure Calculator (UBiLEC) (Unsworth 2011) differs from other parental questionnaires designed to obtain information about bilingual children's language background and language use in that it is a digital questionnaire, in the form of an Excel file, with algorithms that use the obtained information to calculate: a) the quantity of exposure to the target language, b) the cumulative length of exposure to the target language, and, vital for present purposes, c) the quality of exposure to the target language.

The amount of exposure is not measured by asking the parent about the overall amount of exposure to the target language, but by asking about the component parts: time spent with family members and other people at home, at school/day care/out-of-school care and time spend on additional activities (e.g. sports). The parent is asked to indicate how often the target language is spoken to and by each person on a 5-point Likert scale (hardly ever Berber, almost always Dutch – seldom Berber, usually Dutch – about half Berber, about half Dutch – usually English, seldom Dutch – almost always Berber, hardly ever Dutch) .

Furthermore, cumulative exposure measures the child's 'real' length of exposure to one of its languages, given that, in contrast to a monolingual child, a bilingual child has to divide its time between two languages, and thus traditional length of exposure as measured by chronological age is not appropriate. The cumulative length of exposure thus measures the child's amount of Dutch input only, rather than the total amount of input. This information is obtained by asking how much each person at home spoke the target language to the child in each year of its life and what years the child went to school/day care/out-of-school care and what the language of instruction was.

Finally and most importantly, qualitative differences in the linguistic input are measured on the basis of the proficiency levels of the child's conversational partners. The questionnaire asks how well each of these people speak the two languages on a 6-point scale (virtually no fluency – limited fluency – somewhat fluent – quite fluent – very fluent – native). Based on these rankings, I established how much native and non-native input the child has received and what the specific quality of the non-native input is. The amount of non-native input was computed by adding up the exposure time of all those speakers who scored below 6 on Dutch proficiency, i.e. between 0 and 5. The average input quality was obtained by tallying the proficiency scores of all the child´s conversational partners, weighted for the amount of input that each person provides.

To the end of additionally evaluating literacy skills and to obtain more detailed information about children's sources of Dutch input, several additional questions are also included about the children's literacy activities. "Home literacy activities, such as shared book reading and related types of parent-child conversations, [as well as and other language related activities such as watching television or playing video games] are characterized by the use of a rich vocabulary, complex and information-dense sentences, and semantically interconnected discourse, that is, the kind of language use that is generally thought to stimulate language development" (Deckner, Adamson, and Bakeman, 2006; Hoff and Naigles, 2002; Huttenlocher, Vasilyeva, Cymerman, and Levine, 2002; Sénéchal and LeFevre, 2002; Weizman and Snow, 2001; cited in Scheele et al. 2007). Examples of such questions are: *Do you read to your child from Dutch books that teaches him/her sentences, words, letter or numbers? (Leest u voor uit Nederlandse boeken waarin het kind zinnetjes, woorden, letters of cijfers worden geleerd?)* and *Does your child play Dutch videogames in which s/he is instructed to execute a specific task?* (For a complete list of these questions, see Appendix C). These questions were based on, but adjusted for the present purpose, Scheele et al. 2007. Parents rewarded the frequency of the child's partake in such activities with a score between 0 and 1 on a 5-point scale (never – seldom – sometimes – regularly –often).

3.4.2. ALDEQ Parental Questionnaire

The Alberta Language and Development Questionnaire (ALDeQ) (Paradis, Emmerzael, Duncan 2010) is designed to assess the first language development of bi- or multilingual children. It gathers this information by asking the parents about the current linguistic abilities of their child and the child's linguistic milestones in the past. An example of a question about linguistic milestones is: *How old was your child when s/he first spoke a* *word?* An example of a question about current L1 abilities is: *Is it easy for your family or friends to have a conversation with your child?* In addition, the parents are also asked questions about the child's behaviour patterns and activity preferences (to detect any cognitive or perceptual deficits), and her/his family history (to establish possible genetic influences). The questionnaire consists of both open and multiple-choice questions. The questions in ALDEQ are non-language specific and so this questionnaire can be used for any combination of languages.

The present study uses ALDEQ to determine the children's proficiency in Berber or Moroccan Arabic, so that it can be determined if children's proficiency in the minority language is predictive of their Dutch proficiency. For the specific purpose and participant pool of the present study, as well as to eliminate overlap with the questions in UBiLEC, ALDEQ was adjusted in a few minor ways. In addition, the entire questionnaire was translated from English to Dutch.

3.5. Procedure

All children were tested in a quiet room, with no other people present other than the experimenter (the author of this thesis). Children were told, either by their parents or teacher, or by the experimenter right before the start of the tests, that they would be playing some games and that some would be done on a laptop, in which cases a voice on the laptop would explain the task. Each child was asked beforehand if s/he was familiar with working on a computer or laptop and if they understood how to use a mouse, for purpose of the TAK tests. If children expressed an inability or aversion to working independently on the laptop, or demonstrated such an inability during the training items, the experimenter instructed these children to point to the correct picture upon which the experimenter would click on it. The experimenter was therefore seated behind the children when performing this task. In all but these cases the experimenter kept a written record of the children's responses to the TAK tests and in all cases the final scores were collected and written down in addition to the digital records. Auditory stimuli were offered via laptop speakers, allowing the experimenter to encourage and stimulate the child and to provide explanation whenever necessary.[2] A video camera was used to record, either audio or both audio and video images of, the semi-spontaneous speech elicited by The Frog Story. Use of the camera was explained to the children as a means of recording their voices without mentioning the specific purpose.

[2] Pilot tests indicated that an inability to interact with the experimenter caused by wearing of headphones often resulted in decreasing interest and in the task over time and sometimes also lead to confusion on the part of the child.

Children whose parents allowed video recordings were told that the experimenter was going to make a movie about them while they were telling the story. During this task, Interaction between the experimenter and the children was limited to encouragements for the children to speak and to be elaborate, taking especial care not to feed them words. For the Kaufmann Assessment Battery, the child and experimenter sat on opposing ends of a table, so that the child could clearly see the tap sequences made by the experimenter. Correct or incorrect imitation of the sequence was marked immediately after each sequence.

All children were tested in two sessions of approximately 20 minutes. In the first session, children first completed the TAK Receptive Vocabulary task and then the KABC-II Hand Movements task. The first and second test session were separated by at least 20 minutes, during which children would return to their class, to ensure optimal attention for the second part. All children completed both test session on the same day. The second session started with the two TAK Sentence Comprehension tasks, presented immediately after each other. The receptive vocabulary task was chosen to be administered first because it was the longest of the five subtests. It was assumed that children would be most attentive at the very beginning of testing and therefore most likely to successfully complete the longest task at this stage. The working memory task was chosen to separate the two computerised tasks, because this would otherwise lead to a single long stretch of time spent on the laptop performing similar procedures. The Frog Story was chosen to close the test session because this would allow the child to become familiarised with the test setting and more at ease around the experimenter during execution of the preceding tasks. This was considered important because the Frog Story requires children to produce language and interact with the experimenter. Most children performed the tasks in the order described above. Alternatively, administration of the Frog Story and the second sentence comprehension task was reversed for some children, with the Frog Story intervening the two sentence comprehension tasks, when the experimenter observed a significant decrease in concentration.

The parental questionnaires, UBiLEC and ALDEQ, were administered at the homes of the parents, or in a few cases via telephone. Parents were offered the choice of being interviewed in Dutch or in Berber. As a results, of the 33 participating families, 8 were interviewed by a Berber-speaking research assistant. Care was taken to ensure that the experimenter and the research assistant performed the interview in a similar way and that the research assistant could explain the process and purpose of the interview to the parents. Parental responses to ALDeQ were written down at the time of the interview and later inserted into the computer. Answers to the questions in UBiLEC were directly registered on a laptop in an Excel file.

3.6. Summary

This section has discussed all components of this study's methodology, including participants, tasks and procedure. It has served to clarify the choice for testing the Moroccan-Dutch population in The Netherlands and provide details of the participants, as well as explaining all the tasks administered to the participating families and the corresponding procedures. The reader should now have an idea of the possible outcomes of the experiments and thus Chapter 4 will proceed to list the data that were obtained by the tests.

4. Results

4.1. Introduction

The following section of this fourth chapter serves first to describe how the raw data gathered with the methodological tasks and parental questionnaires were converted into usable data. Second, it will clarify the method of analysis that was selected to explore the collected data. With the analysis discussed in sufficient detail, this section prepares for an account of the primary findings which this research has yielded. As such, this final section will only present and explain the statistical results. The discussion will provide an interpretation of these findings.

4.2. Analysis

The data collected by means of the different tasks and questionnaires are not all of the same kind and cannot all be used directly in a statistical analysis. In what follows, a description will be provided of how the final set of data, to be used for analysis, was obtained from the raw data of the child participants.

Of all data, only those collected by means of the TAK tasks, both passive vocabulary and sentence comprehension, required no modification before being used in statistical analysis. The TAK scores are a direct representation of the performance of the child on the capacity under examination at the time of testing. For instance, on the passive vocabulary test, children can obtain any score between 0 and 96, in which a higher score reflects better performance on the task and thus a greater passive vocabulary size. The two separate sentence comprehension scores, with an identical minimum (0) and maximum (42), were combined into one total score. The TAK results thus yield the participants' receptive lexical and expressive morphosyntactic Dutch scores.

Lexical and morphosyntactic Dutch performance was derived from the speech data collected from the Frog Story. As discussed in Chapter 3, performance is measured by means of three components: MLU, Malvern's D and Rate of error-free utterances, to measure morphosyntactic complexity, lexical complexity and morphosyntactic and lexical accuracy, respectively. In order to obtain numeric values, the speech samples were first transcribed using CLAN (Computerized LAnguage Analysis) (MacWhinney 2000). This computerised program is designed to transcribe speech data in a prescribed format, such that it allows for a number of automated computations to be performed on the transcribed data. The computations on the words and utterances in a transcripts are made possible because of uniform use of punctuation, specifications at the beginning of the transcript of for instance conversational participants and pre-codes to specify the properties of an utterance. Moreover, to be able to make the computations required for this study, the transcripts were supplemented with a number of unique post-codes, specified in a secondary file. Specifically, the code [+EF] was inserted after all error-free utterances, [+ELL] was added when an utterance was an elliptical response to a question, and [+EXCL] served to mark utterances which needed to be excluded from all analyses. Error-free utterances needed to be coded for the purpose of computing rate of error-free utterances. Elliptical replies to questions were marked in order to be able to exclude these from certain computations. Utterances that were excluded were: *ja* (yes), *no* (nee), *niet* (not), *wel* (yes), *hee, ok, oh, oow, kijk* (look) or *klaar* (done), as well as exact self-repetitions and exact repetitions of the examiner. The purpose and application of these post-codes will become more clear by explaining the computations made to obtain MLU, Malvern's D and rate of error-free utterances. First, MLU was computed for all child utterances. When computing MLU, utterances post-coded with [+ELL] as well as utterances marked with [+EXCL] were excluded from the count as inclusion of these utterances is thought to artificially decrease the average length of the child's utterances. Second, a command called vocd was used for extraction of Malvern's D. This command is performed over all child utterances, including all those marked with [+ELL] and [+EXCL], because an accurate account of lexical complexity will naturally include the grand total of words uttered by the child. Third, rate of error-free utterances was computed by deriving the total number of child utterances in the transcript (by means of the MLU command) and the total number of error-free utterances only. Subsequently, the number of error-free utterances was manually divided by the total number of utterances, giving the percentage of error-free utterances of the child. For this computation, utterances with post-codes [+ELL] and [+EXCL] were again excluded because most of these utterances would likely be error-free and, thus, would artificially increase the number of error-free utterances. For an example of a transcript based on the Frog Story, see Appendix D.

In addition to the participants' Dutch proficiency, information about environmental factors, to be able to determine the interaction between proficiency and input, is also required to answer the research questions. This information was gathered using the parental questionnaire UBiLEC (Unsworth 2011), which captures children's exposure to non-native input, among other variables. With respect to input quality and input quantity, UBiLEC registers the amount of Dutch input received by the child from each of its conversational partners and an approximation of these persons' level of Dutch proficiency. In this manner, the questionnaire exposes information about the amount of non-native Dutch input that children receive, as only native speakers are rewarded the optimal score on linguistic proficiency. Furthermore, with the use of algorithms, UBiLEC automatically computes overall Dutch input quantity, both absolute and relative to input from the other language and based on cumulative length of exposure, which accounts for exposure to at least one language other than Dutch. In addition, it yields an average input quality score, which is derived from the amount of exposure offered by each of the conversational partners and their Dutch proficiency score. In addition to these three factors, several other variables hidden, so to say, in UBiLEC, were retrieved from it.

For this purpose, a number of additional algorithms not originally present in UBiLEC was inserted into the Excel form. The variables extracted from UBiLEC this way are the number of native speakers, the number of non-native speakers, the quantity of native Dutch input, the quantity of non-native Dutch input, the percentage of native Dutch input and the percentage of non-native Dutch input. The average input quality score was considered insufficiently informative for the potential effect of non-native input on linguistic proficiency because it does not provide insight into the ratio of native versus non-native input. For instance, in a hypothetical scenario, one child with an average input quality score of 3 can have 50% of its input come from native speakers – scoring 5 points – and 50% of its input from highly improficient speakers – scoring 1 point – whereas another child with the same average input quality score might receive all its input from intermediately proficient language users scoring 3 points. This example illustrates that children´s input patterns can be very different, with respect to non-native input, but this cannot always be observed in the average input quality score. In addition to these variables concerning non-native input, the set of extra questions concerning the children’s exposure to language and literary activities, such as watching educational television programmes and being read to, resulted in one combined score (between 0 and 9). Finally, UBiLEC also determines the children’s age at time of testing based on their date of birth and the date at time of testing.

The second parental questionnaire which was administered, ALDeQ, serves to determine the children’s Berber or Moroccan Arabic linguistic proficiency as a possibly predictive factor of their Dutch linguistic skills. This questionnaire is originally used to determine bi- or multilingual children’s L1 proficiency specifically and although Berber (or Moroccan Arabic) is, for most children in the sample, technically their first language since most have been exposed to both Dutch and Berber from birth, the limited exposure to Berber or lack of willingness to speak it made that some of the questions in this questionnaire were often irrelevant to the children’s linguistic situation. For instance, many children in the sample were not, at the time of testing, able to produce full sentences in Berber. In such cases, children were simply awarded 0 points, rather than excluding the data from the total score altogether, as the latter is taken to better reflect the child's limited linguistic proficiency. The final score delivered by ALDeQ is a ratio of scored points divided by the total number of points that could be obtained. Thus, a high score reflects a relatively good control of Berber, whereas a low score is indicative of limited capacity.

Finally, all children were evaluated on their working memory capacity, as measured by the Kaufmann Hand Movements Task. High levels of working memory may increase proficiency (Baddeley 1999, Ellis 2001). The raw score or number of points obtained by a child on this task was converted into a score between 1 and 19 which takes the child's age into account.

4.3. Overview variables

4.3.1. Predictor variables

A list of all predictor variables, including mean scores, standard deviations and ranges, used in the statistical analysis can be viewed in Table 3.

Table 3 – Predictor variables for determining children´s (n=33) Dutch proficiency

		Factor	Mean	Standard Deviation	Range
External	Quantity	Dutch input rel.	78.1	10.5	58-100
		Dutch input ab.	72.4	13.3	31.1-87.8
	Quality	Non-native input rel.	41.6	28.0	0.9-96.6
		Non-native input ab.	29.3	21.2	0.8-62.1
		No. non-native speakers	4.27	2.04	1-8
		Lang. and literacy scale	2.97	2.02	0-6.25
		Av. input quality	4.23	0.59	2.82-5
Internal	Age	ATT	5.19	0.68	4-7
		LoE	3.32	0.85	1.70-4.62
	Experience	Prof. minority lang.	36.0	27.6	0-100
		No. older siblings	1.73	1.49	0-5
	Cognition	Working memory	9.42	2.45	5-14

The total set of variables is divided into external variables, on the one hand, and internal variables, on the other. Within the group of external variables, a further distinction was made between those variables concerning the quantity of the input and those regarding the quality of the input. The quantitative factors are the relative amount of Dutch input in percentages per week (*Dutch input rel.*), as opposed to input from the minority language, and the absolute amount of Dutch input in hours per week (*Dutch input ab.*). On average, children receive most of their input in Dutch rather than in the minority language; on average, almost 80% of their total language input with over 10 hours of input per day. However, there is a fair amount of variation, with some children being exposed to almost equal amounts of Berber/Moroccan Arabic input and at the other extreme exclusive exposure to Dutch. The quality category includes two variables regarding the amount of non-native input, namely the relative amount of non-native input in percentages per week (*non-native input rel.*), as opposed to native input, and the absolute amount of non-native input in hours per week (*non-native input ab.*). Although in total children receive just a little more input from native than from non-native speakers, both extremes, hardly any native versus hardly any non-native input, are attested. This also becomes apparent from the number of non-native speakers (*no. non-native speakers*), as this ranges from just one to as many as eight persons. Additionally, the quality category includes a measure of the average quality of the input on a scale of 1 to 5, based on the proficiency levels and amount of output from the children's conversational partners (*av. quality*). The average quality of the input that the bilingual children are exposed to is extremely high at 4.23, with the lowest score (2.82) coming in only just below average. The opposite is the case for the children's score on the language and literacy scale, which presents the accessibility of language and literacy activities in addition to regular conversation on a scale of 0 to 9 (0 meaning no participation in such activities and 9 frequent participation on all of the components) (*lang. and literacy scale*). On average, this accessibility is just a third of the optimal score. The set of internal variables consists first of two age-related factors, namely the children's age at the time that they were tested (*ATT*) and their cumulative length of exposure to Dutch (*LoE*), taking into account that the bilinguals' input is divided over two languages. The youngest child in the sample had just turned four, whereas the oldest had recently become seven years of age. There is quite considerable variation within the children's length of exposure, in part due to age differences and in part to differences in the amount of weekly input. Children's proficiency in the minority language on a scale of 0 to 100 (*prof. minority lang.)* was determined by answers on the ALDeQ questionnaire. Minority language proficiency was relatively poor, but both low and high scores are obtained. Although the number of older siblings of a child *(No. older siblings)* is arguably a factor of the environment, it is not included in this category because it is a fixed number and therefore not subject to environmental changes. Finally, working memory was measured to reveal any potential differences in the outcome due to cognitive capacities. Despite accounting for age differences, there is large variation in children's working memory capacity.

All predictor variables were first entered into a correlation matrix to determine if there was multicollinearity or strong correlation between any of the predictor variables, between any of the outcomes, or between predictor variables and outcomes. Correlation coefficients between predictor variables ranged from -.009 (n.s.) to .930 ($p < .01$). In total, on the basis of a correlation coefficient above .700 or below -.700, multicollinearity is found for three pairs of predictors variables, namely between *non-native input rel.* and *non-native input ab.* (*r*(31) = .930, $p < .001$), between *number of non-native speakers* and *non-native input rel.* (*r*(31) = .727, $p < .001$), and between *number of non-native speakers* and *non-native input ab.* (*r*(31) = .801, $p < .001$). This is not surprising because all of these variables give information about non-native input. In addition, a number of variable pairs were significantly correlated, although not to the point of multicollinearity: Av. input quality correlated with *non-native input rel.* (*r*(31) = -.575, $p < .001$), *non-native input ab.* (*r*(31) = -.472, $p < .01$), *lang. and literacy scale* (*r*(31) = .493, $p < .01$) and *no. non-native speakers* (*r*(31) = -.407, $p<.05$); *Dutch input rel.* correlated with *Dutch input ab.* (*r*(31) = .674, $p < .001$), *LoE* (*r*(31) = .543, $p < .01$) and *prof. minority lang.* (*r*(31) = -.494, $p < .01$); *no. older siblings* correlated with *non-native input rel.* (*r*(31) = .449, $p < .01$) and *non-native input ab.* (*r*(31) = .547, $p < .01$); and *Dutch input ab.* correlated with *LoE* (*r*(31) = .638, $p < .001$).

4.3.2. Outcome variables

An overview of the mean scores, standard deviations and ranges of the different outcome variables is presented in Table 3.

Table 3 – Outcome variables for children´s (n=33) Dutch proficiency

Outcome	Mean	Standard Deviation	Range
Passive Vocabulary Knowledge (Lexical Comprehension)	42.8	15.2	18-69
Sentence Comprehension[3] (Morphosyntactic Comprehension)	56.2	11.8	36-80
Mean Length of Utterance (Morphosyntactic Complexity)	6.00	0.889	4.71-7.60
Malvern's D (Lexical Complexity)	36.3	12.0	21.3-61.6
Rate of Error-Free Utterances (Morphosyntactic and Lexical Accuracy)	61.6	8.12	47.8-73.7

[3] The sentence comprehension score was originally made up of two separate scores as the result of two separate tasks. These scores were combined into one total score because they were strongly correlated (correlation coefficient < .700, p<.01) and because TAK also combines the two into a single score.

Lexical and morphosyntactic comprehension were both measured by a standardized test from the TAK. The children´s average age of 5.12 comes close to the approximate age of children just starting group 2 of primary school.[4] A comparison can be made between normative scores of monolingual Dutch children at the beginning of group 2 (Verhoeven and Vermeer 1986), ranged in 5 levels from level A (highest) through E (lowest) . For passive vocabulary, the average score of the bilingual children, 42.8 out of a possible 96 points, is comparably to a monolingual score on level D, which is defined as weak to moderate performance. Furthermore, there is massive variation within children's performance on the passive vocabulary test, with highly variable outcomes, ranging from a monolingual level A to a monolingual level E score. For sentence comprehension too, the bilingual children perform at the top of level D, with a score of 56.2 out of a possible 84. Again, a lot of variation is witnessed, with children obtaining scores comparable to all of the monolingual norm levels. With respect to MLU, the bilingual children appear to perform slightly above what is to be expected on the basis of their age. This deduction is made from comparison of their average score to the performance of five-year-olds in the most widely accepted account of age-related MLU scores (Brown 1973, adapted from Miller and Chapman 1981). With the bilinguals producing average utterances of exactly six words, which is comparable to the MLU score of their peers according to Brown. Note though, that Brown measures MLU in morphemes rather than words, so that the difference with our bilingual children will in reality even be slightly larger. Finally, large differences were found in Malvern's D outcomes and the children's rate of error-free utterances.

There were several strong correlations between the outcome variables. The two standardised test scores, Passive vocabulary and Sentence comprehension, were correlated at the .01 level of significance ($r(31) = .543$). Passive vocabulary was additionally correlated with rate of error-free utterances at the .05 level of significance ($r(31) = .357$), as were MLU and Malvern's D ($r(31) = -.437$). Finally, each outcome variable was significantly correlated with at least one predictor variable. Passive vocabulary was correlated with both *ATT* ($r(31) = .568$, $p < .01$) and *Lang. and literacy scale* ($r(31) = .370$, $p < .05$); Sentence comprehension with *ATT* ($r(31) = .399$, $p < .05$), MLU with both *working memory* ($r(31) = .502$, $p < .01$) and *lang. and literacy scale* ($r(31) = .592$, $p < .001$); Malvern's D with *Dutch input rel.* ($r(31) = .358$, $p < .05$); and rate of error-free utterances was correlated with *non-native input rel.* ($r(31)$

[4] In The Netherlands, children turn 6 before moving from group 2 to group 3

= -.385, p < .05), *non-native input ab.* (*r*(31) = -.422, p < .05) and *no. non-native speakers* (*r*(31) = -.378, p < .05).

4.4. Results regression model 1: Basic

Because different predictor variables or combinations of predictor variables may have differential effects on the outcome variables, three different models were constructed. The model which best explains the children's individual differences with respect to linguistic development is selected as the final model. The realisation of the most basic model will be discussed first.

To determine the effect of the independent variables on the dependent variables, all of them were inserted in IBM SPSS Statistics, SPSS for short, and analysed using multiple regression analysis. Separate multiple linear regression analyses were performed for each of the five different outcomes: passive vocabulary, sentence comprehension, MLU, Malvern's D and rate of error-free utterances. The same method was used for each of the outcomes, resulting in the following basic model. First, all inherent or fixed variables were entered into the model, consisting of *ATT*, *LoE*, *prof. minority lang.*, *no. older siblings* and *working memory*. This set of variables served as the basis for our model because they are considered as separate from the environmental variables and are therefore of least interest to the research questions. The additional predictive value of the environmental variables to linguistic proficiency could be established by subsequently adding, first, a block of quantitative variables and , second, a block of qualitative variables onto the inherent variables. The quality variables were entered last so that the ultimate model would present clear results about the additive effect of quality on Dutch proficiency.

In this first model, the block of quantity variables includes only one factor, namely *Dutch input rel.* The reason for excluding its absolute counterpart, *Dutch input ab.* is that multicollinearity was observed between these two variables and including both would therefore jeopardise the predictive power of the model. Since previous research indicates that relative values have a greater effect on language acquisition than absolute values, only Dutch input rel. was included in model 1. Similarly, in the set of qualitative variables, *non-native input rel.* was included whereas *non-native input ab.* was excluded. As a result of the same reasoning, *no. of non-native speakers* was excluded from the quality block because it demonstrated multicollinearity with *non-native input. rel.*, which was deemed the more informative factor of the two as it more accurately displays the division between input at home and at school. In addition to a measure of non-native input, the quality block included the *lang. and literacy scale.*, which measures children's exposure to quality enhancing language and literacy activities. *Av. quality* is not included in model 1 because this more fine-grained variable gives additional information about the amount of non-native input, distinguishing between more and less proficient non-native speakers as well as between native and non-native speakers. Therefore, this variable was not entered in the most basic model 1, but was added in a subsequent model to determine if it is of additional value to an explanation of the data. In sum, model 1 includes the following predictors variables: *ATT*, *LoE*, *prof. minority lang.*, *no. older siblings* and *working memory* (block 1), *Dutch input rel.* (block 2), *non-native input rel.* and *lang. and literacy scale* (block 3). This model was (near-)significant for three of the five outcomes. This analysis was conducted for each outcome variable separately.

4.4.1. Passive vocabulary

For passive vocabulary, the only significant block was the first block, consisting of the inherent variables. This block explains 52.9% of all variance and contains two significant predictors of passive vocabulary size, namely *ATT* ($p < .01$) and *no. older siblings* ($p < .05$). By calculation the ΔR^2, the additional variance explained by the combined external factors (block 2 and 3) was obtained. Addition of the quantitative variable in block 2 does not lead to significantly more variance being explained, neither did addition of the qualitative variables in block 3. Thus, *ATT* and *no. older siblings* remain the only predictors in the final version of model 1. For every year in age, passive vocabulary increases by 14.6 points. With every older sibling, this score actually decreases by 4.0 points. Table 4 presents the results of model 1 for passive vocabulary. A list of results of all predictor variables, including those which are not significantly predictive of the outcome, for passive vocabulary and all other outcomes can be viewed in Appendix D.

Table 4 – Regression analysis results for Passive Vocabulary scores based on model 1

Factors	**Unstandardised coefficients**		**Standardised coefficients**		
	B	**St. error**	**Beta**	**t**	**Sign.**
Constant	-49.874	18.407		-2.710	.012
ATT	14.639	3.416	.619	4.285	.000
No. older siblings	-3.992	1.433	-.384	-2.786	.010

R^2 = .529 for block 1 ($F = 6.061$, $p = .001$), ΔR^2 = .018 for block 2 ($F = 5.234$, $p = .001$), ΔR^2 = .023 for block 3 ($F = 3.986$, $p = .004$)

4.4.2. Sentence comprehension

For sentence comprehension, the third block, including all factors entered into model 1, approaches significance and explains 42.3% of the variance ($p = .063$). The only significantly predictive factor was *ATT* ($p < .05$), and additionally, *lang. and literacy scale* yielded a near-significant score ($p < .07$). Furthermore, calculation of ΔR^2 revealed that the set of quality factors explained an additional 14.9% of variance ($p = .064$). The final version of model 1 was approaching significance. ($p = .064$) and the same two variables are predictive that were so in block 3. Performance on the sentence comprehension task improves by 6.4 points as age increases by one year and by 2.0 points with every additional point scored on the language and literacy scale. Table 5 presents the results of model 1 for sentence comprehension

Table 5 – Regression analysis results for Sentence Comprehension scores based on model 1

Factors	**Unstandardised coefficients**		**Standardised coefficients**		
	B	**St. error**	**Beta**	**t**	**Sign.**
Constant	.009	23.489		.000	1.000
ATT	6.418	2.944	.383	2.180	.039
Lang. and literacy scale	1.945	.953	.359	2.041	.052

$R^2 = .247$ for block 1 ($F = 1.773$, $p = .152$), $\Delta R^2 = .027$ for block 2 ($F = 1.636$, $p = .177$), $\Delta R^2 = .149$ for block 3 ($F = 2.202$, $p = .064$)

4.4.3. MLU

As for MLU, two blocks were found to be significantly predictive, namely block 1 (fixed variables), explaining 38.4% of all variance ($p = .017$), and block 3 (fixed, quantity and quality variables), which explains a total 59.3% of the variance ($p = .008$). The one variable found to be predictive of MLU in block 1 was *working memory* ($p < .01$) and *no. older siblings* is a near-significant predictor ($p < .07$). On the basis of this block, MLU increases by .18 whenever the working memory score is increased by 1 point. MLU decreases by .18 which each additional older sibling. In block 3, *lang. and literacy scale* is added as a significant predictor ($p < .01$), *working memory* approaches significance ($p < .07$) and *no. older siblings* is no longer significantly predictive of MLU. An increase of MLU by .22 words is achieved with every additional point scored on the language and literacy scale and this increase is .11 words whenever performance on the working memory task is improved on by 1 point. The qualitative variables explain an additional 20.1% of all variance ($p = .002$). The final version of model 1 is also significant (p = .002) and has the same predictor variables as block 3. Table 6 presents the results of model 1 for MLU.

Table 6 – Regression analysis results for MLU scores based on model 1

Factors	**Unstandardised coefficients**		**Standardised coefficients**		
	B	**St. error**	**Beta**	**t**	**Sign.**
Block1					
Constant	3.027	1.196		2.530	.018
Working memory	.178	.056	.498	3.166	.004
No. older siblings	-.183	.093	.-310	-1.936	.060
Block 3					
Constant	5.025	1.645		3.055	.005
Lang. and literacy scale	.222	.064	.511	3.456	.002
Working memory	.111	.055	.309	2.015	.055

R^2 = .384 for block 1 (F = 3.371, p = .017), ΔR^2 = .004 for block 2 (F = 2.751, p = .033), ΔR^2 = .201 for block 3 (F = 4.367, p = .002)

4.4.4. Malvern's D

Although explaining 34.7% of the variance, the final version of model 1 was not significantly predictive of the Malvern's D scores (p = .179). In addition, none of the individual blocks of variables proved significant either and, therefore, model 1 yielded no significant predictors of lexical complexity as measured by Malvern's D .

4.4.5. Rate of error-free utterances

Finally, for rate of error-free utterances, the second block (fixed and quantity variables) reaches the .05 level of significance, explaining 12.8% of all variance (p = .037). In block 2, but no longer in the final version of the model, *Dutch input rel.* is a significant predictor of rate of error-free utterances (p < .05). With each additional percentage of Dutch input, .73 utterance is produced free of error. Table 7 presents the results of model 1 for rate of error-free utterances.

Table 7 – Regression analysis results for Rate of Error-free Utterances scores based on model 1

Factors	**Unstandardised coefficients**		**Standardised coefficients**		
	B	**St. error**	**Beta**	**t**	**Sign.**
Constant	-11.496	30.088		-.382	.706
Dutch input rel.	73.195	33.356	.562	2.194	.037

R^2 = .180 for block 1 (F = 1.182, p = .344), ΔR^2 = .128 for block 2 (F = 1.926, p = .114), ΔR^2 = .066 for block 3 (F = 1.790, p = .129)

4.5. Results regression model 2: Supplementation of average input quality

In order to find the best fitting model, two modifications were made to the basic model 1. The first modification resulted in model 2, which was identical to model 1 in all respect other than the inclusion of the average input quality. Being a specification of amount of non-native input, giving more information about the exact quality of this non-native input, av. quality was entered in the model to determine if its inclusion would result in a more fine-grained account of the predictive value of the set of quality factors. The sections below present the regression analyses' results only for those predictor variables which proved significant in model 2.

4.5.1. Passive vocabulary

First, for passive vocabulary size, inclusion of average input did not have much effect on the results. Since the first block of model 2 is identical to block 1 in model 1, this block remains significantly predictive of passive vocabulary size, with *ATT* (p < .01) and n*o. older siblings* (p < .05) as significant contributors. Block 1 explains 52.9% of the total variance. For the same reason, block 2 remains non-significant. Moreover, with the addition of *av. quality,* the set of qualitative variables does not, as in model 1, reach significance. The two predictors from block 1 are therefore they only predictors in the final version of model 2 as well. Passive vocabulary scores improve by 14.6 points for each year in the age of the children, whereas they decrease by 4.0 points by each additional older sibling. The results of model 2 for passive vocabulary, because identical to the results of model 1, can be viewed in Table 4 above.

4.5.2. Sentence comprehension

In terms of overall predictive power, there is not a large difference between the results of model 1 and 2 for the outcome of sentence comprehension. Model 2 still renders a near-significant explanation of the results, with just the third block approaching significance and explaining only slightly more of the total variance than model 1 does, namely 45.8% (p = .065) versus 42.3%. Block 3 explains 18.4% of this total variance. For sentence comprehension, the greatest difference between model 1 and 2 is that, in addition to continued significance of *ATT* (p < .05) and *lang. and literacy scale* (p < .05), *non-native input rel.* becomes a near-significant predictor variable (p < .07) in model 2. Sentence comprehension scores increase by 6.4 points as age increases by one year and by 2.6 points with every additional point scored on the language and literacy scale. Every additional percentage of non-native input leads to a decline of .17 points on the sentence comprehension task. Table 8 presents the results of model 2 for sentence comprehension.

Table 8 – Regression analysis results for Sentence Comprehension scores based on model 2

Factors	Unstandardised coefficients		Standardised coefficients		
	B	**St. error**	**Beta**	**t**	**Sign.**
Constant	29.411	28.474		1.033	.312
ATT	6.418	2.944	.383	2.180	.039
Lang. and literacy scale	2.575	1.075	.476	2.395	.025
Non-native input rel.	-.165	.085	-.424	-1.935	.065

R^2 = .247 for block 1 (F = 1.773, p = .152), ΔR^2 = .027 for block 2 (F = 1.636, p = .177), ΔR^2 = .184 for block 3 (F = 2.164, p = .065)

4.5.3. MLU

The results with respect to MLU remain largely identical to model 1 upon adding *av. quality* as an independent variable. Blocks 1 and 3 remain significant, as do the variables *lang. and literacy scale* (p = .06), *working memory* near-significantly so (p = .062) and *no. older siblings* only in the first block (p = .060). An increase of MLU by .23 words is achieved with every additional point scored on the language and literacy scale and this increase is .11 words whenever performance on the working memory task is improved on by 1 point. Table 9 presents the results of model 2 for MLU.

Table 9 – Regression analysis results for MLU scores based on model 2

Factors	Unstandardised coefficients		Standardised coefficients		
	B	**St. error**	**Beta**	**t**	**Sign.**
Block1					
Constant	3.027	1.196		2.530	.018
Working memory	.178	.056	.498	3.166	.004
No. older siblings	-.183	.093	.-310	-1.936	.060
Block 3					
Constant	5.161	1.980		2.606	.016
Lang. and literacy scale	.227	.075	.522	3.031	.006
Working memory	.112	.057	.313	1.963	.062

R^2 = .384 for block 1 (F = 3.371, p = .017), ΔR^2 = .004 for block 2 (F = 2.751, p = .033), ΔR^2 = .205 for block 3 (F = 3.724, p = .005)

4.5.4. Malvern's D

As for Malvern's D, addition of *av. quality* to the basic model does yield considerably different results. Most notably, model 2 renders a significant model, with a significant third block, explaining 55.0% of the variance (p = .007). This block and the final version of the model produces three significant predictor variables: *Dutch input rel.* (p < .05), *non-native input rel.* (p < .05) and also *av. quality* (p < .01). With each additional percentage of Dutch input, Malvern's D scores improve by .60 points, whereas each additional percentage of non-native input (versus native input) leads to a decrease of .22 points. Finally, whenever the average input quality increases by 1 point, Malvern's D increases by 13.21 points. Table 10 presents the results of model 2 for Malvern's D.

Table 10 – Regression analysis results for Malvern's D scores based on model 2

Factors	**Unstandardised coefficients**		**Standardised coefficients**		
	B	**St. error**	**Beta**	**t**	**Sign.**
Constant	77.625	27.538		2.819	.010
Dutch input rel.	60.777	26.155	.550	2.324	.029
Non-native input rel.	-.223	.083	-.538	-2.696	.013
Av. quality	-13.215	4.106	-.672	-3.218	.004

R^2 = .188 for block 1 (F = 1.251, p = .313), ΔR^2 = .053 for block 2 (F = 1.376, p = .261), ΔR^2 = .309 for block 3 (F = 3.118, p = .013)

4.5.5. Rate of error-free utterances

The results of model 2 prove largely identical to the results of model 1. Adding av. quality to the quality block does not result in the significance of block 3 nor of the final version of the model (p = .129). *Dutch input rel.* remains a significant predictor in block 2 only (p < .05) so that with each additional percentage of Dutch input, .73 utterance is produced free of error. Table 11 presents the results of model 2 for rate of error-free utterances.

Table 11 – Regression analysis results for Rate of Error-free Utterances scores based on model 2

Factors	**Unstandardised coefficients**		**Standardised coefficients**		
	B	**St. error**	**Beta**	**t**	**Sign.**
Constant	-11.496	30.088		-.382	.706
Dutch input rel.	73.195	33.356	.562	2.194	.037

R^2 = .180 for block 1 (F = 1.182, p = .344), ΔR^2 = .128 for block 2 (F = 1.926, p = .114), ΔR^2 = .076 for block 3 (F = 1.591, p = .177)

4.6. Results regression analysis Model 3: Replacing relative with absolute values

Entering both the amount of non-native input and the average quality of input results in a model which is more informative with respect to sentence comprehension and Malvern's D. Therefore, model 2 is preferred over model 1. Having considered that exact quality of non-native input may have a differential effect on language acquisition with model 2, a final model was executed to determine if absolute input values, rather than relative values, may demonstrate a greater, or different, influence on Dutch proficiency. Model 3 included all the same variables as model 2, but all relative values were replaced with their absolute counterparts. Specifically, *Dutch input ab.* replaced *Dutch input rel.* and *non-native input rel.* was substituted for *non-native input ab.* However, this model provided a significant account for fewer of the outcomes than models 1 and 2 and although there were some differences with respect to the variables that the model rendered significant predictors, there was not a greater number of significant predictors nor did these variables have greater predictive power. Therefore, this model was considered less informative and model 2, containing relative values and including *av. quality*, was selected as the best and final model. The results of model 3 are provided in Appendix E.

4.7. Summary

On the basis of raw data gathered by administration of the parental questionnaires UBiLEC and ALDeQ, the following set of predictor variables were made available for statistical analysis in SPSS: *Dutch input rel.* (the relative amount of Dutch input in percentages per week), *Dutch input ab.* (the absolute amount of Dutch input in hours per week), *non-native input rel.* (the relative amount of non-native input in percentages per week), *non-native input ab.* (the absolute amount of non-native input in hours per week), *no. non-native speakers* (the number of non-native speakers), *av. input quality* (the average quality of the input on a scale of 1 to 5, based on the proficiency levels and amount of output from the children's conversational partners), *lang. and literacy scale* (the accessibility of language and literacy activities in addition to regular conversation on a scale of 0 to 9), *ATT* (the age at the time of testing), *LoE* (the cumulative length of exposure), *prof. minority lang.* (children's proficiency in the minority language on a scale of 0 to 100), *no. older siblings* (the number of older siblings) and *working memory* (working memory capacity). The predictive effect of these variables was determined for the five different outcomes separately: Passive vocabulary (Lexical Comprehension), sentence comprehension (Morphosyntactic Comprehension), Mean Length of Utterance (Morphosyntactic Complexity), Malvern's D

(Lexical Complexity) and rate of error-Free utterances (Morphosyntactic and Lexical Accuracy). Large amounts of variation observed for most predictor and outcome variables indicate that there are substantial individual differences between the bilingual children.

Multiple models were constructed to find the best explanation of children's linguistic performance. The first, most basic model included the following predictors variables: *ATT, LoE, prof. minority lang., no. older siblings* and *working memory* (block 1), *Dutch input rel.* (block 2), *non-native input rel.* and *lang. and literacy scale* (block 3). In this model, the following variables reached or approached significance: *ATT, no. older siblings, working memory (near-significant), Dutch input rel.* and *lang. and literacy scale*.

Model 2 was extended to include *av. quality*, in order to reveal its possible value in explaining effects of quality on task performance. Model 2 resulted in the additional significance of block 3 for Malvern's D and near-significance of *non-native input rel.* in sentence comprehension, as compared to model 1. Overall, according to model 2, the following variables have significant predictive power over the children's linguistic performance: *ATT, no. older siblings, working memory* (near-significant), *Dutch input rel., lang. and literacy scale, non-native input rel.* and *av. quality.*

A third and final model was constructed to examine the differential effect of absolute instead of relative values, which was relevant for the amount of Dutch and the amount of non-native input. This alteration did not result in a model with overall greater predictive power than model 2. Therefore, model 2, including all basic values, *av. quality* and relative values only, was selected as the best fit for the data.

5. Discussion

5.1. Introduction

This thesis has aimed to obtain a better picture of the effect of environmental variables on bilingual language acquisition and to achieve a systematic measurement of a range of different internal and external variables to determine their relative importance in the language acquisition process. Within these objectives, the influence of factors determining the quality of children's input received particular focus, concentrating furthermore on the effect of non-native input as compared with native input.

5.2. Significant predictors of bilingual language acquisition

Of the total set of nine variables which were analysed in the multiple regression model, six proved to be (near-)significant in at least one of the five component of linguistic proficiency that were measured for the 33 bilingual children: age at time of testing, number of older siblings, working memory capacity (approaching significance), the relative amount of Dutch in put (in percentages), the language and literacy scale, the relative amount of non-native input (in percentages) and the average quality of the input. The only variables that the model did not yield significant predictors of Dutch proficiency were cumulative length of exposure and children's proficiency in the minority language, i.e. Berber or Moroccan Arabic, both, arguably, internal variables. Of course, not finding an effect for these two factors does not imply that they are of no importance to language acquisition, which previous research has suggested that they are (e.g. Unsworth et al. 2011 for cumulative LoE and Cummins 1991 for L1 proficiency). It does, however, suggest that other factors may be more important in explaining this particular group's linguistic behaviour.

The first point that has become apparent from the total set of results is that the emerging picture is complex and multifaceted. That is, Dutch proficiency is not predicted by a select set of either internal or external variables, but rather the individual components of proficiency are influenced by different combinations of the predictor variables. This finding draws attention to those studies which only consider one factor or a set of correlating factors in their account of language acquisition, for example age of acquisition (Meisel 2008) or length of exposure (Gathercole (2007). In these cases, a positive result does not, of course, mean that this is the *only* possible predictor of language acquisition. In addition, the impact of a particular factor may change when it is examined in combination with other predictive variables. Although such relatively isolated studies are absolutely vital to give a clear and specific account of important affective variables, a broader approach would complement these findings because the interaction between variables is included. When previous research *has* considered the influence of a range of different variables on language acquisition (e.g. Paradis 2011, Place and Hoff 2011), results often show that level of proficiency cannot be explained by one or few factors, but rather that a multitude of highly diverse variables play some role in the acquisition process. This finding is supported by the results of this thesis.

5.3. Internal variables

Before discussing the (effect of the) external variables which were measured by the questionnaires, the following section serves first to elaborate on the effects of internal variables on bilingual development. The only component where external variables play no tangible role is in lexical comprehension, measured by passive vocabulary size. Rather, proficiency in this aspect of linguistic knowledge is significantly predicted by the child's age and by its number of older siblings, both internal variables. Other proficiency components which are influenced by internal variables are morphosyntactic comprehension, as measured by the sentence comprehension tasks, and morphosyntactic complexity, indicated by MLU. The internal predictor variable for the former is age and for the latter it is working memory capacity, albeit just near-significantly so.

The moderate effect found for working memory is consistent with findings of such an effect for both L2 acquisition and for language acquisition in young children in general. Moreover, this result supports findings by Blake, Austin, Cannon, Lisus, and Vaughan (1994) and Adams and Gathercole (1995) (cited in Ellis and Sinclair 1996, 237), who found that good phonological memory ability is generally associated with the production of longer utterances. However, the positive effect of working memory on linguistic development has primarily been found for second language learners in an instructed context (Miyake and Friedman 1998). Little research has considered the effect of working memory when language is acquired naturalistically as a native language (Martin and Ellis 2012). Notably, Paradis (2011) found that when considering phonological short-term memory, a strong correlation with linguistic proficiency did emerge.

As for the number of older siblings present in a child´s household, the meaning of an effect is not straightforward. Paradis (2011) included the factor because she expected a greater number of older siblings to mean a greater amount of target language input available for the language learning child, as older siblings have more experience with the target language at school. However, several other studies suggest that a negative effect of more older siblings is likely to exist. The reason for this is that each child in a household with multiple children will receive less speech directed at him or her, since parents will have to divide their attention between their children (Jones and Adamson 1987; cited in Hoff 2006, 67). Thus, children with siblings, as Paradis seems to suggest also, receive more input from their siblings and less from their parents. Instead of a positive effect of more input in the target language, there may also be a negative effect due to differences in the speech that older siblings and mothers direct to young children. Input from older siblings is structurally less complex and uses a smaller vocabulary (Hoff-Ginsberg and Krueger 1991; cited in Hoff 2006, 67). In the current thesis, more older siblings present lead to lower levels of performance on the passive vocabulary task, a result that supports the notion that input provided by older siblings slows down rather than speeds up the acquisition process.

With respect to an effect of chronological age specifically, it is not surprising that we find it in the two standardised measures from the TAK, as the outcomes of both tests are raw scores. That is, a child is scored on the number of items he or she was able to answer correctly, independent of the child's age. However, no such correction for age was made on children's scores on the productive task either. What needs to be explained, then, is why an age effect is less likely to occur in performance on the experimental tests measuring productive as opposed to the standardised tests measuring comprehension.

This difference points towards a repeated pattern that seems to explain the relative importance of some variables on receptive versus productive components of proficiency. The lack of an age effect, in this case, on the productive proficiency components seems to be the result of an intrinsic difference between the two test forms used: standardised tasks to measure receptive lexical and morphosyntactic knowledge, on the one hand, and an experimental task to measure productive knowledge, on the other. It seems to me that the two different test forms are differentially affected by the set of predictor variables because they measure a different type of knowledge. Both in comprehension as in production, a distinction can be made between *narrow* and *broad* proficiency. As for comprehension, in the *narrow* sense it is simply a matter of perceiving the linguistic stimuli, whereas in the *broad* sense, it is also an interpretive process in which a range of non-linguistic variables additionally come into play (Xu 2011, 161). For production, a similar distinction may be made such that only linguistic variables (narrow proficiency) or a combination of linguistic and non-linguistic variables affect productive proficiency (broad proficiency).

It would seem to me that the standardised tests are set up in such a way that they measure narrow proficiency, whereas successful performance on the productive task requires broad proficiency. For passive vocabulary, children need only recognise a word and match it to the correct picture. The sentence comprehension task requires a similar action, but in this case it is a sentence rather than a word that needs to be matched to a picture. These pictures are constructed specifically such that any non-linguistic, real world knowledge does not make certain options more likely than others.[5] Oppositely, execution of the experimental task seems to depend on a number of other factors in addition to plain linguistic knowledge. Some non-linguistic variables that come to mind are personality (is the child shy or talkative), ability to use words in sentences, willingness to talk, feeling at ease with the experimenter or not and physical/oral capacity or incapacity (e.g. a stutter or lisp). These variables could be thought to make up part only of a broad definition of productive knowledge. Thus, the standardised tests seem to measure narrow proficiency, whereas the experimental task measures broad linguistic proficiency.

The additional non-linguistic factors that play a role in children's productive performance seem largely unrelated to age. Therefore, their effect on productive performance may cloud a potential age effect, such that age does not surface as a significant predictor of active linguistic skills. This does not mean that age could not be predictive of productive proficiency, but merely that it can be levelled by other variables. Recall that this is the result of a task effect, as the current thesis used both standardised and an experimental task. It can only be expected that different tasks will lead to different results, to a certain extent. Some other results also seem to be explained by this task effect, as will be discussed below.

5.4. Input quantity

An importation second finding in this thesis is that all the environmental factors which were measured by the questionnaires, both quantitative and qualitative, were significant predictors of all other proficiency components apart from passive vocabulary. Based on this finding, the following sections will deal with the first research question, which asked what the effect of environmental or external factors is on bilingual language acquisition, distinguishing between input quantity, on the one hand, and input quality, on the other.

With respect, first, to input quantity, the amount of Dutch input proves significantly predictive of lexical complexity, measured by Malvern's D, and the combined measure of lexical and morphosyntactic accuracy by rate of error-free utterances. Since the data do not allow me to distinguish between lexical and morphosyntactic errors within the rate of error-free utterances, it is impossible to know whether both or only one of these domains is

[5] An example of non-linguistic knowledge could guide decision-making is when a child is presented with two images, one depicting a man carrying a child and the second portraying the child carrying the man. The former would generally be preferred over the latter because it is the more likely situation to occur in the natural world.

influenced. Additionally, greater R^2 values and standardised beta coefficients for amount of input in Malvern's D (ΔR^2 = .053, Beta = ,550) and rate of error-free utterances (ΔR^2 = .128, Beta = .562) than for sentence comprehension (ΔR^2 = .027, Beta = ,153) and MLU (ΔR^2 = .004, Beta = -,237) suggest that lexical proficiency is more considerably affected by input quantity than morphosyntactic proficiency. The predictive value of input quantity on lexical development is consistent with previous research (Pearson, Fernández, Lewedeg, and Oller 1997; Vermeer, 2001). However, the current thesis conflicts with previous positive findings with respect to such an effect on comprehensive lexical skills specifically (Paradis 2011, Vermeer 2001). As for morphosyntax, although Gathercole's (2007) finding of an effect of input quantity on comprehensive knowledge is not corroborated by the current thesis. However, the bulk of previous studies examined productive capacity and the results of this thesis are in line with a consistently demonstrated effect on accuracy, specifically (Gathercole and Thomas 2003, Paradis 2011; Nicoladis and Crago 2007; Unsworth, Argyri , Cornips, Hulk, Sorace and Tsimpli 2010). Results of the current thesis are in accordance with this finding.

For lexical and morphosyntactic accuracy, as measured by the rate of error-free utterances, an additional observation is made with respect to the effect of input quantity. This observation suggests that although initially a significant predictor of linguistic proficiency, the predictive effect of the amount of Dutch input disappears when as the set of qualitative variables is added to the model. It would seem, then, that the input quality mediates the effect of input quantity, such that qualitatively poor input can reduce the positive effect of a high amount of input and, at the same time, qualitatively good input can mitigate the negative effect of a low amount of input. Thus, more input does not always benefit linguistic development, if this input is not of a sufficient quality. This is the case even while none of the individual quality factors is significantly predictive of proficiency.

The selective predictive power of input quantity on the various outcomes leads to two questions. The first is why we do not find a strong predictive effect of input quantity on morphosyntactic proficiency. Perhaps, this has something to do with the development of morphosyntax in childhood. Between approximately two and six years, children's vocabulary size expands roughly linearly (Huttenlocher, Haight, Bryk, Seltzer and Lyons 1991, 236). Morphosyntax, on the other hand, does not develop with even steps. Large increases in the amount of input may at times not result in any visible morphosyntactic growth, while at different points in the child's development, a small amount of input perhaps *will* be sufficient for development to occur. Possibly, then, children with a similar amount of input could nonetheless demonstrate different levels of morphosyntactic proficiency. Perhaps there is too much internal variation for a potential linear fit between proficiency and input quantity, although possibly existing, to become visible here. Larger participant numbers may enable the manifestation of such a linear relation. Alternatively, lexical development may simply be more dependent on the amount of input than morphosyntactic development. As for MLU specifically, children's relatively high age and LoE might mean that there is not enough variation in MLU to find an effect. In fact, MLU is thought to become increasingly stable from the age of five onwards and the average length of the bilingual children's Dutch utterances is above that age with exactly 6;0 years.

A second question generated by the results concerning input quantity is why active vocabulary size, i.e. lexical production, would be affected more than passive vocabulary size, i.e. lexical comprehension? A possible explanation for the greater effect of input quantity on active versus passive lexical knowledge concerns the previously discussed difference between the standardised and experimental test forms used to measure receptive and productive proficiency, respectively. For vocabulary specifically, performance on The Frog Story, measuring active vocabulary size, seems to benefit from a certain willingness to talk and a relative ease or confidence with speaking Dutch. This may affect not what children *could* say (that we do not hear), but what they actually *will* say (and we do hear); the broad definition of productive proficiency and arguably the better representation of productive capacity. Furthermore, one may suspect that more input leads to more ease and confidence with the target language. Therefore, this would seem to explain why input quantity has a greater effect on productive than on comprehensive ability.

A differential effect of amount of exposure on receptive and expressive vocabulary size was also found by Thordardottir (2011), who reports additional input to yield higher performance on measures of expressive vocabulary. As for receptive knowledge, the author finds a much less strong relation between input quantity and proficiency. Her results indicate that lexical comprehension does not benefit significantly anymore from more input once a relative amount of exposure to the target language above 60% was reached. For the bilingual children in this study, the mean relative amount of Dutch input constitutes 78.1% and almost all children received more than 60% of their input in Dutch. This suggests that the account provided by Thordardottir is also applicable to the current thesis' results. This thesis seems largely comparable to Thordardottir's study because, despite a different language combination (English-French) being investigated and different vocabulary measures being used, input quantity was also measured by means of parental questionnaires and the children in her study are around the same age (five-year-olds). To my knowledge, Thordardottir's study is the only one to have research both active and passive vocabulary size and therefore the only one allowing for a direct comparison of the two. The results of the current thesis are consistent with her findings.

5.5. Input quality

Finally, the quality of the input was determined by three different factors: the amount of non-native input, the average quality of the input and participants' score on the language and literacy scale. The following section will discuss the latter factor and section 5.5.2 will consider the effect of both variables concerning non-native input on Dutch proficiency.

5.5.1. Linguistic and literacy activities

Amount of exposure to language by extra Dutch language and literacy activities, supplementing input from regular conversation, is significantly predictive of both morphosyntactic comprehension (sentence comprehension) and morphosyntactic complexity (MLU). Thus, morphosyntactic development seems influenced by language and literacy activities more so than lexical development. Lexical development, the results show, benefits more from larger amounts of input, whereas morphosyntactic development increases more quickly on the basis of the availability of this high-quality input.

High-quality input such as witnessed in the extra language and literacy activities measured here is thought to contain more rich, complex and information-dense language (Scheele et al. 2007). Both lexical and morphosyntactic development can be conceived to profit from this. For morphosyntax, high-quality input may facilitate the acquisition of more complex aspects of morphosyntax. Vocabulary size may grow on the basis of home language and literacy activities because the input likely contains a larger variety and more advanced vocabulary. The finding that only morphosyntactic but not lexical development significantly benefits from frequent exposure to language and literacy activities at home is therefore unexpected. Of course it is possible that such an effect for lexical development does exist, but simply did not emerge from this study. On a specific note, perhaps the methodology of this thesis, particularly the limited number of participants in combination with the large variety of variables that were analysed, prevents a strong predictive relation between the independent variable and lexical proficiency.

The positive finding of a predictive effect for morphosyntax informs us that frequent exposure to language and literacy activities can have a beneficial effect on linguistic development. This outcome is consistent with research finding a strong correlation between linguistic proficiency and a wide range of qualitative variables, such as SES of the child's parents and the number of different contexts in which the child receives target language exposure (De Houwer 2007; Goldberg, Paradis and Crago 2008; Paradis in press; Place and Hoff 2011). Positive effects of such variables all assume a similar richness and density of the input as the input resulting from the language and literacy activities discussed here. Specifically, the outcome corroborates findings by Scheele et al. (2010) about the predictive effect of oral and literate L1 and L2 language activities on L2 proficiency.

One possible explanation for the differential effect of exposure to language and literacy activities difference on morphosyntax and vocabulary size is that the former may simply benefit *more* from rich, high-quality input than lexical development. That is, examples of complex constructions may be absolutely *necessary* to move beyond the most simple stages of morphosyntactic knowledge, whereas lexical development will still continue even without such high-quality input. Without exposure to high-quality input, children's morphosyntactic development may slow down vastly as children do not receive enough linguistic clues to learn many new rules or constructions, whereas expansion of the lexicon may still proceed to a comparable rate as when high-quality input is available. Especially at a stage in development when the lexicon is not yet very large, as may reasonably be the case for the young bilinguals in this sample, there may still be plenty of new words available in any type of input, regardless of the quality.

This reasoning is consistent with the outcome that input quantity is more predictive of lexical than of morphosyntactic development. Lexical acquisition seems to benefit most from additional input in general, with the specific content and quality being of secondary importance, whereas morphosyntactic acquisition appears to be most sensitive to a particular, high-quality, type of input. On the contrary, morphosyntactic proficiency may profit most from high-quality input, with the amount of input coming from everyday conversations being less crucial. It seems reasonable to assume that deeper, more advanced understanding of morphosyntax would improve sentence comprehension. In addition, a child with access to more structurally complex language will likely be able to produce more complicated grammatical structures itself. Therefore, it also seems plausible that MLU would increase on the basis of access to high-quality input.

5.5.2. Non-native input

The results of this thesis give some information specifically about the amount and quality of non-native input provided to the children. This information is relevant in answering the second research question: Does non-native input differentially affect bilingual language acquisition compared to native input?

Non-native input variables strongly predict lexical complexity (Malvern's D) and to a lesser extent also predict morphosyntactic comprehension (sentence comprehension). Specifically, both the relative amount of non-native input and the average quality of the input are significant predictors of lexical complexity. Morphosyntactic comprehension is near-significantly predicted by amount of non-native input, but not by the average quality. Notably, though, in both areas of proficiency non-native input did not become a (near-)significant predictor until the addition of average quality to the model. Apparently, average input quality reveals an additional pattern to the amount of non-native input that is not evident from the relation between non-native input only and Dutch proficiency, revealing it as a significant predictor. This pattern is such that as the average quality of the input increases, proficiency improves. Restructuring the data *within* the group of non-native speakers according to this pattern explains why certain speakers are more proficient than others. Taking this information into account, the distinction between native and non-native speaker proficiency, determining children's input quality, becomes significantly predictive of children's lexical complexity and morphosyntactic comprehension scores. Even when the pattern does not yield average input quality itself a significant predictor, as is the case for morphosyntactic comprehension, the pattern appears to be strong *enough* to become visible in the statistical analysis and be superimposed over the non-native input data rendering amount of non-native input significant.

The current thesis adds to the body of research pointing towards a differential effect of non-targetlike input, e.g. non-native input, as opposed to input that is consistent with a certain norm (Blom 2010, Blom and Vasić 2011, Cornips and Hulk 2006, 2008, Domínguez 2009, Paradis and Navarro 2003, Pires and Rothman 2009, Singleton and Newport 1994, Ross and Newport 1996, Sorace 2005, Unsworth 2008). These studies suggest that input which is different from the norm or target leads to acquisition outcomes that are also different form this target, i.e. lower proficiency in the target language, either because the learner is not able to surpass the input (e.g. Sorace 2005, Singleton and Newport 1994, Ross and Newport 1996), or because the learner simply requires a different target (e.g. Hulk and Cornips 2006, 2008; Paradis and Navarro 2003; Pires and Rothman 2009; Domínguez 2009). The target would have to be described as linguistic output that is similar to that produced by the majority of speakers. Any deviation from this norm, either due to exposure to non-native input or to otherwise non-standard input, would be viewed to constitute a lower proficiency.

Specifically and importantly, what can be deduced from the findings is that non-native input negatively affects linguistic proficiency. That is, children who receive high percentages of non-native input will generally develop poorer Dutch language skills than children with more access to input from native speakers. This finding is consistent with results from Place and Hoff (2011) that more non-native input leads to lower levels of proficiency in the majority language of two-year-old Spanish-English bilingual children. Thus, the current thesis was able to replicate the predictive effect of the amount of non-native input established by Place and Hoff for a different age range and language combination, strengthening the validity of their outcome. In addition, it supports the notion that the relative amount, i.e. the percentage, of non-native input in the majority language more accurately discloses an effect of non-native input than the absolute amount.

With respect to the domains in which non-native input could affect proficiency, there are some differences between findings of the current thesis and Place and Hoff's results. Place and Hoff 's study investigated the effect of non-native input only on active vocabulary size and grammatical complexity. The current thesis divided active vocabulary into the components lexical accuracy and complexity, and additionally measured grammatical accuracy and comprehension. Positive findings for lexical accuracy confirm the predictive effect of non-native input on active vocabulary size found by Place and Hoff, although results for lexical complexity fail to corroborate this. Moreover, the current thesis was not able to replicate the authors' findings with respect to grammatical complexity. This divergence may, in part, be the result of different test measures used. Place and Hoff used parental report (CDI data) to determine the children's linguistic proficiency as opposed to the experimental methods chosen for the current thesis. Finally, the moderately predictive effect of non-native input found for morphosyntactic comprehension supplements Place and Hoff's findings, suggesting that passive, receptive knowledge may also benefit from large amounts of native input.

In addition to a negative effect of non-native input, we find a positive effect of average input quality on lexical complexity. Recall that non-native input is divided into different subcategories (rated from 0 to 4) based on quality. Therefore, we must infer that within the group of non-native speakers, differences in the quality of their output lead to different levels of Dutch lexical proficiency with the bilingual children. Specifically, children who receive on average high-quality input generally demonstrate greater Dutch proficiency with respect to lexical complexity than children with relatively low-quality input. Furthermore, average input quality influences the effect of non-native input such that without consideration of the average quality of the non-native input, the predictive ability of amount of non-native input found for lexical complexity and morphosyntactic comprehension disappears. Thus, a*mount of non-native input alone is not always predictive of proficiency because all input that is categorised as non-native may not be of comparable quality*. Children with similar amounts of non-native input may nevertheless have different levels of proficiency because some will be exposed to qualitatively better non-native input than others. Vice versa, children may have a similar level of proficiency despite varying amounts of exposure to non-native input due to differences in the quality of this input. There appears to be a continuum, such that those children with low-quality non-native input are outperformed by those with high-quality non-native input, who are, in turn, generally outperformed by children with predominant exposure to native input. This appears to be the case for the level of lexical complexity and, to a less extent, also for morphosyntactic comprehension.

A more detailed aspect of the effect of non-native input on linguistic development is whether poor input can be compensated for by sufficient amounts of native or high-quality non-native input. Although the results of this study do not provide a direct answer to this question, they do suggest a negative implication. The reasoning is very simple. Since any amount of low-quality input will lower the average quality of the input, and input quality has a positive effect on proficiency, any portion of input that is of low quality seems indirectly to lead to lower levels of proficiency. However, this is a likely but not the only possible interpretation of the results. One may wonder when input should be considered as poor or extremely poor. It cannot be determined from these results at which point input is of a high enough quality to ensure proper acquisition of Dutch, such that the child will become a proficient user of it. What also remains uncertain is if non-native input that is of an extremely high quality can override this negative effect and become equally effective as native input for language acquisition.

In sum, then, it seems that in first instance native input leads to higher linguistic proficiency than non-native input and, in second instance, higher quality (non-native) input yields better proficiency than lower quality input. Phrased differently, high amounts of non-native input generally lead to low proficiency *if* this non-native input is of a poor quality. When non-native input is of high quality, its negative effect on linguistic development is decreased.

6. Conclusion

6.1. Introduction

This final chapter presents a summary of the findings of this thesis and draws the most important conclusions. Furthermore, the societal implications of these scientific outcomes for parents and other interested parties are discussed. Finally, this chapter will consider this thesis' limitations and the consequences thereof, as well as make some suggestions for future research.

6.2. Summary of main findings

This thesis examined the lexical and morphosyntactic Dutch proficiency of Moroccan-Dutch bilingual pre-school children in The Netherlands between the ages of four and seven. Considering the complexity of the language acquisition process and the fact that a multitude of different variables has been found to affect learner outcomes as well as development, several internal and external variables were structurally measured. The relative impact of these variables was analysed to determine how much information about bilingual linguistic development is offered by environmental variables, in supplementation of more frequently researched internal variables.

Results revealed that both internal and external variables play a role in various domains of the children's Dutch proficiency. Different proficiency components were affected by different predictor variables, without one variable being predictive of proficiency across the board. These findings highlight the complex character of language acquisition and bilingual language acquisition specifically.

The first research question asked what the role of environmental or external variables, distinguishing further between quantitative and qualitative factors, is on children's morphosyntactic and lexical development of Dutch. The relative amount of Dutch input was found to be predictive of lexical complexity and lexical and morphosyntactic accuracy. The combined set of qualitative variables was or approached significance for morphosyntactic comprehension and complexity and for lexical complexity. The availability of high-quality input through home language and literacy activities specifically lead to higher levels of proficiency for the morphosyntactic domain.

Non-native input was predicted to have a negative effect on bilingual development, such that proficiency levels for children with high levels of non-native input would be outperformed by children with high levels of native input. This prediction was confirmed for lexical complexity and morphosyntactic comprehension. In addition, input from non-native speakers with a high level of proficiency proved to be more beneficial for lexical complexity than input from less advanced non-native speakers.

6.3. Practical implications

Internal variables such as age and working memory are not something that we as humans can influence. However, caregivers do have the ability to, to a certain extent, mould the linguistic environment of their children. The fact that environmental factors can influence the language acquisition process is, then, a fortunate finding. Generally, children raised in a (part) Moroccan household in The Netherlands will benefit from larger amounts of input in the majority language. Thus, parents should best make an effort to provide their children with enough Dutch input. The effect of input quantity on linguistic development does, however, appear to be mediated by the quality of the input.

Specifically, these results show that it is also important that the input which children receive is of a sufficiently high quality. Although it is probably impossible to determine the exact level of quality, or the exact amount of input, that will 'guarantee' proper development of the Dutch language, the findings of this thesis make it clear that those children with more high-quality input have a better chance at obtaining a high level of proficiency. This also means that an increase in the amount of input is not necessarily beneficial to linguistic development when the quality of this input is poor. The results of this thesis define two means by which high-quality input can be provided to the child.

The first is by providing the child with as much input from native speakers of Dutch. The results demonstrate that, generally, the more non-native input a child receives, the lower its proficiency will be. Therefore, I would like to stress the importance of seeking eithers persons who or environments which have this input readily available. This may be as trivial as asking a neighbour to spend time with the child or finding a Dutch speaking babysitter, or as fundamental as deciding to send the child to Dutch pre-school or have the child participate in after-school activities.

I realise that there may be family situations in which it is impossible to offer the child frequent exposure to native speakers. In this regard, it is important to recall that there appears to be a continuum in terms of the quality of input and its effect on linguistic proficiency. While input from native speakers is more beneficial than input from non-native speakers, input from relatively proficient non-native speakers is in turn more valuable than input from speakers with very low levels of proficiency. Thus, whenever native input is scarcely available and non-native input unavoidably makes up most of the child's input, it is important to make efforts to have much of this input come from relatively proficient non-native speakers of Dutch.

With this in mind, if primary providers of input to the child, parents and mothers particularly, choose to speak Dutch to their children, it is important that they be aware of the benefits of bettering their own proficiency. Learning Dutch when this language was not available during caregivers' childhood would be expected to assist the child in its development, as its average input quality would improve. This is particularly important in situations where the main source of Dutch input, before the child starts attending school, comes from the child's parents or other non-native Dutch speaking family members, but promoting of the child's linguistic development in any setting. With this being said, there likely exist situations in which it is better not to speak Dutch to a child. For caregivers who have not (yet) acquired a reasonable level of Dutch proficiency but who are responsible for a large part of the child's input, it may be better to speak to the child in their native language instead.

This observation is also made by Place and Hoff (2011), who suggest that any deviation from the natural communication between a parent and child in the parent's native language may have a general undesirable effect and take into account that sufficient access to the minority language is vital for complete acquisition. Therefore, Place and Hoff advise against parent-child communication through the majority language. This viewpoint is backed by Wong-Fillmore (2000), who states that acquisition of a L2 nowadays is more often a subtractive than an additive process with the L2 replacing more than supplementing the first language, often leading to (partial) language loss. Wong-Fillmore and Snow (2000) also state that of those migrant children in America that lag behind other children in their English proficiency many actually speak primarily in English instead of their first language, also with conversational partners who speak little English. Although I do not wish to make quite such strong statements, the negative effect of non-native input found in the current thesis suggests that there are situations in which parent-child communication in Dutch may not benefit the child's linguistic development.

The second means of ensuring qualitatively good input is via language and literacy activities at home. Children benefit from frequent engagement in language and literacy activities where the output offered is thought to contain more complex and rich language. Such activities include watching education television programs, being read to from educative reading materials and being told fairy tales, rhymes or riddles. Thus, parents would be advised to seek as much additional sources of language and literacy as possible.

Finally, in the spirit of killing two birds with one stone, input from native speakers or highly proficiency non-native speakers could well be combined with the already high-quality input used in home language and literacy activities. In some cases, again, this might only be possible by asking persons from outside the home to engage in language activities with the child. For example, asking a neighbour or friend to read to the child is one option. Another means of boosting the amount of high-quality input from native or highly proficiency speakers could be by being selective in the type of input offered to the child. For instance, Dutch television programmes are generally available to all and thus provides easy access to native input.

6.4. Limitations and future research

The results of this thesis lend some support to previous findings about the relative importance of internal versus environmental factors and the impact of specific environmental factors, including the amount of non-native input, on bilingual language development. However, a larger sample size would benefit statistical analysis, make results more reliable and convincing and allow for larger generalisations to be made. Increasing the sample size would also allow addition of other variables that have been demonstrated to affect linguistic acquisition, such as SES (Goldberg, Paradis and Crago (2008) or AoO (Meisel 2008). AoO could, alternatively, be kept constant so as to better be able to compare findings about simultaneous versus sequential bilingualism (i.e. early L2 acquisition).

Whereas this thesis has considered the relative impact of the investigated factors on different domains , it did not consider the influence of these factors on a combined score of proficiency, due to time limitations. A Principle Components Analysis could be used to achieve such a combined score, which would reveal which factors are most crucial to complete and proper acquisition of the target language. Specifically, this may give more insight into the relative importance of input quantity versus input quality. Such a comparison is important because we may be able to determine in which situations a greater amount of target language input is more important than high-quality input and vice versa.

This study has used both experimental and standardised tasks, which may at times have made comparison of the results (more) difficult. Future research should seek to use different task forms to extract linguistic data, in order to make different areas of proficiency more comparable and to see which factors affect which components of linguistic proficiency specifically. To complement findings of the current study, future research should also explore, in addition to morphosyntactic and lexical proficiency, the third major component of linguistic proficiency, namely phonological proficiency.

With respect to non-native input specifically, this thesis answers some questions, but also creates or revives some new ones. For instance, it remains uncertain whether poor input can be compensated for by sufficient amounts of native or high-quality non-native input and, as mentioned before, under which circumstances linguistic development benefits more from an increases amount of exposure to the target language or from an improvement in the quality of exposure. Future research should explore such issues and, furthermore, should study ultimate attainment in adult bilingual speakers in addition to child development. This would inform us about bilingual learners' ultimate attainment and reveal if non-native input only leads to slower, less efficient L2 acquisition or ultimately inhibits complete and successful acquisition of the target language. In addition, future research should also seek to analyse parental output data in detail and compare these with child output to determine if specific deviations from the norm in parental output can account for individual differences between children in terms of the level of proficiency that is reached.

Efforts should be made to find confirmative data for the role of environmental and particularly non-native input on linguistic proficiency in bilingual and early L2 acquisition, but also in other learning contexts such as monolingual first language acquisition and adult second language acquisition. The different learner contexts should seek to inform one another in order to achieve a comprehensive account of the language acquisition process.

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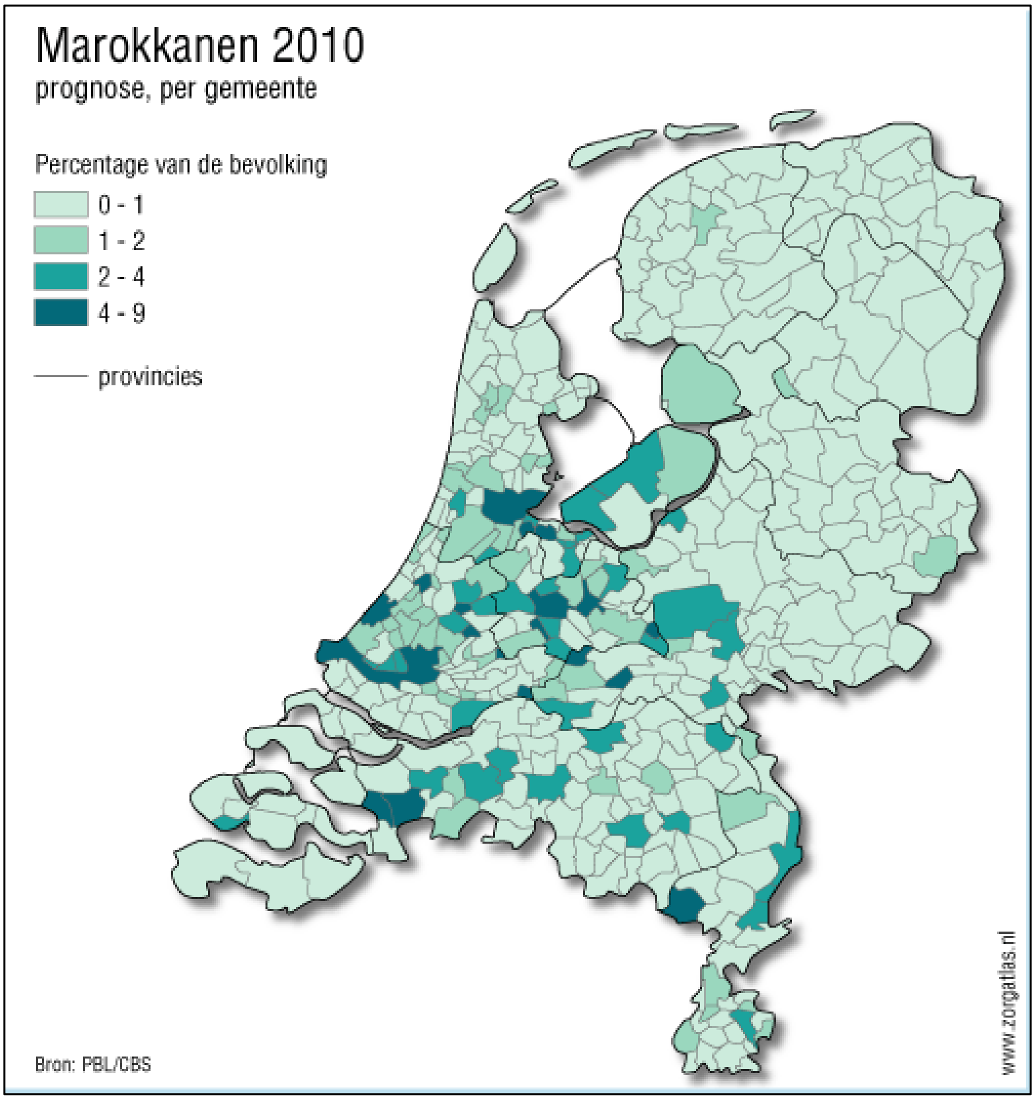
Appendix A

Percentage of Moroccans in The Netherlands



Source: Nationale Atlas Volksgezondheid

Appendix B

List of what rules used to determine what counted as an error in the Frog Story transcripts

A. All grammatical errors, i.e. incorrect subject-verb agreement, incorrect form of verb stem, incorrect form of noun, incorrect word order, incorrectly used particle verbs, missing functional elements and missing *er*.
The following exceptions were made:

- Gender errors

(1) Incorrect use of determiners:

*CHI: Nee die kindje gaat elk holletje zoeken.
No that child goes every hole search
'No the little child is going to search for every little hole

(2) Incorrect inflection of adjectives:

*CHI: Een witte ding.
A white thing
'A white thing'

(3) Incorrect pronouns:

*CHI: Ik zie dat een eekhoorntje uit die gaatje is gekomen.
I see that a squirrel out that hole is come
'I see that a squirrel has come out of the little hole

- Errors that are also frequent in monolingual Dutch

(4) *hun* used instead of *zij:*

*CHI: Nee hun hadden babies.
No their had babies
No they had babies

(5) *heb* used instead of *heeft:*

*CHI: En de hond heb hier zo'n ketting bij zijn keel.
And the dog have here a necklace near his throat.
'And the dog has one of those necklaces near his throat here.

B. All Lexical errors, i.e. incorrect prepositions, incorrect subordinating coordinator, incorrect collocation and correct use of a word form but with incorrect meaning.
The following exception was made:

(6) Correct use of a word form with incorrect meaning when the error is likely due to incorrect definition of the object rather than incorrect word choice:

*CHI: En het hond kijkt weer boos naar spinnen.
And the dog looks again mad at spiders.
'And the dog looks at spiders mad again (where *spiders* are really *bees*)

Appendix C

Questions added to UBiLEC about children’s language and literacy activities (adapted from Scheele et al. 2007)

1. Kijkt uw kind naar Nederlandse tv-programma’s waarin dingen uitgelegd worden, zoals Sesamstraat, Klokhuis of het Jeugdjournaal?
   (Does your child watch Dutch television programs which explain things, like Sesame Street, Klokhuis and het Jeugdjournaal?)

2. Kijkt uw kind naar Nederlandse programma’s of films voor volwassenen, zoals soaps?
   (Does your child watch Dutch television programs or movies intended for adults, such as soap series?)

3. Leest u voor uit Nederlandse boeken waarin het kind zinnetjes, woorden, letters of cijfers worden geleerd?
   (*Do you read to your child from Dutch books that teaches him/her sentences, words, letter or numbers?)*

4. Speelt uw kind Nederlandse video- of computerspelletjes waarin verhaaltjes worden verteld?
   (Does your child play Dutch videogames in which stories are told?)

5. Speelt uw kind Nederlandse video- of computerspelletjes waarin hij/zij iets geleerd wordt?
   (Does your child play Dutch videogames which teach him/her something?)

6. Speelt uw kind Nederlandse video- of computerspelletjes waarin hij/zij uitleg krijgt om een taak uit te voeren?
   (Does your child play Dutch videogames in which s/he is instructed to execute a specific task?)

7. Luistert uw kind naar Nederlandse liedjes?
   (Does your child listen to Dutch songs?)

8. Hoort uw kind thuis Nederlandse rijmpjes of raadsels (bijv. van u of een broer of zus)?
   (Does your child hear rhymes or riddles at home (e.g. from you or a siblings)?)

9. Hoort uw kind thuis zelfverzonnen of echte verhalen, sprookjes of legendes in het Nederlands (bijv. van u of een broer of zus)?
   (Does your child hear made-up or real stories, fairy tales or legends in Dutch at home (e.g. from you or a siblings)?)

Appendix D

Example transcript from the Frog Story

@Begin
@Languages: nld
@Participants: CHI Child, EXA Investigator
@ID: nld|ID30
@Date: 23-MAY-2012
*EXA: Wat zie je allemaal op dit plaatje?
*CHI: Die kind kijkt naar ze hond. [+EF]
*CHI: Die hond kijkt naar die kikker. [+EF]
*CHI: De hond slaapt op het kind. [+EF]
*CHI: Ja en die hond, als hij zo gaat vallen, staat hij hem op.
*CHI: Oow de kikker gaat eruit! [+EF]
*CHI: Hij is al groeit.
*EXA: Ohoh, want hier?
*CHI: Is hij d'r niet meer. [+EF] [+ELL]
*CHI: Die hond zit daar in. [+EF]
*EXA: En het jongetje?
*CHI: Die wil die muts aan doen. [+EF] [+ELL]
*CHI: Ja maar het kan niet. [+EF]
*CHI: Nee veels te klein. [+EF] [+ELL]
*EXA: Ja veel te klein he.
*CHI: Ja. [+EF] [+EXCL]
*CHI: Die hondje heb hem nog steeds aan.
*CHI: En die jongen roept. [+EF]
*CHI: Die hondje is naar buiten gevallen.
*CHI: En die jongetje kijkt naar die kant. [+EF]
*CHI: En die hondje likt hem. [+EF]
*CHI: En die jongen is boos.
*EXA: Waaorm is de jongen boos denk je?
*CHI: Omdat hem hond likt tegen z'n gezicht.
*EXA: Oh dat vindt ie niet leuk.
*CHI: Nee. [+EF] [+EXCL]
*CHI: Die hondje kijkt naar boven. [+EF]
*CHI: En hij roept naar boven. [+EF]
*CHI: En hier zijn nog meer spinnen. [+EF]
*CHI: En hier zijn bomen. [+EF]
*CHI: De jongetje kijkt naar die kuil. [+EF]
*CHI: En die hondje wil naar die mierendingetje in.
*CHI: En denkt dat hij een mier is. [+EF]
*CHI: Die hondje. [+EF] [+ELL]
*CHI: Ja maar dat is hij niet. [+EF]
*CHI: Hij is een hond. [+EF]
*CHI: Een hond past nie(t) hier in. [+EF]
*CHI: Gaat hij hem kapot maken. [+EF] [+ELL]
*CHI: Maar als hij em kapot maakt dan gaan ze ergens anders kijken. [+EF]

*CHI:	Die was op de grond door die hond. [+EF]
*CHI:	En hij kijkt binnen in die kuil. [+EF]
*CHI:	Aah hij valt van de boom. [+EF]
*CHI:	En die hond is bang voor spinnen. [+EF]
*CHI:	En hij loop weg.
*CHI:	Ja. [+EF] [+EXCL]
*CHI:	Hij roept! [+EF]
*CHI:	En hij zegt 'kom iets tegen steen'.
*CHI:	En nog een vuurkogel [?]. [+ELL]
*CHI:	Als een vuurkogel [?] tegen hem hoofd komt dan zijn pas dood.
*EXA:	Oh oow dat is niet de bedoeling he.
*CHI:	Nee. [+EF] [+EXCL]
*CHI:	die mens zit op hem die en die hondje loop weg.
*CHI:	Ja omdat hij heel groot is en gevaarlijk. [+EF]
*CHI:	En hij is bang. [+EF]
*CHI:	En hier is d'r nog één die doet zo op een steen.
*CHI:	Hij valt helemaal naar beneden naar het water!
*CHI:	Wordt hij helemaal nat. [+EF] [+ELL]
*EXA:	Verder nog iets, of volgende plaatje?
*CHI:	Deze nog. [+EF]
*CHI:	Dan moet je hier zo ergens naar benden van ergens.
*CHI:	Ja want als je nergens een ding hebt, dan kan je niet naar beneden. [+EF]
*CHI:	Dan moest je gewoon naar beneden springen. [+EF]
*CHI:	En hier was hij in de water gevallen met hem hondje.
*CHI:	En hij was nog +...
*CHI:	En hier is hij met zijn hondje in de water. [+EF]
*CHI:	En hij is helemaal nog nat.
*CHI:	Ja want dit is de vijver. [+EF]
*CHI:	Hij wilde d'r over heen, tegen die boom ding.
*CHI:	En hier wilt hij verstoppen.
*CHI:	Dat was in de water. [+EF] [+ELL]
*CHI:	Ja hier zit de kik(ker). [+EF]
*CHI:	Maar als dan kikkerdril was dan +...
*CHI:	Wij zijn niet meer buiten. [+EF]
*CHI:	Dan gaan eerst visjes. [+ELL]
*CHI:	En dan zijn echte kikkers. [+ELL]
*EXA:	Ja maar dit zijn echte kikkers he.
*CHI:	Ja maar ze springen niet. [+EF]
*CHI:	Nee want dit is geen +...
*EXA:	Nou en die, kijk.
*CHI:	Dat is de babies.
*CHI:	En dit is de moeder en dit is vader. [+EF]
*CHI:	Hier gaan zo de babies met hun papa en mama mee. [+EF]
*CHI:	En hier gaat één kindje met klein baby kikker zo.
*CHI:	En die hondje gaat daar heen. [+EF]
@End

Appendix E

Predictor variables for model 1

Regression analysis results for Passive Vocabulary scores based on model 2

Block		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-49,874	18,407		-2,710	,012
	No. older siblings	-3,992	1,433	-,384	-2,786	,010
	ATT	14,639	3,416	,619	4,285	,000
	LoE	3,117	2,529	,172	1,233	,228
	Proficiency minority lang.	-6,119	8,017	-,110	-,763	,452
	Working Memory	1,575	,866	,250	1,819	,080
2	(Constant)	-28,989	27,459		-1,056	,301
	No. older siblings	-4,269	1,457	-,411	-2,930	,007
	ATT	14,943	3,426	,632	4,361	,000
	LoE	5,288	3,298	,292	1,603	,121
	Proficiency minority lang.	-11,045	9,343	-,198	-1,182	,248
	Working Memory	1,250	,922	,199	1,356	,187
	Dutch input rel. (%)	-31,178	30,441	-,212	-1,024	,315
3	(Constant)	-17,696	35,776		-,495	,626
	No. older siblings	-3,312	1,785	-,319	-1,855	,076
	ATT	14,744	3,700	,623	3,985	,001
	LoE	5,087	3,485	,281	1,460	,158
	Proficiency minority lang.	-12,101	9,865	-,217	-1,227	,232
	Working Memory	,873	1,030	,139	,848	,405
	Dutch input rel. (%)	-41,781	33,978	-,284	-1,230	,231
	Non-native input rel. (%)	-,062	,107	-,112	-,573	,572
	Lang. and lit. scale	1,068	1,351	,140	,791	,437
	Av. input quality	,085	5,334	,003	,016	,987

Regression analysis results for Sentence Comprehension scores based on model 2

Block		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8,263	16,489		,501	,620
	No. older siblings	,158	1,283	,022	,123	,903
	ATT	7,072	3,061	,422	2,311	,029
	LoE	,537	2,265	,042	,237	,815
	Proficiency minority lang.	-5,230	7,182	-,132	-,728	,473
	Working Memory	1,108	,776	,249	1,428	,165
2	(Constant)	-9,667	24,640		-,392	,698
	No. older siblings	,396	1,307	,054	,303	,764
	ATT	6,811	3,074	,406	2,215	,036
	LoE	-1,327	2,959	-,103	-,448	,658
	Proficiency minority lang.	-1,002	8,384	-,025	-,119	,906
	Working Memory	1,388	,827	,311	1,677	,105
	Dutch input rel. (%)	26,766	27,315	,257	,980	,336
3	(Constant)	29,411	28,474		1,033	,312
	No. older siblings	2,391	1,421	,325	1,683	,106
	ATT	5,902	2,945	,352	2,004	,057
	LoE	-2,355	2,774	-,183	-,849	,405
	Proficiency minority lang.	-1,432	7,852	-,036	-,182	,857
	Working Memory	,905	,820	,203	1,103	,281
	Dutch input rel. (%)	15,917	27,044	,153	,589	,562
	Non-native input rel. (%)	-,165	,085	-,424	-1,935	,065
	Lang. and lit. scale	2,575	1,075	,476	2,395	,025
	Av. input quality	-5,187	4,246	-,280	-1,222	,234

Regression analysis results for MLU scores based on model 2

Block		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,027	1,196		2,530	,018
	No. older siblings	-,183	,093	-,310	-1,963	,060
	ATT	,261	,222	,194	1,174	,251
	LoE	-,051	,164	-,050	-,313	,757
	Proficiency minority lang.	,390	,521	,123	,749	,460
	Working Memory	,178	,056	,498	3,166	,004
2	(Constant)	3,577	1,815		1,971	,059
	No. older siblings	-,190	,096	-,322	-1,975	,059
	ATT	,269	,226	,200	1,187	,246
	LoE	,006	,218	,006	,026	,979
	Proficiency minority lang.	,261	,617	,082	,422	,676
	Working Memory	,170	,061	,474	2,785	,010
	Dutch input rel. (%)	-,821	2,012	-,098	-,408	,687
3	(Constant)	5,161	1,980		2,606	,016
	No. older siblings	-,078	,099	-,132	-,786	,440
	ATT	,150	,205	,112	,734	,470
	LoE	-,023	,193	-,022	-,119	,906
	Proficiency minority lang.	,210	,546	,066	,385	,704
	Working Memory	,112	,057	,313	1,963	,062
	Dutch input rel. (%)	-1,978	1,881	-,237	-1,052	,304
	Non-native input rel. (%)	-,003	,006	-,084	-,443	,662
	Lang. and lit. scale	,227	,075	,522	3,031	,006
	Av. input quality	-,038	,295	-,026	-,130	,898

Regression analysis results for Malvern's D scores based on model 2

Block		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	60,374	18,159		3,325	,003
	No. older siblings	1,029	1,413	,132	,728	,473
	ATT	-3,336	3,370	-,188	-,990	,331
	LoE	1,892	2,495	,139	,758	,455
	Proficiency minority lang.	-4,897	7,910	-,117	-,619	,541
	Working Memory	-1,483	,854	-,313	-1,735	,094
2	(Constant)	33,663	26,715		1,260	,219
	No. older siblings	1,383	1,417	,177	,976	,338
	ATT	-3,725	3,333	-,210	-1,117	,274
	LoE	-,884	3,208	-,065	-,276	,785
	Proficiency minority lang.	1,402	9,090	,033	,154	,879
	Working Memory	-1,066	,897	-,226	-1,189	,245
	Dutch input rel. (%)	39,875	29,617	,361	1,346	,190
3	(Constant)	77,625	27,538		2,819	,010
	No. older siblings	2,032	1,374	,260	1,479	,153
	ATT	-3,440	2,848	-,194	-1,208	,239
	LoE	-2,536	2,683	-,186	-,945	,354
	Proficiency minority lang.	4,023	7,594	,096	,530	,601
	Working Memory	-,280	,793	-,059	-,353	,727
	Dutch input rel. (%)	60,777	26,155	,550	2,324	,029
	Non-native input rel. (%)	-,223	,083	-,538	-2,696	,013
	Lang. and lit. scale	-,191	1,040	-,033	-,183	,856
	Av. input quality	-13,215	4,106	-,672	-3,218	,004

Regression analysis results for Rate of Error-free Utterances scores based on model 2

Block		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	37,535	21,527		1,744	,093
	No. older siblings	-3,115	1,676	-,339	-1,859	,074
	ATT	6,624	3,996	,316	1,658	,109
	LoE	-1,050	2,958	-,065	-,355	,725
	Proficiency minority lang.	-8,468	9,377	-,171	-,903	,374
	Working Memory	,487	1,013	,087	,480	,635
2	(Constant)	-11,496	30,088		-,382	,706
	No. older siblings	-2,464	1,596	-,268	-1,544	,135
	ATT	5,910	3,754	,282	1,574	,128
	LoE	-6,146	3,613	-,383	-1,701	,101
	Proficiency minority lang.	3,096	10,238	,063	,302	,765
	Working Memory	1,250	1,010	,224	1,238	,227
	Dutch input rel. (%)	73,195	33,356	,562	2,194	,037
3	(Constant)	-14,205	37,989		-,374	,712
	No. older siblings	-1,702	1,896	-,185	-,898	,378
	ATT	7,550	3,929	,360	1,922	,067
	LoE	-5,925	3,701	-,369	-1,601	,123
	Proficiency minority lang.	,192	10,475	,004	,018	,986
	Working Memory	1,023	1,094	,183	,935	,359
	Dutch input rel. (%)	57,839	36,080	,444	1,603	,123
	Non-native input rel. (%)	-,107	,114	-,219	-,936	,359
	Lang. and lit. scale	-,974	1,434	-,144	-,679	,504
	Av. input quality	3,454	5,664	,149	,610	,548

Appendix F

Significant predictor variables for model 3

Regression analysis results for Passive Vocabulary scores based on model 3

Factors	Unstandardised coefficients		Standardised coefficients		
	B	St. error	Beta	t	Sign.
Constant					
ATT	14.639	3.416	.619	4.285	.000
No. older siblings	-3.992	1.433	-.384	-2.786	.010

R^2 = .606, p = .002

Regression analysis results for Sentence Comprehension scores based on model 3

Factors	Unstandardised coefficients		Standardised coefficients		
	B	St. error	Beta	t	Sign.
Constant					
ATT	6.402	2.875	.382	2.227	.036
No. older siblings	3.011	1.496	.409	2.013	.056
Lang. and literacy scale	2.689	1.064	.497	2.527	.019

R^2 = .479 , p = .047

Regression analysis results for MLU scores based on model 3

Factors	Unstandardised coefficients		Standardised coefficients		
	B	St. error	Beta	t	Sign.
Constant					
Working memory	.139	.054	.390	2.584	.017
Lang. and literacy scale	.228	.077	.525	2.963	.007

R^2 = .576, p = .008

Regression analysis results for Malvern's D scores based on model 3

Factors	Unstandardised coefficients		Standardised coefficients		
	B	St. error	Beta	t	Sign.
Constant					
Non-native input rel.	-.282	.124	-.515	-2.274	.033
Av. quality	-11.126	4.623	-.566	-2.407	.025

R^2 = .429, p = .100

Regression analysis results for Rate of Error-free Utterances scores based on model 3

Factors	Unstandardised coefficients		Standardised coefficients		
	B	St. error	Beta	t	Sign.
No sign. factors	-	-	-	-	-

R^2 = .343 , p = .273