THE ROLE OF BILINGUAL LANGUAGE INPUT IN CHILDREN'S RECEPTIVE AND PRODUCTIVE VOCABULARY DEVELOPMENT

Master's Thesis
Research MA Linguistics: the Study of the Language Faculty

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July, 2014
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"To my parents, who constantly supported me and listened to all my stories

To Merle, my anchor and sail

To Iris, who will always be remembered"

Abstract

The purpose of the present study was to investigate the role of input quantity and quality in bilingual children's receptive and productive vocabulary development in English and Dutch. In order to do so, information about children's amount (quantity) and type (quality) of language input was obtained by collecting that on 18 children aged 2;6-3;9 attending English/Dutch bilingual day care via a parental questionnaire. Receptive and productive vocabulary in both languages was assessed with standardized vocabulary tests administered at the day care centres. The present study found both quantitative and qualitative child-external input factors to be significantly positively related to children's receptive and productive vocabulary development. Once controlled for other input factors, current exposure at home/day care was significantly positively correlated with children's vocabulary development. In addition, the study found that bilingual children who already received most of their input in one of their languages at home, did not require additional input in that language at day care to reach monolingual norms in that language, while children who received insufficient language input at home were dependent on the extra input at day care. This finding tends to show that there is a certain threshold above which additional input becomes superfluous, a finding suggested in previous literature (Thordardottir, 2011; Unsworth, in press).

Acknowledgements

First of all, I would like to express my special appreciation and thanks to dr. Sharon Unsworth, my daily supervisor, for her professional guidance, great sympathy, and her thorough and helpful feedback during the realization of this master's thesis.

The second person I would like to thank is Prof. dr. Peter Coopmans, my co-supervisor, for his willingness to supervise this thesis, and for his critical reading and useful comments on the pre-final version of the current study.

My acknowledgement also goes to the supervisors of project QuaLIBi (Quality of Language Input in Bilingual Language Acquisition), Sharon Unsworth, Elise de Bree and Josje Verhagen, for the opportunity they have given me to be part of their research group, to the research assistants who tested at Hestia, and, more generally, to the colleagues of project QuaLIBi.

Furthermore, I am grateful to the participating parents and children, together with the teachers at Hestia, for their time and co-operation.

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List of Abbreviations

AToT = age at time of testing

CELF-P = Clinical Evaluation of Language Fundamentals-Preschool

CONV_Prtnrs = conversational partners

CUMU_LoE = cumulative length of exposure

CURR_Dexp = current exposure at day care

CURR_Exp = current exposure at home and day care

CURR_Hexp = current exposure at home

EN = English

ES = Spanish

HI = Hindi

L1 = first language

L2 = second language

LANG_Out = child's own language output

NATIV_Inp = nativeness of input

NL = Dutch

OL = other language than English or Dutch

PPVT = Peabody Picture Vocabulary Test

RICH_Inp = richness of input

SES = socio-economic status

SV = Swedish

The role of bilingual language input in children's receptive and productive vocabulary development

1. Introduction

For the acquisition of language in general, and vocabulary in particular, it is commonly accepted that children need to be exposed to sufficient linguistic input. As children need to learn each (base) word individually to acquire a lexicon, instead of exploring grammatical rules that are more generally applicable, vocabulary acquisition is considered to be largely dependent on the quantity of language input (Oller, Pearson & Cobo-Lewis, 2007; Paradis & Genesee, 1996). For that very reason, it is assumed that children that are exposed to two or more languages simultaneously show a protracted development, since they have to divide their time between the languages, often resulting in less input in each. Various studies have suggested that the distribution of vocabulary over the two (or more) languages may explain the lower standard scores on vocabulary tests of bilingual children in one of their languages compared to those of monolingual children (e.g., Oller, Pearson & Cobo-Lewis, 2007; Uccelli & Páez, 2007). Bilingual children may learn and use certain words primarily in specific environments and circumstances in one of their languages. Words that are associated to the classroom may therefore be learned in the second language (henceforward; L2), while other words that are part of home life, for instance about cooking, may be learned in the first language (henceforward; L1) only. In addition to input quantity, recent studies have shown that differences in the quality of language input are also considered to result in variations in children's vocabulary development (see e.g. Unsworth, 2013b for review).

While several studies have shown that input quantity and input quality play an important role in bilingual children's vocabulary development, few studies have examined both in one study so far. In addition, only recently researchers have started to focus on the effects of input quality on bilingual children's language development, and have mostly examined the impact of non-native language input (Unsworth, 2013b).

The current study seeks to contribute to the extending body of literature on bilingual language development by investigating the relationship of various quantitative and qualitative input factors in bilingual children's receptive and productive vocabulary development in English and Dutch, to get a better understanding of the correlation between the various different input factors and bilingual children's development in the two types of vocabulary in English/Dutch.

This study is organised as follows. Chapter 2 surveys previous literature on input factors that have been found to influence bilingual children's language development. Chapter 3 then describes the methodology of the current study, describing the children participating in the study, the vocabulary tests used to assess bilingual children's receptive and productive development, the questionnaire used to collect detailed information about the amount and type of English/Dutch input children were exposed to, and the procedure. In Chapter 4 the results are presented, and Chapter 5 includes the discussion of the results, implications, limitations and ideas for future research. Conclusions follow in Chapter 6.

2. Previous literature

One of the questions research on bilingual acquisition attempts to answer is why some bilingual children succeed in acquiring two (or more) languages while others are less successful to become proficient in both. What factors are particularly responsible for children to establish bilingualism in the languages they are exposed to? To find an answer to this question, researchers have focused among others on age effects, children's motivation to learn languages, and the status of the languages in the country in which the children are being raised (minority/majority language, high/low prestige). More recently, literature on bilingual acquisition has started to focus on other child-external (input) factors in the language environment in which children grow up. These child-external, or environmental, factors can be divided into more quantitative and more qualitative input factors, i.e. the amount and type of input provided to the child. The focus of this chapter is on the quantitative and qualitative input factors that are found to affect children's vocabulary development.

Chapter 2.1 elaborates on previous literature concerning quantitative input factors. Subsequently, Chapter 2.2 surveys existing research on qualitative input factors. Chapter 2.3 then presents the research questions and predictions of the current study.

2.1 Quantity of language input

There exists considerable variability in the level of language proficiency that monolingual and bilingual children attain, and the amount and type of language each child is exposed to, in part due to various child-external factors such as parental language strategy and type of education (e.g. regular programme (L2 is taught as a subject only) vs. immersion programme) (Unsworth, 2012). Pearson, Fernández,

Lewedeg and Oller (1997) examined the L1 and L2 vocabulary proficiency of 25 simultaneous Spanish/English bilingual infants (8 to 30 months old) with varying amounts of exposure to each language. Vocabulary scores were assessed with standardized parental reports and the amount of exposure to each language was collected via language background questionnaires. The researchers observed a significant correlation between the amount of time a child spent with speakers in either language and the child's active vocabulary knowledge in that language. In a comparable study Cobo-Lewis, Pearson, Eilers and Umbel (2002a, 2002b) found that bilingual children who received more language input in one of their languages performed better on a range of vocabulary tests in that language (i.e. the language in which the children received more input). Other studies found similar correlations between the amount of language input and vocabulary scores (e.g., De Houwer, 2007; Quiroz, Snow & Zhao, 2010; Scheele, Leseman & Mayo, 2010; Vermeer, 2001). A study by Hoff et al. (2012) examined the vocabulary development of English/Spanish bilingual toddlers (aged 1;10-2;6) and a group of age-matched English monolinguals, and found that monolinguals significantly outperformed children who acquire two languages on English vocabulary. However, once the bilingual toddlers were divided into language dominance groups (English-dominant, balanced or Spanish-dominant), based on the amount of in-home exposure to English, the vocabulary scores of the English-dominant group were not significantly different from the vocabulary scores of the monolingual group. Moreover, no differences were found between the monolingual children and bilingual children in total vocabulary size. Bialystok, Luk, Peets and Yang (2010) found that bilingual children's disadvantage on a vocabulary test compared to English monolinguals was largely confined to words that were part of children's home life, while both groups had more comparable scores on vocabulary

that was the basis for the language of schooling. Studies that combined both bilingual children's L1 and L2 vocabularies concluded that the development of bilingual children is very similar to the vocabulary development of monolingual children (see Hoff et al. 2012 for review).

A more recent study by Thordardottir (2011) examined the impact of amount of bilingual exposure on both receptive and expressive vocabulary development in 84 5-year-old simultaneous bilingual English/French children and their monolingual peers. Results showed that the amount of exposure to a language and children's performance in that language were strongly related. Thordardottir found that bilingual children who were exposed to a language for approximately 40% of their total waking hours had similar scores on receptive vocabulary tests compared to monolingual children. However, to reach monolingual norms on the expressive vocabulary test, bilingual children needed at least 60% of language exposure to a given language. Moreover, the study suggested that input beyond these thresholds did not result in significantly better vocabulary development compared to monolingual norms. Bilingual children may thus reach monolingual norms if they are exposed to sufficient language input in each of their languages.

To date, various child-external, or environmental, factors have been found to determine the amount (quantity) and type (quality) of language input available in children's linguistic environment, resulting in the individual differences in language development often found in bilingual children. Input quantity may be divided into several quantitative factors, or more specific properties of input (Paradis, 2011). Apart from the aforementioned role that amount of exposure at home and school plays in language development (e.g., Chondrogianni & Marinis, 2011; Gathercole & Thomas, 2009), the cumulative length of exposure is also considered to be an important

quantitative factor (e.g., Unsworth, 2013a). Another quantitative factor that has been related to input is children's own language output, since output is considered to provoke new (and thus more) input (e.g., De Houwer, 2007; Pearson, 2007; Unsworth, 2012). It has been argued that children who receive more input in a language, thereby obtaining a higher proficiency, will use that language more often. Children who receive less input in a language will finally use that language less often (Pearson, 2007).

2.2 Quality of language input

The quality of the input is also considered to play an important role in children's lexical development (see Unsworth, 2013b for review). An important qualitative input factor is the exposure to various extracurricular activities in a language, i.e. richness of input, such as watching television (in which language is involved), listening to music and for example reading (to a child) (Jia & Fuse, 2007). Reading to a young child, for instance, is an important source of input for the development of language and literacy skills (e.g., Kaderavek & Sulzby, 1998). Scheele, Leseman and Mayo (2010) found that the frequency of shared book reading and for instance storytelling was moderately to strongly correlated with children's receptive vocabulary. Similar findings were reported by Patterson (2002), who found significant relations between book reading activities and bilingual toddler's Spanish and English expressive vocabulary development. Another important factor is the number of conversational partners (Driessen, Van der Slik & De Bot, 2002; Place & Hoff, 2011). Children who receive language input from various conversational partners are suggested to have an advantage both on the recognition and production of words compared to children who hear a language from only one conversational

partner (Richtsmeier, Gerken, Goffman, & Hogan, 2009; Singh, 2008). Children who receive input from more conversational partners are exposed to a higher variability in vocal affect, since the surface form of a word is (slightly) altered among speakers. Experience with a variation of surface forms of words is needed to be able to recognize and produce (spoken) words regardless of the speaker and the variations in articulation among speakers (Singh, 2008). A third qualitative input factor is whether the people from whom children receive the input are native speakers or non-native speakers, i.e. the nativeness of input (e.g., Fernald, 2006; Place & Hoff, 2011). Some children may grow up with more non-standard versions of a language than other children, for instance because parents use non-native phonology when speaking their second language with an accent that is influenced by their L1. This might, for example, happen when a parent uses the language of their partner. Bilingual children are suggested to have a wider distribution of speech sounds compared to their monolingual peers resulting in less efficient mapping of speech sounds to words by the bilingual child (Fernald, 2006). In addition, their parents' mispronunciation of phonemes leads to difficulties in perceiving phonetic contrasts (Fernald, 2006). Less efficient mapping of speech sounds to words and difficulties in perceiving phonetic contrasts may lead to lower vocabulary scores (Fernald, 2006). Parents' own L1/L2 language proficiency is thus expected to affect their children's language use and the language models provided. Exactly this was found in a study by Hammer et al. (2012), in which higher maternal language proficiency resulted in higher vocabulary scores in children's L1 and L2.

Other factors that may influence children's vocabulary development are socio-economic status (SES) (Goldberg, Paradis & Crago; 2008; Hoff, 2003) and age of first exposure to a language (Goldberg, Paradis & Crago, 2008).

To sum up, although several studies have investigated the impact of input quantity and input quality on bilingual children's vocabulary development, few studies have examined both in one study so far. Even fewer studies have examined the impact of various quantitative and qualitative input factors both on children's receptive and productive vocabulary development. It is, however, important to assess both children's receptive and productive lexicon to get a better understanding of the process of bilingual development because bilingual children are often able to understand both languages, but lack the ability to (sufficiently) produce either language (De Houwer, 2007; Place & Hoff, 2011). In addition, the majority of studies have assessed bilingual children's vocabulary skills in only one of their languages.

2.3 Research questions and predictions

The current study addresses the following two research questions:

1) What is the relationship between the quantitative/qualitative input factors and bilingual children's English and Dutch vocabulary development?
2) Which input factors best predict the English and Dutch receptive and productive vocabulary development?

The quantitative factors that will be examined are: 'current exposure at home', 'current exposure at day care', 'child's language output', and the 'cumulative length of exposure'. The qualitative factors that will be examined are: 'nativeness of input', 'richness of input', and the 'number of English/Dutch conversational partners'. To determine the role of each of the input factors on bilingual children's English/Dutch receptive and productive development, this study will investigate what the correlation

is between each of the factors and children's receptive and productive vocabulary scores.

As the previous chapters have revealed, a number of child-external factors influence bilinguals' vocabulary outcomes. Based on the theoretical background above, the following predictions are made. Firstly, it is expected that a certain input threshold needs to be reached, at home and/or at day care, to obtain monolingual norms. Based on previous findings by Thordardottir (2011), the prediction is that bilingual children will reach monolingual norms for receptive vocabulary if they are exposed to at least 40% of their total language input in each language, and will reach monolingual norms for productive vocabulary if they receive 60% or more of their total input in that language. However, as various parents of the children participating in the present study are native speakers of another language than English or Dutch (OL), it is expected that English and Dutch will be used at home less often or only by one of the parents, resulting in less input at home (De Houwer, 2007). As 'amount of input at home' has been found to be an important quantitative factor in previous research (e.g., Thordardottir, 2011; Unsworth, 2012), it might be the case that the participating children in this study receive insufficient input in English/Dutch at home to reach age-appropriate monolingual norms. Therefore, the 'amount of input at day care' is considered to be a factor of interest in the current study, because the majority of the children may only or mainly be exposed to English/Dutch outside the home. The bilingual children participating in this study will have varying patterns of input exposure at home and at day care (e.g. depending on the number of days they attend day care), which is expected to result in different receptive and productive vocabulary scores in the L1 and L2. Based on previous findings among others by Hoff et al. (2012), it is predicted that a child who receives more of his/her input in English will

have a higher English lexical proficiency compared to a child who receives less input in that language. This is also expected for the amount of input children have received over time (i.e. cumulative length of exposure). A child who received more input in the past in a particular language is predicted to have higher receptive and productive vocabulary scores in that language.

Furthermore, the 'child's own language output' is predicted to be of importance in the current study, as it provokes new input at home (Unsworth, 2012). It is plausible to suggest that the more English/Dutch is spoken by the child, the more input in that specific language he/she will receive at home and day care. Children who use more English/Dutch at home and day care will, in return, receive more input in those languages, resulting in better vocabulary scores (Pearson, 2007; Unsworth, 2012).

The qualitative input factors 'nativeness of input' and 'number of conversational partners' are also suggested to play an important role in the vocabulary development of the children participating in the current study. As many parents of the participants speak a third language, the children in this study may be exposed to more non-native versions of English and Dutch compared to monolinguals and bilingual children participating in other studies, which might lead to difficulties in perceiving phonetic contrasts and less efficient mappings of speech sounds to words (Fernald, 2006). Therefore, participants who frequently receive non-native input are predicted to have lower vocabulary scores compared to children who are regularly exposed to input from native speakers. The number of conversational partners is also expected to be correlated with vocabulary development, since contact with more conversational partners leads to experience with different variations in articulation of words, which should give the child an advantage with respect to the receptive and productive

vocabulary tasks in the L1 and L2 (Singh, 2008). Previous research found that nativeness and number of conversational partners significantly correlate with vocabulary development (e.g., Place & Hoff, 2011).

3. Methodology

3.1 Participants

The data from 18 bilingual children aged between 2;6 and 3;9 (*M* = 3;23, *SD* = .48) attending bilingual (English and Dutch) day care in the Netherlands were collected. Children were tested at two different day cares located in the cities of Amstelveen and Amsterdam (more details about testing are given in the following chapter). All bilingual children participated in four different tests, two receptive vocabulary tests, one in English and one in Dutch, and two productive vocabulary tests, one in English and one in Dutch (see Chapter 3.2.2 for more details about the tests). At the time of testing, the language exposure situation was as indicated in Table 1 below. Seven out of 18 participating children were exposed to a third language at home alongside English and Dutch, and three children received input in a fourth language at home/day care[1]. One child attended Japanese day care in Japan for several months prior to day care, and three children received Afrikaans, Chinese or Spanish input from a nanny/grandmother. All families participating in the current study had a high SES, as based on their level of education. All parents had at least a first stage tertiary level of education, with the exception of one mother and one father from different families, who had a post-secondary non-tertiary level (*M* = 5.06, *SD* = .42).

[1] Based on current amount of exposure.

Table 1. *Language use of parents per family*

	Mother's language use (in %)	**Father's language use (in %)**
Child 1	Serbian 100	Serbian 100
Child 2	English 95	English 95
	Hindi 5	Hindi 5
Child 3	Swedish 95	Swedish 100
	English 5	
Child 4	Dutch 100	Dutch 100
Child 5	English 60	English 60
	Hindi 40	Hindi 40
Child 6	Dutch 65	Dutch 75
	English 35	English 25
Child 7	Dutch 80	Dutch 80
	English 20	English 20
Child 8	Dutch 100	Dutch 100
Child 9	Spanish 85	Dutch 85
	English 10	English 10
	Dutch 5	Spanish 5
Child 10	Dutch 100	Dutch 100
Child 11[a]	Spanish 70	Dutch 75
	English 25	English 25
	Dutch 5	
Child 12	English 70	English 70
	Hindi 30	Hindi 30
Child 13	Dutch 100	Dutch 100
Child 14	Dutch 100	Dutch 100
Child 15[b]	English 100	Italian 100
Child 16	Dutch 99	Dutch 100
	Chinese 1	
Child 17	Dutch 99	Dutch 99
	English 1	English 1
Child 18	English 50	n.a.
	Dutch 30	
	Afrikaans 20	

Note. [a] Attended Dutch preschool in addition to day care.
[b] Attended English preschool in addition to day care.

3.2 Materials and procedure

3.2.1 Parental questionnaire. Parents of children participating in the study were asked to fill out the Utrecht Bilingual Language Exposure Calculator questionnaire (UBiLEC) (Unsworth, 2013a) to provide detailed information about the input quantity and input quality their children are exposed to in English and Dutch. Parents were asked to indicate who spends time with the child on a regular base, for how much time (in hours) this is on average per week, and if they interact with the child in English and/or Dutch. Furthermore, parents were asked to give information

concerning language use at home and at day care, and about the amount of time the child spends on extracurricular activities outside day care (taking into account, for instances, parent-toddler groups and music classes, time spent with friends, watching television, reading (to a child), and the use of any digital devices (involving language input)). Moreover, parents mentioned how well each interlocutor speaks English and/or Dutch on a scale from 0 (no fluency) to 5 (native fluency). In addition, information was collected about the child's language input over time, and about the amount and type of input the child is/was exposed to in any other languages.

The information that was provided by parents was used to calculate the subsequent qualitative (a, b, c) and quantitative (d, e, f, g) factors as follows: a) *the nativeness of input (NATIV_Inp)*, by calculating the average quality of English/Dutch input at home/day care provided to the child on a scale from 0 (non-native fluency) to 5 (native fluency), b) *the richness of the input (RICH_Inp)*, by counting the amount of time, in hours, a child spends on extracurricular activities on average during the week in Dutch/English, c) *how many different English/Dutch-speaking conversational partners there are at home (CONV_Prtnrs)*, by counting the number of English/Dutch conversational partners that are in regular contact (i.e. each person that spends time with the child for at least once a week, such as parents, in-house childcare, and/or family members) with the child at home, d) *current exposure at home (CURR_Hexp)*, by calculating the amount of time, in hours, the child spends at home with each person in regular contact with the child multiplied by how much English/Dutch is spoken at home by that person (in %), e) *current exposure at day care (CURR_Dexp)*, by calculating the amount of time, in hours, the child spends at day care multiplied by how much English/Dutch is spoken to the child at day care (in %), f) *child's own language output (LANG_Out)*, by calculating the relative proportion of each language

spoken by the child at home, and g) *children's amount of exposure over time to each language* (i.e. *cumulative length of exposure (CUMU_LoE)*; Unsworth 2013a), by calculating how much each parent and any other adults living in the home spoke English/Dutch for each one-year period in the child's life so far, and whether the child attended English/Dutch day care in these periods. Next, the amount of exposure to English/Dutch was calculated and summed up to give the total amount of exposure to English/Dutch in years over time (see Unsworth, 2013a for more information).

3.2.2 Test measures. Children were tested individually in a quiet room at day care by trained research assistants. They were tested in either language in two separate sessions, with an interval of at least a week between the first and the second session. Sessions included several standardized test measures. Firstly, children's receptive vocabulary in English and Dutch was tested with the Peabody Picture Vocabulary Test-4 (PPVT-4) (Dunn & Dunn, 2007), and the Dutch equivalent, PPVT-III-NL (L.M. Dunn, Dunn & Schlichting, 2005). During the tests, children selected one of four pictures that illustrated best the word uttered by the experimenter by pointing to it. Raw scores were computed and converted to age-based standard scores (M = 100, SD = 15). Secondly, their expressive vocabulary in English and Dutch was tested using the Expressive Vocabulary subtest of the Clinical Evaluation of Language Fundamentals-Preschool-2 (CELF-P, 2nd edition) (Wiig, Secord & Semel, 2004), and the Dutch equivalent, 'Actieve Woordenschat' subtest CELF-Preschool-2NL (Wiig, Secord & Semel, 2012). During the expressive vocabulary tests, children had to name a number of people, objects and activities, which were shown on pictures (20 items). Raw scores for the CELF subtest were computed and converted to age-based standard scores (M = 10, SD = 3). Raw scores were used to conduct all statistical analyses for the PPVT and CELF in the current study.

4. Results

4.1 Parental questionnaire data

Table 2 provides an overview of the results of the parental questionnaire data.

Table 2. *Overview of results of the seven qualitative and quantitative input factors for all children (N=18)*

			English			Dutch		
			M	**SD**	**Range**	**M**	**SD**	**Range**
Child-external factors		NATIV_Inp[a]	4.11	.63	2.50-4.84	4.54	.54	3.50-4.98
	Quality	RICH_Inp (in hours p/w)	4.60	4.24	0-13	8.27	7.29	0-27.20
		CONV_Prtnrs (# of people)	1.11	1.02	0-3	1.83	1.47	0-4
	Quantity	CURR_Hexp (in %)	12	15	0-48	40	34	0-89
		CURR_Dexp (in %)	14	12	3-41	19	10	2-35
		LANG_Out (in %)	27	40	0-99	57	45	0-100
		CUMU_LoE (in years)	.56	.53	.06-1.58	1.76	1.18	.12-3.58

Note. [a] On a scale from 0 (no fluency) to 5 (native fluency).

On average, children received most of their language input in Dutch, both by means of people at home/day care (59%) and via extracurricular activities (approximately 8 hours per week), compared to English or another language. Children spoke English and Dutch at home around the same rate as the amount of exposure they received in that language (57% Dutch, 27% English). Children were mostly exposed to Dutch language input at home (40% of their total waking hours), overall received more language input at home (52%) than at day care (33%), and were exposed to somewhat more Dutch at day care (19%) relative to English (14%). At home, there were generally more conversational partners who spoke Dutch to the child (approximately 2 persons) than English (approximately 1 person), and although most of the input in both languages was provided by near-native or native speakers, the Dutch language input children received was somewhat more nativelike, on average 4.54 out of 5 (cf.

4.11 for English). In the past, children were mostly exposed to Dutch. There were great individual differences for each of the external input factors.

It is important to recall that several parents of the children participating in the present study are native speakers of a language other than English or Dutch. Although children who received language exposure to the OL at home/day care (n = 10) overall were exposed to somewhat more English (M = 38%, SD = 27%) and Dutch (M = 33%, SD = 30%) compared to the OL (M = 29%, SD = 30%), most of their language exposure in the past (CUMU_LoE) had been in a language other than English or Dutch, on average 1.54 years, as indicated in Table 3. In addition, at home, children were mostly exposed to input in an OL (29%). The nativeness of input in an OL is on average very close to native-speaker level (4.85) and higher in comparison to the nativeness of input in English or Dutch (cf. 4.46 and 4.22). On average, there were more conversational partners who spoke in an OL to the ten trilingual children at home than in English or Dutch, and the children spent approximately one hour more on extracurricular activities in the OL than they did in Dutch. Children also spoke slightly more in the OL at home (29%) than they did in Dutch (25%). There were great individual differences for each of the external input factors.

Table 3. *Summary of results of seven child-external factors from 10 trilingual children*

			English			Dutch			OL		
			M	**SD**	**Range**	**M**	**SD**	**Range**	**M**	**SD**	**Range**
Child-external factors	**Quality**	NATIV_Inp[a]	4.46	.32	3.75-4.84	4.22	.53	3.50-4.88	4.85	.30	4.02-5.00
		RICH_Inp (in hours p/w)	6.63	4.14	1.7-13	4.24	3.66	0-9.60	5.12	4.76	0-12.70
		CONV_Prtnrs (# of people)	1.60	.84	0-3	1.10	1.45	0-4	2.30	1.16	1-5
	Quantity	CURR_Hexp (in %)	20	16	0-48	14	22	0-68	29	29	0-82
		CURR_Dexp (in %)	18	13	4-41	19	11	2-35	1	1	0-2
		LANG_Out (in %)	46	45	0-99	25	35	0-100	29	29	0-80
		CUMU_LoE (in years)	.86	.53	.06-1.58	.91	.80	.12-2.52	1.54	.95	.02-2.93

Note. [a] On a scale from 0 (no fluency) to 5 (native fluency).

4.2 Productive and receptive vocabulary

A summary of the results of the scores on the four standardized vocabulary tests is provided in Table 4.

Table 4. *Overview of results of the four standardized vocabulary tests for all children*

			English			Dutch		
			M	**SD**	**Range**	**M**	**SD**	**Range**
Vocabulary tests	**Receptive (PPVT)**	Raw (*N*=17*/18)	13.35	13.45	3-45	36.67	13.93	13-64
	Productive (CELF-P)	Raw (*N*=18)	2.61	3.76	0-13	10.28	8.33	0-24

Note. * One child was excluded for the English PPVT, as he/she could not perform the test.

What can be gleaned from Table 4 is that on average the children's vocabulary scores were higher for the Dutch vocabulary tests than for the English vocabulary tests. Wilcoxon signed-rank tests were performed to compare the children's English vocabulary scores with their Dutch vocabulary scores. The children's Dutch receptive vocabulary scores were significantly higher than their receptive vocabulary scores in English (Z = -3.385, p = .001), and the children performed significantly better on the Dutch productive vocabulary test compared to the English productive vocabulary test (Z = -2.678, p = .007).

4.3 Relationship between input factors and vocabulary development

4.3.1 Bivariate correlations

Nonparametric Spearman's correlation analyses were performed to investigate if there was a relationship between (one of) the seven child-external factors (Table 2), the child-internal factor age at time of testing (AToT), and children's vocabulary scores of each of the four standardized vocabulary tests (Table 4).

Table 5. *Correlations between different child-external and child-internal factors and standardized vocabulary tests for all children*

	PPVT_NL	PPVT_EN	CELF_NL	CELF_EN
External factors	**raw scores**	**raw scores**	**raw scores**	**raw scores**
NATIV_Inp	.583*	.694**	.572*	.672**
RICH_Inp	.597**	.793**	.607**	.608**
CONV_Prtnrs	.635**	.755**	.656**	.565*
CURR_Hexp	.545*	.837**	.565*	.770**
CURR_Dexp	.152	.643**	.292	.807**
LANG_Out	.626**	.754**	.584*	.845**
CUMU_LoE	.703**	.808**	.652**	.816**
Internal factor	*N*=18	*N*=17[a]	*N*=18	*N*=18
AToT	.012	.204	.110	.061

*p = < .05, **p = < .01

Note. Correlations of the CELF standard scores were determined with fewer children (n = 12), as standard scores could only be calculated of children aged ≥ 3;0.

[a] One child was excluded, as he/she could not perform the English PPVT test.

The six child-external input factors NATIV_Inp, RICH_Inp, CONV_Prtnrs, CURR_Hexp, LANG_Out and CUMU_LoE and the children's raw scores on English and Dutch receptive and productive vocabulary were significantly positively correlated (Table 5). Although the child-external factor CURR_Dexp was significantly positively correlated with the children's English raw scores, no significant correlations were found between CURR_Dexp and the children's Dutch vocabulary scores. The children's AToT did not significantly correlate with the vocabulary scores on any of the four tests.

The correlation analyses also indicated that all child-external input factors significantly correlated with each other, as Table 6 reveals, except for the factor pairs English NATIV_Inp & CONV_Prtnrs and CURR_Dexp & CONV_Prtnrs. Dutch CURR_Dexp, however, did not significantly correlate with any of the other Dutch input factors. Input factors with correlations of r = ≥ .9 were considered to be cases of multicollinearity (De Vocht, 2011; Field, 2009). Multicollinearity was found between

the child-external input factors Dutch NATIV_Inp & CURR_Hexp ($r_s(16) = .966$, $p = .000$), and CURR_Hexp & LANG_Out ($r_s(16) = .919$, $p = .000$). Multicollinearity was also found between the English child-external input factors CURR_Hexp & CUMU_LoE ($r_s(16) = .932$, $p = .000$).

Table 6. *Correlation matrix for Dutch and English external and internal input factors for all children*

	Dutch input factors						
External factors	**Nativ_Inp**	**RICH_Inp**	**CONV_Prtnrs**	**CURR_Hexp**	**CURR_Dexp**	**LANG_Out**	**CUMU_LoE**
RICH_Inp	.697**						
CONV_Prtnrs	.681**	.724**					
CURR_Hexp	.966**	.681**	.711**				
CURR_Dexp	.093	.319	.282	.058			
LANG_Out	.890**	.734**	.767**	.919**	.172		
CUMU_LoE	.833**	.755**	.652**	.845**	.226	.870**	
Internal factor							
AToT	-.315	-.188	-.252	-.226	-.109	-.176	.012
	English input factors						
External factors	**Nativ_Inp**	**RICH_Inp**	**CONV_Prtnrs**	**CURR_Hexp**	**CURR_Dexp**	**LANG_Out**	**CUMU_LoE**
RICH_Inp	.533*						
CONV_Prtnrs	.390	.842**					
CURR_Hexp	.654**	.833**	.871**				
CURR_Dexp	.584*	.487*	.437	.632**			
LANG_Out	.744**	.652**	.568*	.846**	.757**		
CUMU_LoE	.749**	.713**	.750**	.932**	.620**	.849**	
Internal factor							
AToT	.090	.393	.270	.207	-.047	.162	.231

*$p = < .05$, **$p = < .01$

In order to find out if more subtle forms of multicollinearity influenced the current findings, the child-external input factors were examined for any variance inflation factor (VIF) values above 10 and/or tolerance values below 0.1, as these values provide a serious indication that there is collinearity in the data (see Field, 2009 for relevant discussion). For the English PPVT and CELF, VIF values above 10 and tolerance values below 0.1 were found for CURR_Hexp (VIF 48.6, .02 tolerance), LANG_Out (VIF 22.2, .05 tolerance), and CUMU_LoE (VIF 21.7, .05 tolerance). Regarding the Dutch PPVT and CELF, VIF values above 10 and tolerance

values below 0.1 were found for the child-external factors CURR_Hexp (VIF 17.9, .06 tolerance) and LANG_Out (VIF 28.0, .04 tolerance). These findings thus confirm the existence of multicollinearity within the data. This multicollinearity between some of the child-external factors may complicate the determination of how important each of these factors is for children's vocabulary development.

4.3.2 Partial correlations

To evaluate which child-external factors best predict the English and Dutch outcomes on the English and Dutch vocabulary tests, it would have been of interest to perform a backward stepwise multiple linear regression analysis. However, due to the small number of participants (N = 18) and the observed multicollinearity between some external input factors, this was not feasible. Therefore, seventh-order partial correlations were conducted to look at the unique effects of each child-external factor on the performance on each vocabulary test, while controlling for the effects of the other independent factors (child-external input factors and AToT). A strong significant positive correlation was found between the quantitative input factor CURR_Dexp and English CELF outcomes ($r(9) = .790$, $p = .004$). A strong significant positive correlation was also found when current exposure at home and day care were taken as one variable (thereby including extracurricular activities and holidays): CURR_Exp and English PPVT outcomes ($r(9) = .621$, $p = .042$). No other child-external input factors remained significant once the effects of the other independent factors were partialled out.

4.4 Age-appropriate monolingual norms

In order to estimate if the vocabulary scores of the children in the current study were age-appropriate and within the monolingual range or not, the standard

scores were compared with the average score of a large age-based monolingual reference group (Dunn & Dunn, 2007). For the PPVT tests, a range of 1 standard deviation of the monolingual average standard score of 100 (range 85 to 115) was used, as this range included roughly 68% of the monolingual population (Manual; Dunn & Dunn, 2007). For the same reasoning, a range of 1 standard deviation of the monolingual average standard score of 10 (range 7 to 13) was used for the CELF tests (Manual; Wiig, Secord & Semel, 2004). As only the CELF standard test scores of the bilingual children and monolingual reference group of children aged ≥ 3;0 could be compared (Manual; Wiig, Secord & Semel, 2004), the standard scores on the productive vocabulary test of 12 children were taken into account.

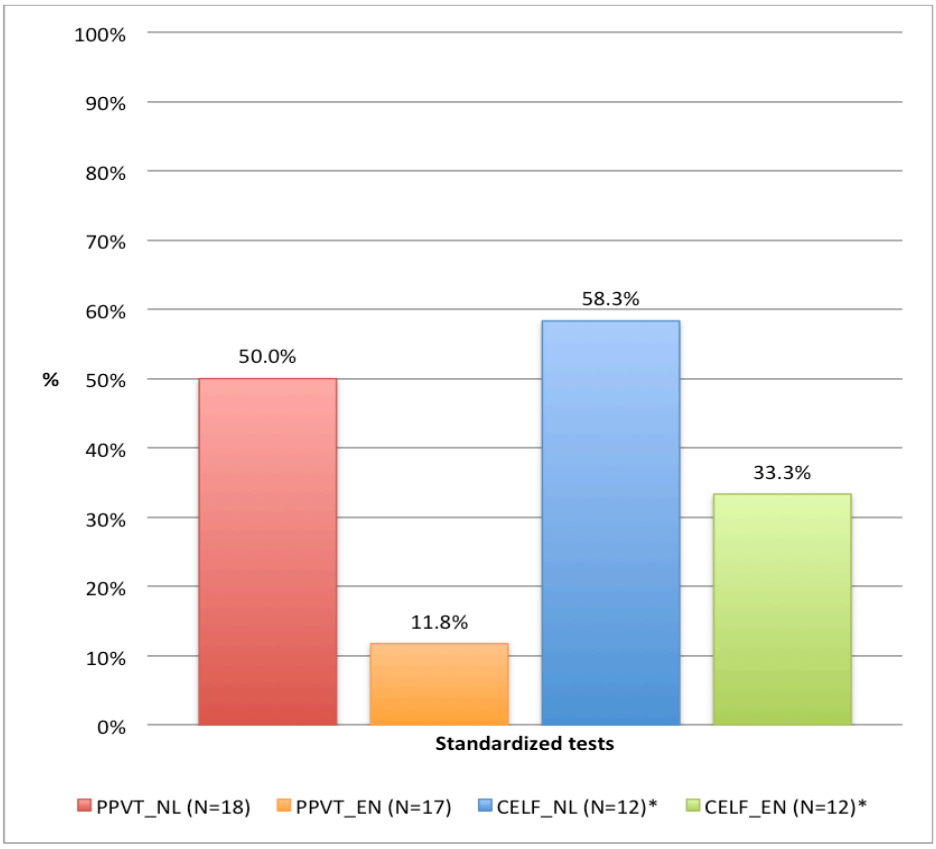
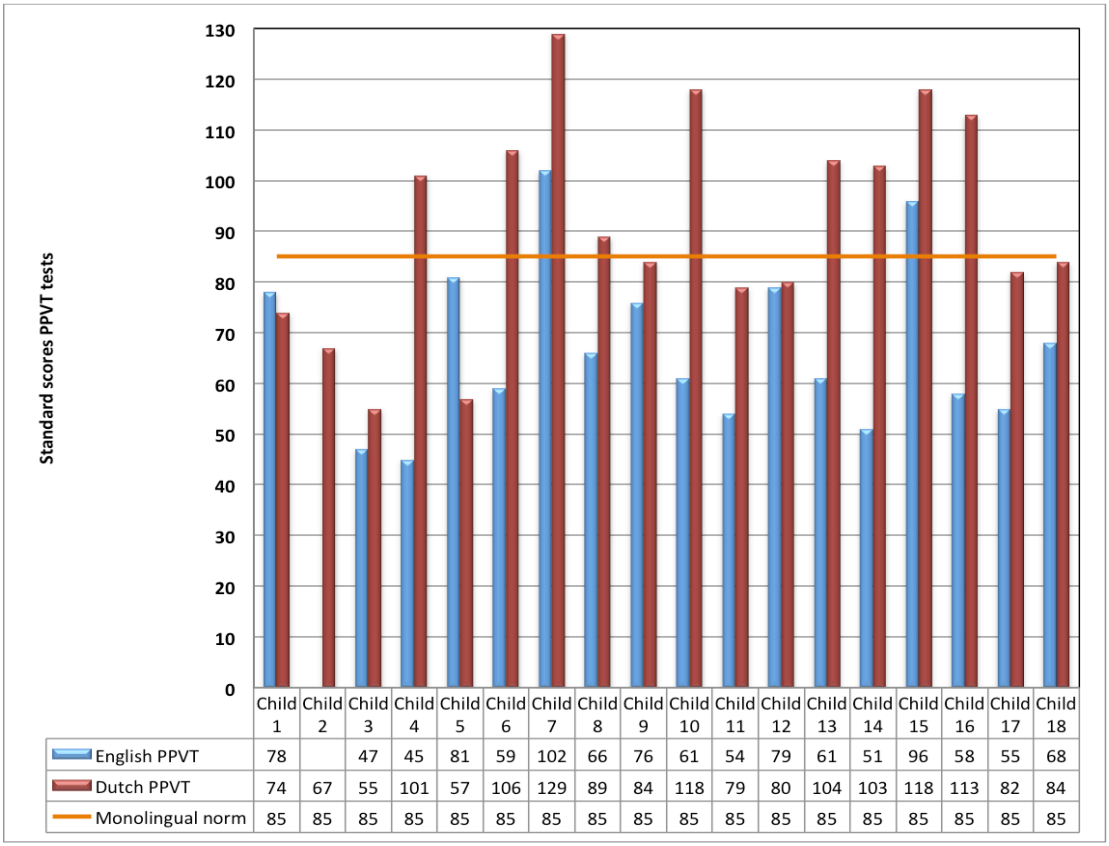


Figure 1. *Percentage of bilingual children reaching age-appropriate monolingual norms on each standardized test*

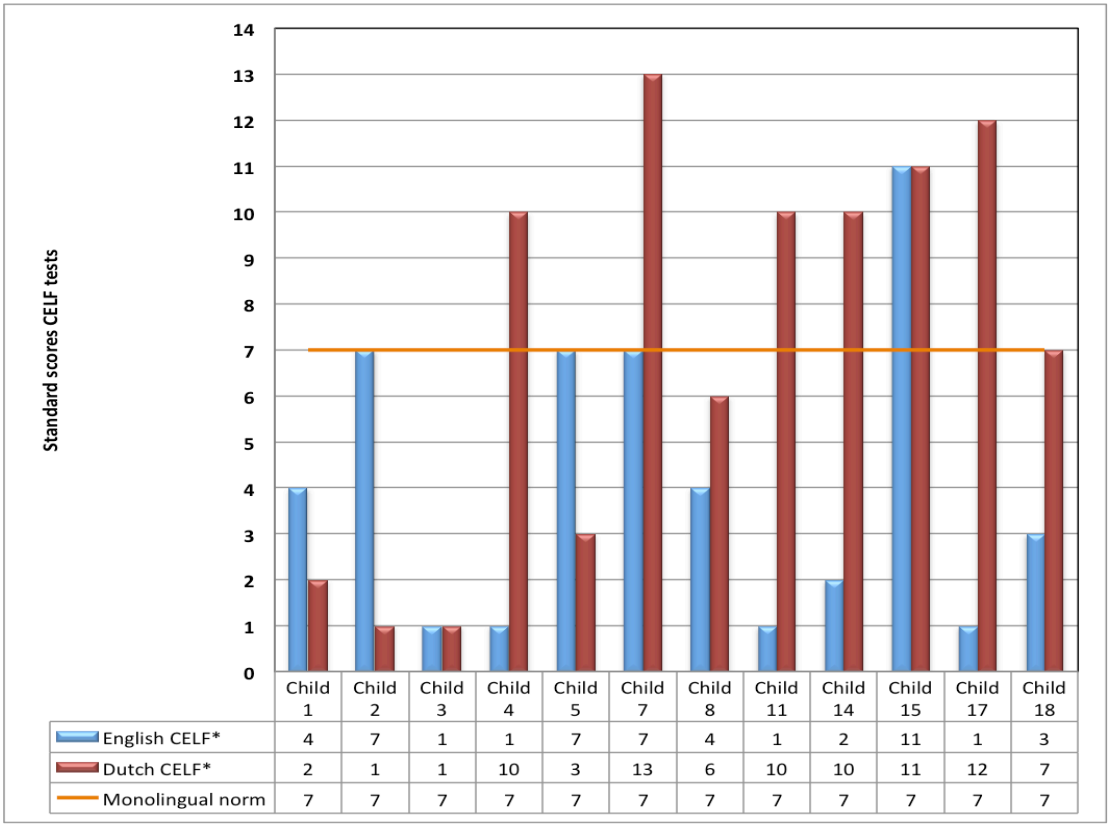
Note. * Based on *n* = 12 bilingual children aged ≥ 3;0.

As shown in Figure 1, half of the children (n = 9), reached age-appropriate monolingual norms for the Dutch PPVT, 7 out of 12 children (approximately 58%) reached age-appropriate monolingual norms for the Dutch CELF, one-third (n = 4) met these norms in English CELF, while 2 out of 17 children (approximately 12%) fell within the age-appropriate range for monolinguals on the English PPVT test.



	Child 1	Child 2	Child 3	Child 4	Child 5	Child 6	Child 7	Child 8	Child 9	Child 10	Child 11	Child 12	Child 13	Child 14	Child 15	Child 16	Child 17	Child 18
English PPVT	78		47	45	81	59	102	66	76	61	54	79	61	51	96	58	55	68
Dutch PPVT	74	67	55	101	57	106	129	89	84	118	79	80	104	103	118	113	82	84
Monolingual norm	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85

Figure 2. *Individual bilingual children reaching age-appropriate monolingual norms on the PPVT standardized tests*



	Child 1	Child 2	Child 3	Child 4	Child 5	Child 7	Child 8	Child 11	Child 14	Child 15	Child 17	Child 18
English CELF*	4	7	1	1	7	7	4	1	2	11	1	3
Dutch CELF*	2	1	1	10	3	13	6	10	10	11	12	7
Monolingual norm	7	7	7	7	7	7	7	7	7	7	7	7

Figure 3. *Individual bilingual children reaching age-appropriate monolingual norms on the CELF standardized tests*

Note. * Based on n = 12 bilingual children aged ≥ 3;0.

As Figures 2 and 3 indicate, four out of five children (4, 7, 14, 15) who reached monolingual norms in Dutch receptive vocabulary, and who were old enough to perform the productive vocabulary test, also reached monolingual norms in Dutch productive vocabulary. Child 8 reached monolingual norms in Dutch receptive but not productive vocabulary (fell short by 1 point). The two children (7, 15) who met the monolingual norms in English receptive vocabulary, and who were old enough to perform the productive vocabulary test, also reached monolingual norms in English productive vocabulary. Child 5 reached monolingual norms in English productive but not receptive vocabulary (PPVT score of 81). Child 11, 17 and 18 reached monolingual norms in Dutch productive but not receptive vocabulary (PPVT scores of 79, 82 and 84). Figures 2 and 3 also showed that two children (7 and 15) reached

monolingual norms on the receptive and productive vocabulary tests in both English and Dutch. To sum up, children reached age-appropriate monolingual norms in Dutch vocabulary more often compared to English. While several children failed to reach age-appropriate norms in English/Dutch PPVT and/or CELF, children who reached the norms in Dutch/English receptive vocabulary generally also reached age-appropriate monolingual norms in productive vocabulary in that language.

4.4.1 Comparison of individual vocabulary outcomes and amount of input at home/day care

To investigate why some of the children reached the monolingual norms while others failed to do so, bilingual children's standard vocabulary scores, their language exposure at home, and language exposure at day care were compared (Table 7), thereby taking into account Thordardottir's (2011) suggested threshold levels of ≥ 40% language input for receptive vocabulary, and ≥ 60% language input for productive vocabulary (see Chapter 2.1 above).

Table 7. *Overview of individual children's standard scores on each of the vocabulary tests and average amount of English/Dutch exposure at home/day care per week*

	PPVT EN	PPVT NL	CELF EN*	CELF NL*	Daycare English (hours p/w)	Daycare Dutch (hours p/w)	EN at home (in % **)	NL at home (in %)	Daycare English (in %)	Daycare Dutch (in %)
Child 1	78	74	4	2	4.22	2.03	9	1	5	2
Child 2		67	7	1	26.5	12.5	48	0	32	15
Child 3	47	55	1	1	9.4	4.1	3	0	11	5
Child 4	45	101	1	10	6.9	30.6	0	60	7	33
Child 5	81	57	7	3	31.5	14.8	29	0	31	14
Child 6	59	106			3	7	0	89	3	8
Child 7	102	129	7	13	16.9	8.1	13	57	20	10
Child 8	66	89	4	6	13.5	6.5	0	74	18	8
Child 9	76	84			15.6	17.7	6	23	18	20
Child 10	61	118			5.6	24.5	0	66	6	28
Child 11[a]	54	79	1	10	3.2	31.8	12	30	4	35
Child 12	79	80			22.3	27.8	33	0	24	30
Child 13	61	104			5.1	22.4	0	69	6	25
Child 14	51	103	2	10	3.2	14.3	0	79	4	17
Child 15[b]	96	118	11	11	35.3	9.8	31	0	41	11
Child 16	58	113			5.1	22.4	0	68	6	26
Child 17	55	82	1	12	3.7	16.3	1	77	4	18
Child 18	68	84	3	7	6.5	28.5	31	18	7	31

Note. Scores below monolingual norms are indicated in red. * Based on $n = 12$ bilingual children aged ≥ 3;0.
** % were calculated by taking the total amount of hours the child spent at home/day care being exposed to English/Dutch/OL divided by the child's total amount of waking hours. 1% NL at home thus means that the child was exposed to Dutch at home for 1% of the child's total waking hours per week. As the % of OL is not indicated in Table 7, % of children who are exposed to an OL will not add up to 100% (or 99%-101% due to rounding).
[a] Child also attends Dutch preschool. [b] Child also attends English preschool.

What can be gleaned from Table 7 is that 12 out of 15 children who failed to reach monolingual norms in English PPVT only received very limited amounts of English input ($M = 10.3\%$, $SD = 6.7\%$ total exposure to English). Child 18 received English input for < 40% of the time. In contrast, child 5 and 12 were exposed to English for more than half of their total waking hours, and only scored 4 and 6 points below monolingual norms. Of the two children who did reach monolingual norms in English PPVT, Child 15 mostly received English language input (72%), while child 7 received less English input (33%). These findings, which are visualised in Figure 4 below, thus show that children who received more English input overall obtained higher English PPVT scores compared to children who received less exposure to that language.

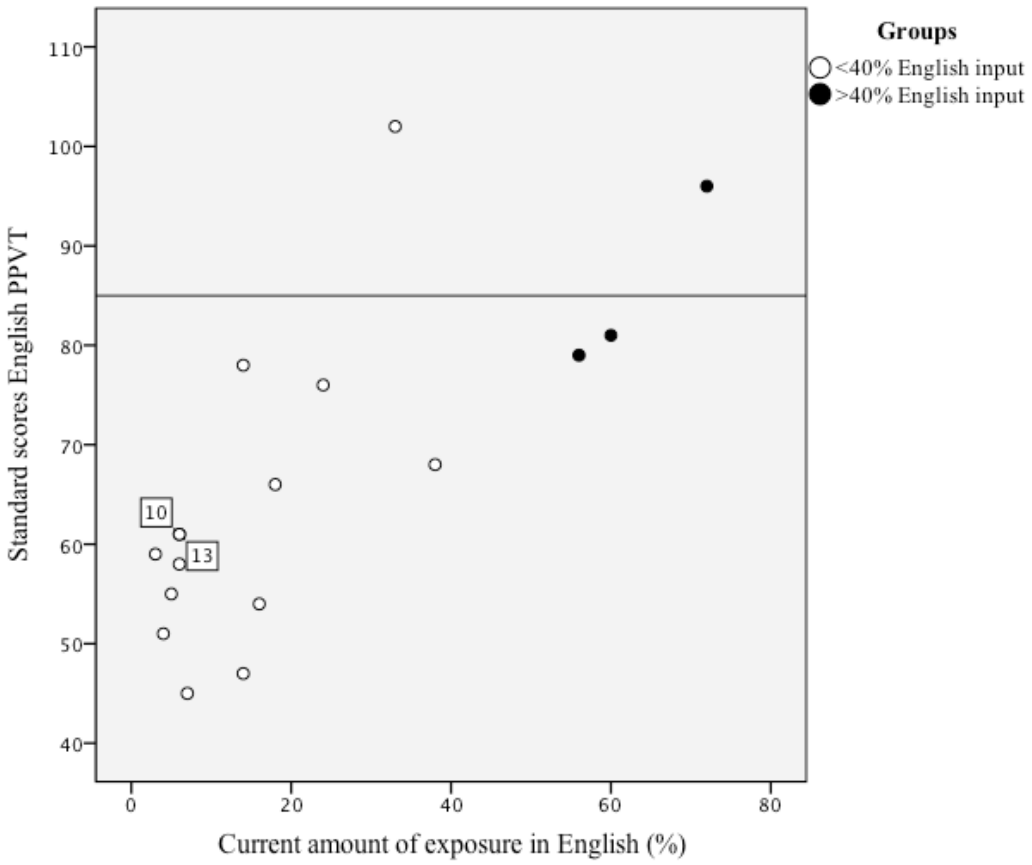


Figure 4. *Relation between children's English PPVT scores and current amount of exposure to English (in %)*

Note. Horizontal line indicates monolingual norm score.

Table 7 also indicates that four of the children who failed to reach monolingual norms in Dutch PPVT hardly ever received Dutch language input at home and/or day care (≤ 15%). Child 12 was exposed to Dutch for 30% of his/her total waking hours. Child 9 and 18 were exposed to > 40% Dutch language input, while child 11 and 17 received Dutch input for > 60% of the time. Table 7 also shows that child 9, 11, 12, 17, and 18 scored just below monolingual norms. Eight out of nine children who did reach monolingual norms in Dutch PPVT were mostly exposed to Dutch input (≥ 67%). An exception was child 15, who received Dutch input for 11% of the time but still reached monolingual norms. These findings are visualised in Figure 5. To sum up, Table 7 and Figure 5 show that children who received more Dutch input generally

obtained higher Dutch PPVT scores compared to children who received less exposure to that language.

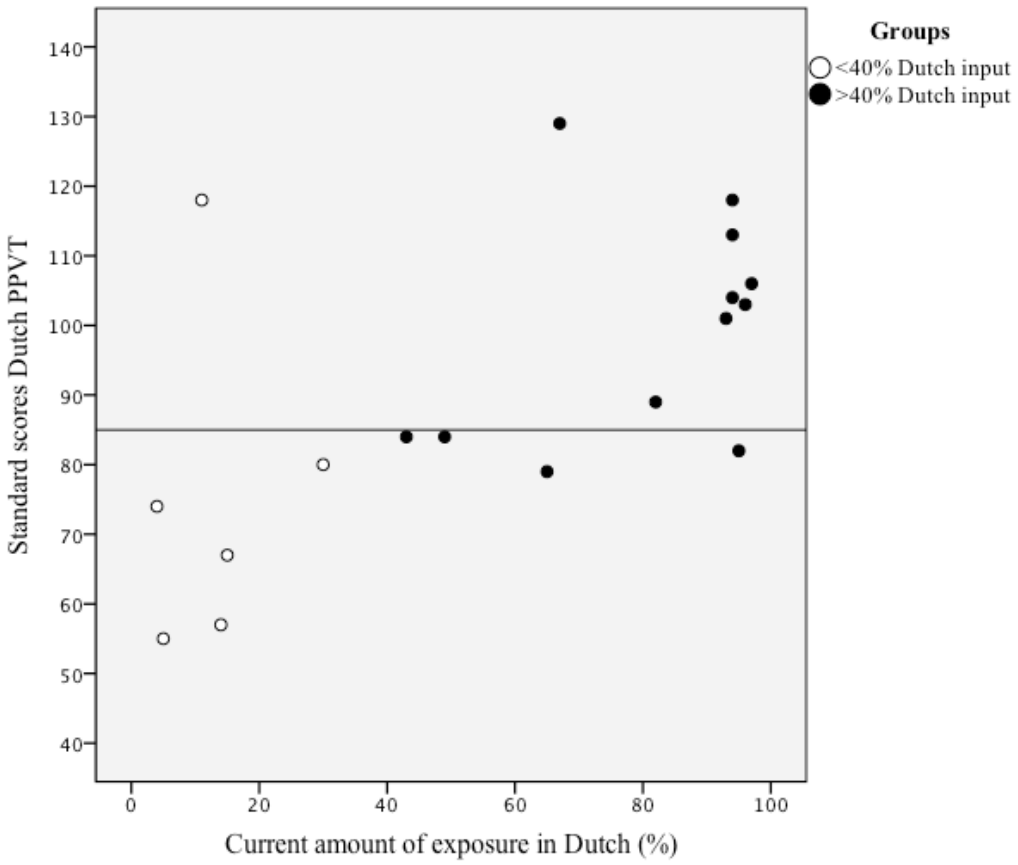


Figure 5. *Relation between children's Dutch PPVT scores and current amount of exposure in Dutch (in %)*

Note. Horizontal line indicates monolingual norm score.

Regarding the English CELF test, Table 7 reveals that the eight children who failed to reach monolingual norms were all exposed to English language input for a small part of their total waking hours per week (≤ 18%), except for child 18 (38%). All these children scored far below the monolingual norm (cf. ≤ 4 points). Of the four children who did reach monolingual norms in English CELF, three children were exposed to ≥ 60% English input, while one child received English input for 33% of the time. These four children also received more English input at day care (*M* = 31%, range 20-41%) compared to the children who failed to reach monolingual norms (*M* = 7.5%, range 4-

18%). These findings, which are visualised in Figure 6, thus show that children who received more English input generally obtained higher English CELF scores compared to children who received less exposure to that language.

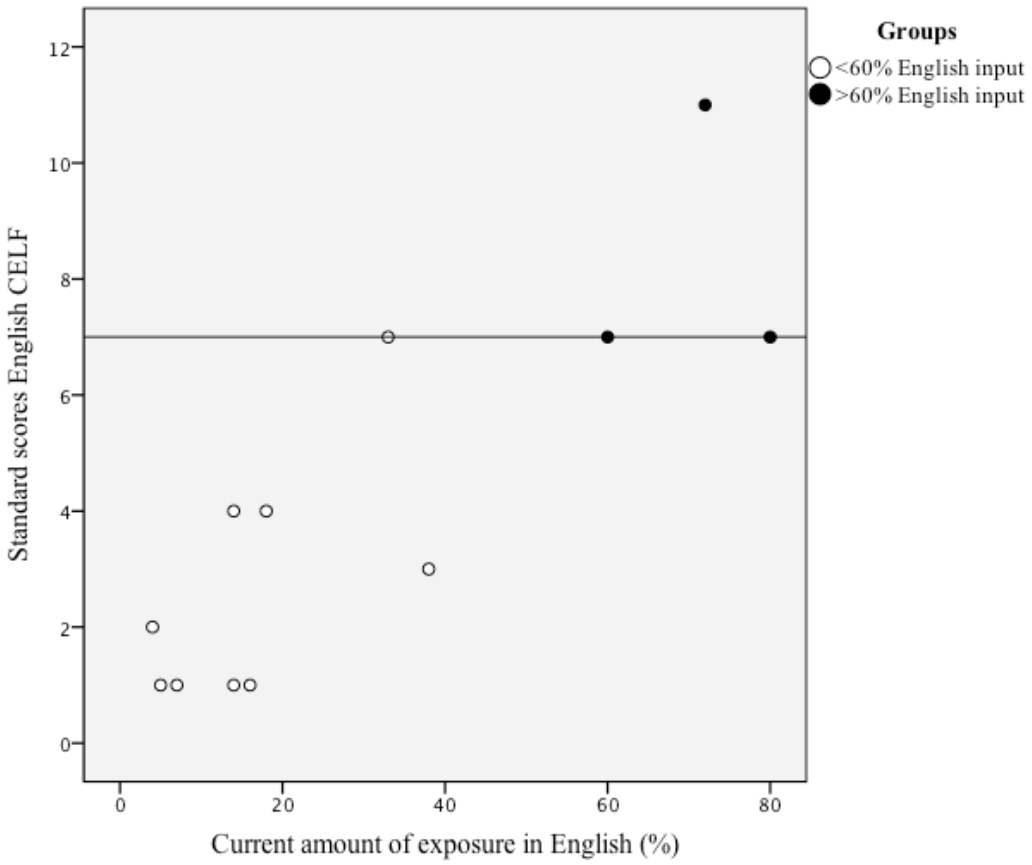


Figure 6. *Relation between children's English CELF scores and current amount of exposure to English (in %)*

Note. Horizontal line indicates monolingual norm score.

Finally, Table 7 shows that four out of five children who failed to reach monolingual norms in Dutch CELF received Dutch language input only for a small part of their total waking hours per week (≤ 15%), and scored far below the monolingual norm (≤ 3 points). Child 8 mostly received Dutch language input (82%) but still scored 1 point below the monolingual norm. Five children received ≥ 65% Dutch input and scored well within the range of monolingual norm scores in Dutch CELF (≥ 10). Child 15 and child 18, however, received < 60% Dutch input, but still met monolingual norms

in Dutch CELF. These findings are visualised in Figure 7. In short, what can be concluded from Table 7 and Figure 7 is that overall children who received more Dutch input obtained higher Dutch CELF scores compared to children who received less exposure to that language.

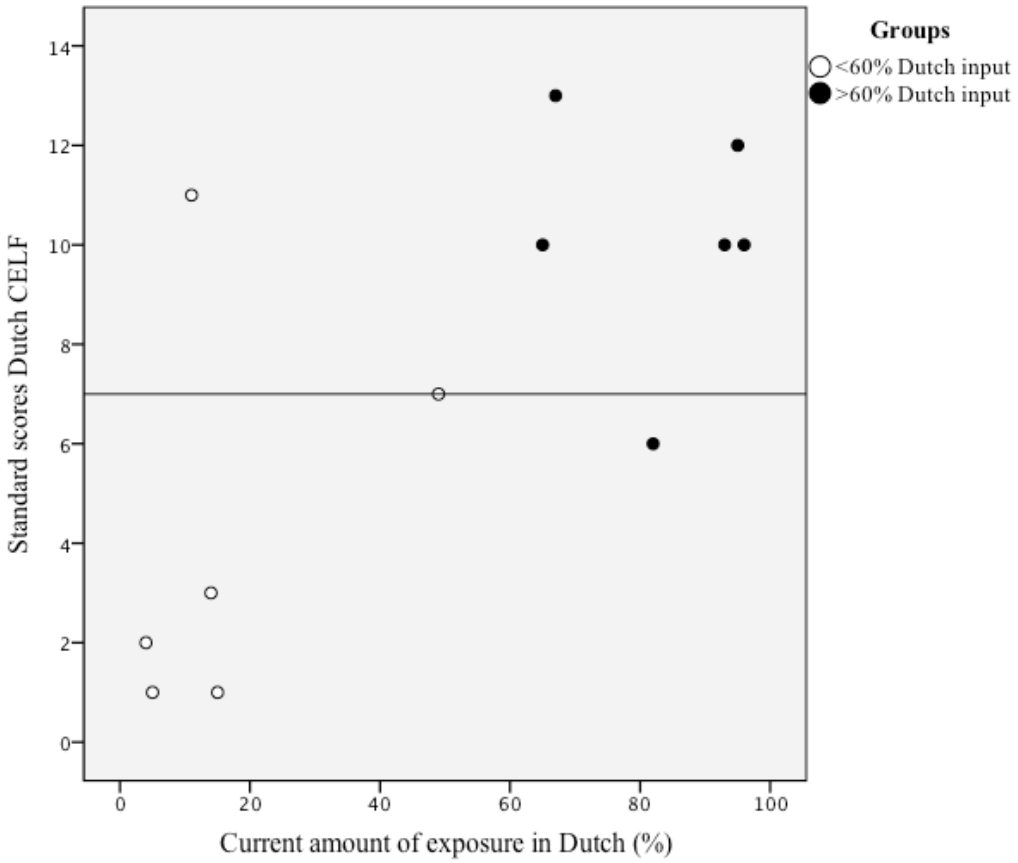


Figure 7. *Relation between children's Dutch CELF scores and current amount of exposure to Dutch (in %)*

Note. Horizontal line indicates monolingual norm score.

4.4.2 Summary of comparison of individual outcomes and input at home/day care

When comparing bilingual children's vocabulary outcomes on each of the four tests and the amount of English/Dutch input they were exposed to at home and day care, it was found that, in general, children who were exposed to more language input obtained higher vocabulary scores. In addition, children generally reached

monolingual norms in receptive vocabulary if they received ≥ 40% of their total language input in English/Dutch, and met monolingual norms in productive vocabulary with ≥ 60% language input in each language (Figure 4-7). A couple of children, however, reached monolingual norms on receptive and/or productive tests in English/Dutch while they received (considerably) less exposure to that language, i.e. < 40% for receptive and < 60% for productive vocabulary. Moreover, some children failed to meet monolingual norms in English/Dutch, despite the fact that they had been exposed to that language for a great part of their total waking hours (although they only fell short by a few points).

5. Discussion

The current study examined data of 18 English-Dutch bilingual children's outcomes on four standardized English/Dutch receptive and productive vocabulary tests, to investigate the relationship between the quantitative and qualitative input factors and bilingual children's English/Dutch vocabulary development. In addition, this study investigated which of the seven child-external input factors best predicted bilingual children's development on receptive and productive vocabulary tests in English and Dutch.

5.1 Correlations between child-external factors and vocabulary development

In order to answer the first research question (see Chapter 2.3 above), correlation analyses were performed to investigate the relationship between each of the seven child-external input factors and the bilingual children's performances on each vocabulary test. Except for 'Dutch current exposure at day care', all quantitative and qualitative input factors, 'nativeness of input', 'richness of input', 'number of English/Dutch conversational partners', 'current exposure at home', 'English current exposure at day care' 'child's language output', and the 'cumulative length of exposure', significantly positively correlated with children's performances on each of the four tests in the present study. This finding seems to confirm the predictions made in Chapter 2.3, that each of the seven child-external factors would play a role in children's vocabulary development and this is in line with previous literature that indicates that a combination of both quantitative and qualitative input factors play a role in the language development of a bilingual child (e.g. Place & Hoff, 2011; Unsworth, 2012; Unsworth, 2013b). The existence of multicollinearity between some of the input factors, however, made it difficult to determine how important each

individual child-external input factor was. Perhaps unexpectedly, the amount of Dutch input at day care did not significantly correlate with children's Dutch vocabulary outcomes, while the English input at day care did. This finding is most probably due to the, in general, relatively high amount of Dutch input children were exposed to at home. It is suggested that as children overall were already exposed to sufficient Dutch input at home to reach monolingual norms on the Dutch vocabulary tests, more exposure to Dutch at day care was not (necessarily) needed, and therefore did not lead to significantly higher vocabulary scores. For English vocabulary outcomes, on the contrary, English input at day care was needed, as the English amount of exposure children received at home was generally insufficient to reach monolingual norms in English vocabulary. This is consistent with previous studies by Hammer, Davison, Lawrence, and Miccio (2009) and Thordardottir (2011), who have stated that additional language input beyond a certain threshold does not significantly affect children's (receptive) vocabulary development.

The second research question explored which of the input factors best predict receptive and productive vocabulary development in English and Dutch if any child-external factors were found to correlate significantly with children's vocabulary outcomes. Firstly, it is important to mention that due to the small sample size, and as there was a problem with multicollinearity between various child-external factors, it was not possible to perform a regression analysis. Therefore, it could not really be determined which of the factors best predicted children's vocabulary outcomes. In an attempt to still find out which of the child-external factors were most important for the vocabulary outcomes, seventh-order partial correlations were conduced to look at the unique effect of one child-external factor on each of the four outcomes. Seventh-order partial correlations revealed that the individual input factor 'current amount of

exposure at day care' was solely significantly positively correlated with the English productive vocabulary test when controlled for other input factors (including age at time of testing). Once current amount of exposure at home and day care were combined as one factor, sixth-order partial correlations revealed that the individual input factor 'current amount of exposure' was solely significantly positively correlated with the English receptive and productive vocabulary test when controlled for other factors. This finding is consistent with previous research that has stated that children's vocabulary knowledge in a particular language is related to the amount of time a child spends with speakers in that language (e.g. Cobo-Lewis, Pearson, Eilers & Umbel, 2002a, 2002b; De Houwer, 2007; Pearson, Fernández, Lewedeg & Oller, 1997; Quiroz, Snow & Zhao, 2010; Scheele, Leseman & Mayo, 2010; Vermeer, 2001). Moreover, this finding confirms the prediction in Chapter 2.3 that current exposure at day care would be a factor of particular interest in this study.

The failure to observe significant correlations between each of the other child-external factors and children's vocabulary outcomes is suggested to be a result of the large number of factors that needed to be controlled for, and the small sample size in the current study, which may have affected the r values. It could also be that the effect of the other child-external input factors is not strong enough to be solely significantly responsible for the children's vocabulary outcomes (once controlled for other factors). This furthermore suggests that a combination of input factors affects bilingual children's vocabulary development.

5.2 Individual differences in vocabulary scores

Children's Dutch receptive vocabulary scores were significantly higher than their receptive vocabulary scores in English and children performed significantly

better on the Dutch productive vocabulary test compared to the English productive vocabulary test. Based on previous research (see discussion above) this was expected as children on average received more than twice as much language input in Dutch compared to English.

As mentioned before, several children received input in a language other than English/Dutch by one or both parents at home. Therefore it was predicted that at least some of the children would not receive sufficient English/Dutch language input at home to reach age-appropriate monolingual norms in the current study. Hence, the amount of exposure to each language to be assessed for these children was (largely) dependent on the amount of English/Dutch input they received outside the home. Overall, the children in this study received Dutch language input for approximately 59% of the time they were awake, and English for around 26% of the time. Therefore, it was expected that (most) children would reach age-appropriate norms on the Dutch vocabulary tests. Previous research by Thordardottir (2011) has suggested that children need to be exposed to a language for at least 40% of the time to reach monolingual norms for receptive vocabulary, and 60% input to fall in the monolingual norm for productive vocabulary. The current findings suggest that a similar pattern is at stake in this study. Children who received more than 40% Dutch input generally reached monolingual norms in Dutch receptive vocabulary, while children who were exposed to less than 40% failed to reach this norm. A similar pattern was found for the English PPVT. Regarding the CELF tests, children who were exposed to 60% or more English input fell within the monolingual norm for English productive vocabulary, while children with less exposure to that language generally failed to reach monolingual norms. A similar result was found for the Dutch CELF. These findings indicate that children who are exposed to two or more languages do not

necessarily show a protracted development, which is in line with what Thordardottir (2011) claims. It is noteworthy, however, that three children formed an exception to the aforementioned pattern, as they reached monolingual norms on one or more tests while they received insufficient input (i.e. less than the threshold) in that language. One child reached monolingual norms on both the English PPVT and CELF although he/she was exposed to 33% English input, one child received 11% Dutch input but still fell within the monolingual norm for Dutch PPVT and CELF, and one child was exposed to 38% Dutch input but reached monolingual norms in Dutch productive vocabulary.

A possible explanation for why a child reached monolingual norms in English PPVT while he/she was exposed to English input for about 33% of the time could be that the minimum amount of exposure to a language to reach monolingual norms is task-dependent. Thordardottir (2011) found that children who were exposed to English for approximately 30% of the time scored within the normal range relative to monolingual children on the PPVT test. Nevertheless, this would only explain why one child that was exposed to 33% language input reached monolingual norms in English receptive vocabulary. It remains unclear why the three children reached monolingual norms, especially in English/Dutch CELF, while they received an amount of input well below the threshold suggested by Thordardottir (2011).

A possibility might be that the SES of the families participating in this study was high, as previous literature has found that children coming from higher SES families are exposed to more and richer vocabulary, and have more advanced language skills (e.g. larger vocabulary size) compared to children coming from lower SES families (see Hoff, 2006 for review). It could also be the case that because English and Dutch are both Germanic languages, and hence have a high number of

cognates, this might have helped the children to do well on tests in their weaker language (e.g. Méndez Pérez, Peña & Bedore, 2010; Unsworth, in press). Some of the other languages spoken at home, such as Afrikaans and Swedish, are also part of the Germanic language family, and hence may also have facilitated the children's English/Dutch vocabulary outcomes due to their similarities. This might, in a sense, also explain the differences between the findings in the current study and findings by Thordardottir (2011), as the children that participated in Thordardottir's study were tested in languages that were less related (French and English).

5.3 Practical implications

It is reasonable to believe that the parents of the children participating in the current study tend to educate their children in English, in addition to at least one other language, as it is considered to be of strategic importance in the child's near future (Saunders, 1988). As the results demonstrated, however, several children in the current study currently receive insufficient language input at home and day care to obtain monolingual proficiency levels in English, one of the reasons being that a number of children participating in the current study mostly were exposed to another language than English at home. More English input at home and/or day care will thus be needed for some children to obtain higher (vocabulary) proficiency levels in English. Although it is expected that children will spend more time on the internet and playing computer games, thereby being exposed to more (quantitative and qualitative) English input, once they become older (Unsworth, Persson, Prins & De Bot, 2014), parents might consider engaging their children in English extracurricular activities more often, such as by them watching television, reading (to their child), listening to songs, or by using digital devices in which they are exposed to language input, in

order to enhance the quantity and quality of English language input that their children are exposed to. Furthermore, parents may try to expose their child to (near-) native speaker input from several conversational partners as much and as frequently as possible, as the current study found, similar to previous literature (see Unsworth, 2013b for review), that in addition to the amount of exposure, the type of exposure has a positive and significant correlation with children's vocabulary development.

5.4 Limitations and future research

There are limitations to the current study. Firstly, a larger sample size would provide the opportunity to perform a regression analysis in order to investigate which child-external input factors, or combination(s) of factors, best predict children's outcomes on the English and Dutch vocabulary tests. According to Green (1991), a minimum sample size of 111 children is needed to test the seven individual predictors in a regression model for the current study. In addition, a larger sample size would enlarge the reliability of the findings of the current study and may solve the problem of multicollinearity between the predictors (i.e. input factors) (see Field, 2009 for relevant discussion), which led to the uncertainty in drawing clear conclusions about the relationship between each of the child-external input factors and children's vocabulary development. Therefore, more research with a larger sample size should be conducted to confirm the outcomes of the current study. Another limitation was the high SES of the families participating in this study, which made the current findings less representative of the whole bilingual population. More research with children of a wider range of SES backgrounds should examine if the current findings are limited to children of families with a high SES, or if they also hold for a more varied group of participants. Thirdly, the current study only focused on bilingual children acquiring

two languages of a similar language family (viz. Germanic). Further research with bilingual children acquiring languages from different language families that are less closely related should be conducted, to see if those children need a similar amount of language input to reach age-appropriate monolingual norms in comparison with the participants in the present study. Fourthly, in the current study, the participating children came from various language backgrounds including bilingual children, trilingual children, and children who were exposed to English/Dutch at day care only. This resulted in considerable variation among children in most variables tested, making it harder to interpret the collected data. In order to examine the by Thordardottir's (2011) suggested threshold levels more closely, future research with a more homogeneous group of bilingual children is needed. The current study attempted to include the most important quantitative and qualitative child-external input factors that have been shown to play a role in children's vocabulary development in previous literature. There may, however, still be input variables that are not incorporated in this study but which are considered to affect vocabulary development in some way. The aim of future research should therefore be to determine if other input factors contribute to the vocabulary development, in order to obtain a more complete insight into how the environment in which children grow up influences their success of acquiring one or more languages.

6. Conclusion

The current study found that both quantitative and qualitative input factors are significantly related to children's receptive and productive vocabulary scores, and that current exposure (at home and day care) is of particular importance in vocabulary development. This finding suggests that a combination of child-external input factors play a role in children's vocabulary development. In addition, this study found that some bilingual children, and even some trilingual children, reached monolingual norms on one or more standardized vocabulary tests, and hence do not necessarily show a protracted development compared to monolingual children. Nevertheless, this was generally only the case if children received a sufficient amount of input at home, at day care, or a combination thereof, in the languages assessed. The current study also suggests that children might vary in the amount of input needed to score within the monolingual norms, although the threshold levels of 40% input for receptive vocabulary, and 60% input for productive vocabulary, as suggested in Thordardottir's (2011) study, seem to be in line with the current findings. Future research should investigate if the current findings hold for a larger sample size with bilingual children with a wider SES background, for a more homogeneous group of children acquiring languages from different language families, and once any other important child-external input factors affecting vocabulary development are taken into account. The current findings can contribute to an extending body of literature on bilingual language development.

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