Universiteit Utrecht

Title: Developmental Differences in Lexical Decision Among Monolingual and Bilingual Children.

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MA Thesis

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Abstract

It has been shown that Bilingual students in the Dutch educational system have low levels of academic performance (CBS, 2008). Though many measures and interventions have been undertaken to improve their academic achievement, there are still obvious differences between the monolingual and the bilingual Dutch students (CBS, 2008). One of the main factors contributing to this circumstance appear to be that bilinguals Dutch children have lower Dutch language proficiency at the age at which they were tested. Previous studies show that bilinguals Dutch children have poor work knowledge (Appel and Vermeer, 1998; Verhallen and Schoonen, 1998; Verhoeven, 2000; Schoonen and Verhallen, 2008) however, did not take into consideration of the words belonging to different domains used in their experiments. Perhaps the bilingual children are only weak with words often used at home in their home language but tested in the school language. This paper attempts to verify this with a pilot experiment to examine the effect on bilingualism by bilingual Dutch children at primary school age with a word association task. The result of the test is contrary to the hypothesis.

1.0 Background

The position of the ethnic minorities, i.e. students speaking languages other than just Dutch, in the Dutch educational system is generally a major cause for concern because of their low levels of academic performance (CBS, 2008). Though many measures and interventions have been undertaken to improve their academic achievement, there are still obvious differences between the ethnic minority students and the native Dutch students (CBS, 2008). As a number of studies in both first (L1) and second (L2) language have demonstrated that lexical knowledge is one of the best predictors of reading ability and the ability to acquire new information from texts (Nassaji, 2006; Nation, 2001, Qian, 2002; Read, 2000), this has led some researchers to examine the second language acquisition (SLA) of Dutch by minority children right from the onset, i.e. at the pre-school and primary school level starting with the most rudimentary stage, language comprehension at the word level (Appel and Vermeer, 1998; Verhallen and Schoonen, 1998; Verhoeven, 2000; Schoonen and Verhallen, 2008). Numerous studies show that children who first acquired a language other than Dutch and then successively acquired Dutch at school have weaker word knowledge in terms of breadth and depth.[1] The main factors contributing to this circumstance appear to be: (i) either that bilinguals Dutch children have lower proficiency than their monolingual Dutch peers in Dutch, at the age at which they

[1] The exact meaning of "breadth" and "depth" are not explicitly defined by the cited authors.

are tested or/and (ii) that the generally lower socio-economical background of the bilingual Dutch children affects their academic performance.

There are many problems facing research on bilingualism. For example, there is no consensus on its definition nor on the age at which L2 acquisition begins, nor on the manner in which an L2 is learned at a young age, and so on. These topics are much discussed in the literature without resolution or consensus. In this paper, attention is directed to the experimental materials used in word recognition tasks. This is because most previous studies in word recognition tasks have not taken into account that some test words are not used in the school domain. Students may be performing badly not because they do not have the vocabulary in place, but because they need longer time and more concentration on the language used in the tests (Nassaji, 2006; Nation, 2001, Qian, 2002; Read, 2000; Mägiste, 1979; Green, 1986). A child who speaks another language in addition to Dutch is at home at least ½ the time playing, helping his mother in the kitchen, etc. The mother may mention, for example, the parts of a mushroom (i.e. the *cap* and the *stem*, words which the child would not hear at school), or the child might also learn in his "home language" that the *toadstools* are poisonous but not *mushrooms*, which such lexical knowledge would never be acquired in Dutch, the language of school. In other words, such "hearth words" may never appear in the school context of an early primary school child.

What that might be going on, then, is that the Dutch bilingual children use one language at home to discuss things at home and use another language at school to discuss things at school. The lack of breadth and depth of words may only apply to Dutch “home language” (i.e. lexical knowledge of Dutch hearth words). Since, the test items used in the previous experiments discussed here include words from both categories, i.e. from both school and home domains. The picture of bilingual Dutch lexical knowledge may be inaccurate. It would not be surprising to find that bilingual students are only weaker in Dutch hearth word knowledge.

In research on vocabulary learning, a distinction has often been made between two dimensions of vocabulary knowledge, (i) size or *breadth* of knowledge and (ii) *depth* of knowledge (Haastrup and Hendriksen, 2000; Meara, 1996; Read, 2000). *Breadth* of vocabulary has been taken to refer to the

quantity or number of words learners know at a particular level of language proficiency (Nation, 2001). However, knowing more words arises together with knowing how words are associated with each other and how this affects their meaning construction. Thus, *breadth* is also the degree to which a word is known to be associated with other words, i.e. the degree to which it primes other words and the number of other words it primes. The term *depth* of vocabulary on the other hand, is used to refer to the quality of lexical knowledge, or how well the learner knows the idiosyncratic characterization of a word (Meara, 1996; Read, 2000)[2]. This includes various kinds of knowledge ranging from truth-functional meaning to pragmatic meaning relative to a given context, register, stylistic value, special morphological, syntactic or semantic constraints, etc. *Depth* also concerns the speed with which all the aspects of a lexicon can be assessed and in the case of bilingualism and L2 relation to other lexicons, and/or the degree to which certain features can be accessed at all. Here, it is also important to note that *depth*, or rather accessibility, is complicated by an additional factor in the case of bilinguals, namely the need to suppress activation of associated words in the other language, for example the need to prevent Dutch *hond* from priming English *dog*. This goes to say that the performance, in terms of response time, of the bilingual children in the previous experiments may be significantly affected by the words from the home domain.

If we put aside reasons of socio-economical factors, language interference, and poverty of dual stimulus, perhaps it is the words used in the home domain tested in Dutch (school language) that pose a problem for bilingual Dutch children. They may need a longer time to process “hearth words” given in school language. They may, in fact, fair equally well as the monolingual children with words used in the school domain in terms of response time. Hence in order to understand this, an experiment has been devised and carried out to answer the following research questions.

1. Do bilingual children in the Dutch primary school between "groep" 5 to 7 (8 to 10 years old) who speak a home language other than Dutch, respond slower to words used in the home domain than those used in school domain when tested in the school language (Dutch).

[2] The problem with this distinction is that the "quality" of a word includes its connotations and co-occurrence with other words (c.f. idioms, collocations). Thus, *depth* entails knowledge of associations, and breath.

2. Do bilingual children in the Dutch primary school between "groep" 5 to 7 (8 to 10 years old) who speak a home language other than Dutch, respond as fast as native children to words in the school domain when tested in the school language (Dutch).

Bilingual Dutch children from "groep" 5 to 7 in the Dutch elementary school system (8 to 10 years of age) would have had at least 4 years of Dutch and should have completed an initial phase of child second language acquisition. The following sections will explain the experiment and results from a pilot test. The organisation of this paper is as follows: First, three previous studies of the word knowledge of the bilingual children in the Dutch educational system are reviewed. Second, some theories on bilingual language acquisition and memory organisation are discussed. Third, the pilot experiment is presented in detail. Finally, the results of the pilot experiment are discussed in the conclusion.

2.0 Studies in Vocabulary Acquisition Carried Out in the Netherlands

In this section, 3 papers will be briefly discussed: in section 2.1 a paper by Appel and Vermeer (1998), in section 2.2 a paper by Verhallen and Schoonen (1998); and in section 2.3 a paper by Schoonen and Verhallen (2008).

2.1 Speeding Up The Second Language Vocabulary Acquisition of Minority Children

Appel and Vermeer (1998) pointed out that, bilingual Dutch children of non-Dutch speaking immigrant parents lag behind their monolingual Dutch peers in the size as well as depth of the Dutch vocabulary. These children not only knew far fewer Dutch words, they were also less secure in their use of Dutch words. What exactly do these authors mean by the "*depth"* of a word and how this can be measured objectively is not clear. However, these authors concluded that immigrant children lagged far behind their Dutch classmates in both quantitative and qualitative lexical skills. Since children with limited knowledge of words would have serious problems comprehending texts used in lessons, their educational attainment will consequently be negatively affected. With these in mind, materials for

extra lessons on Dutch vocabulary were designed by Appel and Vermeer and a longitudinal experiment was carried out using these materials in various schools over a period of four years. Generally, immigrant children at the age of 4 in these schools had to go through four years of extra lessons with implicit vocabulary teaching. In this manner, Appel and Vermeer attempted to address the following research questions.

(1) Did the Dutch vocabulary of [im]migrant children who followed the experimental programme during their first four years in primary school increase more than the vocabulary of [im]migrant children who did not follow that programme?

(2) Did the experimental programme have a broader effect on reading skill?

(3) Were there any long-term effects on vocabulary and reading abilities three years after completion of the programme?

(4) Is it possible, by means of the experiment programme, to increase the [im]migrant children's Dutch vocabulary by more than 1000 words a year, and do they reach the level of their Dutch classmates after four years?

To answer the first research question, two groups of children were tested before (Pre-test) and after (Post-test) the extra vocabulary programme via a picture/word recognition task. The first group, the experimental group (EXP), were children who went through the extra vocabulary learning programme. The second group, the comparison group (COMP) were children who were not in the extra vocabulary learning programme. It is not clear precisely what kind of children COMP consisted in. Presumably they were also bilingual children. In this case, there was no control group of monolingual Dutch children. The authors found significant progress for EXP, with a gain of 25% to 35% word knowledge while COMP only showed a gain of 10% to 22% word knowledge in the post-test. For example, the children from EXP had no clue what *tulp* (tulip) means and even pointed to the picture of a *palm tree*. But during the post-test, although they still did not know the meaning of *tulp*, however, at least they all know that it is a flower and pointed to pictures of various flowers and none of them pointed to the picture of a *palm tree* anymore. Perhaps children at the age of 4 to 7 years of

age, in general, could distinguish between a flower and a tree, but do not know the different types of flowers and trees yet. If a control group was then present, perhaps they might give the same response as what the EXP children did in the post-test.

In a so-called curriculum-independent-test, the authors found again significant differences between the response of the EXP and the COMP in both receptive and productive vocabularies. The meanings of receptive and productive vocabularies were not very clearly stated by the authors. A widely accepted distinction related to vocabulary knowledge refers to lexical "*receptive knowledge*", as the ability to understand a word while listening or reading, versus "*productive knowledge*", the ability to use a word in speaking or writing (Nation, 2001). As a rule of thumb, the receptive vocabulary is at least twice the size of the productive vocabulary. The authors found that the EXP scored better than the COMP with F_{1108}=15.38, sig of F= 0.000 in receptive vocabulary and F_{1108}=9.63, sig of F=0.003 in productive vocabulary. In a reading test administered 3 years after the extra vocabulary programme, children from EXP also scored better than children from COMP with F=13.997; *df*=1.69, p=0.000. Again no control group was present for the comparison.

Finally, to answer for the last research question, the authors based on the standard receptive vocabulary of a 8.3 year old Dutch child at about 5300 words and the productive vocabulary at about 3900 words as a reference for comparison between native Dutch and the EXP after 3 years of the programme. They found that the EXP still lagged behind their Dutch peers for about a year. At the end of the 4th grade (about 7 years of age), Turkish/Moroccan immigrant children for example, had 3600 words in their receptive vocabulary and 2600 in their productive vocabulary.

In short, the results of the study showed that it is possible to speed up the acquisition of Dutch vocabulary by immigrant children when vocabulary building through extra lessons, is emphasized at primary school level. However, although immigrant children have increased their word knowledge, in terms of size, with extra hours of vocabulary lessons, they still lag behind native Dutch children of the same age.

Although lag in both vocabulary size and depth of immigrant children were observed by the authors in their experiment, the authors did not make a clear distinction between *size* and *depth* of words in their experiment. The emphases of the research method and questions in their paper have only focussed on vocabulary size, i.e. how much word they knew. As a result, their tests merely showed *size* or quantity and not *depth* of the participants' word knowledge. Therefore, it might be fair for them to conclude that immigrant children were worse in vocabulary *size* in comparison to their Dutch peers, but this does not automatically mean that immigrant children also lag behind in terms of *depth*. In addition, there was no control group present in their study for a just comparison. Nonetheless, this research is worth mentioning as it shows that immigrant children faced problems with vocabulary size which in turns affected their comprehension of texts in school.

2.2 Lexical Knowledge in L1 and L2 of Third and Fifth Graders

Verhallen and Schoonen (1988) looked at the depth of lexical knowledge in both L1 (Turkish) and L2 (Dutch) of bilingual primary school students. They noted an anomalous development in the lexical knowledge of these children. Not only did these children have a smaller L2 lexicon than their Dutch native speaking peers, they also knew less about the words they do knew. The depth of their word knowledge was weak in terms of "network building" (i.e. association of words, for example, horses and lions are hyponyms of animals and you normally see them in the zoo), the number and the kinds of meanings relations differed from those L1 Dutch children.

A network in relation to the mental lexicon simply refers to the development of an interconnected system (Aitchison, 2003). It is a word association web. For example, a word like *pen* will prime *pencil* and *paper*, as they are frequently associated with each other. Aitchison (2003) notes four types of word association networks in our mental lexicon that may be considered most important: (i) coordination, (ii) collocation, (iii) superordination and (iv) synonymy. *Coordination* is the clustering together of words by coordination, such as *salt and pepper* or *fish and chips*. Opposites fall into this category as well, e.g. *right* or *wrong*, *black and white*. Collocation concerns words which are

likely to occur together for example *salt water*, *bright red* and *email address*. Hence, the term *coordination* refers to words that frequently are found in coordination and it is a closer relation or association than *collocation* because the structure is constant:

$$[\text{NP and NP}]_{\text{DP}} \text{ or}$$

$$[\text{NP or NP}]_{\text{DP}}.$$

In contrast, collocation can occur in a variety of different syntactic structure, for example, *pay attention* and *clever remark*:

$$\text{Please } [\textit{pay attention} \text{ to me}]_{\text{VP}}$$

$$\text{That's } [\text{a pretty } \textit{clever remark}]_{\text{DP}}$$

Superodination, (i.e. hyperonyms) concerns hierarchical relationships among words, for example, *insect* is the superordinate word for *butterfly* and *colour* for *red*. Synonymy is the response involving words of the same or similar meaning such as *tiny* and *small*.

The authors suggest that the anomaly they observed in bilingual children could be due to the nature at the bilingual lexicon, i.e. that bilingual children are unable to build upon (the already existing network in) their L1 lexicon for their L2, but rather, must develop two separate networks, one for each language. Since this is twice as many words, it causes a delay in lexical development vis-à-vis the monolingual child. The restructuring of the lexicon which is induced by education cannot take place because there is a mismatch between the L1 knowledge and the L2 lexical requirements. As a result the word knowledge in the L2 has to be built from scratch hence these children lack a solid base in L2 to enter the process of restructuring concepts from everyday concepts into academic concepts.

In order to understand the development of both L1 and L2 of these bilingual children, a word definition task experiment was devised and was run in both L1 and L2. 40 children of Turkish origin but all born in the Netherlands were tested. Participants were of a non-homogenous group as some spoke only Turkish at home, some spoke only Dutch at home and some spoke a mixture of both. They reported that the academic results of these children were not deviantly high or low. But their average Turkish language proficiency was lower than that of a monolingual Turkish child by a year. They were

interviewed orally in two separate sessions; one in Dutch, the other in Turkish with an interval of at least 1 week between the two sessions; to access their word knowledge. Children were asked to give as many meaning aspects as they could think of with the 6 stimulus words: *nose, alarm clock, book, hair, predator* and *secret*. The results of the interviews were assessed based on a lexical knowledge classification scheme shown in figure 1 below.

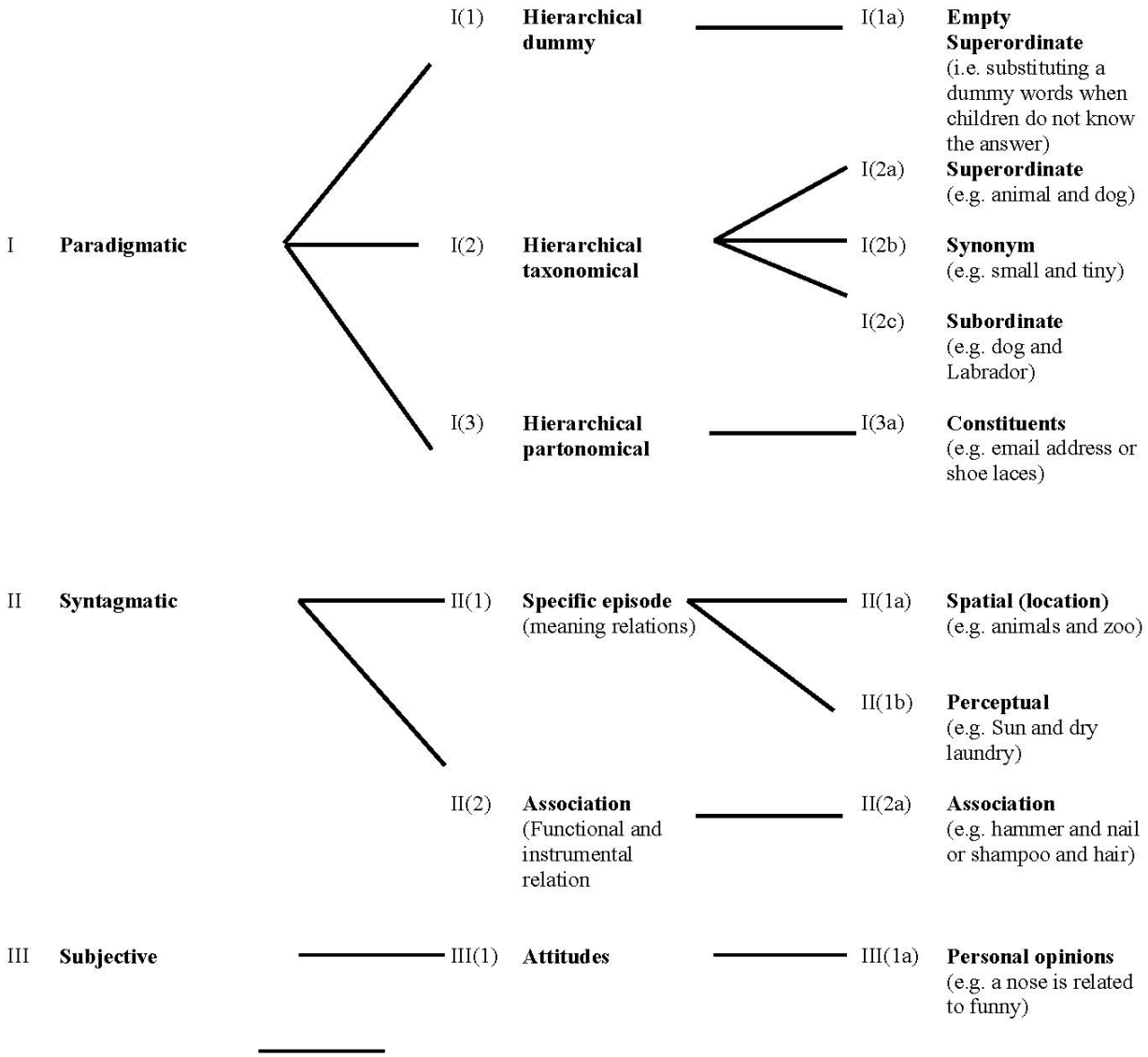


Figure 1: Classification scheme of meaning aspects (Verhallen and Schoonen, 1998)

Though not very clearly explained, but briefly, the authors classified the meaning aspects of words in three main categories. The paradigmatic category marks hierarchical relationships of words like the *superordination* or *subordinate* mentioned by Aitchison (2003), for example a *Labrador* is

associated with *dog* and they are words that belong to the hierarchical relation under *animal*. The syntagmatic category makes distinction between *specific episode* meaning relation and *association* with subcategory of *functional* and *instrumental* sense relations. This means words related to functional or instrumental purposes like *hammer* and *nail* which belong to different *superordination* yet are related to each other in a functional sense. Finally, the subjective meaning relations are classified as *attitude* aspects of the participants. According to the authors, the links between words are formed by habits of the participants. It is a totally subjective manner in associating words.

All in all, the test results show that there was an L2 dominance in the bilingual children. The L2 (Dutch) deep lexical knowledge turned out to be richer than their L1 (Turkish) knowledge. Out of the total of 6154 registered meaning aspects given by the bilingual children in the interviews, 59.4% (3657) were given in Dutch while 40.6 % (2497) were given in Turkish. This means that they could elaborate and express more related meanings of the test words in Dutch than in Turkish. Nonetheless, their L2 was still unsatisfactory in comparison to the native Dutch peers. In simpler terms, what the authors conclude is that, despite the fact that their L2 was better than their L1, these bilingual children were still neither good in their L1 nor in their L2, since they lagged behind both monolingual Dutch and monolingual Turkish children. The chart below (figure 5) shows the percentage of meanings registered with individual stimulus word in both languages.

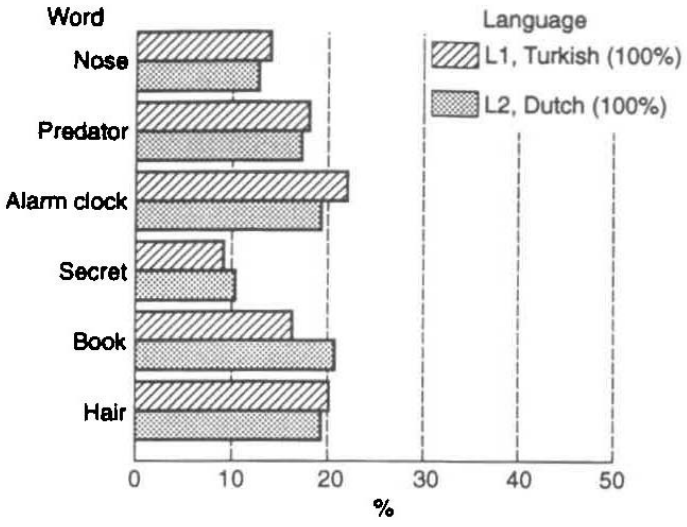


Figure 5: Words by language – Verhallen and Schoonen, 1998

Interestingly, the authors also noted that there were 3 Turkish children who had not the slightest clue what a *wekker* (*alarm clock* in Dutch) was and only one who did not know what a *Çalarsaat* (*alarm clock* in Turkish) was. Perhaps an *alarm clock* is a good example of a hearth word used only at home in the home language. Therefore more meanings related to an *alarm clock* were expressed by the participants in Turkish than in Dutch. It might be possible that for these children, Turkish was the common language spoken at home hence, they could relate more to the meaning of an *alarm clock* in Turkish. On the contrary, the word *book* is expressed with more meaning aspects in Dutch than in Turkish. Without doubt, *book* was a word frequently used in the school domain. Therefore arguably, it was easier for the children to relate to this word in the school language.

In addition, it is important to note that the participants who were chosen in this test were a group of children whose L1 performance was already lagging behind the L1 monolingual Turkish normally developing children. Besides, these children were all born in the Netherlands, fully immerged in the L2 linguistic environment and educational system at the age of 4. Consequently their L2 (Dutch) was better than their L1 (Turkish) since they had no formal Turkish education. Moreover, some researchers have shown that at the age of 4, many aspects of linguistic features, including lexical development of L1 that are not fully automatic and still not in place yet. This is due to the minimal word-to-world mapping experience (Guasti, 2004). Additionally, as what that is pointed out by Aitchison (2003), the most serious shortcoming of word association experiments is that they cannot tell us about the probable structure of human word-web. Hence, it is difficult to objectively determine whether or not the children have *deep* word knowledge if word association can be subjected to the differences in how individuals formed their own lexical network between words. The children were asked to give as many meaning relations to the stimulus words and what they could provide or produce do not automatically tell how much they really knew. Nonetheless, this study shows an important finding that, bilingual children who started learning L2 before the critical age of language acquisition seem to have an impaired lexical development in both L1 and L2.

2.3. The Assessment of Deep Word Knowledge in Young First and Second Language Learners.

Schoonen and Verhallen (2008) have very recently done a large scale assessment of deep word knowledge in young primary-schoolers using the receptive word association paradigm initially developed by Read (1993). Focussing on "how much do you know of a word?' i.e. the depth of word instead of 'How many words do you know?' i.e. the breadth of vocabulary, 822 children (including children of both monolingual and bilingual backgrounds) in the middle and upper grades of primary education (grade 3 and 5) participated in the Dutch version of Word Association Task (WAT). A sub-group of 86 children also took definition task from standardized Dutch test battery for young Dutch L2 learners called TAK. In this analysis, only the results of the WAT test will be discussed.

In the WAT test, children were guided through 2 practice items with explicit explanations and instruction for the paradigmatic (superordination) attribution of words. For example the word *foot*, children were told that whichever way they look at it, *leg*, *toe* and *body part* are related to *foot*, because *foot* is a *body part* and *foot*, and *toes* are part of a *leg*. This does not apply to the other word *cup* that is unrelated to a *foot*. Also children were explained that you can incidentally *hurt* your *foot*, but that is not what it is meant for, and finally, *feet* need not be *large*. Then in the 30 test items, children were instructed to pick three out of the six words that fit the stimulus best, or 'always' go together with the central word. They were asked to draw connecting line for each of their selection (example in Figure 2).

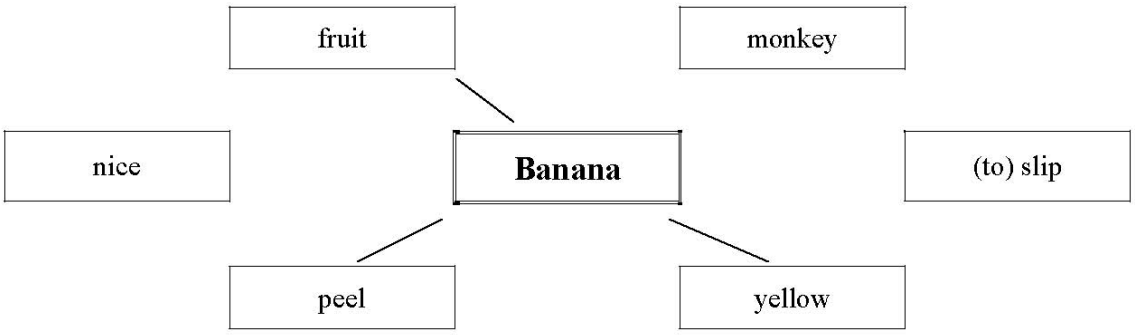


Figure 2: Sample item from the WAT (Translated from Dutch) (Schoonen and Verhallen, 2008)

Children were categorized into six different groups based on their language background: Native Dutch, Frisian, Surinamese/Antillean, Moroccan, Turkish and Others. The category 'others' consisted of a heterogeneous group of new immigrants and also children from mixed marriages which could be Dutch/Turkish, Dutch/English, etc.

Briefly, their results can be concluded with comparison in two important modes: Between the 3rd graders (around 6 years of age) and the 5th graders (around 8 years of age) and between children of different language backgrounds. As presented by them in Table 6 below, firstly and not surprisingly, between the 3rd and the 5th graders, it was found that across all children of all language backgrounds, the 5th graders performed much better than the 3rd graders. Secondly, based on language background of both 3rd and 5th graders, Dutch and Frisian children had the highest scores, followed by the Surinamese/Antillean group and then the 'Others' group. The Moroccan and the Turkish groups obtained the lowest scores (i.e. for example, they did not associate the word *banana* with *fruit* but rather with *monkey*).

	Dutch	Frisian	Surinamese/ Antillean	Other	Moroccan	Turkish
Grade 3						
M	−0.14	−0.21	−0.54	−0.67	−1.10	−1.34
s	(0.80)	(0.71)	(0.61)	(0.65)	(0.70)	(0.58)
n	231	22	33	40	59	25
Grade 5						
M	0.70	0.78	0.32	0.26	−0.02	0.09
s	(0.69)	(0.78)	(0.70)	(0.83)	(0.74)	(0.71)
n	199	31	31	42	50	31

Table 6: Mean ability estimates and Standard deviation by grade and language background – Schoonen and Verhallen, 2008

The authors concluded in this test that in both grade 3 and 5, bilingual children from various backgrounds lagged behind the native children. It was also evident from their result that bilingual children from different background showed different degrees of lagging behind. In other words, there were also differences within the different bilingual groups. It is important to note that though classified

as bilingual children, linguistically, Frisian is not very distinct from Dutch. Also, children of ex-colonial background most likely speak Dutch at home, since Dutch is already a native home spoken language in Surinam and the Antilles.

As pointed out by the same authors in their previous studies (Verhallen and Schoonen, 1998) in section 2.2, word association is a totally subjective matter, depending on the habits of the participants. Hence, it is inevitable that children from different backgrounds would respond to the same word in a different way. Developmental theorists have suggested that children (inclusive of both monolingual and bilingual) are more sensitive to the functional properties of spoken words from an early age (Mandler 1994 in Nation and Snowling 1999) and on some accounts of language acquisition, functional information is considered to be the driving force underpinning the development of semantic memory (Nation and Snowling 1999). This means that for example when the word *hammer* is shown, the word *nail* would be on top of the primed list of words, a more likely candidate than *tool*. Hence in word association tasks, young children (both monolingual and bilingual) are more likely to produce nouns that are functionally related to the target (e.g. *shoes* and *feet* or *hat* and *head*) than nouns that are categorically related (i.e. superordinates for example *banana* and *fruit*). Thus, the key question here should be why the monolingual children understood their task while the bilinguals did not. Perhaps the reason is that, the language of instruction was an L2 for the bilingual children who are already known to be poorer in L2 vocabulary. Since bilingual children have different preferences for word networking than monolingual children, merely having 2 practice items may not have been sufficient for them to grasp the concept of a superordination network or word-web.

In addition, the pattern of this result seems to confirm the notion of ‘a logical problem of bilingual acquisition’ (Yip and Matthews, 2007). In terms of the quantity of input, even in an ideal environment where the input is divided on a 50-50 basis, the perfectly balanced bilingual child could expect to receive only 50% of the input available to a monolingual child for one language (Yip and Matthews, 2007). Therefore, assuming that on a daily basis, the Dutch and the Frisian groups received 100% and close to 100% of the target input respectively, and that the Surinamese/Antillean children

who spoke Dutch at home, at least received more than 50% of the daily Dutch target input, with this we can easily understand that the low performance of the Turkish/Moroccan group was due to the circumstance that they received less than 50% of the target input. Since the group 'Others' was too heterogeneous, it is difficult to know how or whether linguistics properties of their other languages affected their performances. This group consisted of newly arrived immigrant children, for instance from Poland where neither parents spoke any Dutch, as well as mixed Dutch/English where language stimulus was at 50-50, and even German immigrant whose language is very similar to Dutch, etc.

2.4 Section Conclusion

Though the 50-50 input argument argues that the bilingual has less Dutch language input than the monolingual Dutch children, this may not pose a problem to language acquisition of these children since the poverty of stimulus exists anyway in L1 acquisition. What might be going on is that, the bilingual children may be using one language at home to discuss things at home (personal or domestic affairs) and another language at school to discuss things at school (school related matters) as mentioned in the first section. If so, the lack of *breadth* and *depth* of words may only apply to the "home language" or the "hearth vocabulary" in Dutch. However, the test materials used in the experiments discussed above and in many other papers not discussed here, included words from both categories, i.e. school and home domains. Hence, it is not surprising to obtain the type of results found in these studies, namely that bilingual students are generally weaker in word knowledge. In other words, it may be that the lexical capabilities of the bilingual children in the prior experiments were masked by their being tested on Dutch hearth vocabulary, where they had a weakness vis-à-vis the Dutch monolingual child. If we put aside reasons of socio-economical factors, linguistic factors, and poverty of dual stimulus, perhaps it is the words used in home domain tested in Dutch (school language) that pose a problem to these children and they may fair equally well as the monolingual children with words used in the school domain.

3.0 Bilingualism Considerations

Much of the bilingual literature focused on whether there is a critical period for language acquisition, after which optimal performance cannot be achieved. An early effort at understanding the brain-language relationship began with a perspective discussed by Eric Lenneberg, who proposed that "man's capacities for language acquisition change with age" (1969 in Hull 2003). In reviewing clinical studies of language deficits, Lennenberg noted that the majority of cases in which left-hemisphere (LH) lesions caused irreversible language disruption involved post-puberty patients, whereas younger children who suffered LH lesions were often able to recover full language function (Hull, 2003). He further noted that longitudinal studies of linguistic progress of mentally handicapped children and deaf children suggested that language development is arrested after the onset of puberty (Lennenberg, 1969 in Hull 2003). Age-related differences in the functional consequences for language processing after brain damage may reflect the fact that the human cortex and corpus callosum continue to develop in children through the age of five, with the brain becoming increasingly less plastic after that age (Hull and Vaid, 2007).

For this reason, a critical age hypothesis of language acquisition is proposed to be around the age of five. However, the maturational-based differences in the organization of acquisition for L2 vs L1 and bilingualism remain unclear. McLaughlin (1978) for instance, set a distinction at age of three as a cut-off point for simultaneous acquisition of both languages and after the age of three will be a case of successive acquisition. Deuchar and Quay (2000) refer to bilingual acquisition as situations where the child's exposure to both languages begins in the first year of life. In recent neuroimaging studies with brain-intact bilinguals measuring brain activity patterns in early bilinguals (L2 acquired before age of six) showed a high degree of overlap in cortical activation across the two languages, while bilinguals who learn L2 after age of seven showed separate cortical activation (Hull, 2003). Although there may be many differing claims on the age-related considerations, there is however clear differences in processing of L2 words in relation to the age of acquisition of the L2.

Of concern to this paper, young children who learn their L2 (Dutch) at school age (4 year old) is one of the common variables in the Netherlands. They would be considered in this paper as early successive bilinguals. This group of children will eventually develop into proficient bilinguals in later stage of their life. Nonetheless, while reading bilingualism literature, it is essential to recognise that bilinguals are not a homogeneous group. They differ in when and how the second language was acquired, the contexts of use for each language and overall level of proficiency. In the following sections, some theories of how words are activated and the memory organisation of words in the bilingual brain will be discussed, focussing on early successive bilingual children.

3.1 The Time Factor - Bilingual Mental Lexicon

Lexical access is the process of entering the mental lexicon to retrieve information about words. The mental lexicon is like the database containing all words in the mind of the language user. Thus, if a language user is asked to semantically categorize objects represented by words (e.g. the word association task to relate prime words with target words), the word's meaning information must be found from this database before a response can be initiated. Retrieving such information from the mental lexicon takes time. It may take a few hundreds of milliseconds to retrieve a word's meaning information (Dijkstra 2005).

Studies from word activation, found that bilingual speakers pause longer before producing predicted words (Mägiste, 1979). The reason for longer time taken to produce words from one of the languages is suggested by Clyne (1980 in Green 1986) that the effort to avoid interference of the two (or more) languages can be extremely demanding for bilinguals. Since a normal bilingual speaker can elect to speak one language rather than another, it might be thought that this is achieved by completely deactivating the non-selected language (Green, 1986). This means that, where bilingual wishes to speak one language only, lexicon of this language must be selected and the output from the other language is inhibited. Green (1986) states that words possess particular 'tags' where a tag can be thought of as a feature label association with each individual item. He feels that since a bilingual can

speak one or other language and can translate from one to the other, or switch between them, there must be a device that specifies how the language system must be controlled if a person is to act in one or other of these ways. In view of this, extra processing effort is needed for a bilingual when retrieving words from the mental lexicon, thus extra time needed for comprehending and producing words.

3.2 The Time Factor - Bilingual Memory

Apart from brain maturation considerations, one may also expect differences between bilinguals on the basis of possible differences in cognitive architecture or processing strategy associated with bilingualism. It has been suggested that the strategies for lexical and conceptual representations within bilinguals are different to that of a monolingual (Hull 2003). Research on early bilingual children who acquire both languages early in life and in similar learning environments, shows that they develop *autonomous* memory representations for the two languages (Paradis and Genesee 1996). According to this perspective, each language of a bilingual child should develop similarly to the same languages in monolingual children. However, this does not seem to be the case of the bilingual children stated in the studies in section 2. Conversely, the *interdependent* view seems more plausible. The *interdependent* memory view posits a single underlying conceptual system that subserves both languages and in which each language influences the other (Hull, 2003). This condition would give rise to language development in early bilinguals that is qualitatively different from the development of either language in monolinguals (Hull, 2003). Hence, this may be a reason why the Turkish students did badly for both their L1 and L2 since, a second language (or additional language) may provide additional paths for retrieval of information from their memory.

If the two (or more) language systems are interdependent, there may also be conditions in which the bilingual is at a disadvantage (Ransdell and Fischler 1987). Some studies comparing bilinguals and monolinguals in the monolingual's language show that bilinguals are at a disadvantage. The demonstrations of this disadvantage in these studies include phonemes detection (Blair and Harris 1981 in Ransdell and Fischler 1987), speed of rejection of non-words (Soares and Grosjean 1984 in

Ransdell and Fischler 1987), and classification of multidimensional arrays of forms (Kiljkovitch 1980 in Ransdell and Fischler 1987). For example, one such study by Mägiste (1979) reported that the latency of response in a variety of memory tasks was slower for bilinguals than for monolinguals, even after the point at which the bilingual's dominant language was the test language (Swedish). In lexical task, this result could be due to the cross-language semantic priming if memory of two languages is interdependent, i.e. the interference of L1 to L2 or vice versa (Ransdell and Fischler 1987). So in order to understand to what degree is the semantic representation from one of the languages is shared with the other to allow cross-language semantic priming, the next section will look at what are the predictions from the models of bilingual memory.

3.2.1 Bilingual Memory - Word Recognition and Lexical Access

The most influential model in bilingual memory, the revised hierarchical model by Kroll and Stewart (1994) assumes that, in the initial stages of L2 learning, learners have access to the semantic system via their L1. Only when the learners have a high degree of proficiency is there direct semantic processing from L2 (Silverberg and Samuel, 2004). In other words, in this model there is an early dependence on L1 to mediate access to meaning for L2 words. This however, does not seem to be fully the case for childhood bilingualism. Children at the age of four are still at the early development stage of their L1 when they are exposed to L2 at school age.

Another highly influential model in the literature on bilingual memory is the Bilingual Interactive Activation (BIA) model with the present extension to the initial model to deal with semantics: the BIA+ model (Dijkstra and van Heuven, 2002). In the BIA+ model, the process of bilingual word recognition can be affected by linguistic context. The idea is that when sublexical/lexical orthographic representations become active, they start to activate semantic representations. Hence, semantic representations of both languages are activated during word reading (Silverberg and Samuel, 2004). If this is true, like what Green (1986) suggests, when words from both languages are activated, an inhibitory system is required in order to suppress the non target language

upon production as this model predicts the existence of automatic semantic priming across all languages. In other words, it may also imply a shared semantic representation in the bilingual memory.

In order to test this, a semantic priming experiment was carried out by Silverberg and Samuel (2004). They adopted the architecture of monolingual word recognition as a starting point from the interactive activation framework which posits three levels of word representation (shown in figure 4 below). Words are represented at the lexical level, with their meanings represented above them at the conceptual level, and their constituents (letters for printed words and phonemes for spoken ones) represented below them at an orthographic/phonological level. In the interactive models, activation of a unit at one level increases the activation of units above or below it that are consistent with it. The result of their test for organisation of the word recognition system for early and late proficient L2 learners is shown in Figure 4.

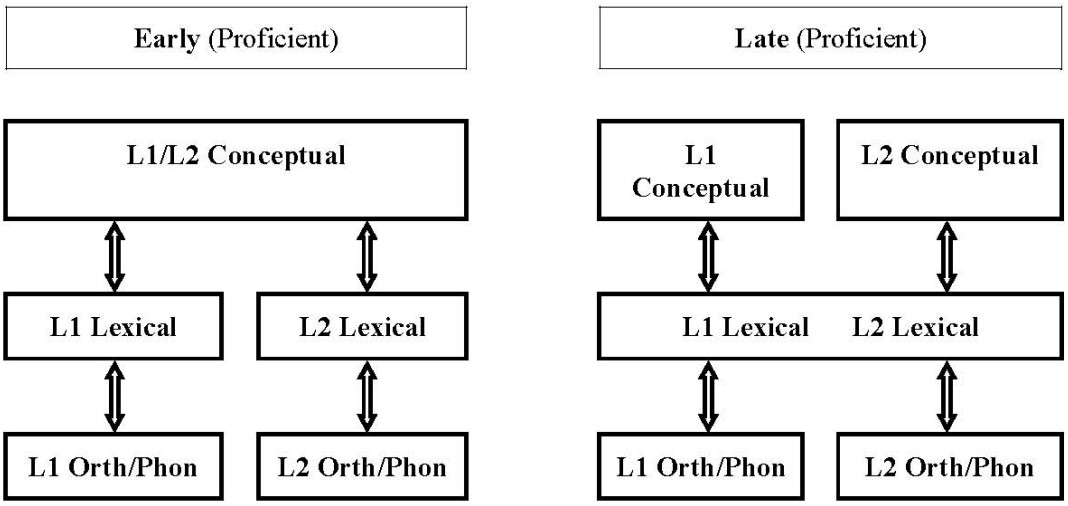


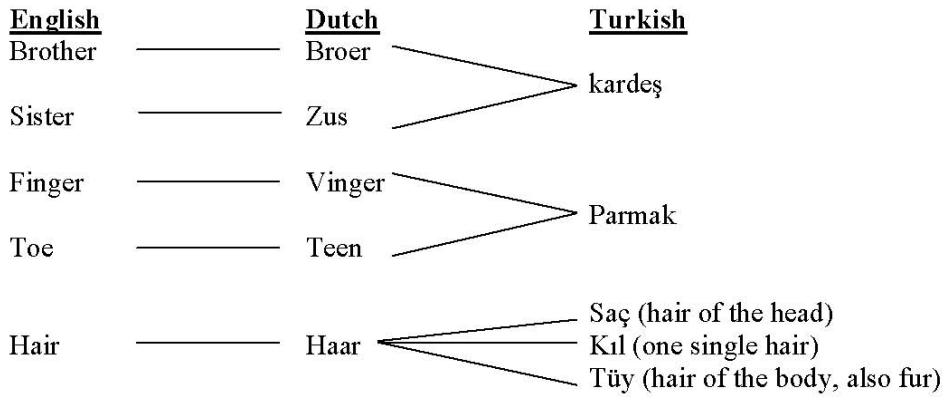
Figure 4: Hypothesized organization of the word recognition systems for Early and Late Proficient L2 Learners (Silverberg and Samuel, 2004).

For Silverberg and Samuel (2004) the cut off age of early bilingualism is at the age of seven. In Silverberg and Samuel's model, the immigrants in the Netherlands, learning Dutch at school age, would fall under early bilinguals. In their conclusion, for early bilinguals, an L2 semantic prime should activate representations in the shared conceptual level that are in common with its related L1 words. However, if the conceptual level is shared for both L1 and L2, this may also mean, not only

that the children need to put in extra effort in suppressing the non target language while producing the target language, they may also be confusion at the early stage of language acquisition since there are not always straightforward cognates between languages. Hence, they may need a longer time to search for words that match with the concepts in their head. The implication of a shared conceptual knowledge shall be discussed in the next section.

3.2.2 Implication of Shared Conceptual Knowledge

L1 lexical conceptual knowledge has a massive influence on how the learner structure connections between words in an L2. There is in fact no logical reason to believe that learners relinquish their knowledge of this structure (from their L1) when they initially approach an L2. Furthermore, it seems highly unlikely that they begin structuring L2 lexical knowledge from scratch when presented with new L2 lexical items. This L1 lexical conceptual structure is useful for building L2 lexical network. But it will also sometimes provide learners with misinformation. We know that between different languages, there are a lot of so called '*false friends*'. There may not be an exact cognate for many words between different languages. Even within one language, certain words consist of various meanings and of different concepts. For example,



The above list of words is not exhaustive. Therefore, if a word like the Dutch *haar* is used in the experimental task, the L1 Turkish participants may need longer processing time to determine if it is the hair on the head or one strand of hair. Another example is the meaning attached to the word *long*

which has a different sense to Dutch in comparison to English. In Dutch, you describe a *tall* man as a *long* man. Similarly the Japanese describes a big spacious room as a *wide* room.

So with these differences existing across-languages, young bilingual children may need extra processes even at the initial labelling of the word since many words in two languages do not have completely overlapping meanings or semantic contents, while some words of both languages have partially shared meaning and concept. As a result, this leads to them having a different sensitivity towards semantic relations of words. So far, all the proposed theories of the architecture of conceptual knowledge did not account for the aspects of activation/inhibitory process in order to make distinction between the different concepts between languages in the bilinguals. Perhaps the reason why studies found weaker breadth and depth of word knowledge in bilingual children is simply due to the fact that they have more than one language stored up in the brain. Furthermore, children who acquire a second language at the age of 4 or 5 are categorized as successive bilingual. Studies have found that they (successive bilinguals) have a different cognitive organisation and memory access mode due to the fact that they have a different language experience to that of the monolinguals, before the critical age of language acquisition (Wolter, 2006; Nassaji, 2006; Moreno et al, 2008; Paradis, 2008; Saiegh-Haddad, 2003; Ransdell and Fischler, 1987).

As mentioned, the lack of breadth and depth of words for the bilingual children may only apply to the "hearth language" in Dutch. In addition to what Green (1986) has suggested, selection and suppression tasks are require for bilinguals to make the relevant outputs, other factors such as the memory organisation of bilingual, has shown to be different between the bilingual's and monolingual's brain. These result in developmental differences in terms of time factor and in sensitivity to semantic relations among monolingual and bilingual speakers. Since bilingual children speak a different language than Dutch at home, when presented with a word normally spoken in their home language in L2 (Dutch), semantic priming (conceptual stage) between their L1 and L2 competes with one another and an additional inhibitory process is necessary to suppress their L1. In other words, when they are presented in L2 with words normally spoken or heard in their L1 (home words) their

response time will be slower in comparison to when they are presented with words normally spoken in L2 (school words). As the difference in responding to words of the two different categories may be very subtle, an online experiment to measure the response time (RT) may detect such nuance.

4.0 The Experiment

In order to test the hypotheses, a pilot project was carried out using the single presentation Word Association Task (WAT). To control for the different groups of participants, a Mental Rotation Task (MRT) which relies on working memory processes, including processing speed is used to control for IQ between the target (bilingual) and control (monolingual) groups. This was used to rule out the possibility that any observed group differences are due to IQ rather than lexical development. In this section, the experimental design and how the test materials for the pilot project will be described in three parts. First, the purpose and function of a questionnaire used before the test shall be explained. Then the details of the MRT and finally the WAT will be given.

4.1 The Questionnaire

A short questionnaire was first filled in by every individual participant in the study. The content of the questionnaire is shown in Appendix A. One of the main purposes for this was to help to identify the participants' home language or languages used. Another goal was to obtain some information on their home "reading culture". Most studies of bilingual Dutch children argue that their socio-economical status is the best predictor for educational success (Verhoeven, 2000; Verhoeven and Vermeer, 2005; van der Slik et al, 2006), and the main reason for this is that children with lower socio-economical background read less at home and have less exposure to literary, which could assist them in their literacy skill, hence school success. Thus, the questionnaire also acts to rule out if there is a possible effect on reading culture. It provides a way of determining that both control and experimental groups have similar reading habits at home.

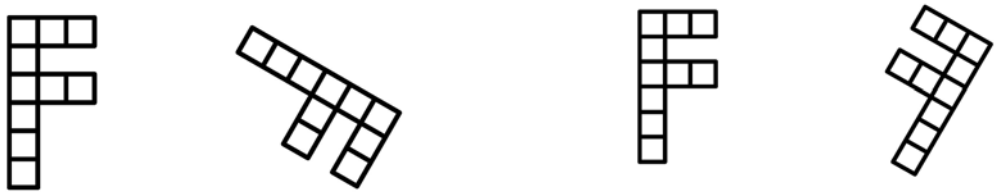
4.2 MRT

Measures of working memory (WM) capacity have been repeatedly shown to be excellent predictors of IQ as measured by standard IQ tests. It has been demonstrated that WM and IQ are highly related because they share capacity limits (Ackerman et al 2002; 2005; Colom et al 2004; 2005; 2008; Colom and Shih 2004; Conway et al 2002; Kane et al 2004; Kyllonen and Christal 1990; Miyake et al 2001; Stauffer et al 1996; Engle et al 1999). According to Colom et al. (2008), these limits restrict both the amount of information that can be temporarily retained in the short-term memory and the ability to update relevant information. Both mechanisms rely on discrete brain regions belonging to frontal and parietal areas (Colom et al 2008). Thus, both anatomically and functionally, what IQ seems to be is simply WM capacity. In addition, in a study to determine what type of WM function is the best predictor for intelligence, Johnson and Bouchard (2005) argue that spatial image rotation ability is highly relevant to the overall structure of human intellect. Hence, many behavioural tasks involving WM functions, in particular, the Mental Rotation Task (MRT), are used to test general intelligence.

MRT is a cognitive task that involves mental simulation. In the MRT, the participants have to decide whether the two shapes, presented in various orientations, are identical or mirror images as illustrated in Figure 7.

Figure 7

Identical **Mirror-Imaged**



The results of psychological studies reveal that the response time (RT) of participants increases with an increase in the angle of rotation between the shapes (Shepard and Metzler 1971). The result implies the existence of mental analogue processes of imagining rotation of visual stimuli as mental simulation during these tasks (Shepard and Metzler 1971). It usually takes place in the right cerebral hemisphere,

in the areas where perception also occurs, and is associated with the rate of spatial processing and general intelligence (Johnsosn 1990; Jones and Anuza 1982; Hertzog and Rypma 1991; Pellizzer and Georgopoulos 1993). According to Johnson (1990), MRT can be separated into the following cognitive stages.

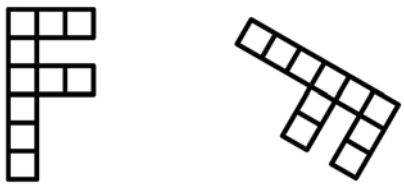
1. Create a mental image of an object
2. Rotate the object mentally until a comparison can be made
3. Make the comparison
4. Decide if the objects are the same or not
5. Report the decision

The mental rotation of visual objects can be studied with a variety of figures. In this study, two dimensional stimuli (letters and cubical polygons) and three dimensional cubical blocks similar to Shepard and Metzler's (1971) cubes were used. There are in total 9 sets of stimuli used as practice items and 18 sets as test items. The next section describes these visual images designed for the test.

4.2.1 The Materials

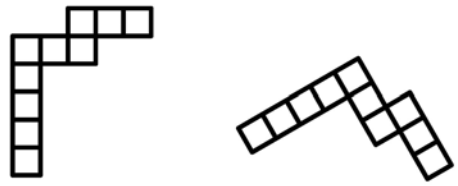
There are three types of figures used in the pilot project. The first type (A) is the two dimensional stimuli alphabet, the letter 'F' shown in Figure 8, (also in appendix D Type A).

Figure 8 - *Type A*



The second type (B) is the two dimensional stimuli shapes made up by cubes shown in Figure 9 (also in appendix D Type B).

Figure 9 - *Type B*



The last type (C) is the three dimensional stimuli shapes made up by cubes shown in Figure 10 (also in appendix D Type C).

Figure 10 - *Type C*

There are 6 sets of each stimulus type (A, B and C), therefore in total 18 sets of test stimulus. Out of the 6 sets of each type, 3 sets are identical and 3 sets are mirror images. In other words, there is a balance of 3 ‘yes’ and 3 ‘no’ answers for each type.

4.2.2 The Procedure

Preceding the MRT, all participants first answer the questions of the questionnaire mentioned in section 4.1. Then the experimenter explained the concept of ‘identical’ and ‘mirror-imaged’ with physical blocks that look similar to the digital stimuli. The experimenter rotated the physical blocks in different angles in both ‘identical’ (*zelfde*) and ‘mirror-imaged’ (*spiegelbeeld*) forms and asked the participants to answer if they are ‘identical’ or ‘mirror-imaged’. To make sure that they understand the task, this procedure was repeated several times until the participants grasped the concept.

After the explanation, participants first of all answer 9 practice items on the laptop. On the laptop screen, two figures appeared side-by-side as shown in Figure 11.

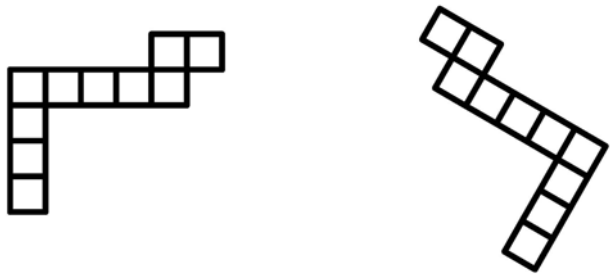


Figure 11

Participants were asked to press, the '*Yes*' button on the button box using their dominant hand, if they thought that the two figures shown was 'identical', and press '*No*' if they thought the two figures are mirror-imaged. The figures stay on the screen until participants have made their choices by pressing the button. Then the second set of figures appears. After the practice items, they proceeded to the actual MRT, which consisted of 18 sets of figures. All instructions at the test itself were given in Dutch and in a quiet room provided by the school.

4.3 WAT

Semantic priming refers to the facilitated processing of a probe word (*target* word) when preceded by a related *prime* word. Since the well-known pioneering study of Meyer and Schvaneveldt (1971), a large number of studies have shown that a target word (e.g. Nurse) is responded to more rapidly and accurately when it is preceded by a prime word that is semantically related word (e.g. doctor) than when it is preceded by an unrelated word (e.g. football). Hence, it is a widely used technique for investigating word knowledge. In this experiment, the single presentation lexical decision paradigm, the Word Association Task (WAT), was adopted. For the purpose of this study, the RT was measured and compared between the words (nouns) used in the school and home domains. The following section explains the material and procedure of the task.

4.3.1 The Material

Nouns and proper names were used since young children are more likely to produce and recognise nouns than the more abstract verbs, which are relatively more complex. In order to find out a list of

different words used at home and in school, a small scale survey was first carried out with a group of 28 adults. A questionnaire (Appendix B) was given to the participants to identify the most frequent nouns used and heard in the two different areas. Only 5 items out of the list of most frequent words according to each domain were selected, hence in total there were 10 test items. Table 1 shows the 10 most frequent words from the response of the survey.

Table 1:

School Words	**Home Words**
1. Krijt	1. Bed
2. Schrift	2. Keuken
3. Schoolplein	3. Tuin
4. Potlood	4. Kat
5. Meester	5. Woonkamer

There were also a few words which appeared frequently in both categories from the response of the participants. These words weree selected as practice items and control items. The number of control items was the same as the number of test items, while there were 4 practice items. Hence in total there were 24 items for the entire test (10 test items, 10 control items and 4 practice items)

The bilingual children's semantic processing time was tested with an on-line lexical decision task run on an experimental laptop. The language used in the experiment was fully in Dutch. The pair of related or unrelated words was shown in the following order: Firstly, the prime words were shown on the laptop screen for 1 second. Then it disappeared after which a second word (the target word) appeared. The participant were instructed to press either the *yes* button if they thought that the second word "goes together" (*bij elkaar passen of samen gaan*) with the first word or the *no* button if they thought it did not.

In order to find out how school children normally associate words, a small scale test was run in a primary school with 2 classes of 31 students in total, between the ages of 7 to 10 years old to determine the related target words. This test (Appendix C) was done all in Dutch to avoid interference. This helps to determine the more accurate answers for the target test items from the frequency of the answers given by the participants. The result of the test is as follows shown in Table 2.

Table 2		
Test items	**Associated words given by children between 7 to 10 years of age (Appendix B)**	**Frequency (out of 31 participants)**
1. Krijt	Schoolbord	28
2. Schrift	Pen	14
3. Schoolplein	Spelletjes	21
4. Potlood	Gum	21
5. Meester	Juf	12
6. Bed	Deken	25
7. Keuken	Afwas	26
8. Tuin	Bloemen	18
9. Kat	Huisdier	7
10a. Woonkamer	Televisie	14
10b. Woonkamer	Gordijn (second choice)	6

For item 10a above, the noun *televisie*, answer for *Woonkamer*, is a word which appeared in both school and home categories. Children watch television programmes at home as well as in the school. Therefore, the second most frequent answer, *gordijn* was chosen to replace *televisie*. However, in terms of frequency, *gordijn* is not very closely associated with *Woonkamer* according to the children. Similarly, for item number 9, *Kat* versus *Huisdier* is also a pair which has a low frequency in association by the children. Nonetheless, these items were all used in the pilot project. The problems and implications of choosing these words will be discussed in the Problems and Recommendations in section 5.0.

In this experiment, the types of semantic relation, i.e. if they are associated by superordinates or by functional relationship, is not the main focus. The answers for the 10 test items will all be *yes* while the control items will counterbalance with 10 *no* answers (e.g. Tas versus Boom or Fiets versus Theedoek). Therefore the entire list of prime and target words (including both test and control items) contains an equal number of related and unrelated pair, fully counterbalanced across conditions. They were all appeared at random order on the experimental laptop.

The final list of the pair of items (prime and target) is shown in table 3.

Table 3								
(I) Practice items			**(II) Test items**			**(III) Control items**		
(A) Prime	**(B) Target**	**(C) Answer**	**(A) Prime**	**(B) Target**	**(C) Answer**	**(A) Prime**	**(B) Target**	**(C) Answer**
Tafel	Stoel	Yes	Krijt	Schoolbord	Yes	Fiets	Theedoek	No
Bal	Liniaal	No	Schrift	Pennen	Yes	Tas	Boom	No
Man	Vrouw	Yes	Schoolplein	Spelletjes	Yes	Boek	Kleding	No
Auto	Muur	No	Potlood	Gum	Yes	Botterham	Raam	No
			Meester	Juffrouw	Yes	Huiswerk	Schoenen	No
			Bed	Deken	Yes	Zandbak	Oven	No
			Keuken	Afwas	Yes	Bank	Pan	No
			Tuin	Bloemen	Yes	Trap	Vis	No
			Kat	Huisdier	Yes	Koekje	Bos	No
			Woonkamer	Gordijn	Yes	Kleurboek	Gang	No

The (B) Target column in (II) Test Items includes words from both school and home domains are of interest to this experiment. The total number of word syllables in each category is also taken into consideration. This is to avoid the effect on RT due to longer words. In order to match with the same number of syllables in both categories, some changes were made to the initial list, for example, *pen* is changed to *pennen*, the plural form, and *Juf* is changed to *Juffrouw*. Consequently, the list of words in Target (B) of Test Items (II) has 10 syllables in total, for words in both school and home domains.

4.3.2 The Procedure

Each child was tested individually in a quiet room in their school, right after administration of the MRT. They were told what to do in a short explanation with all instructions in Dutch. In order to make sure that the participants understood the task, they were asked to produce by themselves 2 words that do not go together and 2 that do.

All the words were first digitized onto a portable laptop. A response was made by the participants to every pair of items by pressing either the ‘yes’ or ‘no’ button using the dominant hand. First, the prime word appeared on the screen for 1 second. It then disappeared and after which a small cross appeared on the screen for 0.75 second to indicate where the participants should stay focus. Then the target word appeared. It stayed on the screen until the participants made their decision by pressing

the button. This means that there was a short interval of 0.75 seconds between the prime and the target words. The RT was measured from the onset of the appearance of the second word (target word) on the screen till they pressed the yes/no button. Four practice items preceded the actual test to make sure that the children understood what they were supposed to do. The test items from both categories and the control items were all randomised by the programme. At the end of the experiment, the RT of the 5 words from the school domain was compared with that of the 5 words from the home domain. The right and wrong answers of participants were taken into consideration as well. If a participant had less than 80% correct response, he or she was excluded from the study.

4.4 The Participants

This pilot project was carried out in 5 different public primary schools in 3 different cities in the Netherlands. In total 30 monolingual Dutch children and 60 bilingual Dutch children (of various backgrounds) were tested. Among the monolingual Dutch children, one of them was excluded from the data analysis because, his step-mother, who he was living with then, was a German. Thus the sample consisted of 29 monolinguals, 14 boys and 15 girls. Matched by gender, age (approximately) and IQ (MRT scores), 14 boys and 15 girls were selected from the bilingual sample. In addition to matching gender between groups, the date of birth of the participants was also taken into consideration. Each monolingual child was paired with a bilingual child of the same year of birth, with birth dates no further apart than 4 months. The children were all between the ages of 8 to 11 years at the time of test. The results (response time) of the MRT and the Reading Culture scores were also used to match subjects. In total there were 58 participants, with an average age of 10.5 years. Appendix E shows the date of birth of each pair (monolingual vs bilingual) of participants. Table 4 summarizes details of their MRT scores between-subjects.

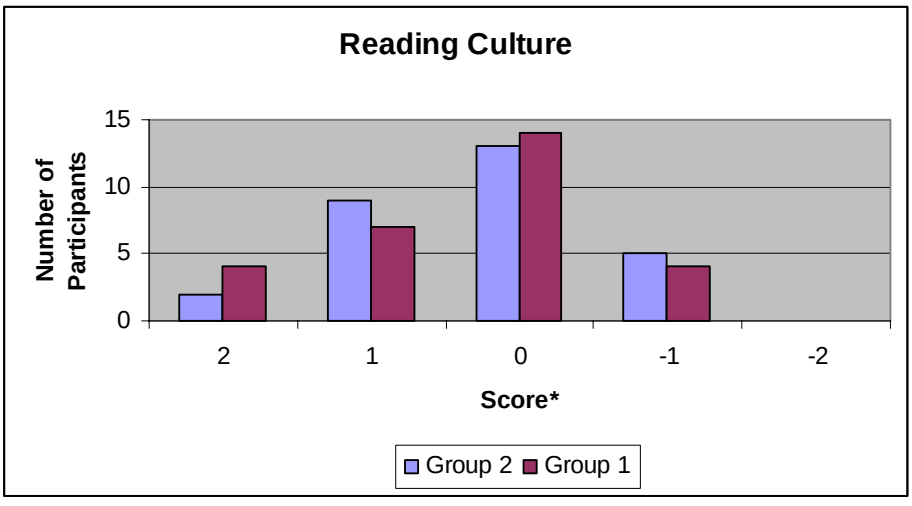
	N	Mean (msec)	SD
Group 1*	522	4532.19	2959.440
Group 2*	522	4561.58	2280.401
Total	1044	4546.89	2640.602

Table 4 - *Group 1 = Monolingual, Group 2 = Bilingual

The standard deviation of the MRT within the group of bilingual children is less than that of the monolingual children. A one-way ANOVA with RT as dependent variable and group (monolingual and bilingual) as independent variable shows no significant difference with the MRT scores between-groups of $F(1,1043) = 0.032$, $p<0.857$.

The summary of the Reading Culture scale is shown in the chart below. More than 50% of the participants in both groups fall into the scale of 0 (i.e. niet veel/niet weinig). And none falls under the scale of -2 (i.e. Heel weinig). There is also no significant difference in reading culture between the two groups (Chart 1).

Chart 1: Reading Culture



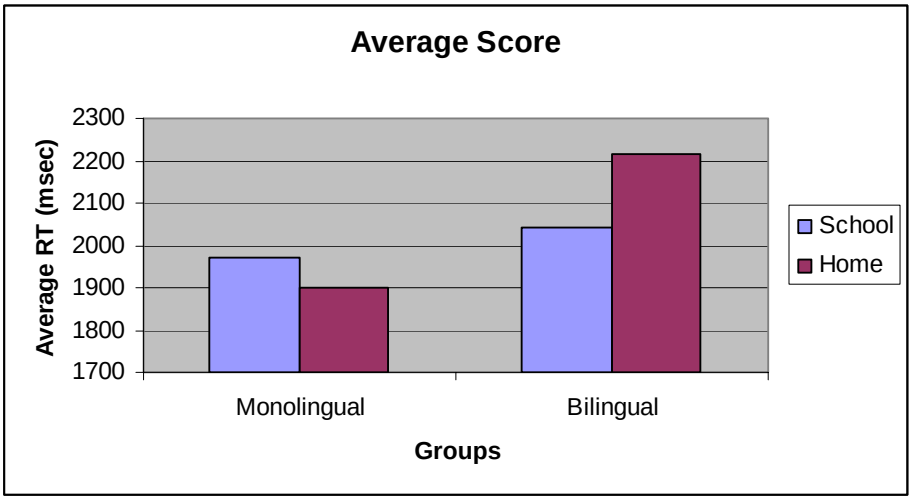
Group 1 = Monolingual, Group 2 = Bilingual
*Score: 2=Heel veel, 1=Veel, 0 = Niet veel/niet weinig, -1=weinig, -2=Heel weinig

It is important to note that the bilingual group was linguistically heterogeneous. It consisted of children with various other home languages, including Turkish, Berbers, Arabic, Cantonese, Mandarin, Vietnamese, and Somali. Implications of this will be discussed in the Problems and Recommendations in section 5.0. Nonetheless, for this project, the most crucial inclusion factor is that they must speak a different language other than Dutch at home. However, the frequency and degree to which these languages were spoken at home may also have varied considerably across individuals. Many children have older siblings who speak Dutch to them at home as well. In order to address the research questions, the result of the RT of WAT, between the monolingual and the bilingual group and within the bilingual group will be presented in the next section.

4.5 The Result

The data is taken from 58 participants (29 from each group) who were presented with 10 test items, out of the 10 items, 5 belong to the *school* domain and 5 belong to the *home* domain. 100% of the participants completed all the practice and test items. All of them scored at least 80% correct answers (i.e. at least 8 out of 10 are correct). Chart 2 shows the overall result of all the participants of all the test items.

Chart 2



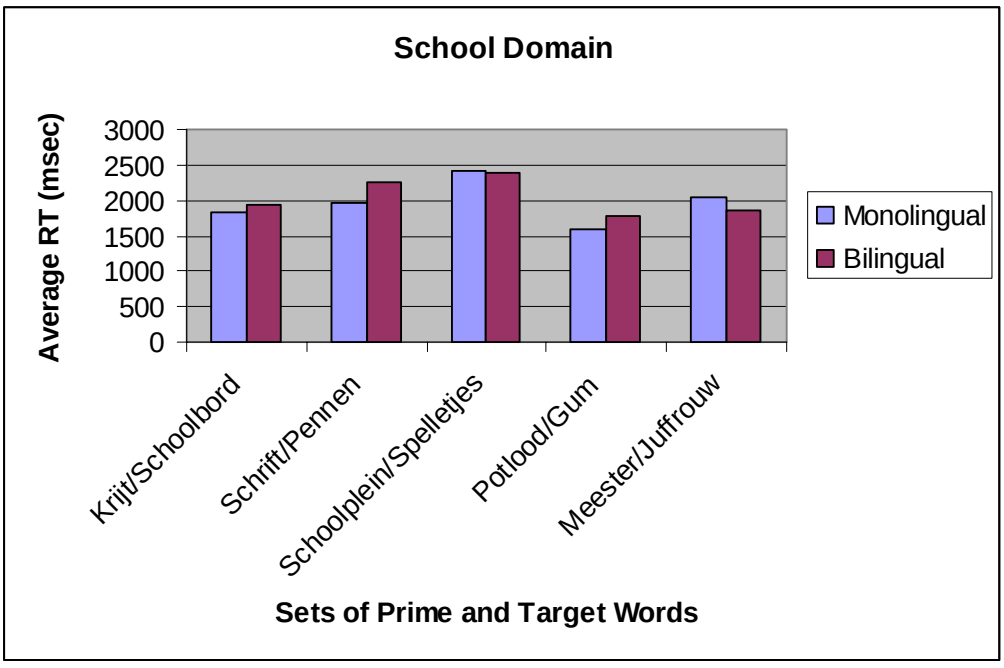
On the average, the bilingual children took a longer time than the monolingual children with words from both domains. It is important to be cautious when interpreting these data as the number of participants is relatively small in this pilot project.

In order to address the second research question - Do bilingual children respond equally as native children to words in the school domain when tested in the school language - an analysis using a univariate analysis of variance with the RT as dependent variable and the Group (monolingual and Bilingual) and Domain (School and Home) as independent variables was used. This showed that there was no interaction between the groups. Between groups, there was a noteworthy contrast but it did not quite reach significance of $F(1,579) = 3.676$, $p<0.056$. Thus, the hypothesis correctly predicted that both monolingual and bilingual children would fare equally well, in terms of time, with words belonging to the school domain.

Chart 3 gives a pictorial idea of the average RT between groups responding to words from the school domain.

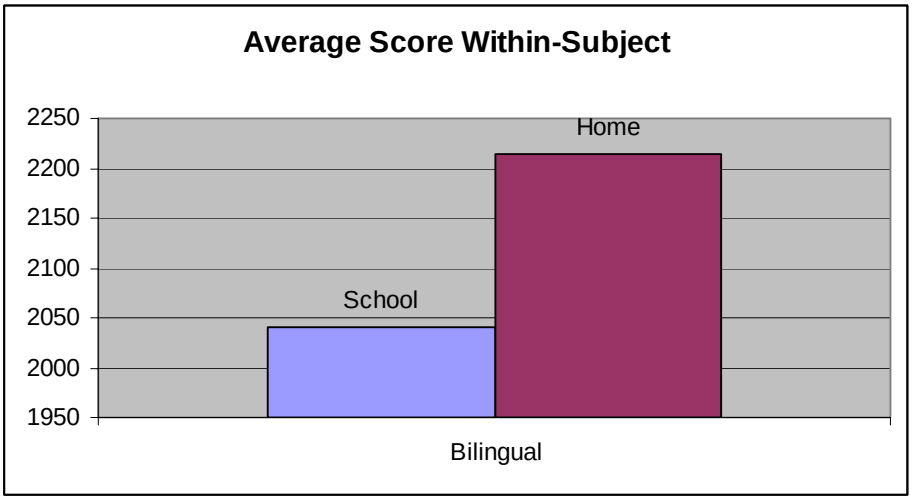
Chart 3

Words from the School Domain



As for the first research question - Do bilingual children respond slower to words used in the home domain than those used in school domain when tested in the school language – Chart 4 gives an overview of the average RT between the two domains within-subject.

Chart 4



The bilingual children did take a longer time to respond to Dutch words from the home domain than to the Dutch words from the school domain, however, the within-group statistical analysis shows no significance group contrast of $F(1,288) = 2.070$, $p < 0.151$. There was also no significant difference between the performance of boys and girls. In addition, the overall test of between domains analysis (total participants including both monolingual and bilingual children) appears to have no significance of $F(1,579) = 0.279$, $p<0.597$ as well.

During the experiment, however, some problems with the *prime* and *target* words were detected. Many children (both monolingual and bilingual) seemed to be unfamiliar to two particular sets of *prime* and *target*. The first pair is the prime *woonkamer* (living room) and target *gordijn* (curtain). The total average time taken for all the test items (n = 580) was 2031.74msec. However, for this particular pair of words, participants took a longer time of 2456 msec and 20% of them gave the wrong answer. They thought that the two words, *woonkamer* and *gordijn* were not related. A reason for this could be that there are different varieties in window decoration today, such as curtains, rollers and blinds. As a result, in many homes, window rollers and blinds are installed instead of curtains. The

young children therefore might not be familiar with having curtains at home, hence in their perception the words *living room* with *curtain* are not related. On top of that *gordijn*, as mentioned in section 4.2.1 is in fact the second choice from the answers given by the children during the initial word association survey. Most children relate *woonkamer* to *televisie* (television). However, *Televisie* was not chosen as a target word for the test because it appeared in the list of words in both school and home domains, hence *gordijn* was selected instead. But only 6 (19.4%) out of 31 participants in the survey think that they are related while 14 (45.2%) out of 31 participants think that *televisie* was a better choice. Hence this pair of words may not be that suitable for use as the test item. Some suggestions will be given in the section Problems and Recommendations.

The second pair is the prime *schoolplein* (school yard) and target *spelletjes* (games). Like the previous pair, the average time taken for this is also longer than the average of all the test items. On the average, for this particular pair, children took 2400.4 msec (c.f. total average of 2031.74 msec) to decide for the answer and 46% of them got it wrong. This could be explained that the word *spelletjes* is translated as board games for some children, but to others, it means any kind of games like running around in the yard, skipping rope, etc. or simply as a hyponym of all the games. Therefore due the ambiguity of the meaning, children needed a longer time to decide whether or not *schoolplein* is related to *spelletjes*. And due to the ambiguity of the meaning, many of them think that *board game* is not related to *schoolyard*. Therefore this pair of prime and target words is also not suitable for the test.

As a result of this ambiguity and unfamiliarity of the two sets of test items used, the result of the experiment may be affected by them. Especially the average RT is very much increased by these pairs. Though there is another pair of words, *Kat* (cat) vs. *Huisdier* (pet), which children also took a longer time than the average time taken, but all of them gave the right answer. Hence another analysis was done by removing just the two pairs of problematic test items (*woonkamer* vs, *gordijn* and *schoolplein* vs. *spelletjes*), and the result is as follows. After removing the 2 pairs of items, the results still show no significant effect between RT of the two domains and groups, with the between groups of $F(1,464) = 2.638$, $p<0.105$ and between domains of $F(1, 464) = 0.251$, $p<0.616$.

In summary, the answer to the first research question, within the bilingual group based on the hypothesis that words from different domains do make a difference in RT is not affirmative. That is to say, contrary to the expectation, the words from the two different domains do not affect the RT significantly for the bilingual children. However, the answer to the second research question, between groups based on the hypothesis that both groups perform equally in terms of RT to the words from the school domain is positive. There was no significant difference between the monolingual and bilingual children when responding to words from the school domain, tested in the school language.

4.6 Discussion

This study examined the relationship between RT and word domains of monolingual and bilingual children. It found no significant effect at all with regards to the differences between both the monolingual and bilingual groups or between school and home words. This means that: i) both monolingual and bilingual children at the average age of 10.5 years reacted equally fast or slow to words belonging to both school and home categories; and ii) there is no significant difference between the RT of words in the home category and that in the school category amongst the children. The results indicate that words which are argued to be often used at home in their L1, do not affect the respond time of the bilingual children when tested in their L2.

However, these findings do not add to or confirm any differences between the two groups of children. Unlike what most studies show, children whether monolingual or bilingual appear to respond to words in the same manner and speed in this study. The bilingual children were not significantly slower than the monolingual children even though they had more than one language stored in their mental lexicon. Although the results did show that bilingual children, in total, had a longer RT than the monolingual group in both domains, nonetheless, the statistical analysis showed these differences were not significant. Bilingual children did respond slower to home words than school words. However, again, the statistical analysis showed no significant here either.

Another finding of this study concerns claims that, due to the fact that there is more than one language stored in the mental lexicon of bilinguals, more cognitive processes are necessary before they eventually provide at their responses. According to the analysis of this research, there is no significant difference between monolinguals' and bilinguals' processing speed. Perhaps the mental lexicon is just one big conceptual storage system in both monolinguals and bilinguals, in other words, young children may not think with words but rather with concepts. Overall, the above findings seem to support the view that bilingual children perform the same as monolingual children with words often used in school and tested in the same school language.

An important question arising from these findings is whether there really is any difference between bilingual and monolingual in language processing speed even though the bilinguals have two or more words in their lexicon that compete with each other.

5.0 Problems and Recommendations for Future Research

Some problems with the setup and design of the experiment that may affect the accuracy of the results are discussed in this section, along with possible recommendations for improvements in methodology.

First, as mentioned in section 4.3, all the participants of the bilingual group were from various language backgrounds. As this was just a small-scale pilot project, only a small sample size was tested. As a result, it was not possible to categorize the bilingual children further into individual linguistic groups like the Turkish, Moroccans, and so on. Thus, the study did not control for differences within the bilingual group but rather treated this group as a whole. A larger scale test with a larger sample size or one concentrating on only one language would remedy this problem.

Second, though many children reported that they spoke another language other than Dutch at home, many said they also speak Dutch among their siblings, suggesting that, for these children, there was a lot of code switching and mixing in their home situation. It is not certain if they use or know in their L1 with the list of hearth words presented in the test. A short questionnaire asking children to translate the list of hearth words into their L1 would help control for the possible confound. This could

help to verify if they do have the vocabulary of the hearth words used in the test in both languages. What that is needed is an independent measure of proficiency in the home language, for example, the standard Turkish language proficiency test mentioned by Verhallen and Schoonen (1988) in section 2.2. By comparing the result with the monolingual Turkish children, proficiency level in Turkish, of the bilingual Dutch children can be determined.

Thirdly, the number of practice items for both MRT and WAT needs to be increased. Some children need a longer and clearer explanation of the tasks. Therefore the number of practice items need to be increased to make sure that they totally understand what they are supposed to do. Also, the 3-dimensional block (type C) of the MRT seemed too difficult for the younger children. Therefore in future test, the number of type A and B can be increased while type C can be omitted.

Finally, the list of school and hearth words needs to be re-determined. As the initial word frequency and relation survey was a relatively small survey, some words from the list of words used in the experiment are ambiguous to the children. That was the reason why children took a longer time and gave wrong answers. Another suggestion for the pair of prime word *woonkamer* and target word *gordijn* is that they can be swapped around, i.e. prime *gordijn* and target *woonkamer* to eliminate the ambiguity. However, the best way to deal with this is to carry out a bigger scale survey with children instead of with adults. It is more accurate if we ask children to name words they use at home and in school. On top of that, many children commented that they did know all the words used as *home domain* in this experiment at their *poppenhoek* (dolls corner) in school. As *poppenhoek* is where children play with toys, sometimes domestic toys like pots and pans. Hence clearer instructions in the survey need to be given to the participants to list down only words that they use at home but not in school and vice versa.

6.0 Conclusion

In conclusion, the finding for the first research question is not affirmed while the findings for the second research question yields true. Bilingual children did not take a longer or shorter time to

respond to words from different domains. And they performed as well as the monolingual children with words from the school domain. Due to the fact that this is just a small-scale pilot project, the result therefore cannot be generalisable. A bigger scale test is necessary in order to obtain a more accurate result.

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Appendix A

Questionnaire

Participant's name:		Datum:	
Birth date:	_____-_____-_____	Gender:	F / M
Handedness:	Left / Right	Grade:	5 / 7

Checklist:

1. Heb je broers of zussen? (If *yes*, go to 2. If *no*, go to 3)
2. Hoeveel broers en zussen heb je? En hoe oud zijn ze? (age of each sibling)
3. Welke talen spreken jullie thuis? [If they only answer one, prompt for Any other languages besides this? (list the language or languages)]
4. Tegen wie spreek je XXX thuis? (If more than 1 language is given, repeat the question for each language). e.g Dutch to sister, Turkish and Turkish to mum and Turkish to dad.
5. Lazen je ouders vroeger, toen je nog zo klein was dat je nog niet naar school ging, verhalen voor?
6. Hoeveel boeken lees je ieder jaar voor je plezier en niet voor school?
7. Leest je vader thuis vaak boeken of de krant of kijkt hij vaak tv? / moeder
8. Hoeveel lezen jullie thuis? Lezen jullie weinig of veel? Als dit weinig is en dit veel, hoeveel lezen jullie dan?

Appendix B

In English
Write down a list of **7 Simple Dutch Nouns (Non Loan words)** that is most likely to be used or heard in **school** when you were younger.
e.g. Blackboard, history, etc.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Write a list of **7 Simple Dutch Nouns (Non loan words)** that is most likely to be used or heard at **home** when you were younger.
e.g. Dog, Salt, etc.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Appendix B
In Dutch
Maak een lijst van **7 eenvoudige Nederlandse zelfstandig naamwoorden** (**geen leen-woorden**, zoals bijv. Computer), waarvan het waarschijnlijk is dat je ze veel gehoord of gebruikt hebt **op school** toen je jong was.
Bijv. Schoolbord, geschiedenis, etc.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Maak een lijst van **7 eenvoudige Nederlandse zelfstandig naamwoorden** (**geen leen-woorden**, zoals bijv. Computer), waarvan het waarschijnlijk is dat je ze **thuis** veel gehoord of gebruikt hebt toen je jong was.
Bijv. Hond, zout, etc

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Appendix C

In English
Before starting the small exercise, get all students to take out a piece of blank paper and write number 1 to 10.

Instruction:
Write down what thing comes into your mind that is related to the word I say. For example if I say 'table', you could write down chair.

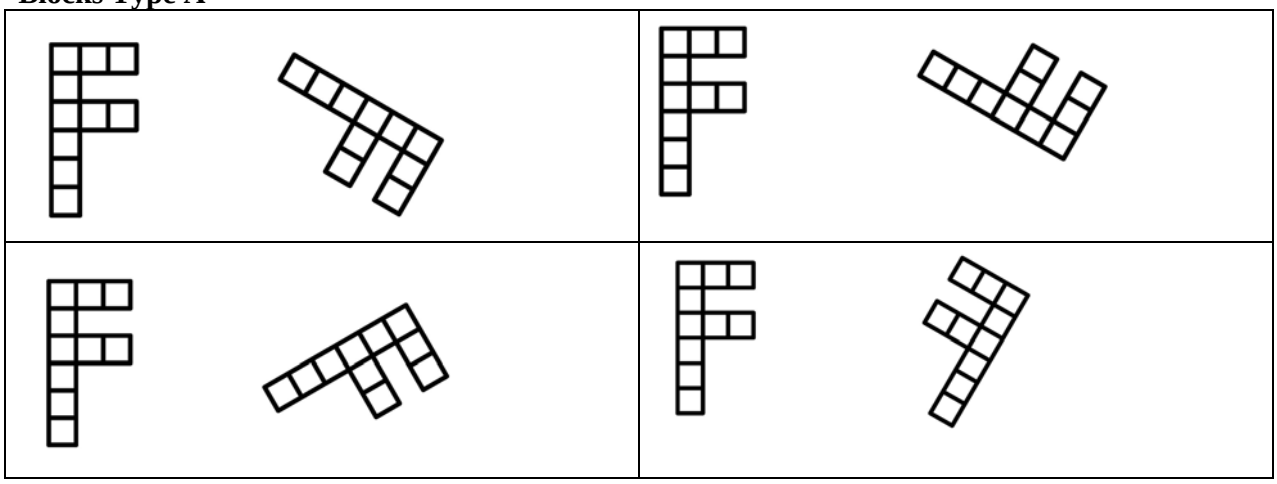
number 1, krijt
number 2, schrift
number 3, schoolplein
number 4, potlood
number 5, meester
number 6, bed
number 7, keuken
number 8, tuin
number 9, kat
number 10, woonkamer

In Dutch
Zorg, voorafgaand aan deze oefening, dat de leerlingen een vel papier hebben waar ze de nummers 1 t/m 10 op hebben geschreven.

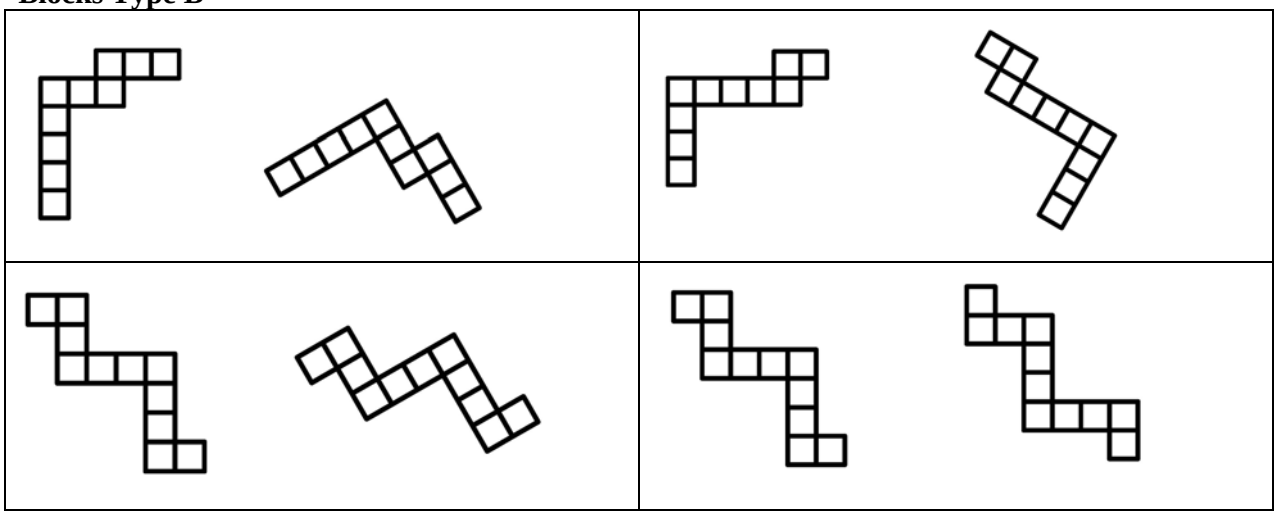
Instructie:
Schrijf het woord op dat je te binnen schiet, in relatie tot het woord dat ik noem. Als ik bijvoorbeeld 'tafel' zeg, dan zou je 'stoel' op kunnen schrijven.

nummer 1, krijt
nummer 2, schrift
nummer 3, schoolplein
nummer 4, potlood
nummer 5, meester
nummer 6, bed
nummer 7, keuken
nummer 8, tuin
nummer 9, kat
nummer 10, woonkamer

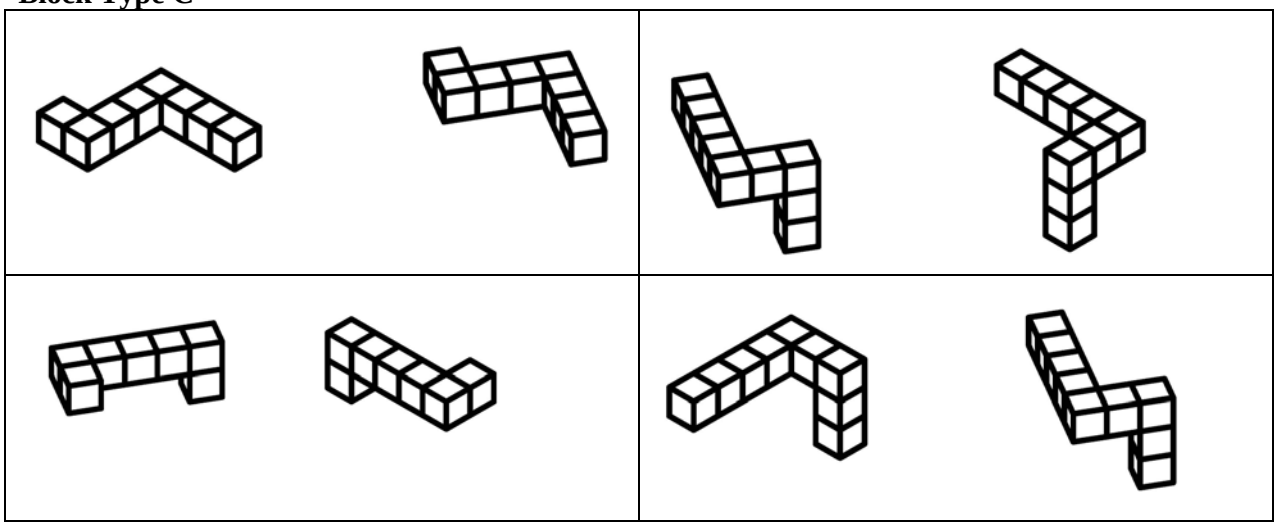
Appendix D
Blocks Type A



Blocks Type B



Block Type C



Appendix E

Participants' details

Pair No.	Group *	Gender	Date of Birth	Pair No.	Group *	Gender	Date of Birth
1	1	F	17-04-1997	16	1	M	18-08-1998
	2	F	25-04-1997		2	M	17-08-1998
2	1	F	27-09-1998	17	1	M	27-05-1999
	2	F	03-07-1998		2	M	14-05-1999
3	1	F	14-11-1997	18	1	M	29-10-1997
	2	F	30-10-1997		2	M	31-10-1997
4	1	F	30-04-1998	19	1	M	02-11-1998
	2	F	02-04-1998		2	M	12-10-1998
5	1	F	14-08-1998	20	1	M	12-08-1997
	2	F	27-05-1998		2	M	11-06-1997
6	1	F	04-07-1998	21	1	M	09-05-1998
	2	F	24-05-1998		2	M	27-04-1998
7	1	F	28-12-2997	22	1	M	16-07-1998
	2	F	08-11-1997		2	M	06-07-1998
8	1	F	29-07-1998	23	1	M	11-11-1999
	2	F	25-05-1998		2	M	12-11-1999
9	1	F	05-01-1998	24	1	M	07-12-1999
	2	F	17-01-1998		2	M	15-12-1999
10	1	F	16-08-2000	25	1	M	21-06-2000
	2	F	14-09-2000		2	M	12-05-2000
11	1	F	18-06-1998	26	1	M	17-05-2000
	2	F	31-03-1998		2	M	20-03-2000
12	1	F	01-04-1998	27	1	M	23-07-2000
	2	F	07-03-1998		2	M	24-05-2000
13	1	F	21-05-1999	28	1	M	05-11-2000
	2	F	21-05-1999		2	M	13-11-2000
14	1	F	12-08-2000	29	1	M	04-09-2000
	2	F	10-07-2000		2	M	21-09-2000
15	1	F	31-01-2000				
	2	F	23-01-2000				

* 1 = Monolingual, 2 = Bilingual