THE INFLUENCE OF SECOND LANGUAGE EXPERIENCE IN THE PATTERN OF LANGUAGE PROCESSING OF THE BILINGUAL LEXICON [1]

P. Sudasna[2]*, S. Luksaneeyanawin[2]*, D.Burnham[2]**

Abstract

The present experimental research studies whether Thai-English bilinguals' language experience in their non-native language influences the pattern of language processing of the bilingual lexicon. Two groups of 100 native Thai bilingual speakers with high or low English language experience were asked to perform Stroop Interference Tasks, with the processing of word forms being either Thai or English and the processing in colour naming also being either Thai or English. The results showed that when the processing of word forms was in Thai, there was more intra- than interlingual interference, and that the degree of interference was equivalent between the two English experience groups. When the processing of word forms was in English, the high and the low groups showed more intra- than interlingual interference; however, the high group showed more interference than the low group did. The results provide evidence that the maximal interference occurs in the processing of the first language and the interference in the processing of the second language is proportional to L2 language experience. The results suggest that there is a relationship between language experience and language processing of the bilingual lexicon.

Introduction

In the studies of bilingualism and bilingual speakers, definitions of the words "*bilingualism*" and "*bilinguals*" are numerous. Early works (Bloomfield, 1935; Haugen, 1935) defined *bilingualism* as a condition in which any individual can use two languages (their mother tongue and another language) equally well, and any such an individual is called a *bilingual*.

On the other hand, the definitions of the words "*bilingualism*" and "*bilinguals*" in later studies (Barkman, 1968; Mackey, 1968; Weinreich, 1968; Beardsmore, 1986) are broader than the definitions provided earlier. According to these works, the term *bilingualism* is defined as a condition in which an individual can use two or more languages. This individual is called a *bilingual*. His/her ability in these two

---

[1] An earlier draft of this essay was presented for the Symposium on Natural Language Processing 2000, held in ChiangMai, Thailand, May 10-12,2000.

[2]* Centre for Research in Speech and Language Processing, Department of Linguistics, Chulalongkorn University, Bangkok, Thailand

[2]**Macarthur Auditory Research Centre-Sydney (MARCS), University of Western Sydney Macarthur, Sydney, Australia

languages may or may not be equal.

These later works on bilingualism and bilinguals suggested that most bilingual speakers can use one language better than the other language. In addition, they suggested that it is rare to find bilinguals who can use two languages equally well. These works suggested that research in language processing of the different types of bilinguals is more interesting than attempting to delimit the words "*bilingualism*" and "*bilinguals*". As a result, these recent studies defined the words "*bilingualism*" and "*bilinguals*" in a broader sense. They also concentrated on various types of bilinguals. Bilingual speakers who are capable of functioning equally well in two languages in all activities without any interference of one language on the other language are called "*balanced bilinguals*" or "*true bilinguals*". Bilinguals who are capable of functioning more dominantly in one language than in the other language are called "*pseudo bilinguals*" (Beardsmore, 1986).

In the present study, the word *bilingualism* is defined as a condition in which a person can use two or more languages, whether his/her ability in the two languages is or is not equal. The subjects in this study are pseudo bilinguals. They can function in Thai and English at different levels of proficiency.

One of the central issues in bilingualism theories concerns the problem of how words in two languages are stored in, and retrieved from the bilingual lexicon. Past studies on this issue examined whether word forms and concepts or meanings in the two languages of the bilinguals are represented independently or integratedly within a unitary lexical and semantic system.

Early research studies on this issue (Taft, 1991; Kroll and Dé Groot, 1997) suggested two alternative hypotheses. The first hypothesis is associated with the *Word Association Model* and the second hypothesis with the *Concept Mediation Model*. These two models are shown in Figures 1 and 2 .

Word Association Model

Unitary Interlingual Lexical and Semantic Systems

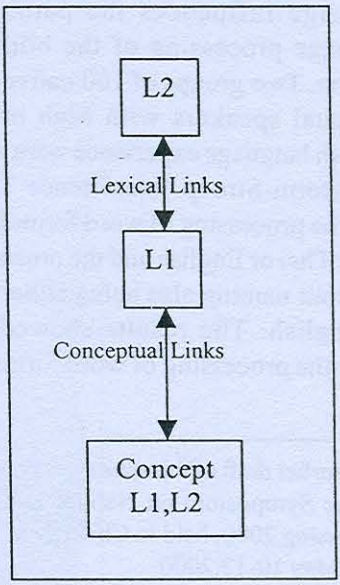

Figure 1. The Word Association Model (Adapted from Zakinthinos, 1994)

Concept Mediation Model

Two Intralingual Lexical and Semantic Systems

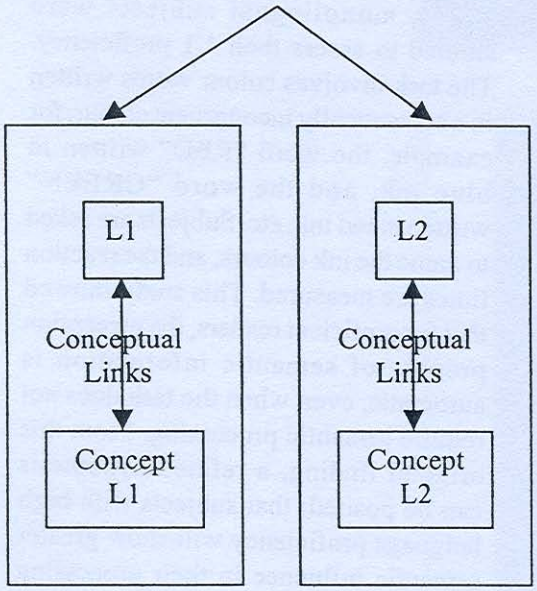

Figure 2. The Concept Mediation Model (Adapted from Zakinthinos, 1994)

According to the *Word Association Model*, words and concepts in the first language (L1) and the second language (L2) are stored in, and retrieved from a unitary interlingual lexical and semantic system. That is, words in L1 and L2 share the same lexical and semantic system. Words presented in L1 can directly access concepts from the semantic system. On the other hand, words presented in L2 access concepts from the semantic system via words with the same meaning in L1.

In contrast to the Word Association Model, in the *Concept Mediation Model*, words and concepts in L1 and L2 are stored and retrieved from two intralingual lexical and semantic systems, which belong to L1 and L2. Stimulus words in L1 directly access concepts from the semantic system of L1, and stimulus words in L2 directly access concepts from the semantic system of L2. The lexical and semantic systems of the two languages are separate, yet partially overlap.

Research work in lexical access in the past supports both the unitary interlingual hypothesis (Dalrymple-Alford, 1968; Rosenberg and Simon, 1977) and the intralingual hypothesis (Kintsch, 1970; Gerard and Scarborough, 1989). Both these studies used balanced bilingual subjects, i.e., those whose L1 and L2 proficiency was equal.

There are two further research works in lexical access, in which lexical access in non-balanced or pseudo-bilingual subjects was studied.

According to Zakinthinos (1994), bilingual lexicon models need to consider developmental aspects. She suggested that for bilinguals with lower L2 proficiency, the lexical and semantic systems can be explained in terms of the Word Association Model. On the other hand, for bilingual subjects with high L2 proficiency, their lexical and semantic systems for the two languages can be explained in terms of the Concept Mediation Model. A similar idea was described by Kroll and De Groot (1997). Their findings showed that the lexical

and semantic systems of the two languages are different in bilinguals with different L2 proficiency levels. Both Kroll and De Groot suggested that for the less proficient bilinguals, the links between words in L1 and L2 are stronger than the links between concepts and words in L2. However, the links between words in L1 and L2 do not disappear, while the links between concepts and words in L2 develop. The links between words in L1 and L2 appear to remain as an alternative connection.

These two research works suggest that bilingual speakers with different proficiency levels of L2 will have different lexical and semantic processes. L2 proficiency levels in these two works were measured by standardized reading tests which determined the reading ability of the subjects.

In this paper we describe an experiment constructed to address two main issues. The first issue concerns whether the lexical and semantic systems of the two languages are different in bilinguals with different proficiency levels in L2. The second issue concerns whether we can indirectly measure proficiency level by means of language experience, which in turn is measured in terms of contact hours with L2, in formal classroom situations, extra curricular activities, language attitudes toward L2, and exposure durations to L2.

Research Design and Methodology

In the study of the bilingual lexicon, various methods have been employed. One of the most frequently used methods is the cross-language Stroop Interference Task.

In the original Stroop Task (Stroop, 1935), monolingual subjects were studied to assess their L1 proficiency. The task involves colour words written in a semantically incongruent colour, for example, the word "RED" written in blue ink, and the word "GREEN" written in red ink, etc. Subjects are asked to name the ink colours, and the reaction times are measured. This study showed that for proficient readers, the perception process of semantic information is automatic, even when the task does not require semantic processing. From this original finding, a refined hypothesis can be posited: that subjects with high language proficiency will show greater semantic influence in their processing of word forms than subjects with low language proficiency.

If the form has no meaning (eg. XXX), subjects should be able to name the colour of the form without any interference. If the form is a lexical item (represented by a written word), there will be an interference proportional to the linguistic competence, which can be measured by the subjects' reaction time in naming the colour of the ink of the word form. In the high proficiency subjects, linguistic interference should be stronger than in the low proficiency subjects. As a result, reaction times in colour naming for the high proficiency subjects should be slower than for low proficiency subjects (Sudasna, 1999).

In research using the cross-language Stroop Task, three types of interference

are examined. The first type is when the form is non-linguistic (i.e. XXX). In this case, there should be no interference due to linguistic competence in colour naming. This should result in relatively short reaction times. The second type is when the stimulus item and the naming of colour are in the same language, either L1 or L2. This is called *intralingual interference*. The last type is when the stimulus item and the naming of colour are in different languages. The interference from this type is called *interlingual interference*.

In both the intralingual and interlingual Stroop Tasks, there are two levels of processing, the perception and the production levels.

In the intralingual interference, it is hypothesized that the reaction time in L1 naming is slower than in L2 naming because L1 linguistic competence should be better than L2 linguistic competence, resulting in the faster perception process of L1 word forms than the perception process of L2 word forms and more interference in L1 production process than in the L2 production process.

In the interlingual interference, it is hypothesized that the reaction time in L1 perception and L2 production should be slower than in L2 perception and L1 production.

Non-Linguistic Stroop Task		Intralingual Stroop Task		Interlingual Stroop Task	
Perception of Non Linguistic Forms and Colour Concepts	Naming of the Colour Concepts using Colour Words	Perception of Word Forms and Colour Concepts	Naming of the Colour Concepts using Colour Words	Perception of Word Forms and Colour Concepts	Naming of the Colour Concepts using Colour Words
XXX	L1	L1	L1	L1	L2
XXX	L2	L2	L2	L2	L1

Table 1.Non-linguistic, Intralingual, and Interlingual Stroop Tasks

The control condition (non-linguistic) and the two test conditions (intralingual and interlingual) are schematically presented in Table 1.

There are two main hypotheses in this study.

Hypothesis I: In the intralingual condition, the degree of interference from L1 linguistic competence should be higher than the interference from L2 linguistic competence in both the high and the low English proficiency groups. (From now on these will be referred to as the Hi group, and the Lo group.)

Hypothesis II: In the interlingual condition, the degree of interference from L2 linguistic competence should be higher in the Hi group than in the Lo group, whereas the degree of interference from L1 linguistic competence should not differ between the Hi and Lo groups. In this way the Stroop task in the interlingual condition should be able to be used to indirectly measure the L2 proficiency level of the subjects.

Subjects in this experiment were 100 Thai-English non-balanced pseudo-bilingual speakers. They were grouped into 2 groups on the basis of their L2 language experience. L2 language experience was measured with the "English Language Experience Questionnaire" concerning the subjects' contact hours with English i.e., in formal classroom situations, extra - curricular activities, their language attitude towards English and their exposure time to English (see Appendix).

This questionnaire was developed from the studies of Baworn Chajthawin (1997) and Saranthorn Nimphaibule (1996). According to Nimphaibule, the study supported that the English Language Experience Scores (ELES) are related to English language performance in Thai-English bilingual speakers. Nimphaibule found that the pronunciation of English final consonants is more subject to interference by the mother tongue's language system (Thai) among subjects with less English language experience than among those with more language experience. Chajthawin also found that subjects with high ELES pronounce the English final /l/ as a [ɬ], whereas those with low ELES pronounce this /l/ with an [n].

For the present study, the subjects were split into 2 groups using the median score. Fifty subjects whose scores on the questionnaire were higher than the median score were called the high language experience group and the other fifty subjects whose scores were lower than the median score were called the low language experience group.

In the Non-linguistic Stroop Task, the stimulus items were XXX, written in red, blue, green and black ink, and the subjects were asked to name the colour concepts using colour words in L1 and L2.

For the Intralingual Stroop Task of L1, the stimulus items were four Thai colour words, i.e. "แดง", "เขียว", "ฟ้า", and "ดำ" written in mismatching colours--either red, blue, green or black, and the subjects were asked to name the colour of the ink using colour words in Thai.

For the Intralingual Stroop Task of L2, the stimuli were four English colour words, i.e. "Red", "Green", "Blue", and "Black," again written in mismatching colours and the subjects were asked to name the colour of the ink using the English colour words.For the Interlingual Stroop Task, when the stimulus items were Thai colour words, the subjects were asked to name the ink colour in English. When the stimulus items were English colour words, the subjects were asked to name the ink colour in Thai.

Each stimulus item appeared three times at random to prevent the subjects from the effect of previous practice of words and the naming of colour pairing of colour concepts. The test tokens in all conditions were 36 items (4 items x 3 conditions x 3 test tokens). The subjects were asked to name the colours of the form (non-linguistic forms, L1 word forms or L2 word forms) as accurately and as quickly as possible. Their reaction times were recorded with a stopwatch.

Non-linguistic Stroop Task		Intralingual Stroop Task		Interlingual Stroop Task	
XXX written in blue ink	Expected naming is /fah/ (L1)	"แดง" written in blue ink	Expected naming is /fah/ (L1)	"แดง" written in blue ink	Expected naming is /blu/ (L2)
XXX written in blue ink	Expected naming is /blu/ (L2)	"Red" written in blue ink	Expected naming is /blu/ (L2)	"Red" written in blue ink	Expected naming is /fah/ (L1)

Table 2. Examples of the Task in Non-linguistic, Intralingual, and Interlingual Conditions

Results and Discussion

The Non-Linguistic, the Intralingual, and the Interlingual Experiments

The mean reaction time in milliseconds (ms) (which from now on, will be referred to as RT) for the non-linguistic, the intralingual, and the interlingual conditions are the average RT that each group of subjects used to name the colour of the test tokens in a particular condition. The mean RT of the 100 subjects in non-linguistic, intralingual, and interlingual Stroop Tasks are presented in Table 3.

RT in Non-linguistic Stroop Task (in ms)		RT in Intralingual Stroop Task (in ms)		RT in Interlingual Stroop Task (in ms)	
Perception of Non-linguistic Forms and Naming of Colour Concepts Using L1 Colour Words	420.5	Perception of L1 Word Forms and Naming of Colour Concepts Using L1 Colour Words	668	Perception of L1 Word Forms and Naming of Colour Concepts Using L2 Colour Words	707
Perception of Non-linguistic Forms and Naming of Colour Concepts Using L2 Colour Words	460.5	Perception of L2 Word Forms and Naming of Colour Concepts Using L2 Colour Words	568	Perception of L2 Forms and Naming of Colour Concepts Using L1 Colour Words	490.5

Table 3. The RT of the Non-linguistic, Intralingual, and Interlingual Stroop Tasks in All Subjects

As can be seen in Table 3, the RT for the non-linguistic Stroop Task is relatively short (420.5 ms in the naming of colour concepts using L1 colour words and 460.5 ms in the naming using L2 colour words) as compared to the RT found in the intralingual and the interlingual Stroop Tasks. This is presumably because in the non-linguistic condition, the form (represented by XXX) has no meaning. Thus the subjects can name the colour of the form without any interference due to linguistic competence. In contrast, in the intralingual and the interlingual conditions, the forms are written words. Hence, there is interference from the linguistic competence in colour naming resulting in slower RT both in the intralingual and the interlingual conditions. However, the RT for the non-linguistic Stroop Task when using colour words in L2 is slower than in L1. This may be due to interference from the L2 linguistic production process.

In this study, the RT data were analyzed using a three-way analysis of variance (ANOVA) considering language proficiency group (high and low), experimental condition (Non-linguistic, Intralingual, and Interlingual Stroop Task), and response language (Thai and English).

In the intralingual condition, the RT in processing L1 (668) is slower than in processing L2 (568). The results imply that there is more interference from L1 than L2 in the Intralingual Stroop Task. However, the difference between the RT in L1 processing and L2 processing is not significant [$F(1, 28) = 2.224$ $p<.01$].

In the interlingual condition, the RT in the perception of L1 word forms and L2 colour naming was found to be significantly slower than when subjects access words with the perception of L2 word forms and L1 colour naming [$F(1,28) = 4.648$ $p<.01$]. These results imply that the subjects' linguistic perception of L1 in this experiment is

better than their linguistic perception of L2, thus resulting in more interference due to L1 linguistic perception and L2 production than to L2 linguistic perception and L1 production.

Interference of L2 in speakers with different language experience

For the present study, the degree of interference is represented by an *Interference Index Score* (IIS). IIS is calculated from the mean reaction time (in milliseconds) of the test condition (intralingual or interlingual) subtracted by the mean reaction time of the controlled non-linguistic condition in the naming task of the same language (Stroop, 1935)

IIS = Mean RT of the Test Condition – Mean RT of the Control Condition with Colour Naming of the Same Language

It is expected that in the control non-linguistic condition, there is no interference from linguistic competence. In contrast, in the test condition, there is an interference from linguistic competence. Thus, IIS, the difference between RT of the test condition and of the control condition, is taken to represent the degree of linguistic interference.

The RT of the non-linguistic, intralingual, and interlingual conditions are shown in Table 4 below.

RT in Non-linguistic Stroop Task			RT in Intralingual Stroop Task			RT in Interlingual Stroop Task		
Perception of Non-linguistic Forms and Naming of Colour Concepts Using L1 Colour Words	Hi	472	Perception of L1 Word Forms and Naming of Colour Concepts Using L1 Colour Words	Hi	741	Perception of L2 Word Forms and Naming of Colour Concepts Using L1 Colour Words	Hi	606
	Lo	369		Lo	595		Lo	375
Perception of Non-linguistic Forms and Naming of Colour Concepts Using L2 Colour Words	Hi	526	Perception of L2 Word Forms and Naming of Colour Concepts Using L2 Colour Words	Hi	704	Perception of L1 Word Forms and Naming of Colour Concepts Using L2 Colour Words	Hi	706
	Lo	395		Lo	432		Lo	708

Table 4. The RT of the Non-linguistic, Intralingual, and Interlingual Stroop Tasks in the High and Low English Experience Groups

Results of the Intralingual Condition

From the RT Table, the IIS of the intralingual conditions comparing the Hi and the Lo groups are presented in Table 5 and Figure 2 below.

English Experience Groups	IIS of the Processing of L1	IIS of the Processing of L2
Hi	269 (741-472)	178 (704-526)
Lo	226 (595-369)	37 (432-395)

Table 5. The IIS of the Intralingual Condition in the High and the Low English Experience Groups

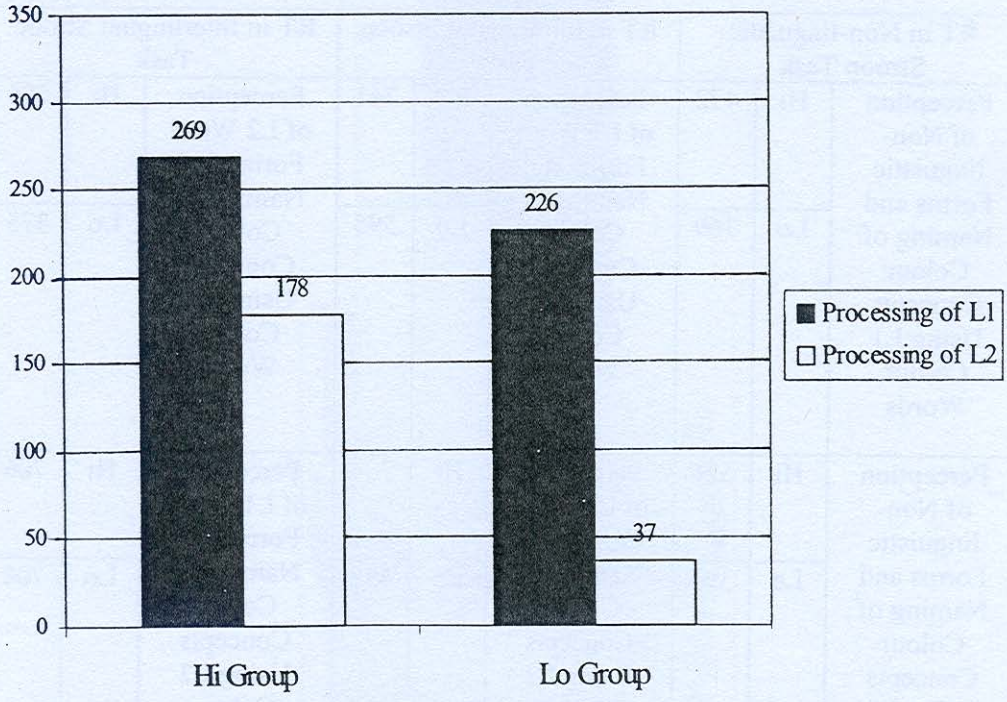

Figure 3. The IIS of the Intralingual Condition Comparing the Processing of L1 and L2

In the intralingual condition (Table 5 and Figure 3), the IIS found in L1 processing is significantly higher than those found in L2 processing in both the Hi group [$F(1, 28) = 10.01$ $p<.01$] and the Lo group [$F(1, 28) = 12.21$ $p<.01$]. However, the result is clearer in the Lo group than in the Hi group. The IIS found in L1 processing in the Hi group (269) is higher than in the Lo group (226) but not much. However, in the processing of L2, the IIS found in the Hi group (178) is remarkably higher than in the Lo group (37). These results imply that the interference of L1 is higher than the interference of L2 in both the Hi and the Lo groups.

However, in the Hi group, the IIS of L2 processing is closer to the IIS of L1 processing than in the Lo group. These results show that the closer in IIS of L2 to L1 processing suggests the closer the proficiency of L2 to L1 and we can indirectly measure language proficiency levels by means of language experience. Thus, we suggest that the language experience questionnaire used in this experiment can be indirectly used to determine the language proficiency levels of subjects, without using other language tests, for example, standardized reading tests.

Results of the Interlingual Condition

From the RT Table, the IIS of the interlingual conditions comparing the Hi and the Lo groups are presented in Table 6 and Figure 4 below.

From Table 6, the IIS of L1 perception and L2 production is calculated from the RT of non-linguistic perception and L2 production subtracted by RT of L1 perception and L2 production. Also, the IIS of L2 perception and L1 production is calculated from the RT of non-linguistic perception and L1 production subtracted by RT of L2 perception and L1 production. This is because in the interlingual condition, interference is linked to both linguistic perception and the production process.

English Experience Groups	IIS of the Perception of L1 And Production of L2	IIS of the Perception of L2 And Production of L1
Hi	180 (706-526)	134 (606-472)
Lo	313 (708-395)	6 (375-369)

Table 6. The IIS of the Interlingual Condition in the High and the Low English Experience Groups

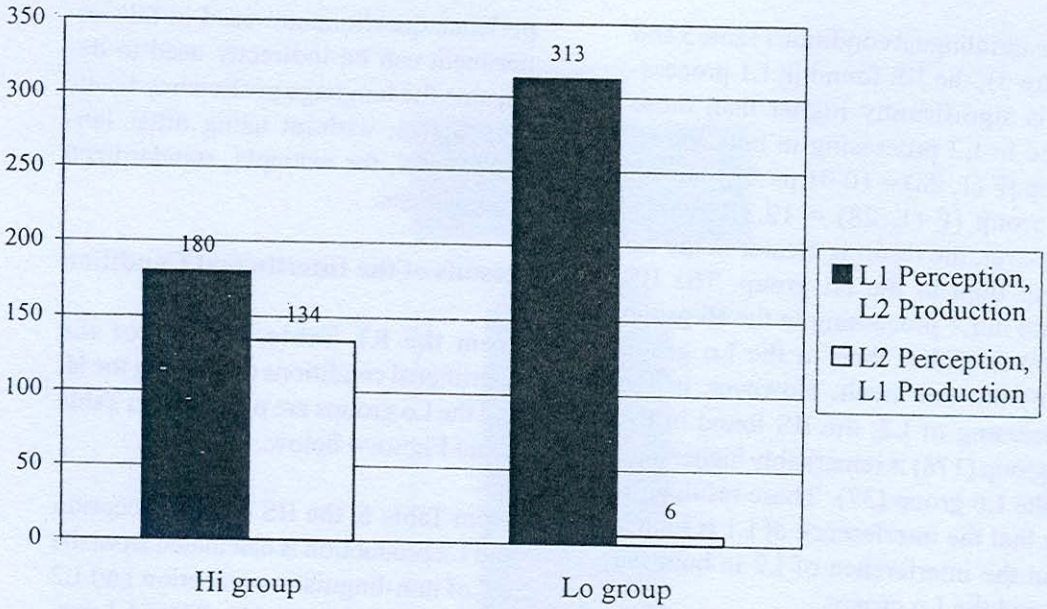

Figure 4. The IIS of the Interlingual Condition Comparing L1 Perception, L2 Production and L2 Perception, L1 Production

In the interlingual condition (Table 6 and Figure 4), in L1 perception and L2 production, the interference in the Lo group is significantly higher than in the Hi group [$F(1, 28) = 9.57$ $p<.05$]. In contrast, in L2 perception and L1 production, interference in both the Hi and the Lo groups is lower than in L1 perception and L2 production. These results imply that the degree of interference found in L1 perception is higher than that found in L2 perception in both the Hi and the Lo groups but the interference of L1 perception to L2 production is clearer in the Lo group than in the Hi group. This is because the proficiency level of L2 production in the Lo group is lower than in the Hi group.

In addition, in L2 perception and L1 production, the IIS in the Lo group is extremely low (6ms) as compared to the Hi group (134ms). These results suggest that the interference of L2 perception to L1 production found in the Lo group is very little as compared to that found in the Hi group.

As can be seen in Figure 3, the IIS for L1 processing is significantly higher than that found in the processing of L2 in both the Hi and the Lo groups. The results suggest that the language proficiency level of L1 is better than L2 in both the Hi and the Lo groups. However, the difference between the IIS in the processing of L1 and L2 in the Lo group is greater than in the Hi group. These results imply the language proficiency level of L2 in the Hi group is closer to the proficiency level of L1 than in the Lo group. The present results further indicate that the language proficiency levels can be indirectly determined by means of language experience, which is measured in terms

of contact hours to L2. The subjects with low L2 language experience will have low L2 proficiency level and also, the subjects with high L2 language experience will have high L2 proficiency levels

As can be seen in Figure 4, the IIS of L2 perception and L1 production in the Hi group is significantly higher than in the Lo group. The results suggest that the interference of the perception process of L2 in the Hi group is greater than in the Lo group. The IIS of L2 perception and L1 production in the Lo group is extremely low (6ms) as compared to the IIS of the Hi group (134ms). This implies that the L2 language proficiency of the Lo group is lower than in the Hi group. The perception process of L2 in the Lo group is slower than that of the Hi group. As a result, there is very little interference from the L2 perception process in the naming of colour concepts in L1 as compared to the interference found in the Hi group.

However, the IIS of L1 perception and L2 production in the Hi group is significantly lower than in the Lo group. The results suggest that production in L2 may involve more complex processes than in perception. Thus, the Lo group has greater difficulty with speech production in the naming of colour concepts in L2 than the Hi group does.

Overall, the results of the present experiment suggest that the Stroop Task in the interlingual condition can be used to indirectly measure the L2 proficiency levels of bilingual subjects in both the perception and production process of L2.

Conclusion

In the intralingual condition, the interference of L1 processing in the Hi group is slightly higher than in the Lo group but not much. However, the interference of L2 processing in the Hi group is remarkably higher and closer to the interference of L1 processing than in the Lo group. The results suggest that the proficiency level of L2 can be indirectly inferred in terms of language experience, without language tests. In addition, the closer the interference of L2 processing to L1 processing can suggest near native (L1) proficiency level in L2. In the interlingual condition, the interference of L1 perception and L2 production in the Lo group is remarkably higher than in the Hi group. However, the interference of L2 perception and L1 production in the Lo group is extremely lower than in the Hi group. The results suggest that the interference in the interlingual condition is from both the linguistic perception and production. We can examine L2 proficiency level in both perception and the production process using the Interlingual Stroop Task.

According to the two alternative hypotheses of Lexical Access, the *Word Association Model* and the *Concept Mediation Model*, in the intralingual condition, it seems that in the Hi group, there are two intralingual lexical and semantic systems resulting in the difference between interference in the processing of L1 and L2 in the Hi group (269/178) being closer to each other than in the Lo group (226/37). In the interlingual condition, it is very clear that in the Lo

group, the interference in L2 production is extremely high (313), whereas the interference in L1 production is extremely low (6). The difference in the interference from L1 and L2 production is very clear between the Hi and the Lo groups. The interference from L2 production and L1 perception is higher than in L1 production and L2 perception in the Lo group (313/6) as compared to the Hi group (180/134). The results suggest that there is a strong interference from the production process in the Lo group compared to the Hi group. Further research should be designed to examine the interference in the production process of bilingual speakers with different levels of L2 proficiency.

Acknowledgement

This research was supported by the Royal Golden Jubilee Ph.D. Program of the Thailand Research Fund and Macarthur Auditory Research Centre-Sydney (MARCS), University of Western Sydney.

References

Barkman, L.B. 1968. Bilingualism and the Teacher of English as a Foreign Language. In *Applied Linguistics: A Survey for Language Teachers*, ed. by M. Kehoe, pp. 58-72. London : Collier-Macmillan.

Beardsmore, H.B. 1986. *Bilingualism: Basic Principles*. Cleyedon : Multilingual Matters.

Chajthawin, Baworn. 1997. Variation of Pronunciation of the Final Consonant /l/ in English Words : Comparative Study in the First Year Students with Different English Experience, Faculty of Arts, Chulalongkorn University. In *Science of Language*, ed. by Amara Prasithrathsint, pp.51-73. Bangkok: Chulalongkorn University Press.

Dalrymple-Alford, E. 1968. Interlingual Interference in the Stroop Task. *Psychonomic Science* 10 : 215-216.

Gerard, L.D. and D.L. Scarborough. 1989. Language-Specific Lexical Access of Homographs by Bilinguals. *Journal of Experimental Psychology: Learning Memory and Cognition* 15: 305-315.

Haugen, E. 1956. *Bilingualism in the Americas. A bibliography and research guide*. Alabama : University of Alabama Press.

Kroll, J.F. and M.B. De Groot. 1997. Lexical and Conceptual Memory in the Bilingual: Mapping Form to Meaning in Two Languages. In *Tutorials in bilingualism: psycholinguistic perspectives*, ed. by M.B. De Groot, and J.F. Kroll, London : Lawrence Erlbaum Associates.

Kintsch, W. 1970. Recognition Memory in Bilingual Subjects. *Journal of Verbal Learning and Verbal Behavior* 9: 405-409.

Nimphaibule, Sranthorn. 1996. Variation of Thai Air Hostesses' Pronunciation of the Final Consonants (ts, d3, s) in English Words. M.A. Thesis. Faculty of Arts, Chulalongkorn University.

Rosenberg, S. and H. Simon. 1977. Modelling Semantic Memory: Effects of Presenting Semantic Information on Different Modalities. *Cognitive Psychology* 9: 293-325.

Stroop, J.R. 1935. Studies of Interference in Serial Verbal Reactions. *Journal of Experimental Psychology* 18: 643-662.

Sudasna, P. 1999. Lexical Access in Thai Speakers with Different Language Experience: An Experimental

Study Using the Stroop Task. Paper presented at the 26th Annual Experimental Psychology Conference, Sydney, and the abstract appeared in *Australian Journal of Psychology* 51: 43-44.

Taft, M. 1991. *Reading and the Mental Lexicon.* London : Lawrence Erlbaum Associates.

Weinreich, U. 1968. *Languages in Contact.* The Hague: Mouton.

Zakinthinos, A. 1992. Stroop Interference Patterns in Adult Bilinguals Effects of Cross-Language Phonological Manipulations. Submitted in partial fulfilment of the requirements of the degree of Bachelor of Science (Psychology). University of New South Wales.

APPENDIX

English Language Experience Questionnaire

Part 1

Directions Please mark the best answer with a cross (X)

Situations	Never	Occasionally	Often	A lot
1. I have studied English with a foreign teacher at school or university.				
2. I have studied with a foreign (English-speaking) student at school or university.				
3. I have studied in an English lab.				
4. At present, my English teachers speak English to me in English courses.				
5. I have presented reports in English.				
6. I read English magazines.				
7. I read English newspapers.				
8. I read English fiction.				
9. I read English textbooks.				
10. I read information in English from the internet.				
11. I read English cartoon books.				
12. I correspond a penfriend, using English.				
13. I correspond with people, e.g., sending e-mails in English.				
14. I have been to a foreign country and had to communicate in English.				
15. I have taken English courses in a foreign country.				
16. I have joined extra curricula activities using English, e.g., debating.				
17. I listen to English songs.				
18. I watch English movies and VDOs.				
19. I watch English news.				
20. I watch English documentaries.				
21. I watch concerts with English singers.				
22. I play games such as scrabble and crosswords using English.				
23. I read classified and advertisement in English newspaper.				
24. I listen to English teaching tapes.				
25. I have English conversations with foreigners.				

Part 2

Directions Answer the following questions.

1. How many hours per week did you study English courses in Grade 12?

2. In Grade 12, which grade (1-4) did you get in English courses?

3. At present, how many hours per week do you study English at university?

4. At present, how many hours per week do you study English outside the university?

5. Name the English magazines you read.

6. Name the English newspapers you read.

7. In which subjects do you use textbooks in English?

8. Name the English fiction you read.

9. How many penfriends do you have? (The ones you have to correspond within English)

10. If you have been to a foreign country where you had to communicate in English, please say which country and for how long.

11. Have you ever taken English courses in a foreign country? Which country and for how long?

12. Which TV programmes in English do you watch?

Part 1. Never=1 mark
Occasionally=2 marks Often=3 marks
A lot=4 marks
Part 2. One hour = 1 mark
Grade 4 = 4 marks, Grade 1 = 1 mark
etc.