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Lexical Links across the Languages in Multilinguals:
The study of Turkish Persian Bilinguals

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Abstract
Lexical connections across the languages are a well established fact. This research followed the ideology of Revised Hierarchical Model (RHM) - a model proposed by Kroll and Stewart (1994) - and investigated the architecture of a multilingual language representations regarding lexicon and semantic connections across the languages and conceptual representation (CR) on Turkish-Persian early dominant with elementary bilinguals English knowledge. RHM not only shows the components of bilinguals' mind and explains their relationship but also predicts the language learner's behavior. Three experiments were conducted in 7 different tasks. The findings were partially consistent with RHM predictions. The results confirmed that the more dominant a language was, the stronger connections with conceptual representation and newly learned language would be. Unlike the predictions of this model, this research supported the idea that each language is developed separately and newly learned language did not necessarily need the mediation of any dominant language for its semantic processing even at elementary level. In line with Slinkier,(2001); Dewaele,(1998,2001) and Ecke,(2001), this research also confirmed that L3 has stronger connections with L2 rather than L1.

Key words: Bilingualism, multilingualism, lexicon, cross-linguistic influence, priming

Introduction

The present research aimed at testing the predictions of Revised Hierarchical Model(RHM) by Kroll and Stewart(1994) in trilinguals' lexical connections especially in cases where L2 was regarded as the dominating language. The subjects of the research were Turkish-Persian bilinguals who were learning English as their third language.

As soon as these children entered school, they spent most of their time learning Persian. It is spoken everywhere in society, but Turkish as the mother tongue is spoken at home or with ethnic groups only. Then, gradually the importance of Turkish language becomes less and Persian more. Turkish children like other children at their age start learning English through formal instruction. Turkish-Persian bilinguals in learning each English new words in the English lexicon, at the same time; they should establish lexical connections with Persian and Turkish lexicons. This research sought to find out how the predictions of RHM in multilinguals were valid when L1 and L2 were more or less at the same power and how strongly each language accessed to CR. Another interesting issue was whether L3 access to CR was through L1 or L2.

In this research, language activation means word cognition in different languages. By priming it will try to answer how the languages are connected to each other in order to understand the strength of connections across the languages. This issue will lead us to one of the dominating languages which is

the link for newly learned language access (L3) to conceptual representation. On the other hand, this research will try to find out the level of activation of which language is higher; as a result, which of the two dominating language (L1 or L2) is stronger in establishing lexicon connection with L3. Since L3 depends on its links for semantic processing, any semantic difference across the languages may cause error for learners. If the dominant language acts as a filter in learning a new language, its identification will lead us to the appropriate channel or method for teaching L3 to bilinguals. Meanwhile, comparing the semantic and lexical processing of the two dominant codes will shift the attention on age of language learning.

Background

Bilingualism

In principle, bilingualism is 'the habitual, fluent, correct and accent-free use of two languages'(Paradis,1986).However, on this definition, few individuals qualify as complete bilinguals. It often happens that a bilingual is not equally competent in different aspects of the two languages; for example, they might have a more restricted vocabulary in one than in the other or might exhibit different abilities in respect of speaking, listening, reading, and writing. Furthermore, many bilinguals use their languages in ways that are domain-specific: one language might be used in the family and one reserved for educational contexts.

Grosjean (1982) defines bilingualism in terms of language use rather than language proficiency. For him, a bilingual is somebody who needs and uses two or more languages in everyday life. The stage at which the two languages are acquired remains an important consideration in recent accounts, which often distinguish simultaneous bilingualism, early successive or sequential bilingualism and late bilingualism.

Cross-Linguistic Influence

When the languages have contact, constituents from one language are sometimes introduced into an utterance involving the other in an effect called code-mixing. The transfer occurs at many different linguistic levels: phonological, semantic and phrasal, can involve the structural features such as word order. Cross-linguistic lexical influence is seen in borrowing, where a word is transferred from one language to the other with its pronunciation and morphology adjusted accordingly.

Lexicon

Lexicon is the system of vocabulary which is stored in the mind in the form of a lexical entry. According to Levelt (1993) the knowledge of words exists in three different levels. The conceptual level consists of nodes that represent concepts; nodes are connected to other nodes by various relations. Lemma level refers to syntactic aspects of word knowledge and lexeme level is for phonological properties of words.

Multilingualism

As stated by some scholars (Fouser,1995;Jessner,1999), there exists a degree of terminology and conceptual confusion regarding third language acquisition. In general terms, third language acquisition denotes those languages learned after a second one, which may imply a third, forth, or fifth language. This conceptualization involves a series of different L2 backgrounds and learning situations that would point not only to third but also to bilingual, or even multilingual acquisition. Heredia and Gesner's notion (2000) contrasts with traditional aspects characterizing language learning in the same way as first or second language acquisition process. They present representative features of third language acquisition 1) non-linearity, 2) language maintenance, 3) individual variation, and 4) independence and quality change.

Priming Effect

An increase in the speed with which a word is recognized, which results from having recently seen or heard a word that is closely associated with it. Exposure to the prime is represented as activating a range of associated words. These words become easier to identify because they are already fore grounded in the mind. The process known as spreading activation is highly automatic and not subject to conscious control. Priming effect have given rise to a research method which measures reaction time in order to establish which words are most closely associated with a given prime. Priming task consists of a two phrases. In the first phrase, a priming stimulus is presented. Often no response to the prime is required or recorded. In the second phrase, a second

stimulus (the target) is presented, the participant makes some response to it, and the time taken to make this response is measured and recorded.

Method

Participants

Since the research concerns early, fluent bilinguals learning another language as the third one, high school students of Turkish-Persian bilinguals living in Isfahan were selected as the population of the research. Forty (25 female and 15 male) Turkish-Persian bilingual students of Kharazmi and Dehkhoda high schools were selected among the population of the schools. All the subjects were second and third graders majoring mathematics or science between 16 or 17 years old. Mother tongue of all the subjects was Turkish.

Materials

The materials used were word lists (English word list, English-Persian word list, Persian word list, English- Turkish word list, and Turkish word list), a series of pictures, a developed program in Author ware 7:00 software, and a laptop computer.

Procedure

After random selection of 25 female and 15 male high school students of grade two and three, they were given a student code like 01,02,03… There had been 7 experiments in this research. The distribution of experiments were counter balanced so that the results would not be biased to the order of the experiments. The experiments were conducted with one-week intervals in a quiet place at

school where the light was also taken care of to be normal. The instructions of the experiments were given in the subjects' mother tongue. Subjects sat at the computer with the distance of 30 cm. The keys of the mouse were defined as the indicator of subjects' judgments. Left click was for correct relations and right click for incorrect relations. In addition to required experiments, a special program was developed for the subjects, which was given before any kind of experiments. The purpose was to teach the participants how to click the intended buttons and put them in semi- experimental situation in order to prepare them for the real experiments. This 15-item-complimentary test was programmed on odd and even numbers. Taken procedures were as follows:

The subjects were given their codes and the instructions were described in details. After entering their codes, the program showed fixation point(+) on the screen which blinked for 3 times. A pair of numbers appeared on the colored box, if both were odd or even the subjects were suppose to click on the left button, but in case of seeing an odd with an even numbers in pairs like (18,81) the subjects had to right click to express that the numbers did not share the characteristics. This special program not only taught them how and when to click, but also puts the subjects on real experimental situation. They found out that the yellow box showed where the primes and targets might appear and blinking point warned that next item would be displayed in a second. After this exercise the participants took the assigned experiment based on the arranged order by the researcher since each subject has a special order of

experiments. The experiments had been taken in a class at school, the exercise took 3 minutes for each subject but the experiments took 5 to 7 minutes each. As there was one experiment each week, the data collection took 7 weeks in total.

Data Analysis

Data Screening

The subjects of the research participated in three different experiments. The main factors in this research are lexical and semantic processing of each language in early bilinguals learning English a third language. After descriptive statistical analysis, only those subjects whose RT means was between ±2 standard deviation (SD) remained for further analysis as a result L2 participants were excluded, and 30 subjects remained.

Table 3.1.Descriptive Statistics of Semantic Matching and Translation Task

	N	Minimum	Maximum	Mean	Std. Deviation
ET	42	0.88	2.73	1.53	0.39
EF	42	0.81	2.32	1.33	0.30
EP	42	0.79	1.78	1.12	0.23
FP	41	0.72	1.43	1.00	0.16
TP	42	0.84	2.07	1.16	0.23
FEP	41	0.83	1.80	1.08	0.13
TEP	41	0.92	1.76	1.13	0.15
Valid N (list wise)	41				

Table 3.2.Descriptive Analysis of Filtered Data of Tasks

	N	Minimum	Maximum	Mean	Std. Deviation
E-T	30	0.88	1.97	1.43	0.27
E-F	30	0.81	1.91	1.29	0.27
E-P	30	0.79	1.41	1.08	0.20
F-P	30	0.72	1.27	0.97	0.13
T-P	30	0.84	1.35	1.10	0.12
F-E-P	30	0.83	1.23	1.05	0.10
T-E-P	30	0.92	1.43	1.13	0.15
Valid N (list wise)	30				

(P→Picture , F→Farsi (Persian)

As tables 3-1 and 3-2 show, data screening caused reduction in the RT means; smaller RT mean implies faster reaction on the half of the participants. The fastest reaction is observed in F-P (Persian semantic matching task) and the lowest in E-T(English- Turkish Translation Task).

Table 3.3.Error Rate Analysis of the Task

Task type	Correct response	Percentage	Error rate
E-P	82	91.07%	8.93%
F-P	83	92.26%	7.74%
T-P	83	92.63%	7.37%
E-F	79	87.85%	12.15%
E-T	78	87.11%	12.89%
F-E-P	85	94.44%	5.56%
T-E-P	84	92.90%	7.1%

The error rate analysis was carried out in translation and semantic matching tasks (table 3-3). The best situation is on Persian priming in English semantic matching task where 94.44 % of the responses are correct and the least correct response rate is in English-Turkish translation task that the correct responses are 87.11 %.

As it is clear in above table, error rate for L3 (English) is high in translation task than in semantic matching task (E-T, 12.89 % but E-P, 8.93 %).Also, the table shows a fall in the error rate of L1 (Turkish) semantic matching task in comparison with L2 (F-P, 7.74 %, but T-P, 7.37 %).

Results

Obtained Results from experiment1 and 2

Table 3-5 shows the statistical analysis on the English-Persian translation task and English semantic matching task. The table shows the observed mean difference 0.21 is statistically significant since the T-value is 5.19. Then one of the hypotheses is also rejected. This result rejects the prediction of RHM at least for concrete words, because semantic processing is significantly faster than lexical processing. (Tables 3-4 and 3-5)

Table 3.4.Paired Samples statistics of English-Persian and English-Picture

	Mean	N	Std. Deviation	Std. Error Mean
E-F	1.2917	30	0.26550	0.04847
E-P	1.0813	30	0.19671	0.03591

Table 3.5.Paired Samples t-Test of English-Persian and English-Picture

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
E-F & E-P	0.210	0.22162	0.0405	-0.1276	0.2931	5.198	29	0.000

Obtained Results from experiment1 and 3

Based on RHM predictions L1 is the mediator for L2 semantic processing and facilitates its semantic processing. Experiment 3 clarified a significant difference of Persian priming in English semantic matching task over Turkish priming. Then the data of English semantic matching task with Persian priming from experiment 3 and the data of English semantic matching task were subjected to statistical analysis in order to test whether the dominant language has priming effect in non-dominant language semantic processing. The results are as follow:

Table 3.6.Paired Samples statistics of E-P and F-E-P

	Mean	N	Std. Deviation	Std. Error Mean
E-P	1.0813	30	0.19671	0.03591
F-E-P	1.0527	30	0.10164	0.01856

Table 3-6 clarifies that the F-E-P is faster than E-P because (F-E-P) M=1.05 SD=0.10 whereas (E-P) M=1.08,SD=0.19.

Table 3.7.Paired Samples t-Test of E-P and F-E-P

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
E-P & F-E-P	0.029	0.20676	0.0378	-0.0485	0.1059	0.759	29	0.454

Table 3-7 shows in spite of 0.029 RT mean difference between E-P and F-E-P, the observed mean difference is not statistically significant as a result Persian does not have priming effect on English semantic matching task ($t=0.75$, $P<0.45$).

Discussion

In the current research, it was sought to determine the relations across the components of a trilingual mind whose first language is minority language and second language is majority language. The starting point for this research was Kroll and Stewart's Revised Hierarchical Model (RHM) which proposed strong lexicon connections from L1 to L2.This model shows strong connections from L1 to semantic representation which implies fast semantic processing for L1

lexical items. According to them L2 semantic process is through L1 at early stages, only later L2 can establish weak connections with conceptual representation. Semantic matching task used to record semantic processing of each language separately and translation task to record lexical connections across the languages. L1 and L2 primes in L3 semantic matching task were designed to provide convergent evidence for the results from the semantic matching task also to justify whether any of dominant languages can facilitate L3 semantic process.

The findings support the notion that the processing of the second language lexical items did not gain the same degree of automaticity in comparison with the processing of the first language lexical items. Although the subjects of this research acquired Turkish as their mother tongue at early childhood, Persian at the age of 5 and get formal language instruction in both, they do not process the lexical items and pictures at semantic matching task with the same speed. This difference definitely has certain reasons. It can be attributed to a difference in proficiency of the subjects since they get 20 hours Persian instructions and four hours Turkish weekly. Another possible explanation could be different reading speed due to different amount of practice in these two languages the effect of practice is the most important goal of many researchers. In semantic processing of Turkish, Persian and English languages, it was found that Persian is the fastest then it is the most dominant language, Turkish is the second and English is the third with regard to speed of processing although the difference is not

significant. Therefore, the findings of this research are in line with Heredia's claim (1996) that RHM needs a revision in its L1 and L2 concepts. The RHM is not concerned with the order of the language learned but with which language is the more dominant language and which is the less dominant language. This model allows either of L1 or L2 to be the more dominant language depending on their frequent use. Referring to RHM, L2-L1 lexicon connections are stronger than L1-L2. According to Heredia, subjects are able to access CR directly, whereas L2 lexicon uses its direct links to L1 lexicon to access the CR; therefore, the link from L2 to conceptual representation remains weaker. In the present research, L3-L1 and L3-L2 lexical links were investigated by translation. L3-L2 lexical links are stronger than L3-L1.This finding is not surprising since the semantic proceeding also confirm the superiority of L2 over L1 in these subjects. The role of dominant languages in learning a new language cannot be neglected. The results of this research confirm Heredia's (1996) explanation of the manner in which a new language is learned. The learners normally associate the new words to their already dominant languages this shows that the meaning of L3 subordinates the meaning of dominant languages. Thus, the dominant languages clarify their meanings and help the learner understand the meaning of a new lexical item, the use and activation of this term in L3 is beyond the scope of any of the dominant languages and it is independent.

Turkish and Persian languages do not have the same power in establishing lexical connections with L3. Referring to the literature review, amount of language exposure and use, language mode, linguistic awareness are the most effective factors that make Persian superior over Turkish. Third experiment of the research confirms that none of the dominant languages have priming effect in L3 semantic processing which is exactly in line with previous findings.

Although Persian has some priming effect on L3 semantic processing, this effect is smaller to accelerate L3 semantic processing and makes it faster than in no-dominant language priming task.

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Conclusion

There has been an emphasis placed on the importance of studying bilingual memory, not only as a means of merely understanding bilingual memory organization and processes, but rather as a means of shedding light on general memory process. The review of literature focused on lexicon organization, gradually converged on lexicon transactions and language process of bilinguals. Evidence from other studies suggested that lexical and semantic processing in bilinguals and multilinguals is a dynamic process where many factors are involved. Amount of input, age of learning, language awareness and language mode are among the most effective factors in this regard. This research

investigated semantic processing of the languages in semantic matching tasks and lexical processing in translation tasks. Unlike the previous findings (Kroll and Stewart, 1994; De Groot et al., 1994; De Groot and Root, 1997; …) backward translation is semantic mediated process just like forward translation. This is in line with Salamoura and Williams, (2005), Heredia (1996), Dufour and Kroll (1995), Segalowitz, (1993).Regarding the types of words used here, the level of L2, L3 proficiency and the special language learning situation of these samples; an adopted model was suggested based on Kroll and Stewart bilingual model on a multilingual language mind. It seems that semantic retrieval is a necessary component of bilingual and multilingual lexical processing.

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