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RECOGNIZING THE LEXICAL UNITS OF SEMANTIC UN-RELATED TASKS IN ARABIC- ENGLISH BILINGUAL SPEAKERS WITHIN MILLISECONDS: A NEUROLINGUISTIC COMPARATIVE STUDY

Rasheed Ali Mohammed Saleh*

Abstract: *The brain is the most powerful organ in the human body. It has a very complex network. There are billions of neurons in the brain network. It decodes the lexical units and responds swiftly for the visual stimuli of semantic un-related (SUR) of Arabic language and English language within an incredible speed. The aim of the study is to compare the reaction time (RT) of SUR in Arabic language with the RT of SUR in English language experiments. Two experiments have been conducted in this study. One for SUR in Arabic language into English language, and the other one is from English language into Arabic language. 30 Arabic native subjects have been participated in the present study. 200 lexical units were elicited for Arabic language experiment and 200 lexical units were also elicited for English language experiment. These lexical units based on noun category. RT was recorded by DMDX software while the subjects implemented the visual stimuli task. The results revealed that there is a high level of significance in this comparative study.*

Keywords: *Arabic Language, English Language DMDX, Lexical units, Semantic Un-related, stimuli, Neurolinguistics*

*Senior Research Scholar, KIKS, DoS in Linguistics, University of Mysore

INTRODUCTION

Neurolinguistics (NL) is an interdisciplinary subject in nature. It is considered as a branch of linguistics. Based on background knowledge, coding, decoding, thinking, and feeding back, the subjects implemented the linguistic task swiftly within milliseconds. As per Athaifani (2014c) within cognitive linguistics, the subject thinks divergently when he/she does see and / or hear the stimulus i.e. if he/she has seen the concept stimulus '' vehicle'', the expectation will be multi comparisons for the subject. He/she may think about the other related features of the concept either in his/her native language as what does that concept mean either a denotative meaning or a connotative meaning by what is the nearest / closest word for the concept in the native language or in the foreign language.

The brain is the center of all human beings activities. It responds to the outer stimuli with a very fast reaction. The brain does recognize on the visual stimuli more rapidly in a short period of time. It has a very complicated network. The cerebellum contains approximately millions of neurons. The language exists in the areas of the brain. There are many references/ layers for recognizing these salient of languages in the brain i.e. the areas of semantics and other areas such as N400 and others. It is generally agreed that the period of scientific study of the brain and language relations began with the identification of 'the language centers' of the cerebral cortex in the latter half of the nineteenth century. Although, Broca- Wernicke- Lichtheim (BWL) model was formulated around the turn of the previous century (Ingram, 2007), it continues to provide a useful organizing framework for contemporary cognitive NL (Smith, et al. 2001).

Semantics is the study of meaning. Priming is an improvement in performance in a perceptual or cognitive task, relative to an appropriate baseline, produced by context or prior experience. As per McNamara, (2005), semantic priming refers to the improvement in the speed or in the accuracy to respond to a stimulus, such as a word or a picture, when it is preceded by a semantically related stimulus (e.g., cat-dog) or when it is preceded by a semantically unrelated stimulus (e.g., table-dog)''. In semantic unrelated, the feature of Collin and Loftus's model (1975) for its enduring influence is that it provides an easy-to-understand explanation of semantic priming. Consider a lexical decision task in which a prime word and a target word are displayed on each trial (Neely, 1991). Subjects are instructed to read the prime silently and then to decide whether the target word is a

correctly spelled word in English. Start with a trial in which the prime and the target are unrelated, such as ''see-tiger''. Reading the word ''see'' would cause activation to spread from the concept ''see'' to its entire associate i.e. boat, river, fish, etc. The node corresponding to river would therefore be active, but very little if any activation would get to ''tiger'' because '' see'' and ''tiger'' are presumably very distant in the network. When the word ''tiger'' appeared, its node would be in a state of baseline activation. Lexical decision time would depend on the normal duration of the perceptual and the cognitive processes needed to decide whether or not the string of letters on the computer screen constituted a correctly spelled word in English (Athaifani, 2014b). It is the same matter that goes in Arabic language, when the subjects implemented the current task from Arabic language into English language. The prime word is in Arabic language and the target language is in English language as well.

Experiments

Experiment (1) Reaction Time (RT) of Semantic Un-Related (SUR) from Arabic language into English language

Methods

Participants

30 native Arabic English bilingual candidates from M.A. and Ph.D. degree in English language participated in this study. With a high intermediate level of proficiency in their second language, all subjects had exposure to L2 as a medium of instructions at least for 5 years. They were provided information in the language they were capable of understanding and were explained about the aims, methods of the research and approximate duration of the testing.

Design

The study comprised on an experiment of a Lexical Decision Task (LDT) in which a condition of semantic unrelated (SUR) was presented. Hence, it included different words stimuli which appeared in the middle of the screen. In respect of SUR in Arabic language, first, a prime word appeared during 500 msec. Second, there is a gap of a given time of 500 msec. between the prime and target words to think, and to be ready for the appearing of the coming up visual stimuli. Finally, the target English word took its place and emerged in the middle of the screen and vanished after a given 1,500 msec. duration. Similarly, in respect of

English language experiment, the prime word is in English language, following by the gap and finally the target word appears in Arabic language. When the time disappeared, the other stimuli emerged in the screen automatically. Though, the subjects would press the button or not, the lexical item takes its given time. The whole duration of the process is 2500 msec. for both the languages. The subject has to respond in this duration.

Procedures

- The subjects were seated in a comfortable position facing the 14 inches screen of HP laptop.
- The procedures were carried out on an alley environment.
- Participants instructed to be ready for the task, focused on the screen and focused on the buttons (1) and (0) on a keyboard. When the stimulus appeared on the screen, the subjects have to read the stimulus and they have to decide whether it is a word for an equivalent translation or a non-word. Words and non-words were matched in terms of lengthy and familiarity. If the word is equally fine, he/she has to press the button (1). Otherwise, the subject has to press the button (0). After pressing any one of the keys, everything will record automatically in DMDX software program either positive or negative. Time taken, also, recorded for the process of taken a decision in each and every lexical unit in the study. The lexical decision, then, used to measure the RT in the test language.

Data Analyses

Data subjected to Normal Distribution Test (NDT) in order to find either they are parametric or Non-parametric. While subjecting the data to SPSS package, it has been observed that they were parametric and NDT is the best statistical method for this task. Therefore, the distribution of RT for SUR in Arabic language and English language was analyzed statistically based on the program of SPSS and the results were as follows:

Reaction Time

RT of SUR in Arabic English language was analyzed as follows:

Figure (1) Histogram and frequency curve of RT of SUR in Arabic English Language.

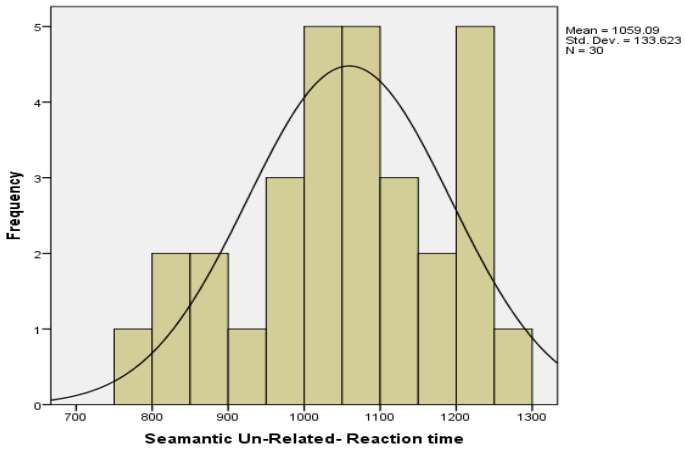


Figure (1) represents the RT of SUR in Arabic English language and seems to be approximately normal with mean of 1059.085 and SD of 133.622.

Figure (1) ,also, has shown that the mean of the entire subjects ranged in between 700 and 1300 msec. Representing the lexical units in the brain were more familiar as the historical and famouse nouns that might affect on RT representation in the brain in this connection. The bilingual brain sees the familiar visual stimuli and does think more about the stimulus in many ways. The thinking, thus, goes beyond the topic in many divergent areas. In this case, the subjects were late by responding on time. Though, the task is very easy, more time has been taken.

Table (1) test for normality using Kolmogorov Smirnov test

Hypotheses Test Summary				
No.	**Null Hypothesis**	**Test**	**Sig.**	**Decision**
1	The distribution of RT of SUR in Arabic English language is normal with mean 1095.085and standard deviation 133.622	One-Sample Kolmogorov-Smirnov Test	.852	Retain the null hypothesis

Due to Fig. (1) has shown the normality, KST has been applied for the confirmation of the normality. Hence, table (1) has shown that there was no significance because p value was .852, and that does mean there was normal distribution for the entire data of the experiment of the study. Therefore, the decision was that H0 has to be remained.

Experiment (2)

Reaction Time (RT) of Semantic Un-Related (SUR) in English Language

Methods

Participants: same participants

Design: same design

Procedures: same procedures

Reaction Time

RT in the experiment of SUR in English Arabic language was implementing as follow:

Figure (2) Histogram and frequency curve of RT of SUR task in English Arabic language

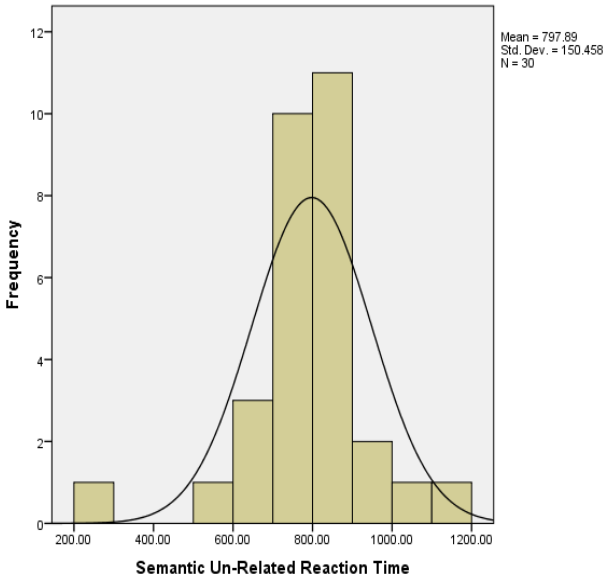


Figure (2) represents the RT of SUR in English Arabic language for N=30 by histogram and frequency curve and it was observed that the data was approximately normal. The average degree of RT in SUR experiment is 797.89 and SD of 150.458. The main reason behind that was the concept of non-words. Moreover, the psychological issues that occurred while were implementing the experiment such as fatigue and other related factors.

Table (2) test for normality using Kolmogorov Smirnov test

Hypotheses Test Summary				
No.	**Null Hypothesis**	**Test**	**Sig.**	**Decision**
1	The distribution of RT of SUR in English Arabic language is normal with mean 797.89 and standard deviation 150.46	One-Sample Kolmogorov-Smirnov Test	.527	Retain the null hypothesis

Due to Fig. (2) has shown the normality, KST has been applied for data analyses and to confirm the normality. Hence, table (2) has shown that there was no significance and that means that there was normal distribution for the entire data of the first experiment of the study. Additionally, KST has shown the mean, and standard deviation of SUR in English Arabic language experiment. Therefore, the decision was that H0 has to be retained.

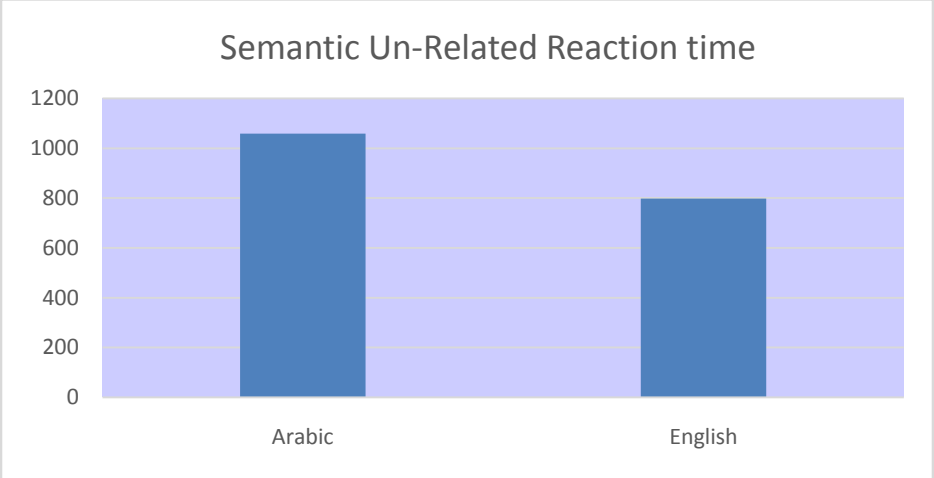
t-test:

t-test for RT of SUR in both the languages

Table (3) RT of SUR in both the languages

	t-test for Equality of means			
	t-value	df	Sig. (2-tailed)	Remarks
Reaction Time of Semantic Un-Related between Arabic language and English language.	7.109	58	.000	Sig.

Figure (3) RT of SUR between Arabic language and English language



An independent sample t-test was conducted to compare between RT of Arabic language and RT of English language in condition of SUR. Table (3) has shown that there was a significance difference in the RT of SUR task in Arabic language *(M= 1059.0852, SD= 133.6229)* and RT of SUR task in English language *(M= 797.8922, SD=150.4575) condition; t (58) =7.109, p=.000*. These results suggest that when the subjects implement any task in linguistics, the time is going to differ because the implementing task from Arabic language into English language as native one required more time comparing by implementing the experiment from another language into the native one. The main reason attributed to the

conceptual model of language. From NL point of view, the firing of the neurons from the first language (L1) / the native language into second language (L2) will be slower than firing the neuron from L2 into L1as the memory recognizes the native lexicons by the conceptual model. The bilingual subjects have taken more time while implementing the task of SUR from L1 into L2. This was, also, due to the familiarity of the lexicons in this experiment. The familiarity, then, scattered their mind for much thinking about other related culture and social things. But if the lexicons are not familiar, the subjects would response as much as they can with whatever may they know. Therefore, culture of the language also plays the major role in the realm of language contact, more particularly in the lexical processing in the bilingual brain.

Findings

- The speed in SUR from L2-L1 was faster than the speed of SUR from L1-L2.
- In regard to the brain network, the neural circuits are composed of a number of neurons that communicate with one another through special junctions called synapses. Through a process involving the creation of new proteins within the body of neurons, and the electrochemical transfer of neurotransmitters across synapse gaps to receptors, the communicative strength of certain circuits of neurons in the brain is reinforced. With repeated use, the efficiency of these synapse connections increases, facilitating the passage of nerve impulses along with particular neural circuits, which may involve many connections to the visual cortex, the auditory cortex, the associative regions of the cortex, etc. It has been found that one of the delays in responding to the visual lexical items is the long and complicated process in the bilingual brain. The reaction, then, was late and that affect on the accuracy, too.
- After the stimulus has been recognized, it may undergo further process by enrichment or elaboration. It is, therefore, after a word is recognized, it may trigger associations, images or stories on the basis of subject past experience with the word. The brain has the power to react swiftly for any visual stimuli.
- The implementing of the experiment from L-L2 depends on the concept mediation model (CMM), while the implementing of the experiment from L2-L1 depends on the revised hierarchal model (RHM).

CONCLUSION

The study matter concentrated on the major parameter, RT. RT is considered the central concept in SUR. Due to RT, the study focused on NL study as the process of recognizing the visual stimuli of the lexical items. Thinking is considered highly in this regard. Due to RT, also, there were many components including in the study such as coding the lexical units, storing, thinking, (comprehending) retrieving and / or calling the long term memory, and decoding (producing).

The current study has involved in the relative time course. In this perspective, the brain does respond rapidly to any visual stimuli within millisecond. The relative time course of SUR in Arabic language ranged from 700-1300 msec. while in English language ranged from 400-1200 msec. By a comparison, this result attributed to that implementing of the experiment from L2-L1 is faster than implementing of the experiment L1-L2. The bilingual brain does react in this case based on RHM within milliseconds.

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