CORRELATION BETWEEN REACTION TIME AND ACCURACY IN SEMANTIC PRIMING OF ARABIC LANGUAGE LEXICON: A COGNITIVE STUDY

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ABSTRACT

One of the cognitive tasks for investigating semantic priming is a lexical decision. Semantic priming refers to the improvement in the speed and accuracy in order to respond to a stimulus. The goal of the study was to examine the effective of Reaction Time (RT) on the accuracy of semantic priming of lexical units from Arabic language into English language. Methodological and theoretical implications were present in the study. 200 lexical items were elicited syntactically from a questionnaire of 400 noun word class category in both languages. Stimuli presented visually through the screen via a DMDX technique for 30 native university subjects in a speeded word and non-word classification. The Stimulus Onset Asynchrony (SOA) was 500 ms. Technology has been undergone systematically either in recording data vis. DMDX or in analyzing them statistically by SPSS. Results have shown that there was a statistical significance in the study.

KEYWORDS: Accuracy, DMDX, Lexical Items, Reaction Time, Semantic Priming, Stimuli.

INTRODUCTION

Technically, the lexical item of the first language that appears in the screen is called the prime and the second lexical item of the second language is called the target. Therefore, processing the stimuli depend upon what come first. In semantic priming, a nurse is better understood if a doctor comes first than when a nurse comes first. Semantic priming, the prime and the target are from the same semantic category and share the related features. The word ‘dog’ is a semantic prime for ‘wolf’, because the two are both similar animals. According to McNamara: (2005, p.3-4), ‘’semantic priming refers to the improvement in speed or 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) relative to when it is preceded by a semantically unrelated stimulus (e.g., table-dog).’’

Semantic memory research utilizing the lexical decision task in the last two decades has produced one of the largest bodies of cognitive psychological literature (Neely, 1991). As per Fischler, 1977, the nature of the word relationships and the nature of the task and
methodology can influence the magnitude and presence of priming. When the prime is recognized, semantic information about the word becomes available and word detectors in lexical memory are activated according to their semantic similarity to the prime (e.g., Morton, 1969). Semantic matching is also a relatively high-level cognitive process that depends on attention being allocated to the prime and to the target for some critical amount of time. When the Stimulus Onset Asynchrony (SOA) is sufficiently brief, attention is not focused on the prime long enough to support semantic matching. Alternatively, semantic matching may be triggered by presentation of the context defined by the prime and may be interrupted when the target occurs too soon after the prime.

The prime-task effect occurs even when SOAs of 200-240ms are used between the prime and the target (Henik, Friedrich, Tzelgov, & Tramer, 1994; Smith, Bentin, & Spalek, 2001). In addition, visual or auditory preview of the prime restores semantic priming in lexical decision (Friedrich, Henik, & Tzelgov, 1991; Stolz & Benser, 1996). In this study, the SOA of 500 msec. was used between the prime and target. The magnitude of semantic priming in lexical decision is larger for low-frequency words than for high-frequency words, even with associative strength equated (e.g., Becker, 1979; Stone & Van Orden, 1992). Semantic priming is also larger for degraded targets (e.g., masked or presented at low contrast) than for intact targets (e.g., Meyer, Schvaneveldt, & Ruddy, 1975).

The specialization of the left cerebral hemisphere is for many language functions (e.g., Whitney, 1998) suggested that semantic priming, at least for linguistic materials, may evince hemispheric asymmetries. Such asymmetries exist and are potentially revealing about semantic priming processes.

Meyer and Schvaneveldt (1971) provided an early demonstration of how recognizing semantically related words (bread-butter) can speed the lexical decision latencies compared to seeing unrelated words (floor-butter).

In a lexical decision task, if the cue contains the target and the prime, familiarity will be higher for a target related to its prime than for a target unrelated to its prime (e.g., lion-tiger vs. table-tiger, respectively). If familiarity is inversely related to response time, basic priming effects can be explained (Balota and Chumbley, 1984; Ratcliff & McKoon, 1988). The theory made a number of assumptions about the structure and processing in human semantic memory. These notions supported the semantic model called spread activation model, which was first incorporated by Quillian (1967) and elaborated by Collins and Loftus.
In their model, semantic meaning or concepts were represented by nodes which corresponded to individual words.

Many researchers have confirmed that reaction to visual stimulus is very fast within the mean of reaction times being 180-200 msec. (Galton, 1899; Woodworth and Schlosberg, 1954; Fieandt et al., 1956; Welford, 1980; Brebner and Welford, 1980). Perhaps this is because a visual stimulus takes 20-40 msec. to reach the brain (Marshall et al., 1943). It was, then, for about 120 years, the accepted figures for mean simple reaction times for college-age individuals have been about 190 ms (0.19 sec) for light stimuli and about 160 ms for sound stimuli (Galton, 1899; Fieandt et al., 1956; Welford, 1980; Brebner and Welford, 1980). Laming (1968) concluded that simple reaction times averaged 220 msec but recognition reaction times averaged 384 msec. In Henry and Rogers (1960) theory of "memory drum": those more complex responses require more stored information, and hence take longer. The status of this theory was reviewed by Klapp (2010). McNamara and Altarriba, (1988) obtained two steps mediated priming in a sequential lexical decision task in which items were presented one at a time on the computer screen and subjects responded to each as it appeared. Pace of presenting was rapid (80-100 ms response stimulus interval). Ratcliff and McKoon (1981) showed that priming in item recognition was statistically reliable when the SOA (Stimulus Onset Asynchrony) between the prime and the target was as short as 100 msec. Becker (1980), also, used a relatively long SOA of 1050 ms. This look like rejected according to the current study as the subjects get more confusing either to react on time or to perform better.

**Methods:**

**Participants:**

30 native Arabic English bilingual candidates 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. The average age of the subjects was ranged from 23 to 35 by an average of 29 years old. They completed two years in a foreign country like India.

**Procedures:**

- The subjects were selected 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 stimuli appeared on the screen, the subjects have to read the stimuli 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.

Results and discussion:
Data has been subjected to Pearson Correlation Test in order to find the correlation between RT and Accuracy and the crucial thing was how RT does effect on Accuracy in this task.

Correlation:
Table (1) Correlation between RT and Accuracy of SR in Arabic English direction.

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<tr>
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<th>SRRT*</th>
<th>SR accuracy</th>
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<tbody>
<tr>
<td>Pearson correlation</td>
<td></td>
<td>.688**</td>
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<tr>
<td>SRRT</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sig.(2-tailed)</td>
<td></td>
<td>.000</td>
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<td>N</td>
<td>30</td>
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*Semantic Related Reaction Time
** Correlation is significant at the 0.01 level (2-tailed)

Table (1) shown that there is a very significant among the subjects of SR task of Arabic English language direction and that does mean there was a good correlation in this task. Hence, there was a positive correlation. That does mean, if there is increasing in the RT, there is, also, increasing in the Accuracy. If there is decreasing in the RT, there is also decreasing in the Accuracy. The correlation and significant have been occurred due to the factors and due to the inputs of the study.
Finding:
It was observed that subjects have been effected by given time to respond to the visual stimuli, because of the academic background that played a major issue. Though, most of them carried almost same degree. The effectiveness, then, was on the identification of target words as well. Also, there was an effective significance on the speed because of the distribution. There are so many reasons behind this effectiveness as because of interconnected links, because of related and associated words, because on lexical semantic words and lexical semantic concepts and because of such psychological issues as tension and attention.

Conclusion:
A cognitive study on semantic priming of Arabic language lexical items has been conducted in order to figure out the effect of RT on the performance of the subjects when they have been implemented the task.

Results have shown that there was statistically a high level of effectiveness significant in the study. There was many reason of how RT effects on the Accuracy level in this linguistic task, either linguistically, psychology or other factors related to cognitive issues. In respect to cognitive issue as the study concerned, there was a matter of perception and attention along with making a decision. There was also a finding in respect of RT and performance in terms of facilitation and inhibition. Fastest responses indicate to the facilitation because of familiarity, clarity and simplicity as well as flexibility. The slowest in RT, on the other hand, indicated to the inhibition and that has been occurred because of clumsy, complexity, etc.

References: