Journal of Positive School Psychology http://journalppw.com
2022, Vol. 6, No. 2, 4584 – 4594

# The Recognition of Word Stimuli and Picture Stimuli in Arabic-English Bilinguals

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## Abstract

The goal of this study was to evaluate if the recognition of words by Arabic-English bilinguals in Kuwait College of Science and Technology, was comparable to their recognition ability with pictures. We can determine if there is a difference in lexical semantic structure between words and pictures by evaluating the speed of lexical activation of bilinguals and their rate of correct responses. The study conducted several comparisons contrasting the study's various variables. These comparisons were made using statistical analysis, with response time and accuracy serving as the foundation for all of these assessments.

**Keywords**: Arabic-English bilinguals, Word Stimuli, Picture Stimuli.

## 1. INTRODUCTION

Every language speaker has an individual psychological dictionary or vocabulary store, from which he accesses and chooses a word to use and responds to other speakers' utterances (Kroll, van Hell, Tokowicz and Green, 2010). A language speakers' psychological representations of terms, their different meanings, and the semantic classification denote which category a word belongs to is known as the mental lexicon. The organization of these different meanings and information in the mental dictionary is an essential concept to be studied and to be paid more interest. A language vocabulary, including its words and expressions, is known as Lexicon. It also includes the lexemes used to obtain terms formed according to particular morpho-syntactic rules (Grainger and Dijkstra, 1999). Therefore, a lexicon arranges the mental vocabulary in the mind of a speaker in compliance with certain concepts (e.g. all verbs of motion can be connected in a lexical network). Under specific linguistic rules, a generative system produces complex and straightforward terms.

In the mental lexicon, the characteristic features shed light on essential dimensions of semantic representation's essence. These statistical patterns form the operational concepts of numerous proposed semantic hypotheses and meaning representation models. As indicated by these hypotheses and models, semantic properties are often used to do reliable and quantitative verification of the mental lexicon structure statements. Many semantic representation hypotheses are also focused on semantic features, such as prototype theory (Rosch & Mervis, 1975) and moral theories (Smith & Medin, 1981). Semantic characteristics are also the essential components of several approaches, including the hierarchical network model of semantic memory and language representation (Collins & Loftus, 1975), the Semantic Feature Comparison Model (Smith, Shoben & Rips, 1974), Featured and Unitary Semantic Space (FUSS) Model (Vigliocco, Vinson, Lewis & Garrett, 2004), the Vector Model of Memory (Hintzman, 1986; Murdock, 1982), and the Model of Memory (Hinton & Shallice, 1991; Plaut & Shallice, 1993).

The Revised Hierarchical Model was developed due to previous research that concentrated solely on the organization and production of a bilingual's two languages (RHM; Kroll and

Stewart, 1994). That is, how a language is preserved in one or more regions of bilingual memory. In addition to storing and organizing two representational systems, the RHM considers second language proficiency (L2). This is a significant factor since, as previously said, it affects the organization of the two languages. Despite starting to learn English (L2) before the age of 7, both Arab (L1)-English (L2) high proficient bilingual participants selected for Experiments in both tasks performed well on the c test.

The RHM included a developmental theory to account for proficiency

variation between bilinguals says that: "As a bilingual becomes more proficient in L2, the lexico-semantic mapping for L2 will slowly become stronger." While there is quite some proof in support of this paradigm (see Kroll & Tokowicz, 2005; Kroll & de Groot, 1997), some works have suggested that even at the early stages of L2 proficiency, the lexico-semantic mappings from L2 could be more robust than usually presumed (e.g., Duyck & Brysbaert, 2004; Duyck & Warlop, 2008). However, it is commonly agreed that all languages are mapped onto the same conceptual system.

Chee and colleagues (2001) indicate that proficiency level plays a critical function in the lexical-semantic organization. Higher proficiency was found to be associated with decreased RTs & higher ACC and a lesser activation degree in the left prefrontal and parietal brain regions. Including other brain areas, low-proficient bilinguals engaged the left and right frontal cortex. Xue et al. (2004) evaluated low-profile, 10-to 12-year-old bilingual children (Chinese/English) for word-level semantic decision-making (visual modality). Children showed the stimulation of the left inferior frontal cortex of both L1 and L2, but the additional activation of the left inferior parietal and cingulate cortex in L2 was believed by the authors to link the attentional demands of L2. Marian et al. (2003) proposed that, in general, the same brain structures are present in the late L1 (Russian) and L2 (English) learners, incorporating eye-tracking and fMRI. Still, variations in these structures may exist as a feature of the degree of processing and through languages.

## 2. METHODOLOGY

### 2.1 Participants:

Bilingualism would imply that the bilinguals of the research would be tested in bilingual settings. Based on their English level as a second language, they are both categorized into high and low bilinguals who use Arabic as their native language. 30 Arabic-English bilinguals from the pool of 50 Arab students studying at Kuwait College of Science and Technology to whom LEAP Q was administered, were appropriately selected to participate in the study. Bilinguals, whose Arabic language is their native and English is the second language, were divided into two groups (High proficient group and Low proficient group). Proper statistical analyses were conducted to compare their performance in both tasks in general and in the two languages (Arabic & English) in particular.

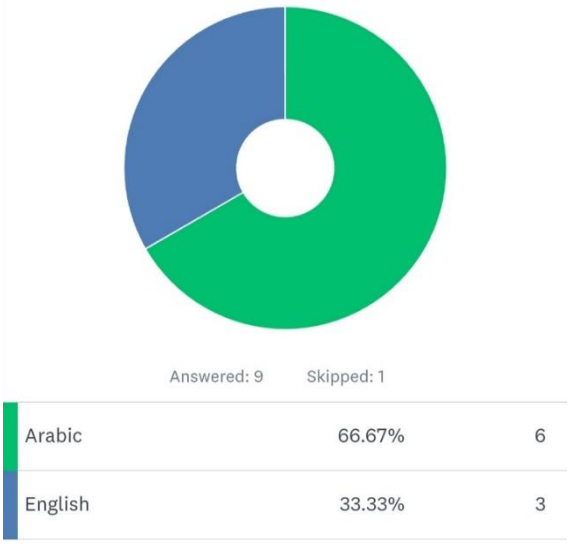


Figure 2.1 *Participant's ratings of their most used language in their daily life.*

The first group, the Arabic-English group at the higher proficiency level in L2, consisted of 15 students (aged 19–22) who had studied English as a subject from their childhood and continue to learn it in their primary and high schools as a foreign language (language in the class). They had the experience of living abroad in an English- speaking environment. They grew up in an Arabic dominant linguistic environment but were enrolled in an English speaking educational institutions. Their English proficiency in speaking, listening, reading and writing and the mean of their self-ratings on a scale of 5 were 4.5 for speaking, 5.0 for

understanding; 4.0 for reading; and 4.0 for writing.

Table 2.1 *Details of participants of Group I*

| ***SI No*** | ***L2Proficiency*** | ***AGE/Gender*** | ***AOA*** | ***MOA*** | ***L1*** | ***L2*** |
|---|---|---|---|---|---|---|
| ***1*** | *H/4.25* | *21/M* | *5/E* | *F* | *Arabic* | *English* |
| ***2*** | *H/4.5* | *22/M* | *6/E* | *F* | *Arabic* | *English* |
| ***3*** | *H/4.5* | *20/M* | *5/E* | *F* | *Arabic* | *English* |
| ***4*** | *H/4.25* | *19/M* | *5/E* | *INF* | *Arabic* | *English* |
| ***5*** | *H/4.25* | *19/M* | *5/E* | *F* | *Arabic* | *English* |
| ***6*** | *H/4.5* | *20/M* | *5/E* | *F* | *Arabic* | *English* |
| ***7*** | *H/4.25* | *21/M* | *5/E* | *INF* | *Arabic* | *English* |
| ***8*** | *H/4.25* | *22/M* | *5/E* | *F* | *Arabic* | *English* |
| ***9*** | *H/4.75* | *21/M* | *5/E* | *F* | *Arabic* | *English* |
| ***10*** | *H/4.5* | *21/M* | *6/E* | *F* | *Arabic* | *English* |
| ***11*** | *H/4.75* | *22/M* | *6/E* | *F* | *Arabic* | *English* |
| ***12*** | *H/4.25* | *20/M* | *7/L* | *F* | *Arabic* | *English* |
| ***13*** | *H/4.5* | *19/M* | *7/L* | *INF* | *Arabic* | *English* |
| ***14*** | *H/4.5* | *21/M* | *5/E* | *F* | *Arabic* | *English* |
| ***15*** | *H/4.5* | *20/M* | *7/L* | *INF* | *Arabic* | *English* |

The second group, the Arabic-English group at the lower level in L2, also consisted of 15 students (aged 19–22) who studied English as a foreign language in their native Arab countries but did not have adequate time to learn and practice English during their daily life or out of their educational institutions. They all indicated that the age of English acquisition was late in their primary school years (after the age of 7). Their English proficiency in the four skills of speaking, listening, reading and writing were measured, and the mean of their self-ratings on a scale of 5 was 3.0 for speaking, 3.0 for understanding, 2.0 for reading, and 2.5 for writing.

Table 2.2 *Details of participants of Group II*

| ***SI No*** | ***L2-Proficiency*** | ***AGE/Gender*** | ***AOA*** | ***MOA*** | ***L1*** | ***L2*** |
|---|---|---|---|---|---|---|
| ***1*** | *L/2.75* | *21/M* | *7/L* | *INF* | *Arabic* | *English* |
| ***2*** | *L/2.25* | *20/M* | *10/L* | *F* | *Arabic* | *English* |
| ***3*** | *L/2.75* | *20/M* | *10/L* | *INF* | *Arabic* | *English* |
| ***4*** | *L/2.75* | *20/M* | *10/L* | *INF* | *Arabic* | *English* |
| ***5*** | *L/2.5* | *21/M* | *7/L* | *F* | *Arabic* | *English* |
| ***6*** | *L/3* | *19/M* | *10/L* | *F* | *Arabic* | *English* |
| ***7*** | *L/3* | *21/M* | *5/E* | *INF* | *Arabic* | *English* |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***8*** | *L/3.5* | *20/M* | *10/L* | *INF* | *Arabic* | *English* |
| ***9*** | *L/3.25* | *20/M* | *5/E* | *F* | *Arabic* | *English* |
| ***10*** | *L/2.75* | *22/M* | *10/L* | *INF* | *Arabic* | *English* |
| ***11*** | *L/3* | *20/M* | *6/E* | *F* | *Arabic* | *English* |
| ***12*** | *LL/2.75* | *19/M* | *7/L* | *INF* | *Arabic* | *English* |
| ***13*** | *L/3.25* | *19/M* | *7/L* | *F* | *Arabic* | *English* |
| ***14*** | *L/3.25* | *20/M* | *10/L* | *INF* | *Arabic* | *English* |
| ***15*** | *L/3* | *21/M* | *7/L* | *INF* | *Arabic* | *English* |

### 2.2 STIMULI

One hundred picture and 50 Arabic words with its 50 English equivalents were selected to be used during the performance of the tasks (the expanded version of 400 pictures in Cycowicz, Friedman, Rothstein, and Snodgrass 1997). The stimuli were of different semantic categories (vegetables, animals, fruits, birds, instruments, and furniture). They were assessed by 5 Arabic-English bilingualism experts who are professional in English linguistics. They have been given a list of 200 pictures with their Arabic and English meanings to rate them and check their suitability for the study based on certain perspectives.

During the tasks, the participants were asked to name each picture and translate the words as quickly as possible while stimuli were presented on a computer screen. The dependent variables were RT and accuracy. The pictures appear on the screen one by one after pressing the space bar, and the participant was requested to name it either in L1 or L2 or translate the words.

The participants were requested to name pictures and words and were encouraged to say “don’t know” or “pass” if they don’t know the name of any. With the word stimuli, there were 50 English words presented in the form of pictures to be translated and to give their equivalents in Arabic and another 50 Arabic words to be translated into English. One hundred pictures were used as picture stimuli. Headset microphones connected to the laptop were used to record reaction times (RTs) by using DMDX software. Instructions were read in English, and subjects were encouraged to respond as quickly and accurately as possible. Ten practice trials were given before each session to get the subject used to the experiment's task demands in each mode of presentation (L1 to L2 &L2 to L1).

Reaction times were coded for correct responses, and all invalid responses were excluded from the analysis. Besides, we calculated the mean correct response times for the low- and high-proficient participants in all study conditions. The accuracy and response time scores for the participants in the tasks were computed separately. The main objective of the analysis was to compare the participants' performance with the picture stimuli and their performance with the word stimuli, taking into account the conditions of each task. We compared the performance of each bilingual group in each task separately and found that there was a significant difference in their performance between high and low proficient groups, especially in L2, where proficiency had a direct impact on their performance. The hypothesis for this analysis was that the HPB and LPB groups' output on picture stimuli and word tasks would be the same. The investigation of the results of the two groups in L1 and L2 was conducted from different perspectives. For instance, we compared high and low-proficient bilinguals in the L1 picture task with their performance in the L1 word task.

## 3. Result and discussion

- Comparison of bilinguals’ performance in L1 through picture and word tasks.

In this analysis, the speed of picture activation was compared to word activation's speed (RT), and the difference between them was calculated. The picture naming task and the translation task were chosen for this analysis because they clearly distinguish picture processing (represented by the picture stimuli in the picture naming task) and word translation (represented by the word stimuli in the translation task). An independent t-test using RTs and ACC on

picture naming and translation tasks in L1 was used to achieve this objective. The findings showed that subjects took longer to name a word (word translation) in L1 (1545.3606) than they took to name a picture (1176.8439). The test showed a significant difference in their LI results; thus, participants performed better on picture naming than word translation (word naming), t (2, 98) = -7.550, MSE = 48.807405, p=.001< .05.

Table 3.1 *MRTs and ACC of both groups in L1 across the two tasks.*

| | | N | Mean | Std. Deviation | Std. Error Mean | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| RT L1 | PNT | 30 | 1176.8439 | 177.91479 | 25.16095 | -7.550 | 48 | .000 |
| | TR | 30 | 1545.3606 | 295.72701 | 41.82211 | -7.550 | 80.362 | .000 |
| ACC L1 | PNT | 30 | 93.7400 | 2.01838 | .28544 | 93.8 | 48 | .000 |
| | TR | 30 | 86.4200 | 8.68517 | 1.22827 | 86.4 | 54.277 | .000 |

The data from both picture naming and translation tasks are shown in figure 3.1 &3.2, which illustrates HPB & LPB groups' performance on picture and word naming tasks in L1. Subjects were also less accurate when naming words (word translation) in L1 (86.4% correct) than naming a picture in LI (93.8% correct), t (1, 98) = -7.550, MSE = 1.26100, p = .001<.05.

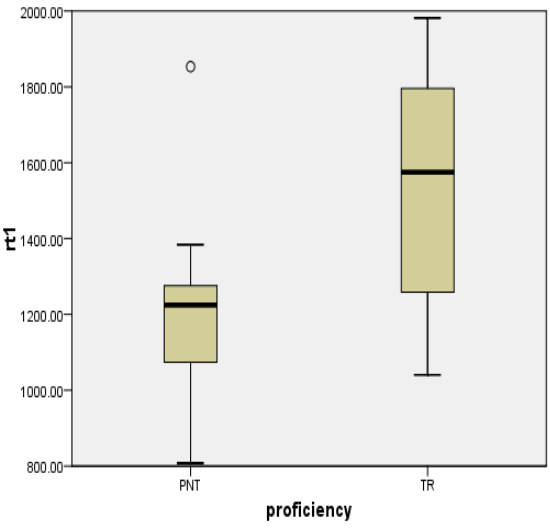


Figure 3.1 *Mean reaction time of both groups on the two tasks in L1.*

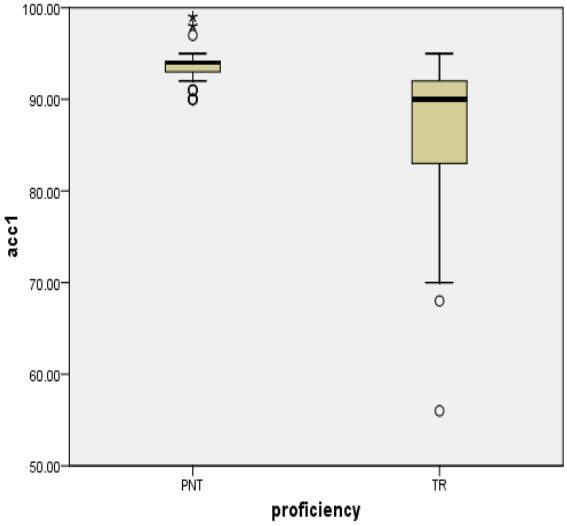


Figure 3.2. *Comparison of ACC of both groups on the two tasks in L1.*

The previous distinction's key idea was to equate the time taken to name a picture with a word translation in L1. The result showed a substantial difference between naming a picture and translating a word that supports the assumption that the task of naming a picture is faster and more precise than the task of translation. However, this study's findings contradict many studies conducted to equate word translation with picture naming, showing that words in L1 can be enabled faster than

pictures. Their conclusions were based on the idea of the word association model, which presumed that the translation from L1 to L2 was faster than the naming of an image in L2. Therefore, the outcome of the current study was contrary to this assumption. This disparity could be due to the frequency of L1 images, which provided the participants with a broader opportunity to perform faster and more precisely.

To name a picture, particularly in L1, the participant does not need to have access to any other language store, making it easier for him to trigger the meaning of the stimulus presented. However, in the translation task, the participant should have access from one language store to another to activate the word's meaning. In the picture naming, the participants need to use only their first language (dominant language), which gives the advantage of faster activation and the opposite in the translation task. They are obliged to enable other language stores. The findings of this study agree with the concept mediated model assumption that picture naming and word translation have similar reaction times and that picture naming is often faster than word translation. Both picture naming and translation, in my opinion, necessitate conceptual entry, and neither relies only on lexical links.

- Comparison of bilinguals in L2 performance through picture naming and word tasks

In addition to the performance of both groups in L1 through picture naming and word translation, a distinction was made between their performances on both tasks in L2. The high and low proficient group's speed and accuracy on picture naming in L2 were compared with these groups' speed and accuracy on the translation task in L2. The assumption set for this part of the analysis was that there is no difference between groups' performance on both picture naming and translation tasks in L2. Based on the word mediation model, words organization takes less time than pictures due to the words' direct lexical connections with their meanings in the bilingual's memory. Another assumption was based on the conceptual mediation model that suggested that word and pictures have similar reaction times to be organized. There is no difference in the performance between them from any perspective.

To prove one of the assumptions mentioned above, we have conducted a t test to give a clear analysis of both tasks' performance. The result obtained by the test suggested a significance differences between the performances of both groups on the two tasks. The reaction time of high and low proficient bilinguals on picture naming in L2 was 1357.566, MSE = 44.40050 and their performance in the word translation task was 1513.2992, MSE = 45.25884. The test result illustrates that there is a significant difference between the RTs on PNT and WT, t (2, 48) = -2.456, MSE = 63.40163, p=.016 < .05.

Table 3.2 *MRTs and ACC of both groups in L2 across the two tasks.*

| | | N | Mean | Std. Deviation | Std. Error Mean | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| RT L2 | PNT | 30 | 1357.5659 | 313.95891 | 44.40050 | -2.456 | 48 | .016 |
| | WT | 30 | 1513.2992 | 320.02830 | 45.25884 | -2.456 | 97.964 | .016 |
| ACC L2 | PNT | 30 | 86.4200 | 8.68517 | 1.22827 | .751 | 48 | .455 |
| | WT | 30 | 85.2400 | 6.93574 | .98086 | .751 | 93.428 | .455 |

On average, both tasks' accuracy rate in performing picture naming and word translation was similar. Their performance in PNT was 86.42% and on WT was 85.24%. This indicates that the performance on both tasks in L2 was conceptually mediated, so there were no direct lexical connections between the word or the pictures and their meanings. The accuracy data were given in table 3.2 as a function of translation and picture naming performance. A t-test was performed on the accuracy data showed no significant difference of ACC on word translation and picture naming tasks, t (2, 48) = .751, MSE = 1.57186, p = .455 > .05.

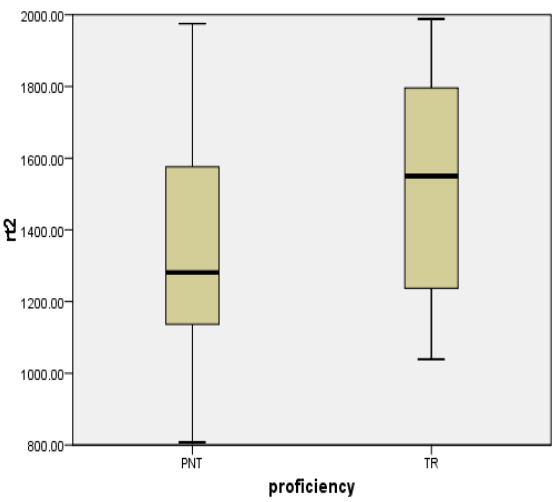


Figure 3.3 *Mean reaction time of both groups on the two tasks in L2.*

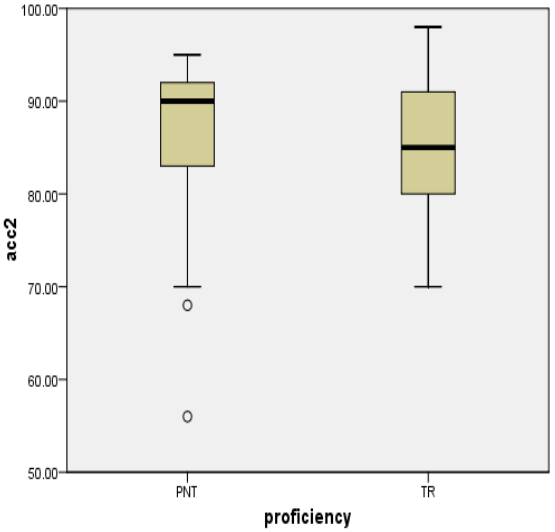


Figure 3.4 *Comparison of ACC on the two tasks in L2.*

## 4. Discussion

The main goal of the current study is to compare the two tasks' results and assess the essence of lexical-semantic organization in each task. The results show that the MRTs of the groups' scores on both picture naming and word translation are significantly different. It has long been thought that there is a distinction between word and picture organization, with words being organized faster and more accurately than pictures (e.g., Potter & Faulconer, 1975). The results of this study confirmed the claims that pictures are organized and processed faster than words. The theory behind the easy organization of pictures is that bilinguals are more familiar with pictures in general than with the orthographic forms of words, so pictures are called faster than words. This assumption replicated the findings of (Paivio 1986; Shepard, 1965), who stated that pictures are remembered better than words so that pictures are recalled and organized faster than words based on the current study's findings.

Another key finding of the previous study is that both picture and word naming are conceptually mediated before reaching the relation links of meanings. This research looked at one, or both models described earlier, the word mediation model or the conceptual mediation model. It indicates that pictures and words are conceptually mediated and that pictures are often accessed faster and more accurately than words in the current study. This result agrees with another study by potter (1984) who compared the picture naming and translation and stated that the time taken for picture naming and translation are very similar and are conceptually mediated. Therefore, any difference between the picture naming and word translation is due to any related differences in the representation of the respective surface form.

One of the most intriguing results of this study is that the accuracy rate in L2 did not differ between the two tasks. Consequently, when participants incorrectly interpreted or called a picture or word, several naming and translating errors occurred. The various types of errors can be divided into three categories: producing invalid picture responses, failing to respond within 4 seconds, and another fundamental error that occurred when participants attempted to assign a similar meaning to the target stimulus related to their culture. The picture naming task's overall results revealed substantial differences in performance between the HPB and LPB groups. Still, there were no significant differences in accuracy rates between the tasks when we compared the translation task's accuracy rates.

To get a better understanding of the current analysis, we compared the HPB and LPB groups' performance on the two tasks in terms of reaction time and accuracy in L2. The study was carried out using an independent t-test, which revealed significant differences in reaction times between HPB (1258.4398, MSE = 40.47294) and LPB (1612.4253, MSE = 36.74990). The

comparison revealed a significant difference in L2 output between the two groups across the picture naming and translation tasks, t (2, 98) = - 6.475, P =.001< .05. The accuracy rating was also calculated using the same test, and it revealed a significant difference in accuracy between the two groups, with HPB scoring 91.46 %, MSE = 36164. LPB scoring 80.20 %, MSE = 1.02976, indicating a statistical difference t (2, 98) = 10.317, P =.001< .05.

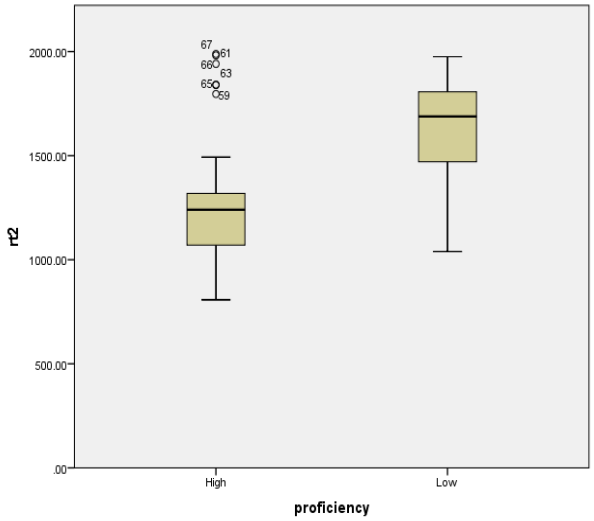


Figure 4.1 *MRTs of HPB Vs LPB groups across tasks.*

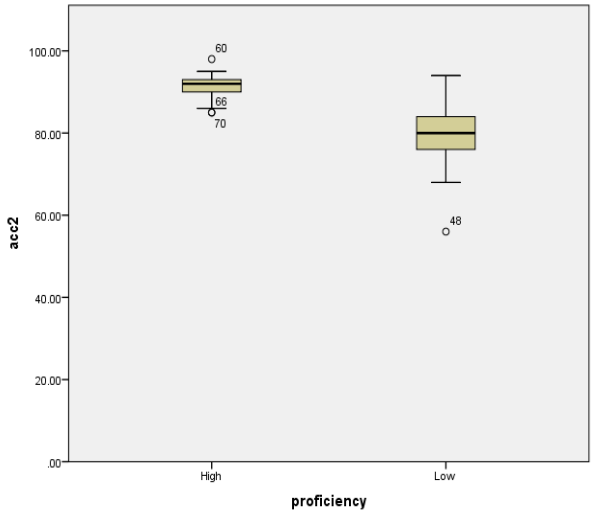


Figure 4.2 *Comparison of ACC of HPB vs LPB groups on the two tasks in L2.*

The current findings is to some extent similar to the assumptions of the BIAS+ model which states that pictures have easier access to meanings than words and are categorized more quickly. The time taken to trigger Pictures' meaning was significantly less than the time taken to translate a word. Furthermore, categorizing pictures took less time or a similar time, and both words and pictures are conceptually mediated without relying on direct lexical connections. On the other hand, pictures and words can only access semantic knowledge after passing through the lexicon. Since they have exclusive access to the semantic system, pictures can access more affectively to semantic knowledge. The HPB participants were able to retrieve words and pictures faster and more accurately than the LPB participants, demonstrating the influence of proficiency and other language history factors on lexical activation speed. Also, words and pictures in L1 were triggered faster by both groups relative to their activation speed in the L2 where the LPB output was prolonged and less reliable, suggesting that when they were highly competent in L1 as a mother tongue, they performed better than L2 when they were less competent.

## 5. Conclusion

The lexical-semantic organization is the process by which words from the lexicon are selected to represent meaning, and the context influences the word's extraction. The mental state of learning about words is referred to as lexicon. The grammar, spelling, part of the expression, and context of a word are all stored in the mental lexicon. Although lexical activation refers to extracting the most appropriate representation from the lexicon, it requires a complex series of procedures, including encoding, searching, and retrieving (Forster, 1976; Allport & Funnel, 1981; Granham, 1985; Emmorey & Fromkin, 1988).

The importance of the proficiency component in the lexical-semantic organization process was shown by comparing the two tasks of bilinguals. If a bilingual's proficiency grows, so does his or her response time and accuracy. In this sample, the bilingual population with high proficiency had faster response times and completed tasks more reliably than the group with low proficiency. The low-proficient bilinguals did well in the L1 picture naming test in terms of response time and accuracy. Still, they were slower and less precise in the L2 picture naming and both directions of the translation assignment

than the high-proficient group. The high degree of native language proficiency shared by both high and low-proficient groups, with the only distinction being the level of L2 proficiency, was behind the low-proficient group's significant performance in L1 picture naming.

The study's fundamental aim was to compare the outcomes of the two tasks and determine which is recognized faster a word or a picture. According to the findings, the MRTs of the groups' ratings on both image naming and word translation were slightly different. It has long been assumed that there is a difference between word and image organization, with words being arranged more quickly and reliably (e.g., Potter & Faulconer, 1975). The findings of this research stands with the arguments that pictures are better at organizing and processing information than words. Since bilinguals are more familiar with images in general than with the orthographic forms of language, pictures are quicker than words. Based on the current research results, this assumption repeated the findings of (Paivio 1986; Shepard, 1965), who claimed that pictures are remembered better than words and that pictures are retrieved and arranged faster than words.

According to the study findings, images provide better access to definitions and are classified more easily than words. It took substantially less time to trigger the meaning of Pictures than it did to translate a word. Furthermore, categorization of pictures took the same amount of time as categorization of words, and both words and pictures were conceptually mediated rather than dependent on direct lexical relations. On the other hand, pictures and phrases can only access semantic information after going through the lexicon. Pictures can access semantic information more effectively when they have unique access to the semantic system. The HPB could recall words and pictures quicker and more correctly than the LPB, indicating that lexical activation speed is influenced by proficiency and other language history influences. Furthermore, both groups activated words and pictures in L1 faster than in L2. The LPB performance was prolonged and unreliable, implying that while they were highly competent in L1 as a mother tongue, they performed better than when they were less competent in L2.

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