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To cite this article: Saddam H.M Issa, Fares H A Awadh & Hazhar Ramadhan Ahmed | (2022) The role of proficiency level in the speed of lexical activation, Cogent Arts & Humanities, 9:1, 1999613, DOI: [10.1080/23311983.2021.1999613](https://doi.org/10.1080/23311983.2021.1999613)

To link to this article: <https://doi.org/10.1080/23311983.2021.1999613>



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Published online: 04 Jan 2022.



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Received: 16 August 2021
Accepted: 25 October 2021

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Reviewing editor:
Jeroen van de Weijer, School of Foreign Languages, Shenzhen University, Shenzhen, China

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LITERATURE, LINGUISTICS & CRITICISM | RESEARCH ARTICLE

The role of proficiency level in the speed of lexical activation

Saddam H.M Issa^{1*}, Fares H A Awadh² and Hazhar Ramadhan Ahmed³

Abstract: The goal of this study was to evaluate if the lexical-semantic organization of Group I (high-proficient bilinguals) was comparable to that of Group II (low-proficient bilinguals), as measured by reaction time and name accuracy scores. We can determine if there is a difference in lexical semantic structure between the two groups by evaluating the speed of lexical activation. To explore the present goal of the study, the researcher conducted several comparisons contrasting the study's various variables. For accurate responses on the picture-naming test, the MRT (in milliseconds) for HPB and LPB groups in L1 was computed. The t-test result of the group comparison shows that there is no significant difference in RTs between the HPB and LPB groups in L1, while there is a significant difference between the groups in L2. These comparisons were made using statistical analysis, with response time and accuracy serving as the foundation for all of these assessments.

Subjects: Arts & Humanities; Language & Literature; Language & Linguistics; Applied Linguistics; Psycholinguistics

Keywords: lexical semantic; lexical memory; speed of activation

1. Introduction

Human beings communicate with each other quite frequently by spoken or written language, and both the speaker and the listener are involved in this interaction. Thus, some researchers are now exploring the transmission of written codes or voice sounds for both the speaker and the listener. From speech sounds (phonemes) to contextual information (pragmatics) and at other levels,



Saddam H.M Issa

ABOUT THE AUTHOR

The first and corresponding author of the current work is Saddam H.M.Issa an assistant professor of English Linguistics. He has a collaboration work with some other experts in the field of language whose concerns are language cognition and psycholinguistics. Most of their publications were sent to international journals indexed by Scopus and Springer. Some of these works were published and some of them are in press. The team concerns in doing some future works related to psycholinguistics, studying language and mind through newly invented machines and tools (Empirical work).

PUBLIC INTEREST STATEMENT

The current study closely examined the role of proficiency level in the speed of the bilinguals' first and second languages. Picture naming is one of the tasks used to achieve and explore the lexical semantic organization. The result of the study are close to the conclusion of the BIAS+ model. Even though the study was carried out with a sample of fifty bilinguals, the methodological clarity and accuracy of the study has yielded a good result. It justifies several existing observation on lexical semantic organization and put forwarded new observations in the field. The study is an attempt to understand how bilinguals do organize and how fast the word of their languages are activated in relation to their level of proficiency. It has used a systematic research methodology and has followed most steps in each level of data collection. It certainly contributes to the understanding of the Arabic-English bilinguals.

contact codes' production occurs. The organization of the definitions of words (lexical-semantic organization) unique to a given language, culture, and environment can be clarified by recognizing the basics of communication and vocabulary and the critical influencing language comprehension. Therefore, the learning and speech process of two languages is a dynamic process in which the development of the second language (target language) is specifically influenced by the first language's prior acquisition and production (native language).

Language is the most robust mechanism of human interaction, as it appears to be conveniently used to grasp and express a great range of ideas and emotions. It is utilized to convey thoughts to one another and adequately represent what we see around us. Another significant role of language is enabling us to think about ourselves, considerations and other people. Arabic is considered as one of the leading languages of the world. Arabic ranks fourth among the most commonly spoken languages in the world, behind Mandarin, Spanish and English (Abushariah et al., 2012). Arabic was approved as a foreign language in 1974 by the United States. Abushariah et al. (2012) have confirmed that Arabic is the first language of 250 million people in the Middle East and North Africa. Spoken Arabic (SA) is a local dialect which does not have a written version and it is the mother tongue of the vast majority of native Arabic speakers. Literary Arabic (LA) is used for reading and writing, as well as for structured correspondence. For the literate Arabs, these two languages of daily life are extensively interconnected. Consequently, considering the distinction between them, LA will not be treated by the cognitive structure of native Arabic speakers as a standard second language, but rather as an expansion of the spoken lexicon.

Language for communication includes different sophisticated mental processes in the bilingual's mind and massive information about the various meanings of words that ease the thoughts and ideas to be transmitted. The mental lexicon, which is a part of logical understanding, is presumed to consist of a wide collection of lexical entries. Lexical entries belong to a word's preserved knowledge that is important for identifying, interpreting and separating that word from related words. In terms of semantic characteristics, this knowledge regarding the meaning of the words may be represented. Semantic characteristics are individual meaning components that provide the full meaning of the term when put together. For e.g., you may use semantic features to define the term apple, such as <fruit>, <red>, <juicy>, <sweet>, <grows on trees> etc. These characteristics give insight into the associated word's representation, which correlates to the word, and the concept categorization.

Several hypotheses and models proposed to explain semantic representation (Rosch & Mervis, 1975; Norman & Rumelhart, 1976; Minsky, 1975; Smith et al., 1974; Collins & Quillian, 1969), which take semantic representation into account in terms of semantic characteristics as well. For a particular collection of concepts, the semantic characteristics are usually created by asking participants to list semantic characteristics that they believe are necessary to characterize the respective concepts (e.g., <animal>, <has four legs>, <barks>, etc., for the target word "dog"). While words are used as prompts in the role generation task, the semantic characteristics nevertheless provide insight into conceptual representation as to the word and conceptual awareness are strongly connected. Nouns representing specific ideas, abstract concepts to a degree, verbs defining actions and even adjectives can be the triggers used to generate semantic characteristics. In the development of semantic characteristics, variables such as familiarity and imageability of concepts and even the quantity of these concepts in a language play a key role.

The study investigates the speed and time that bilinguals use to retrieve and store the two lexicons' entries in a bilingual's mind, which is still a confusing process because various languages have different words, identical, or connected concepts. How the two lexicons' entries are stored and retrieved in the bilinguals' minds can be clarified depending on which language is used and another way by having a different store for each language and accessing it on a serial basis (Grosjean, 2014). In the bilingual activation, the model assumes that words come from two languages but refer to two language nodes, one for each language, are accessed simultaneously

so that words from the same language are activated and words in the other language are inhibited (Grainger et al., 2010; Kroll & Tokwicz, 2005). A variety of imaging experiments backed this opinion, indicating that different brain regions may be associated with other languages (Kim et al., 1997; Perani et al., 2003).

2. Methodology

2.1. Participants

From a group of 100 Arab students, 50 Arabic-English bilinguals were chosen to participate in the study. On the basis of their self-rating of their competency in L2 (English), bilinguals whose native language is Arabic and English is their second language were separated into two groups. The table below illustrates the participants' self-ratings of their competence level in the four language abilities in two groups: high proficient and low proficient.

The first group, the Arabic-English group with higher proficiency in the second language, was made up of 15 male and 10 female students (ages 19–34) who had studied English as a subject in primary and secondary schools as their foreign language (language in the class) and had spent between 2 and 6 years living abroad in an English-speaking environment in India. As assessed by the mean of their self-ratings on a 5-point scale, their English proficiency in the four areas of speaking, listening, reading, and writing was 4.96 for speaking, 5.00 for comprehending, 4.88 for reading, and 4.80 for writing.

The second group, the Arabic-English group at the lower level of second language, consisted of 15 male and 10 female students (ages 19–34) who had studied English as a foreign language in elementary and secondary schools in their home countries and had lived in an English-speaking environment in India. Their English competence was assessed in four areas: speaking, listening, reading, and writing, and the mean of their self-ratings on a 5-point scale was 3.52 for speaking, 3.12 for comprehending, 2.68 for reading, and 2.52 for writing.

2.2. Stimuli

From (the extended version of 400 photos in Cychowicz et al., 1997) of different semantic categories, one hundred pictures were chosen for the research (vegetables, animals, fruits, birds, instruments, and furniture). The images were judged by a panel of ten Arabic-English multilingual specialists in the field of English linguistics. They were given a list of 170 images to grade and assess their appropriateness for the research. These images were chosen based on a variety of criteria, including picture familiarity, picture-name agreement, picture clarity and complexity, and picture frequency. While the photos were being displayed on a computer screen, the participants were instructed to name each one as rapidly as possible. RT and accuracy were the dependent variables. The image below demonstrates how photos display on the screen one by one after hitting the space bar, and the participant was asked to identify it in L1 or L2 exactly with their supplied names. The image below shows an example of how stimuli appear in the task and the participant's reaction.

3. Results and discussion

The key objective of the current study was to see whether Group I (high-proficient bilinguals) “lexical-semantic organization was equal to that of Group II (low-proficient bilinguals), as determined by response time and naming accuracy scores. By measuring the speed of lexical activation, we can decide if there is any difference between both groups” lexical semantic organization. Participants were split into two categories depending on their language proficiency: high proficient bilinguals (HPB) and low proficient bilinguals (LPB), including their performance in each language (L1 and L2) which was assessed within each group. A normality test was administered independently for the HPB and LPB groups, and the findings indicated that the data were normally distributed. Statistical study of reaction time (RT) and naming accuracy (ACC) variables in L1 was also performed to achieve this goal (see Appendix for individual scores on these variables).

Figure 2. Comparisons in RTs and ACC between HPB Vs LPB in L1.

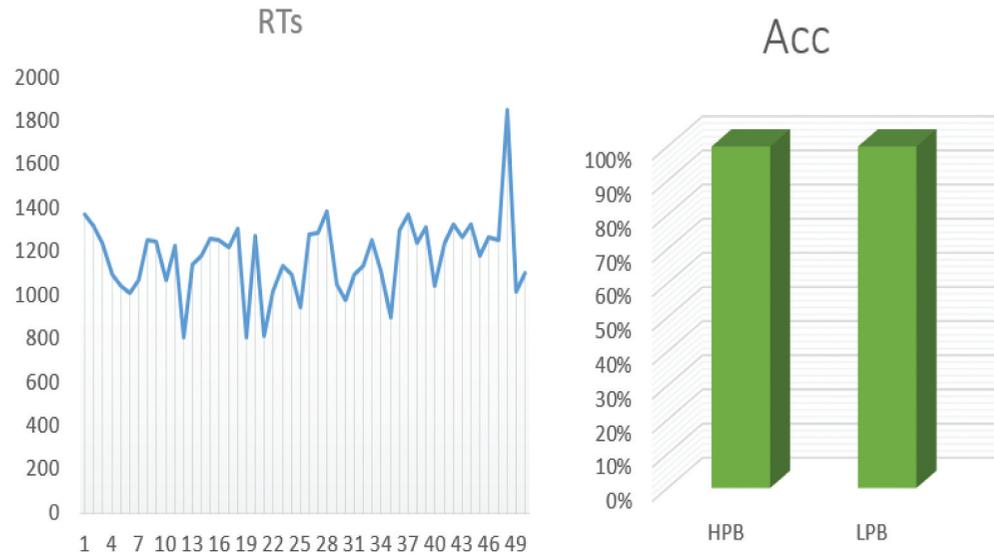
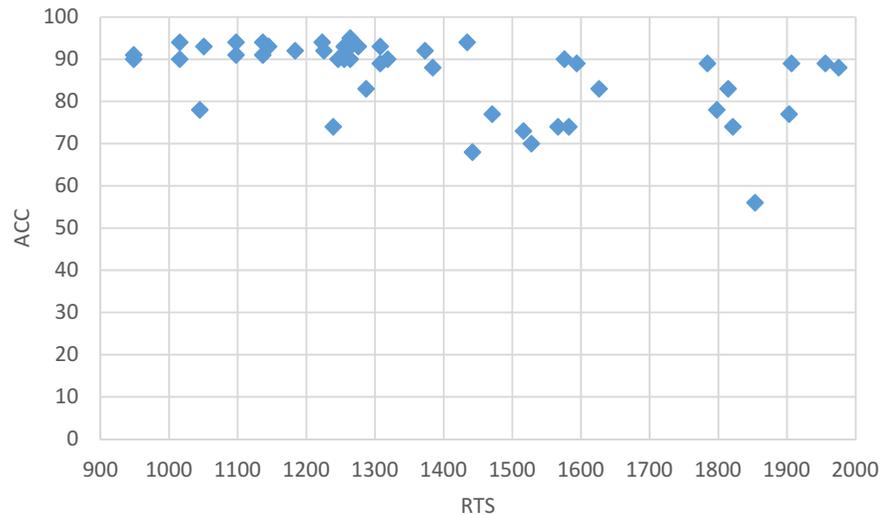


Figure 3. Distribution of scores of HPB and LPB in L2.



language. It's just that proficiency levels in L2 vary, and as a result, we'd see a significant difference in L2 but not in L1.

This analysis hypothesized that there is no significant statistical difference between HPB and LPB results in L1 and L2. As a result, HPB's percent mean score on the picture naming task (ranging from 93 to 99) was similar to LPB's (ranging from 90 to 99). As previously hypothesized, there are no significant differences in naming RTs and ACC for groups I&II in L1, but little to tell about L2 naming until the RTs and ACC of participants in L2 are evaluated in the next portion.

The RHM, which was developed to understand asymmetrical bilingual translation results, or why bilinguals name pictures faster in their L1 than in their L2, predicts this outcome. Furthermore, Kroll et al. (2010) suggest that translation is equivalent to picture naming (p.374; Kroll & Stewart,

Figure 4. A comparison of Reaction time of HPB Vs LPB in L2 picture naming.

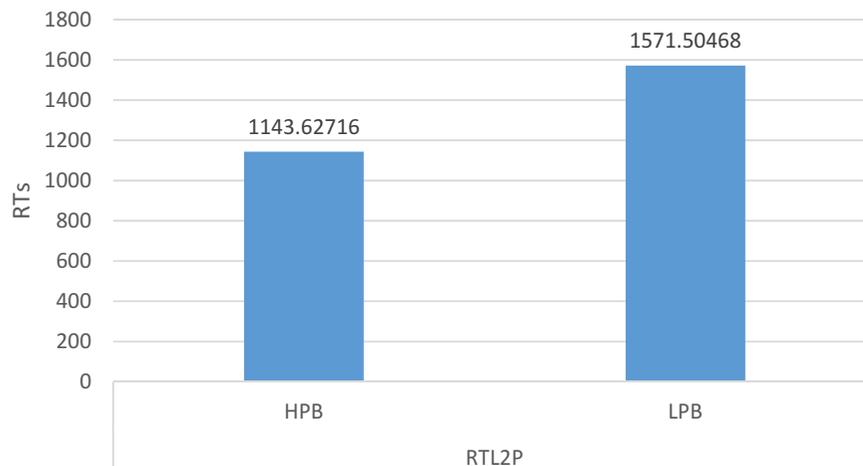
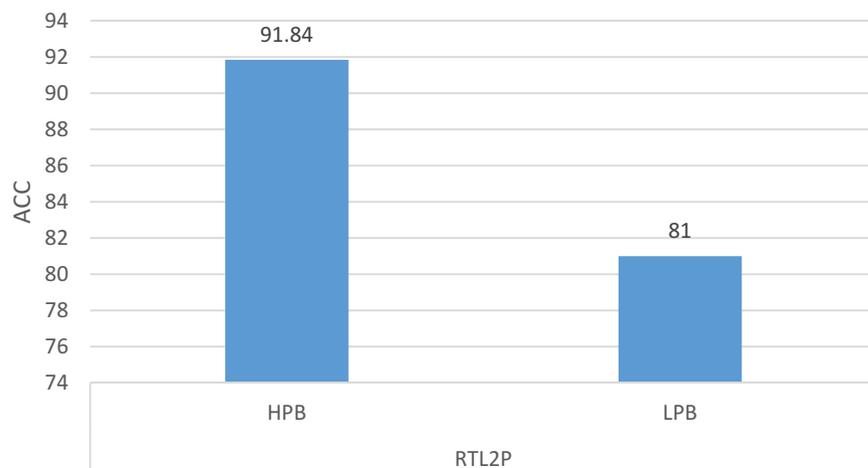


Figure 5. A comparison of the HPB Vs LPB accuracy score in L2 picture naming.



1994; Potter et al., 1984) in that it depends on semantic feature activation. As a result, it might be possible that our products were in line with numerous studies that assumed that L1 naming is faster than L2 naming due to several variables that have a significant effect on the naming process (e.g., word familiarity, frequency, etc.). Since L1 words are more familiar to the language learner than L2 words, naming in L1 is usually faster than calling in L2.

3.1. Comparison of performance of Group I and Group II in L2 on picture naming task

Another significant measure of the lexical-semantic organization is through the measurement of bilinguals' speed of lexical activation in L2. In L2 only bilinguals' show differences in RTs and ACC, which are thought to be the most critical determinants of lexical-semantic organization between HPB and LPB groups. Therefore a t-test was performed to compare HPB and LPB in L2 (second language). A description of the bilinguals' scores of both groups in L2 is depicted in [Figure 2 and 3](#).

When naming pictures in L2, the HPB group took substantially lesser time than the LPB group. RT for the HPB group was 1143.63 ms, MSE = 33.975794, and for LPB was 1571.5 ms, MSE = 55.510320. On the naming task in L2, the difference in MRTs between groups was

Figure 6. MRT of HPB & LPB across L1&L2 on picture naming.

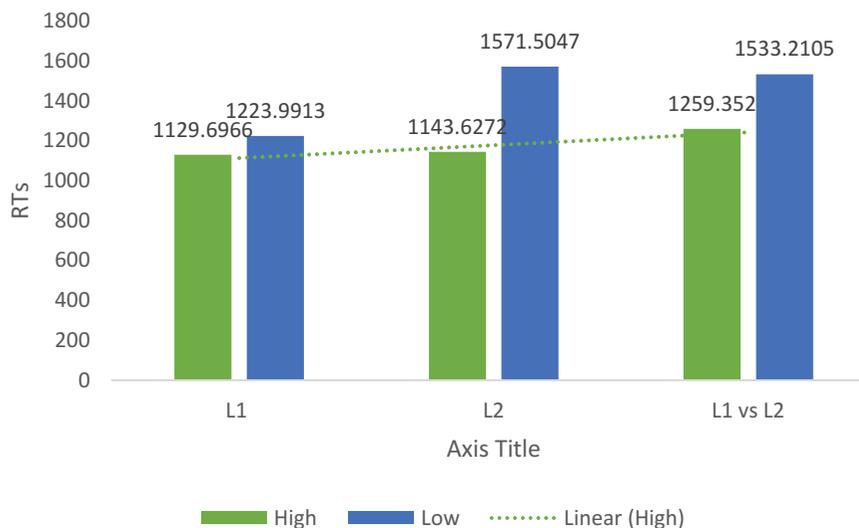


Table 1. Descriptive scores of Group I and Group II MRT across L1&L2			
Proficiency		High	Low
RTL1P	Mean	1129.6966	1223.9913
	N	25	25
	Std. Deviation	161.49603	169.87897
RTL2P	Mean	1143.6272	1571.5047
	N	25	25
	Std. Deviation	184.15833	277.55160
Total	Mean	1259.352	1533.2105
	N	50	50
	Std. Deviation	212.824228	203.779332

statistically significant, $t(48) = -6.574372$, $p < .05$. Figure 4 shows the comparison between the MRT of HPB and LPB groups, and it reveals that there is a significant difference in the outcomes of both groups. Besides, it demonstrates the scores of HPB and LPB individually.

The number of correct HPB responses in L2 was 91.84% accurate, $MSE = 0.3497$, and the percentage of correct LPB responses in L2 was 81% correct, $MSE = 1.895$. The performance of HPB in L2 is higher than the performance of LPB, so the difference between the performance of HPB and LPB groups in L2 was statistically significant, $t(48) = 5.6262$, $p = 0.001 < 0.05$. The comparison between the performance of the HPB and LPB groups can be seen in Figure 5 and 6, which provides a good description of the performance of the HPB and contrasts it to the performance of the LPB in L2. The graph reveals that the LPB performance was not as good as the HPB performance.

To investigate the performance of HPB and LPB in L2 is another way to examine and describe the lexical-semantic organization in these two different groups. Different comparisons were conducted between RTs and ACC of HPB and LPB in L2 picture naming. These comparisons concluded that

there are significant differences between MRTs and ACC of HPB and LPB. In other words, the HPB group took lesser time on naming pictures in L2 and their accuracy rate was higher than the LPB group, whose accuracy was less and took a longer time to name pictures in L2.

One of the significant aspects of the present findings is that there was no significant difference when we compared high and low proficient groups in L1. Still, when we compared their L2 performance, there was a considerable difference. When we conduct the language proficiency assessment for L1 and L2, we assume that all participants will have high proficiency in L1 and different proficiency levels in L2. That's why we don't have a significant difference between high and low in L1 proficiency. But when we took L2, it was directly dependent on the level of proficiency. In other words, the level of proficiency in L1 is the same for high-proficient and low-proficient since it is their mother tongue and in the mother tongue or the native language; each person is supposed to have strong proficiency. It's just that the degree of proficiency will vary in L2, and that's why we would have seen a significant difference in L2 and not in L1.

Failure at one stage will lead to errors at the next because naming is a set of processes (Rumalhart, 1999). Group I had higher percent mean scores on picture naming tasks (ranging from 89 to 95) than Group II (ranging from 56 to 94). The findings revealed that group II (LPB) performance was not as good as group I performance (HPB) in picture naming. There are so many reasons behind the group II participants' weak performance, and one of these reasons is their low proficiency level, which is directly reflected in their lexical activation speed and the high rate of incorrect responses. This result demonstrates the crucial role that proficiency level plays in the lexical activation process, directly associated with the lexical-semantic organization. On the other hand, individuals in Group II made a few correct naming responses, but not as many as those in Group I. Aside from those mentioned earlier, both Group I and Group II performed unexpectedly and their performance rejected the hypothesis set for this objective on the picture naming task.

In the previous two tests, we have individually investigated the main differences between HPB and LPB groups. We concluded that there were no significant differences between these two groups in L1 picture naming. However, in L2 picture naming, the HPB group showed better performance than the LPB group, which was weak. The performance of these groups included their response times and accuracy rate. In a comparison between the performances of these two groups across the two languages, we intend to obtain the MRT of HPB in L1&L2 then compare it with the MRT of LPB in L1&L2 as well.

As shown in [Table 1](#), the mean reaction time for the HPB group across L1&L2 was 1259.352, $STD = 212.824228$ and the MRT of the LPB group was 1533.2105, $STD = 203.779332$. MRT of HPB was lesser than MRT of LPB, which means that HPB responded faster than LPB across L1&L2 picture naming. Therefore, a *t*-test was conducted to investigate the significant differences between both groups and to know to which extent they differ in naming picture across L1&L2. The *t*-test result showed a significant difference between MRT performance of both groups across languages, $t(98) = -6.572060$, $p = 0.001 < 0.05$.

Using picture naming, proficiency-based investigations show that low-proficient bilinguals can only form lexical, not conceptual, connections." Bilinguals with high levels of proficiency establish conceptual links between their first and second languages' lexicons (cf. Chen & Leung, 1989; Kroll & Curley, 1988). For example, in the so-called developmental RHM version of L2, highly skilled bilinguals are relatively closely linked to L2 (Dufour & Kroll, 1995; McElree et al., 2000), while low-proficient bilinguals have an L2-concept relationship that is only moderately strong and rely more heavily on lexical word associations (Guttler -Kotz & Elston, 2004). As an example, McElree et al. (2000) found that bilinguals who were balanced (very competent) could translate from one language to the other and vice versa. Verbal translation, on the other hand, showed that unbalanced bilinguals were less accurate in L2 and took longer to process conceptual material than balanced bilinguals. Assumption: When a non-dominant language cannot support the direct

extraction of conceptual information, dominant languages have given access to conceptual knowledge (McElree et al., 2000, p. 229).

4. Conclusion

To provide an analysis of the process of lexical-semantic organization in Arabic- English bilinguals and determine the speed of how bilinguals retrieve words of a particular language is an essential finding of this study. The aim here was to investigate the lexical-semantic organization of HPB and LPB by using the free naming task. Comparing bilinguals' performance in L1 and L2 through measuring their reaction time and accuracy was the main objective of this analysis. Individuals in Group I (HPB) and Group II (LPB) performed well in L1 (Arabic) compared to L2 (English), in L1 but the opposite happened in L2 when HPB performed well in the L2 picture naming task. When a general t-test was conducted, we realized a significant difference between the high proficient group and the low proficient group in both MRT and ACC the $P < 0.05$.

Slower L2 naming may be due to a lower frequency or later age of acquisition of L2 words in a bilingual lexicon or due to L1 competition. The available evidence in this investigation suggested that these factors have an impact on L2 naming latencies but did not provide an exact answer to our query because these factors appear to be capable of influencing various lexical and post-lexical processing stages.

The study illustrated the speed and time that bilinguals use to collect and store the entries from the two lexicons in their minds, which is still a perplexing process because different languages have distinct words, same concepts, or concepts that are connected. The way the items from the two lexicons are kept and retrieved in bilinguals' thoughts may be clarified in two ways: one, depending on which language is utilized, and another, by having a separate store for each language and accessing it sequentially (Grosjean, 2014). The model proposes that words come from two languages but refer to two language nodes, one for each language, which are accessible concurrently such that words from the same language are activated while words from the other language are blocked in bilingual activation (Grainger et al., 2010; Kroll & Tokwicz, 2005). Several imaging studies supported up this theory, showing that distinct brain areas may be linked to various languages (Kim et al., 1997; Perani et al., 2003). Fluent speakers are often believed to be native speakers of the language they speak fluently, but a small group of researchers maintains that all (regular) native speakers are fluent in their L1. (2008, the Hilton). A well-known finding in this area that proves my study's findings is that L2 picture naming latencies are substantially longer and more variable than L1 picture naming latencies (Ivanova & Costa, 2008; Kroll, Bobb, & Wodniecka, 2006). The obtained result can be considered evidence that the proficiency level in a language plays a significant role in the lexical semantic organization measured through the speed and accuracy of lexical activation. It means to say that the no-significance between the HPB and the LPB in L1 picture naming is attributed to the high level that the participants of these two languages had in L1 (all are highly proficient). However, there was a significant difference between HPB and LPB in L2 picture naming where HPB & LPB varied in their proficiency based on the general analysis of the MRT of both groups across both languages.

The L1 role in L2 picture organization is highlighted by the naming delay in bilingual picture naming. When the L2 lemma or lexeme is retrieved from the mental lexicon, the L1 lexical candidates compete with the L2 enabled representations in the selection process. The key concern of this issue is whether bilingual languages are separated by the time of activation spreading exclusively to the target language's lexical representations and word types (La Heij, 2005), or whether the two structures are shared, with a lexical-external process modulating the relative activation of lexical candidates, for example, by inhibition (Green, 1998). A person is accurate when he has understood that he can perform well. As described clearly in the results, we can see that the accuracy score was better in L1 when compared to L2. This tends to show the relationship between accuracy and proficiency. The higher the proficiency is in a particular language, the better

the accuracy scores he/she obtains. This result shows that if the proficiency in a specific language is better, the reaction time would be lesser and the accuracy would be better.

The Null hypothesis of this task predicted that there is no significant difference between groups across L1 and L2 picture naming, and the analysis conducted for approving this hypothesis claims the opposite and agrees with the findings obtained (Abhishek, B.P, 2012) who claimed that bilinguals of a higher proficiency level performed better in their L1 than their L2. There is impact of proficiency in the lexical activation of LI and L2. However, there is a contradiction between the analysis findings of the study which states that the high proficiency of the bilingual leads to a faster reaction time and a more accurate response, with the findings of (Rasheed, 2015) who stated that those highly proficient bilinguals took a longer time and there is no significant difference between the reaction time of the high proficient and the low proficient. We can obviously say that the higher the proficiency is in a particular language the better accuracy scores he/she obtains. This result tends to show that, if the proficiency in a particular language is better, the reaction time would be lesser and the accuracy would be better.

5. Implications of the current work

It would be interesting to compare the lexical structure of bilingual and L2 learners. Men and women are different when it comes to the way their lexical semantic organization is organized, which may be useful when looking at the skills male and female L2 learners have. There is also an interesting question of whether bilinguals and/or L2 learners in oral language processing access lexical elements differently. More research should be done on the distinctions between auditory and visual word processing to determine which modality of word presentation organizes the meaning of the stimulus the fastest. This may be investigated via an ERP research, which examines the brain's reaction to oral stimuli (Sur & Sinha, 2009). It's worth investigating if bilinguals' access to L1 lexical items affects the structure of L2 when Arabic and English are utilized interchangeably. The variations in lexical semantic structure between men and women may be investigated further using novel techniques of lexical access measurement.

Funding

The authors received no direct funding for this research.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Citation information

Cite this article as: The role of proficiency level in the speed of lexical activation, Saddam H.M Issa, Fares H A Awadh & Hazhar Ramadhan Ahmed, *Cogent Arts & Humanities* (2022), 9: 1999613.

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