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Lexical Semantic Activation in Bilinguals: Evidence Through Blocked Naming Task

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Abstract---The retrieval of the most appropriate word from the lexicon is referred to as lexical semantic activation. Bilinguals are those who use at least two languages and can be classified based on various degree of proficiency in both languages. The facilitation and interference access that takes place during lexical access can be found out through blocked naming task. The two language representation and its processing are some important aspects to be considered in bilinguals. The general constrains on bilingualism processing models can be also explored through the researches on lexical semantic activation. The proficiency of the second language can determine the inhibitory or facilitator effect on dominant language. The present study aimed at knowing the effect of the language not in use on the lexical semantic activation of the language in use. Through blocked naming task showed that the reaction time for naming numbers was more in first language than second language. The accuracy in naming numbers in first language was less compared to first language.

Keywords---facilitation, interference, lexicon, retrieval.

Introduction

Bilingualism is defined as the use of at least two languages by an individual. The use and proficiency in two languages may change depending on the opportunities

to use the languages and exposure to other language users during interaction. It is a complex psychological and socio-cultural linguistic behaviour and has multi-dimensional aspects. Bilinguals are classified based on their varying degree of proficiency in both the languages as balanced bilinguals, dominant bilinguals, recessive bilinguals and semi bilinguals. Balanced bilinguals refer to individuals who are fully competent in both languages (Competency of L1=L2) (Lambert, Havelka and Gardner, 1959). Dominant bilinguals have L1 competency greater than or less than L2 (Peal & Lambert, 1962).

The concept of language representation in bilingual brain with regard to bilingual individual's two language system or two lexicon systems has debated among two hypotheses; First hypothesis states that each language system will be stored separately in memory and selective activation of words in each of the languages (Kolers, 1963). The second hypothesis assumes an integrated lexicon supports non-selective and parallel activation of word forms in both languages (Kolers, 1966; Lopez et al., 1974).

Lexical semantic activation (LSA) is the retrieval of the most appropriate word from the lexicon. LSA is achieved at three levels namely conceptual activation, lexical node activation and phoneme retrieval. LSA process can be measured through a variety of tasks such as event related potentials, priming based tasks (lexical decision tasks, rapid automatized naming, confrontational naming, and modified Stroop task) and naming tasks (verbal fluency task). These tasks tap more towards the use of strategy in naming rather the automatic process.

Blocked cyclic naming task is one of the tasks which can be used in the research to test the nature of lexical semantic activation. Blocked cyclic naming task empirically can yield information about the facilitation and interference effect that takes place during lexical access (American Speech-Language-Hearing Association, 2004).

In blocked cyclic naming task, participants will name a series of pictures several times in two conditions. In the homogenous condition, objects presented in a block belong to the same lexical category (e.g., lion, tiger, cow). In the heterogeneous condition, objects in a block belong to different categories (e.g., elephant, chair, apple). Naming latencies in homogenous condition will be slower when compared to heterogeneous condition and this effect is termed as semantic blocking or cyclic naming effect (Damian et al., 2001). This effect's strength is directly proportional to the degree of relatedness among semantically related items (Vigliocco et al., 2002). A study by Belke et al. (2005), on undergraduate students naming pictures of monosyllabic word length and found blocking effect to be prominent only after the first presentation of the homogeneous and heterogeneous sets. Later, the effect remained stable throughout. Response latencies on any given sets of stimuli in blocked cyclic naming will be reflected with short-termed semantic facilitation and longer semantic interference (Navarrete et al., 2012).

Research on bilingual population with regard to lexical access can yield substantive knowledge about their two language representation and its processing. Further, also provide insight into general constraints on bilingualism processing models. A study by Costa & Santesteban (2004), investigated lexical

access in Spanish-Catalan bilinguals through language switching picture naming task. It was found that both groups (Spanish has L1 and Catalan has L2; Catalan has L1 and Spanish has L2) evidenced difficulty in switching from weaker language to stronger or dominant language compared to other way around. [Bialystok et al. \(2008\)](#), studied lexical access using PPVT and Boston naming task in younger and older monolinguals and bilinguals. It was found that monolinguals performed better on lexical retrieval tasks when compared to bilinguals. Younger adults performed better than older adults ([Kolers, 1963](#); [Lambert et al., 1959](#)).

In Indian context, the lexical organization in high and low proficient bilinguals was investigated, using a semantic and translational cross language priming paradigm. The result of the study revealed the presence of cross language priming in both directions, that is, from Kannada to English and vice-versa. The study also noted that the performance of high proficient bilinguals were faster than low proficient bilinguals. An asymmetry in priming was observed with faster priming in L1-L2 condition than L2-L1. In both languages, the magnitude of translational priming was more than semantic priming. Evidence through performance based task is sparse in this direction ([Bruno et al., 2003](#); [Fowler, 2008](#)).

Need for the study

The dominant language may exert facilitation or inhibition to the second language based on the proficiency of the second language. Though a handful number of studies are done in this regard most of the studies are based on priming task where the response is prone to false positive responses hence there is a need to test the evidence on lexical semantic activation through naming tasks ([Fertonani et al., 2010](#); [Bouma, 1973](#)).

Objectives of the study

- To compare the reaction time and accuracy scores for the blocks presented in L1
- To compare the reaction time and accuracy scores for the blocks presented in L2

Method

- **Participants**
The test was conducted in 30 individuals (females) who were native speakers of Malayalam, and second language was English. The age range of participants was 18 to 22 years with the mean age of 20 years. All the participants had an exposure to English for a minimum of 10 years. The second language proficiency was estimated through LEAP Q ([Ramya & Gosami, 2009](#)). 11 Questions on LEAP Q allowed the participants to rate their proficiency on 5 point rating scale from 0-4 on the domains of understanding, reading, writing and Expression. All the participants considered for the study had the same level of proficiency and were high proficient bilinguals. In other words, the proficiency was the same for L1 and L2. The participants did not have any history of cognitive,

communication and sensory deficits. Participants either had normal or corrected visual acuity (Xie et al., 2008; Wulff et al., 2019).

- **Materials**
Total of 60 pictures was used as stimulus. 30 pictures were supposed to be named in Malayalam and were labeled as Block 1. While, the remaining 30 pictures were supposed to be named in L2 and it was labeled as Block 2. Each of these blocks had two sub blocks. The first sub block contained numbers while the second sub block contained pictures from various lexical categories. Items from 6 lexical categories such as fruits, vegetables, common objects, animals, vehicles, birds which are commonly seen in day-to-day basis were considered. Stimulus was collected directly from internet. The stimulus was presented by employing DMDX and the vocal reaction time was derived.
- **Procedure**
The task of the participants was to name the picture as early as possible which is shown in block 1 (lexical items and numbers in Malayalam) and block 2 (lexical items and numbers in second language (English)). The participants were asked to adhere to Malayalam for the 1st block and English for the second block compulsorily. The vocal reaction time for the naming was elicited and analyzed for the two blocks along with the accuracy in naming.

Discussion

The reaction time and accuracy scores were determined for the sub blocks of block 1 and the two sub blocks of block 2. The reaction time for sub block 1 (of block 1) was 1632.28 milliseconds, while the reaction time for sub block 1 (where the participants were asked to name numbers in Malayalam) for block 2 (where the participants were asked to name the numbers in English) was 1332.21 milliseconds. The accuracy score for the two sub blocks was 90% and 98% respectively. In order to verify if there was any significant difference between the reaction time scores, Wilcoxon's signed rank test was used (as data was non parametric), the Z score obtained on comparison was 3.12 and corresponding p value showed significant difference (Hillman et al., 2000; Meyer, 1970).

In the same lines, the reaction time and accuracy scores were determined for the two sub blocks of block 1 and 2. For the second sub block, the participants were asked to name pictures in Malayalam (block 1) and English (block 2). The reaction time was the pictures to be named in Malayalam were 1556.33 milliseconds and the accuracy scores was 97%. While the mean reaction time and accuracy scores for the pictures to be named in English were 1663.26 and accuracy scores was 98% (Noppeney & Price, 2004; Wu et al., 2000).

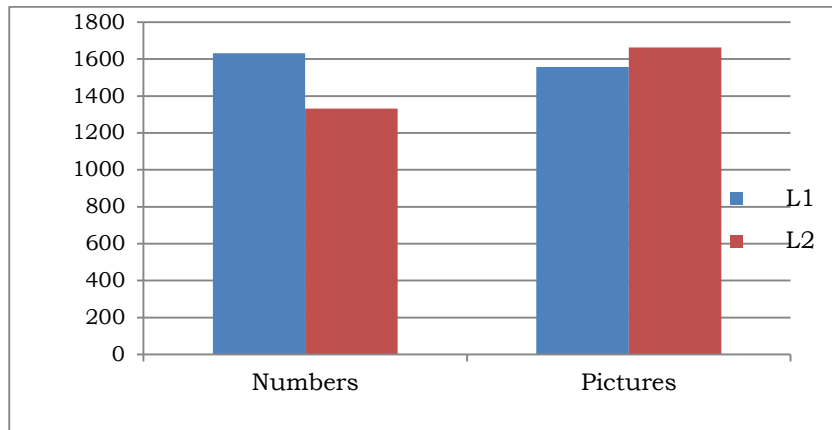


Figure 1. Reaction time for numbers and pictures in L1 and L2

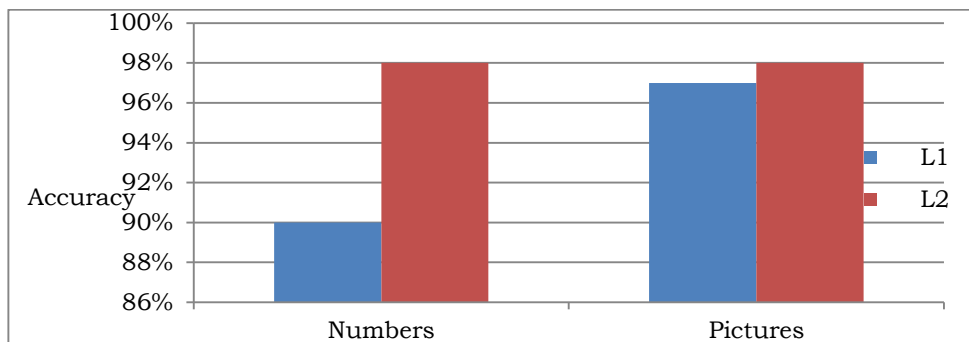


Figure 2. Accuracy for numbers and pictures in L1 and L2

Wilcoxon's signed rank test was used again and the Z score was 1.78 and corresponding p value showed no significant difference. The reaction time and accuracy varied for number naming. The participants were used to name the numbers in English; they exhibited difficulty when they were asked to name in Malayalam. This was also evident as the accuracy scores were poor for naming numbers in Malayalam as the responses were provided in English instead of the desired language. In other words, the lexical nodes in English (the dominant language) in this context exerted inhibition making the lexical activation difficult. The present results support the earlier findings of Costa and Santesteban study. Another reason could be due to the function of differences in the use and exposure to language in bilingual population leading to relatively poorer activation of nodes and poorer performance in the language (Whitford & Titone, 2015). For naming pictures, pictures (lexical items) were frequent in both the language. Most activated word in the system will be retrieved easily because of the frequent use and exposure to the word. Hence inhibition of lexical nodes was not experienced and the participants could name the picture without the interference of the language not in use (Jafarova, 2021; Kambarova, 2021).

Conclusion

The aim of the study was to investigate the effect of the language not in use on the lexical semantic activation of the language in use. The participants were asked to name the pictures presented as blocks. The first sub block was numbers, while the second sub block was pictures. The participants were asked to name block 1 in Malayalam and block 2 in English. There was a significant difference between the reaction time and accuracy in naming the numbers in Malayalam due to the inhibitory response offered by the lexical nodes of English.

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