Lexical semantic activation in bilinguals: Evidence through blocked naming task

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1   **Lexical semantic activation in bilinguals: Evidence through blocked naming task**

2   **Abstract**

3   The retrieval of the most appropriate word from the lexicon is referred to as lexical

4   semantic activation. Bilinguals are those who use at least two languages and can be classified

5   based on various degree of proficiency in both languages. The facilitation and interference

6   access that takes place during lexical access can be found out through blocked naming task.

7   The two-language representation and its processing are some important aspects to be

8   considered in bilinguals. The general constrains on bilingualism processing models can be

9   also explored through the researches on lexical semantic activation. The proficiency of the

10   second language can determine the inhibitory or facilitatory effect on dominant language.

11   The present study aimed at knowing the effect of the language not in use on the lexical

12   semantic activation of the language in use. Through blocked naming task showed that the

13   reaction time for naming numbers was more in first language than second language. The

14   accuracy in naming numbers in first language was less compared to first language. The

15   inhibition offered by the lexical nodes in second language for number naming and the

16   difference in use and exposure to language are the possible reasons for relatively poorer

17   activation of nodes and poorer performance in first language. This inhibition was not found in

18   case of naming pictures. It can be attributed to the frequent use and exposure to the word

19   which leads to easy retrieval of most activated word in the system. This prevented the

20   inhibition of the lexical nodes and facilitated the picture naming without interference from

21   second language.

22   **Key words:** blocked naming, lexical semantic activation, bilingualism, lexical retrieval

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Introduction

Bilingualism is defined as the use of 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 (ASHA, 2004). It is a complex 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 & 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 words get activated selectively 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 & Young, 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. The lexical representation that is corresponding to the target picture/concept is not only one that gets activated but other related representations also gets activated. This process is called lexical node activation. Among all the representations that is activated, one lexical representation gets selected which is appropriate to the context. Following this, phoneme retrieval takes place. The appropriate phoneme segments which are required gets activated pertaining to the activated lexical representation.

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LSA process can be measured through various 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 investigate 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.

In blocked cyclic naming task, a series of pictures will be named several times in two conditions. In the homogenous condition, pictures presented belong to the same lexical category (e.g., lion, tiger, cow). In heterogeneous condition, pictures presented belongs 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 or interference effect (Damian et al., 2001; Belke et al., 2005; Schnur et al., 2006). This effect's strength is directly proportional to the degree of relatedness between semantically related items (Vigliocco, Vinson, Damian, and Levelt (2002)). In homogenous condition, there will be an increased activation of all lexical competitors. To accomplish the selection of target lexical name among the competitors, it needs a mechanism which can facilitate the activation of target name or inhibiting the competitors' activation (Roelofs, 2003).

A study by Belke, Meyer and Damian (2005) on undergraduate students naming pictures of monosyllabic word length and found blocking effect to be prominent only after the initial presentation of the homogeneous and heterogeneous sets. Later, the effect remained constant 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, Prato and Mahon (2012). A model of lexical activation explaining

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the incremental interference in a continuous naming task like blocking naming should have these properties: shared activation, competition and priming, according to Howard et al. (2006).

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 and 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.

Studies on high-proficient bilinguals using cross language semantic priming paradigm found that irrespective of language direction, the extent of priming between semantically related words remained constant (Perea et al., 2008; Travis et al., 2017). Bilinguals experienced similar level of semantic interference in both the languages on picture naming task (Runnqvist et al., 2012). These findings suggest that lexical selection is language independent. Neural based studies also confirmed that semantic network while processing lexical representation in first language and second language exhibited similar activation in brain (Grogan et al., 2009; Chee et al., 2001; Pillai et al., 2003). A study in Indian context with contradicting findings to the above-mentioned research, investigated the lexical organization in high and low proficient bilinguals by Rajani (2005) 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 was faster than low proficient bilinguals. An asymmetry in priming was observed with faster priming in L1-L2

condition that 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.

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.

Aim of the study: 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.

Objectives

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

Participant details

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 & Goswami, 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.

Materials

Total of 60 pictures was used as stimulus. 30 pictures were supposed to be named in Malayalam language and were labelled as Block 1. While, the remaining 30 pictures were supposed to be named in L2 (English) and it was labelled 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 analysed for the two blocks along with the accuracy in naming.
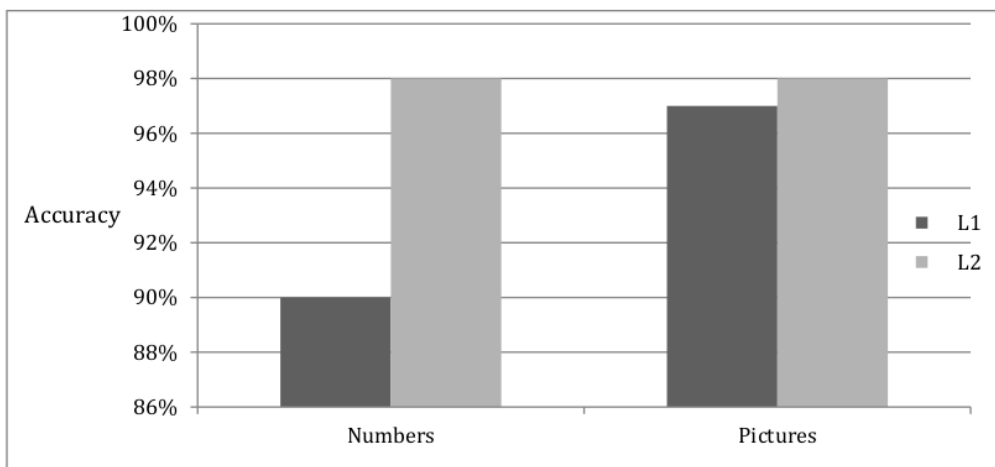
Results

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 (where the participants were asked to name numbers in Malayalam) was 1632.28 milliseconds, while the reaction time for sub-block 1 of 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

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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), it was found significant difference (|Z|= 3.12, p<0.05, r=0.40).
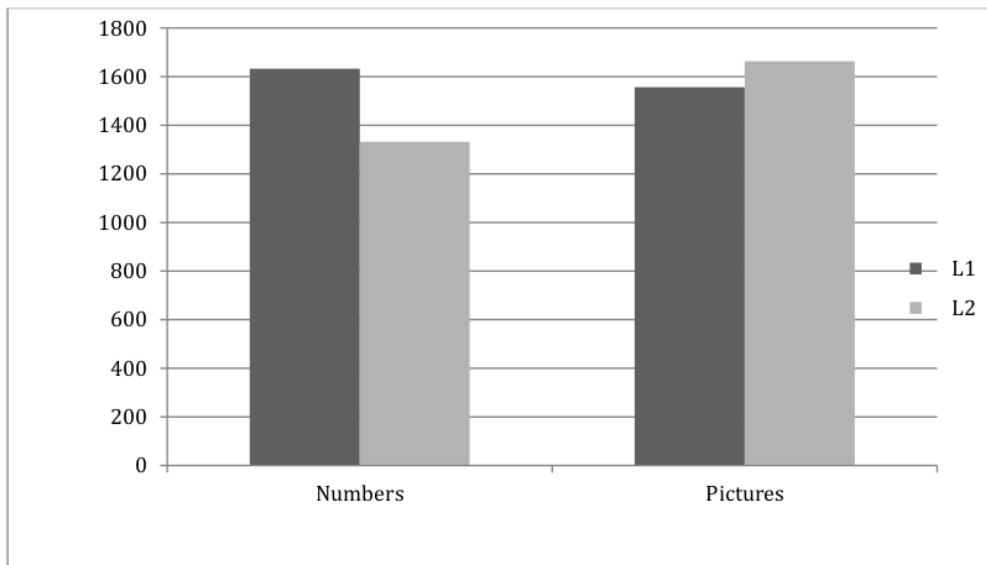
Figure 1: Reaction time for numbers and pictures in L1 and L2

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

On 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 for 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%. Wilcoxon's signed rank test was used again and the observed no significant difference ($|Z|= 1.78, p>0.05, r=0.22$).

Discussion

Lexical activation refers to the activation of the words from the lexicon. It has been an enigmatic phenomenon which has been studied in bilinguals. In bilinguals, the lexical semantic activation depends on the language proficiency. There are handful of studies which connect the lexical semantic activation and bilingualism.

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 (2004). Another reason could be due to the function of differences in the frequency of language 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 (lexical items), the words for lexical items most of the time its basically used in English, so there would be more of influence or inhibition offered by the second language than the words. From this, it can be concluded that along with the proficiency, the language used also would influence the lexical semantic

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activation. However not many studies on lexical semantic activation as a function of bilingual proficiency has not been carried out much.

Earlier investigations have attempted to explore the relationship between bilingual proficiency and lexical semantic activation. However, the effect of stimulus on lexical semantic activation has not been explored much. The present study throws light at studying lexical semantic activation as a function of word use. Thus, two type types of stimulus were used in the current study. Interestingly, the lexical semantic activation varied with respect to the stimulus used and the amount of influence exerted by the other language was more while naming numbers when compared to naming lexical items. This pattern of results highlights that along with bilingual proficiency, the stimulus would also influence the lexical semantic activation.

Conclusion

The aim of the study was to study 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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