STM JOURNALS

Emerging Trends in
Languages

Volume 1, Issue 1, 2024
January—June
DOI (Journal): 10.37591/ETL

https://journals.stmjournals.com/etl

Research ETL

Switching in Bilinguals: Evidence from Forward and Backward Switching Tasks Across Visual and Auditory Modality

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Abstract

Bilingualism refers to the use of two languages on a day-to-day basis. Defining bilingualism operationally is complex due to the heterogeneity associated with it. Proficiency in the second language can vary on an individual basis. Bilinguals can be classified as balanced or dominant, high proficient or low proficient based on the proficiency levels. The effect of bilingual proficiency on executive functions has been studied extensively. The current study explored the switching ability. Switching refers to the ability to switch from one language to another language from L1-L2 and L2-L1 and this phenomenon refers to forward and backward switching. The current study investigated the effect of proficiency and modality on language switching. 30 Female participants in the age range of 18-30 years were included in the study. High proficient bilingual Participants were asked to switch the information presented in visual and auditory modality from L1to L2 and L2 to L1. The results showed that the performance on L1-L2 was superior compared to L2-L1 and the results were against the traditional claim that there would be no difference in forward and backward switching in balanced bilinguals. The results did not vary as a function of modality. The results signified the role of linguistic use over proficiency in determining the efficacy of switching. The result signifies that factors beyond the proficiency may influence executive function and the use of L2 in day-to-day context is one such potential factor which may have influenced the results.

Keywords: Bilingualism, proficiency, forward translation, backward translation, language use, Executive function.

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Received Date: June 11, 2024
Accepted Date: June 25, 2024
Published Date: June 27, 2024

Citation: Aslin, Jilda Sulthana, Fathima Mehjabin, Abhishek B.P. Switching in Bilinguals: Evidence from Forward and Backward Switching Tasks Across Visual and Auditory Modality. Emerging Trends in Languages. 2024; 1(1): 19–23p.

INTRODUCTION

An individual's ability to speak in two languages is bilingualism. It can be acquired early or late in one's life. Approximately half of the world population is bilingual or multilinguals. Bilinguals are classified based on their age, context, way of language acquisition and as based on the hypothesised processing mechanism or hypothesised language representation which include: 1) Early/Late 2) Compound, coordinate, and sub-ordinate 3) simultaneous and successive A bilingual can have considerable level of fluency/mastery in the second language and this factor is called proficiency. Proficiency is a very important factor, and it refers to the skill of an individual to use their second language like a native or fluent speaker. It indicates a person's proficiency in using a second language at a level that is close to that of a native or fluent speaker, which has a significant impact on cognitive and communicative

capacities. High proficiency can improve executive function and cognitive flexibility, which will facilitate bilinguals' smooth language switching [1].

Understanding, speaking, reading and writing forms the four core skills for the attainment of bilingual proficiency. Understanding would be the easiest to acquire followed by speaking, reading and then writing. Theoretically, there is no direct connection between the ability in one skill or the other. This, in fact, is true as a bilingual might have a good understanding of the language but may not be proficient enough while using the language for speaking. On the basis of proficiency, bilinguals are classified as balanced and dominant types [2]. When L1 competence is equal to L2 competence, the condition is a balanced type. In a majority of the cases, balanced bilinguals are early bilinguals, who have acquired their languages simultaneously. On the other hand, in the dominant type, the L1 proficiency is greater than or less than the L2 proficiency. Bilinguals can also be classified as high proficient and low proficient based on the proficiency possessed in the second language.

Bilinguals regardless of their proficiency levels has been shown to have a positive effect on individuals' cognitive development; this effect is mediated by executive function, in particular through selective attention and inhibition control [3,4]. Executive functions are a complex set of higher cognitive functions and meta-cognitive functions that work together to regulate thoughts, feeling, and behaviours in order to solve issues and achieve goals (The executive function becomes pivotal in regulating language switching and control. Bilinguals regardless of their proficiency levels has been shown to have a positive effect. The bilingual advantage is due to relative inhibition i.e. facilitation of relevant information and not due to active inhibition, where there is active inhibition of irrelevant information [5]. This selection process is part of the cognitive function called the executive control system. Thus, the bilingual advantage is not a result of inhibiting the irrelevant language constantly, but a better selection of the relevant/target language from the irrelevant competing language(s) Hence, language selection tends to have generalized cognitive benefits. It is also assumed that as the number of years of experience of selecting and managing two language increases, an individual becomes more skilled across different aspects of executive functions and this skill would reduce with aging [6,7].

Words from a language may either facilitate or cause interference when a bilingual processes a language. The facilitation/inhibition holds good for all domains like writing, listening, and reading. The term "Language control" is used to refer to the ability to restrict the processing to the relevant language and selectively inhibit the unused language, this skill is crucial for effective communication. The language control can vary as a function of proficiency. One of the most remarkable abilities of bilingual population is their capacity to switch between two languages with ease. However experimental investigations have demonstrated that switching between languages can come at a cost in terms of speed and accuracy [8]. Language switching during bilingual production is often shown to incur costs in the form of slower production when compared to remaining in the same language [9].

In both speech comprehension and speech production costs have been observed [10]. When switching from a stronger first language(L1) to a second language (L2) that is relatively weaker, the cost of switching language should be higher for switching to L1 than for switching to L2 [11]. There is clear dearth of studies on the relationship between language switching and proficiency necessitating the current study. Additionally, the frequency and context of language use may have an impact on the cognitive load related to language change. The current study aims to bridge the knowledge gap on the relationship between language switching and proficiency, which is still lacking.

Need of the study: Bilingualism/Multilingualism is a heterogeneous phenomenon. Executive functions like language control and switching can vary as a function of proficiency. In addition to this the modality of stimulus presentation also can have a significant effect on the efficiency of language switching hence these parameters become important in context to switching.

The aim of the study is to compare the proficiency of code switching between L1 and L2 using auditory and visual (orthographic) modality. The study attempts to shed light on the factors impacting language switching skill and efficiency by analyzing how bilinguals navigate between languages based on the format of information—visual or aural. This study may provide important new understandings of the mental processes that underlie multilingual language processing.

METHODS

Participants

30 native female speakers of Malayalam (L1) with varied proficiency level in English (L2) were selected through convenience sampling. The participants were undergraduate and postgraduate students with a Mean age of 21.1. Language Experience and Proficiency questionnaire (Ramya & Goswami, 2009) was administered on the participants, and it is noteworthy that all the bilinguals considered were dominant bilinguals in L1 as per their self-rating.

Materials

Pre-recorded Audio and visual samples of both English and Malayalam words with different levels of familiarity were used. Recordings were done using smartphone and presented via free-field.

15 Malayalam and English words, both in auditory and visual (orthographic) modes which adds upto a total of 60 stimuli were presented. The word length ranged from 2 syllables to 5 syllables.

Procedure

A total of 4 tasks were given to each participant:

In task 1, participants were presented with 15 words auditory in their L1 and instructed to switch it to their L2. In task 2, next set of 15 words were presented to the participants orthographically in their L1 and instructed to switch it to their L2. In task 3 and task 4 the same procedures were repeated for switching L2 to L1 in auditory and visual (orthographic) mode. Participants were expected to switch between L1 and L2 and the visa-versa within a time limit of 5 seconds.

Scoring

A score of '1' was given for each correct response and '0' for no response/ incorrect response/ responses given after the specified time limit.

RESULTS

The median scores for the stimulus presented in visual modality for L1-L2 and L2-L1 switching was 12.0 and 11.0 respectively. While the median scores for the stimulus presented in auditory modality for L1-L2 was 14.0 and 11.0 respectively. The objective of the study was two folds. The first objective was to compare L1-L2 and L2-L2 for the visual modality and auditory modality respectively. The second objective was to compare the effect of modality on L1-L2 and L2-L1 switching respectively. Shapiro-Wilk's test of normality revealed that data was non parametric. Wilcoxon's signed rank test revealed that there was no significant difference between L1-L2 and L2-L1 conditions with Z scores of 0.58 ($p>0.05$) while the same statistic revealed that there was a significant difference between the two conditions on auditory modality. The same statistic was used to verify if there any significant between visual and auditory modality for L1-L2 and L2-L1 switching conditions and the statistic revealed that there was a significant difference between the two modalities for L1-L2 switching with a Z score of 2.12 ($p<0.05$) for L2-L1 switching a Z score of 0.10 ($p>0.05$) was obtained.

DISCUSSION

The median scores were higher for L1-L2 switching and this hold good for visual as well as auditory modality. This can be attributed to the primacy effect. The participants considered for the current study were balanced to dominant bilinguals in their L1 but they used L2 English in their day to day contexts.

This could have attributed to the difference between L1-L2 and L2-L1 switching. The result signifies the importance of the primacy factor in language switching and shows that the proficiency may not be a sole factor in regulating the language switching. All the participants were native speakers of Malayalam and invariably it is assumed that the native language of the participants is expected to be dominant and exert influence over the other language, considering this the participants should have performed better in L2-L1 condition, however the results showed slightly different results. When the stimulus was presented in L1 the participants found it easy to translate it to L2 p, this can be attributed to the dominancy of L1. The other factor for better translation in L2 could be that the participants were young individuals who used L2 excessively in their day-to-day context. The median scores were relatively less for L2-L1 conditions. This could be because the participants were not able to translate L2 words to L1 in real time and also that the participants were not able to retrieve the words in L1 which was relatively less used. The results hold true for both visual and auditory modality. In the other words, the results remained consistent across the two modalities. However, correlation between proficiency levels and the scores on switching was not carried out as it was beyond the purview of the current paper. The current paper investigated the effect of modality on the two switching conditions, the median scores on auditory modality was higher for L1-L2 condition while the median scores was equal for the visual modality for L2-L1 condition. Thus, it can be inferred that the modality did not have a confounding effect on the scores on switching.

CONCLUSIONS

Balanced to L1 Dominant Bilinguals were considered for the current study and L1-L2 and L2-L1 conditions (switching) was carried out on the participants across the visual and auditory modalities. The results showed that there was a significant effect of condition on switching and the scores were superior for L1-L2 switching condition against the standard notion that in balanced or dominant bilinguals, performance would better for L2-L1, and the results was attributed to the ‘use factor’ signifying the primacy effect. The results also showed that the proficiency influenced the executive functions. The results did not vary across the modality showing that the switching ability remained uniform across the two modalities. This consistency highlights the bilingual cognitive system's resilience in handling language switching tasks, regardless of sensory modality, and offers fresh perspectives on how bilinguals handle language shifts in various situations.

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