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Effect of Language Proficiency on Bilinguals' Processing of Regular Past Tense Inflections in Second Language

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ABSTRACT

The study aimed at finding out how Pakistani non-native users process morphologically complex words in English. The study employed a masked priming experiment involving 39 (17 female and 22 male) Pakistani non-native users of English. The participants were divided into 3 groups (13 each according to their proficiency levels in English. The experiment contained items with the same primes and targets, items with completely unrelated primes and targets, and items with regular past tense inflections as primes and their uninflected forms as targets. The results show that full priming effects took place in case of the same primes and targets whereas no priming effect was witnessed in case of the unrelated primes and targets across all the items in all the three groups. Partial priming was observed in the items involving past tense inflections. However, the partial priming effect was limited only to the high proficiency group and the low and the medium proficiency groups did not show any priming effects. This confirms that L2 processing becomes more native-like as the users attain a higher level of proficiency in the second language which means that proficiency in L2 is the key factor in processing.

Keywords: priming, masked priming, L2 processing, morphologically complex words

INTRODUCTION

Language processing has always generated a consistent debate among researchers. Research in the area has tried to answer questions like how words, sentences and grammatical rules are stored and internalized in the human mind. Many theories about the processing of language have been presented and tested via constant research in the area. Psycholinguistics is the branch of linguistics that pertains to the research in the area of language processing as it deals with both linguistics, the study of language, and psychology, the study of human mind.

Steven Pinker (1994) presented the dual mechanism theory which suggested that the native users of English treat regular and irregular past tense forms of verbs differently. According to the theory, the native speakers of English break down the regular past tense inflections into the combining morphemes. That is, *played* is broken down into *play* and *ed* and these two morphemes are stored separately in the mind. The irregular past tense forms, on the other hand, are stored in full form. Breaking down the morphologically complex past tense inflections makes it easy for the native language users to store and retrieve the words. That is why native language users process the regular past tense inflections relatively quickly as concluded by many studies afterwards. (Pinker et al., 2002; Pinker & Prince, 1991; Sereno & Jongman, 1997)

Later research in the area did not limit the research to regular and irregular past tense forms and expanded the debate to processing of morphologically complex words like inflections and derivations. However, there was one consistent finding till early 2000s: native speakers break down the morphologically complex words before storing them in their mental lexicons. The conclusion was reached because the native speakers took less time to retrieve the morphologically complex words as compared to the non-native speakers of a language. This led the researchers to believe that the non-native users of a language store all the inflected forms of a morpheme as separate entries in their mental lexicons which makes the size of their lexicons bigger as compared to the native users of the language. That is why the non-native users take more time to retrieve the morphologically complex words from their mental lexicons. (Arkadiev & Gardani, 2020; Audring & Masini, 2019; Leminen et al., 2016)

Later, other elements like the L2 proficiency and age of acquisition of L2 were factored into the studies in the area of language processing. Many studies found evidence suggesting that the non-native users of a language also process the morphologically complex words in a native-like fashion but only after attaining a certain level of proficiency in the second language. Therefore, it was established that morphological decomposition at the time of processing is not limited to the native speakers only. (Clahsen & Felser, 2018; Malovrh & Benati, 2020; Rehak, 2010; Slabakova, 2016)

In the Pakistani context, however, language processing has not been investigated that much. There are a few experimental studies in the area, but they focus on offline methods rather than gauging real-time language processing. Recent research is more inclined towards natural language processing and is focused on Urdu for the most part. (Anwar et al., 2006; Daud et al., 2017; Hussain, 2008)

English is the official language of Pakistan and is taught in schools and undergraduate programmes as a compulsory subject. English also enjoys a great deal of social pride in Pakistan and that is why people prefer their children to go to mediocre level English medium schools rather than the state-run Urdu medium schools in Pakistan. (Manan et al., 2017; Shamim, 2017). Almost all the educated population of Pakistan can use English at some level because English is a compulsory subject in schools, colleges, and universities. However, there are almost zero studies on how Pakistani English bilinguals process the language.

The present study focuses on how Pakistani L2 users of English process the morphologically complex words. The primary focus of the study is on the role of proficiency in the processing of English. The study experiments upon how the Pakistani English L2 users process regular past tense inflections. It uses a lexical decision-making experiment involving 39 participants divided into three groups according to their proficiency level in English. The names of the groups are Level 1, Level 2 and Level 3. Level 1 is the low proficiency group, Level 2 is the medium proficiency group, and level 3 is the high proficiency group. Their level of proficiency was determined via an online English proficiency test, LexTALE which judges the proficiency level in English quite reliably (Lemhöfer & Broersma, 2012; Tatsuya et al., 2020).

Objectives of the Study

The present study aims at the following objectives:

- To bring forth how Pakistani English L2 users process the past tense inflections in English.
- To determine whether proficiency levels in English affect the processing by the Pakistani L2 users.

Literature Review

There are a number of studies conducted in the area. However, it is the beauty of experimentation in psycholinguistics that altering one or more variables leads to new aspects of language processing. A few of the most similar studies are mentioned in this section. Many studies in the past have been focusing on the past tense inflections and their processing by both native and nonnative speakers. Almost all the studies came up with similar conclusions that the native speakers break down the past tense inflections into the stem and inflectional morphemes before storing them in their lexicons (Pinker et al., 2002)e users of a language are able to do that only after attaining a higher level of proficiency in the language (Kim, 2013; Nagarajan et al., 2016; Rehak, 2010)

Experiments involving morphological priming usually use primes and targets that share the stem morpheme. For example, *worker/work* or *worked/work* type of morphologically related pairs are used in such experiments (Baayen et al., 2011). In the recent past, however, experiments focusing on prefixes and suffixes only have also been attempted (Crepaldi et al., 2010). There was an attempt to focus on prefix priming involving morphologically related pairs of primes and targets like *dislike/disprove* and orthographically related items like *violin/violate*. However, no priming effects were witnessed (Chateau et al., 2002). Similarly, a number of studies have been conducted on pairs of primes and targets focusing only on orthographical relatedness but without solid evidence of the occurrence of priming effects except a few (Ciaccio & Jacob, 2019; Foote et al., 2020; Nakano et al., 2016).

There are a number of studies focusing on the proficiency levels in L2 processing. As discussed above, psycholinguistic experimentation allows for a number of variations which highlights various aspects of language processing. Almost all the studies that focused on the proficiency of the L2 users came to the conclusion that higher proficiency in the second language is directly linked with native-like processing of the language (Ansarin & Manesh, 2017; Liang & Chen, 2014; Zeng et al., 2019)

Methodology

The present study employed a masked priming experiment for data collection. Masked priming is a useful technique wherein a prime is shown to the participants in a very controlled manner. The participants are shown a number of meaningless characters (like + sign) on a computer screen and then the prime word is shown for a very limited time before showing them the target words. The primes, if related to the target words, help the participating individuals in recognizing the target words quicklier than normal. There are many variations in masked priming experiments with regards to the style and the time duration in which the prime words are shown.

In this study hashtags (####) were used to cover the primes. The primes were shown to the participants for 50 milliseconds before the target words were shown to them. The individuals were asked to decide whether the targets shown to them were words or

nonwords by pressing certain keys on the keyboard as quickly and accurately as possible. This is called lexical decision-making.

Participants

The participants for the experiment were 39 in total including 17 females. Their ages ranged from 21 to 45 and they belonged to different walks of life. They were divided into three groups, Level1, Level 2, and Level 3, according to their proficiency levels in English, decided via the LexTALE test, as mentioned earlier. Level 1 is the low proficiency group, Level 2 and Level 3 are the medium and the high proficiency groups respectively.

Items of the experiment

The experiment contained 24 items out of which 10 were given as practice items before the actual start of the experiment. The ten practice items had 5 items with nonword targets placed for the purpose of enhancing the concentration of the participants. If nonwords are not included in the experiment, the purpose of lexical decision-making is defeated. There were 5 items in the practice session that had words as targets. However, the data generated via the practice items were not included in the analysis. The 14 actual items also had 7 nonwords. The items with actual words experimented upon were 7. Three out of these seven items were used both as primes and targets without any change. This is called repetition priming and is used to examine whether the settings for the primes are reliable. The three items used *face, global,* and *child* both as their primes and targets. There were two items with words as targets without any relationship between primes and targets. The two items had *truck* and *provided* as primes and *become* and *summary* as targets respectively.

The actual items for which the experiment was designed had regular past tense forms as the primes and their respective present tense forms as the targets. One of these two items had worked as the prime and *work* as the target, while the other used *impressed* as the prime and *impress* as its target.

Procedure

The participants were made to sit comfortably in front of a laptop computer. They were shown instructions for the experiments on the screen and these instructions were explained to them verbally in Urdu also. They were asked to press the Right Shift button on the keyboard if they thought the string of letters shown to them was a word. The Left Shift button was to be pressed in case they decided that the target shown to them was not a word. When ready for the experiment, they were instructed to press the spacebar to begin the practice for the experiment. At the end of the practice session the experiment paused automatically to give rest to the participating individuals. They were supposed to press the spacebar again for the experiment to resume beginning with the actual test items.

The letter strings (both words and nonwords) were shown in the Times New Roman font with black colour and white background. The size of the font was 24. The primes were shown in small letters whereas the targets were in capital letters. The practice items were shown in one sequence. However, the actual experiment items were shown in a random order to the participants.

DmDx software was used to carry out the experiment. It is a free resource developed by the University of Arizona and is available to be downloaded from the university's website.

The data were statistically analyzed via the ANOVA (Analysis of Variance) test and the SPSS (Statistical Package for Social Sciences) was used for the purpose.

Data Analysis

The data analysis shows full priming effects for the items involving repetition priming. All the three groups showed good priming effects across the three items which had the same words both as their primes and targets.

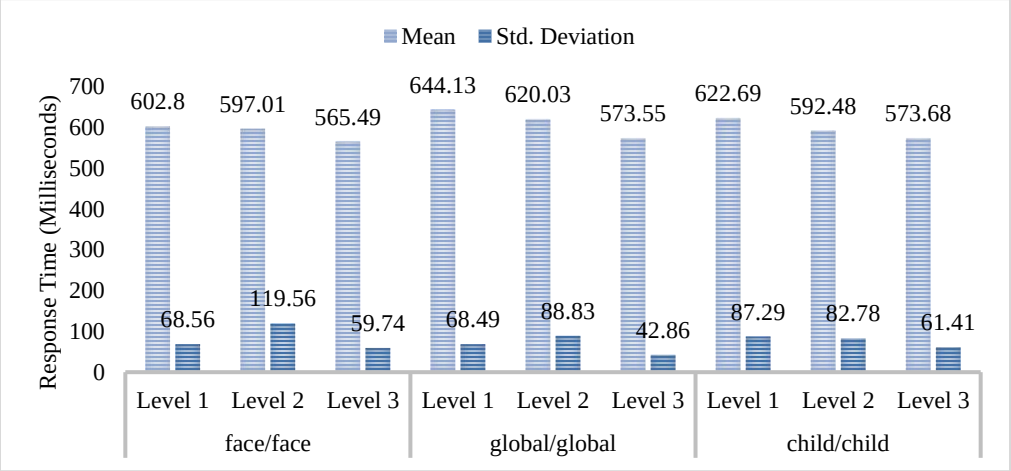

Figure 1. Items with the same words as primes and targets

The above figure illustrates how evenly all the three proficiency groups responded to the items that had the same words as both primes and targets. In case of *face/face*, the mean response by Level 1 was 602.8 milliseconds with a standard deviation of 68.56. Level 2 responded very similarly with 597.01 milliseconds as their mean and 119.56 as their standard deviation. The high proficiency group, Level 3, also responded similarly with a mean response time of 565.49 milliseconds and a standard deviation of 59.74.

The three groups also responded in a similar fashion to the second item which had *global* as both the prime and the target. In response to this item, Level 1 responded with a mean of 644.13 milliseconds with a standard deviation of 68.49. Level 2, the medium proficiency group, responded with 620.03 as their mean response time and 88.83 as the standard deviation. The mean response time of Level 3 was 573.55 and their standard deviation in the item was 42.86.

The third item, having *child* as both its prime and target, also recorded a similar response wherein Level 1 responded with a mean response time of 622.69 milliseconds and a standard deviation of 87.29. Level 2's mean response time was 592.48 while the standard deviation in this case was 82.78. The high proficiency group, Level 3, responded very similarly to the other two groups as their mean response time was 573.68 with a standard deviation of 61.41.

The above data shows that the response times were very similar (all between 565 and 645) across all the three groups in all the three items. This means that full priming effect in case of the repetition priming took place, and all the respondents were facilitated by the primes in their responses to the targets in these items.

In case of the items involving unrelated primes and targets, the response times seem to be wayward which shows that there was no facilitation provided by the primes in these cases.

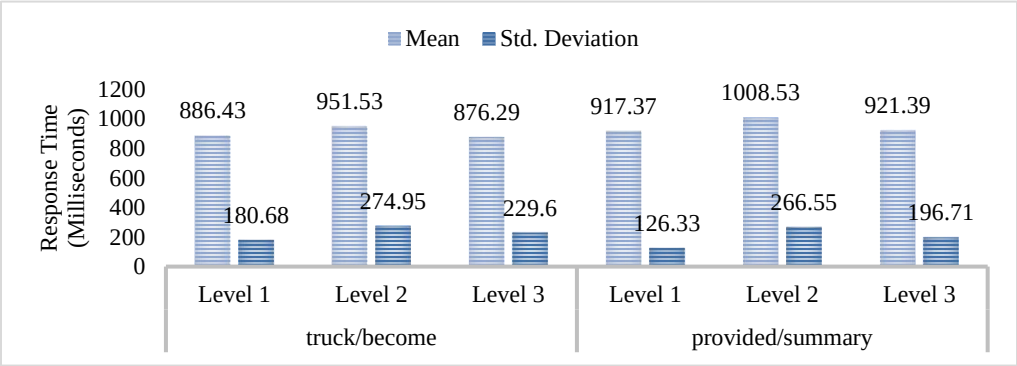

Figure 2. Items Containing Unrelated Primes and Targets

The above figure suggests that no priming effect was recorded for the above items as the mean response times across all the groups in both the items are very high. This was expected as the primes in both these cases did not provide any facilitation to the participants in recognizing the target words. In case of the item having *truck* as prime and *become* as target, the mean response time of Level 1 was 886.43 millisecond with a high standard deviation of 180.68. Level 2 also responded similarly with a mean response time of 951.53 milliseconds with a very high standard deviation of 274.95. The response time of Level 3 was not different as the group responded with a mean response time of 876.29 milliseconds with a standard deviation of 229.6 which is quite high.

The item containing *provided* as prime and *summary* as target also elicited similar responses from all the three groups. Level 1 responded with a mean response time of 917.37 milliseconds and their standard deviation was 126.33. Level 2 took 1008.53 milliseconds on average in recognizing the target while the standard deviation was very high at 266.55. The mean response time for Level 3 was 921.39 milliseconds and standard deviation in this case was 196.71.

The above data shows that priming did not take place in these two items as the responses took a lot of time and deviation across the participants was quite high. It is pertinent to mention here that the results here were expected as there was no relationship between the primes and targets in these two items.

The items containing past tense forms as the primes and their respective uninflected present tense forms as the targets did witness some partial priming effects. However, these priming effects were only limited to Level 3, the high proficiency group.

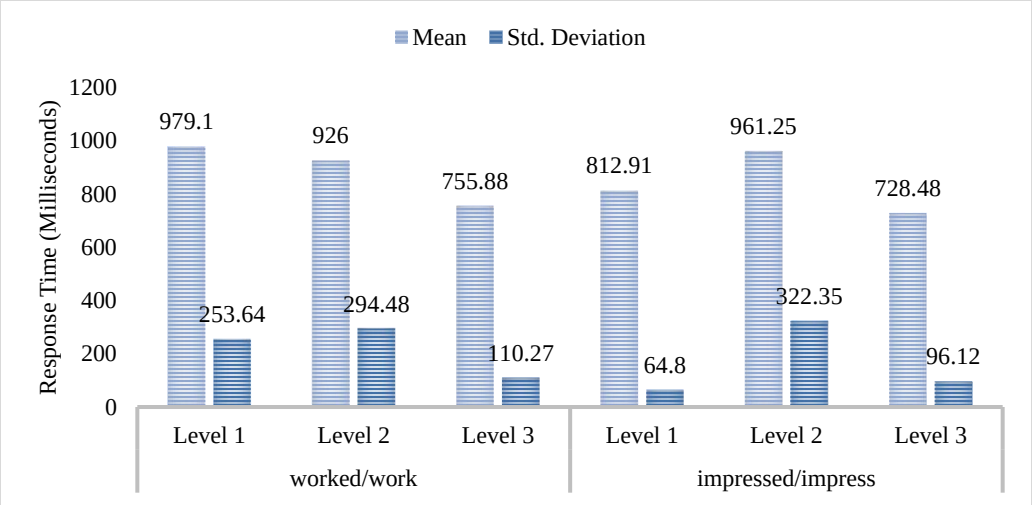

Figure 3. Items containing regular past tense inflections

The above figure suggests that Level 3 was the only group facilitated by the primes in these items. In case of the *worked/work* item, Level 1 responded with a high mean response time of 971.1 milliseconds with a very high standard deviation of 253.64. The response from Level 2 was not different as they responded with a mean response time of 926 milliseconds with a very high standard deviation of 294.48. In contrast to the responses by Level 1 and Level 2, the high proficiency group, Level 3, responded with a much lower mean response time of 755.88 and a much lower standard deviation of 110.27.

The other item involving regular past tense inflection had *impressed* as the prime and *impress* as the target. In response to this item, Level 1 responded with a mean response time of 812.91 and a standard deviation of 64.8. Level 2 responded with an average response time of 961.25 milliseconds with a very high standard deviation of 322.35. Level 3 responded differently in this item too, with a mean response time of 728.48 milliseconds and a standard deviation of 96.12.

The statistics presented above indicate that partial priming in both the items involving regular past tense inflection took place only in the case of Level 3, the high proficiency group. No priming effects were observed in case of Level 1 and Level 2 as their mean response times are high and very similar to the statistics shown in Figure 2 where priming was neither expected nor possible.

The mean response times of Level 3 in both these items are lower as compared to the other two groups in Figure 3. However, if these response times are compared with the response times in Figure 1, they seem relatively higher. The reason behind the difference is that in repetition priming, full priming effects take place which facilitates the respondents fully in recognizing the target words. In case of inflections, the target words are only morphologically related to the primes and that is why only partial facilitation occurs which is evident in this case by relatively higher mean response times shown by Level 3.

Conclusion

The above data analysis and discussion suggests that Pakistani L2 users of English

process the morphologically complex words in two distinct manners. The low and medium proficiency L2 users do not use morphological decomposition while processing the morphologically complex words. They save the inflected forms of the morphologically complex words (regular past tense forms, in this case) as separate entries in their mental lexicons. That is why the uninflected forms of the same words do not facilitate them in recognizing the inflected ones and they take relatively more time to recognize them.

The highly proficient Pakistani users of English as a second language, however, process the morphologically complex words differently. It is quite evident that they break down the morphologically complex words into their combining morphemes before storing them in the mental lexicon. That is why the inflected forms of the words facilitates them in recognizing and retrieving the uninflected forms as shown in the statistics presented above.

In the light of the above data and discussion, it can be concluded that proficiency in the second language is a key factor in the processing of language. The processing of a non-native language user becomes more native like as they attain a higher degree of proficiency in the language.

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