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Parafoveal Preview Benefit in Word Recognition in Urdu

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Abstract

Studies on parafoveal preview benefit suggest that fixations to the word fixated next are shorter in duration. The parafoveal preview enables a reader to access length, orthographic, phonological and morphological information of the word next to the fixation. However, preview benefit depends on the linguistic and orthographic features of a language. Studies in English suggest orthographic and/or phonological codes are accessed in parafoveal preview in that language while morphological codes are accessed in Hebrew. The present study investigates parafoveal preview benefit in Urdu, one of the lesser studied languages. We examined if presentation of borrowed tri-consonantal root that forms the major part of Arabic loan words in Urdu in the parafoveal region facilitates word recognition when the target words are base words, root words with inflections and root-derivative words. The results showed that mean response time differed significantly between base word condition and root inflectional word as well as root derivative word conditions.

Key words: Parafoveal preview benefit, Tri-consonantal root, Urdu, Word recognition, Derivational morphology.

1. Introduction

Word identification often starts before the eyes fixate on a target word as readers get information from the parafovea (Rayner, 1998). When the information is extracted from the parafovea there is partial activation of lexicon and this activation is integrated with subsequent activation from the foveal word (Rayner, McConkie, & Zola, 1980. Parafoveal preview benefit is derived from abstract letter codes (McConkie, & Zola, 1979; Rayner, McConkie, & Zola, 1989), orthographic codes from the beginning letters of a word (Inhoff, 1989; Rayner, Well, Pollatsek, & Bertera, 1982), phonological codes (Henderson, Dixon, Peterson, Twilley, & Ferreira, 1995; Pollatsek, Lesch, Morris, & Rayner, 1992). However, while studies in English showed no morphological preview benefit (Inhoff, 1989; Lima,

1987; Kambe, 2002) robust preview benefit was observed in Hebrew (Deutsch, Frost, Pollatsek, & Rayner, 2000; Deutsch, Frost, Peleg, Pollatsek, & Rayner, 2002).

Parafoveal preview benefit is either assessed in the context of a sentence or in single word identification. When assessing for parafoveal preview benefit during sentence reading, duration of fixation on the target word is measured for single word naming. The parafoveal preview benefit is studied with the boundary paradigm in eye tracker studies (Rayner, 1975, 1978).

Studies in Hebrew and other languages suggest that preview of morphologically related words induce a priming effect on target words (Bentin, & Feldman, 1990, Deutsch, Frost, Pollatsek, & Rayner, 2000)since morphological units may help in organizing mental lexicon and may mediate lexical access. The morphological analysis of an upcoming word during reading may be influenced by an ongoing processing of the sentence context (Deutsh, Frost, Pelleg, Pollatsek, & Rayner, 2003). The process of lexical access may consist of both lexical retrieval of whole words and a mandatory parallel processing of morphological decomposition.

Urdu, like Hebrew, has a non-concatenated derivational morphology. All verbs and a majority of nouns and adjectives are comprised of two basic derivational morphemes: root and word pattern as seen in Semitic language. The root consists of three consonants and word pattern consists of vowels or consonants and vowels. Root usually carries the core meaning of the word and word pattern determines its word class and other grammatical characteristics.

Hebrew has great internal variability in the distributional properties of the morphemes and semantic transparency. But the morphemes in Urdu are not necessarily contiguous units within a given word. They often obscure the phonological and orthographic transparency of constituent morphemes.

Findings in Hebrew (Deutsch, Frost, Pollatsek, & Rayner, 2000) suggest that: a) Naming is fastest for the identical words (same preview and target word); b) a significant preview benefit effect of 12ms is observed when preview consists of the root; c) morphological units mediate word identification in Hebrew; d) a parafoveal presentation of letters with root morphemes facilitates identification of target word, since root words can be dispersed within a word; e) Hebrew presents a unique case where a sub-lexical unit that

mediates lexical access does not have linear characteristics. Thus in languages like French and English, readers may attend to first letters of a word to initiate lexical processing but in Hebrew readers may be tuned to attend morphological units in word identification.

Given the reported similarities between Hebrew and Urdu, these findings serve a sure forerunner for making a hypothesis for the present study. We hypothesized that the presentation of root letters in the preview should differentially influence response time for recognition of stem/base word, extension (inflectional) word, and derivative forms.

2. Participants

Thirty Undergraduate students between the age group of 20- 25 years (Mean age= 21.67; SD=2.41), who studied Urdu as their first language throughout their education and whose mother tongue was Urdu participated in the study. They were paid INR 50.00 for their participation. Every participant had normal /corrected vision and normal hearing. Informed consent was obtained by all the participants. The study was approved by the Research Committee constituted by the University for the candidate.

3. Stimulus Material

The stimulus words were Arabic loanwords in Urdu with tri-consonantal root as in Arabic. The experimental set had presentation of stimuli with a preview of Arabic triconsonantal root in the parafovea and a target in the foveal region. The target words were formed from root letters across three conditions. Each condition had 40 Arabic loan words. Condition 1 (C1) had the base word, condition 2 (C2) had extensions of the base-word (inflections) and condition 3 (C3) had derivative of the base-word or the root letters. The preview was tri-consonants root for all the conditions. A total of 120 words were chosen for three conditions. Word length of target words in condition1 was 3-4 letters (Mean length=3.65; SD = 0.66) and in conditions 2 and 3 was 4-6 letters (C2: Mean= 4.78, SD=0.65; C3: Mean=4.8, SD=0.75). The root letters that form all the target words across conditions were of 3 letters each, meaningless and not pronounceable. The letter sequence of the target word in the base-word and extension condition was similar to the arrangement of roots in the preview and was not the same in the derivative condition most of the time (see Table 1).

	Preview	Target		
	Root	Word	Transliteration	Meaning
C1- stimuli with identical words as the roots	اخ ر	آخر	Aakhar	unchangeable, imperishable
C2- Stimuli with an extension of the words in C1	اخ ر	آخری	Aakhari	last, final
C3- Stimuli with Derivatives of the root word used in C1	اخ ر	آخرت	Aakherat	afterlife, the ultimate, the ending

Table1. Stimuli type for three conditions used in the experiment.

4. Procedure

Stimuli were presented using E-Prime experimental software in a simple priming parafoveal preview benefit task. Each trial started with a "+" sign at the centre of the screen on which the subjects were asked to fixate. This display lasted for 500ms and was followed by a 'preview screen' which consisted of a "+" sign in the centre and a preview stimulus located to the left of the plus sign. The distance between the "+" sign and the first character of the preview stimulus was about 3^0 visual angle. The preview stimulus was timed at 50ms. The 'preview screen' was replaced by a 'target screen' with the target appearing at the centre and remained on the screen until the participant responded. The 'ready screen' would allow the participant to go to the next trial. Participants were instructed to look at the "+" sign and recognize the word in the display as fast as they could. When the 'ready screen' appeared they were asked to write the word they just saw. This was done to ensure reading accuracy. Response time from the onset of the target until the participants responded was considered as dependent variable (see Figure 1).

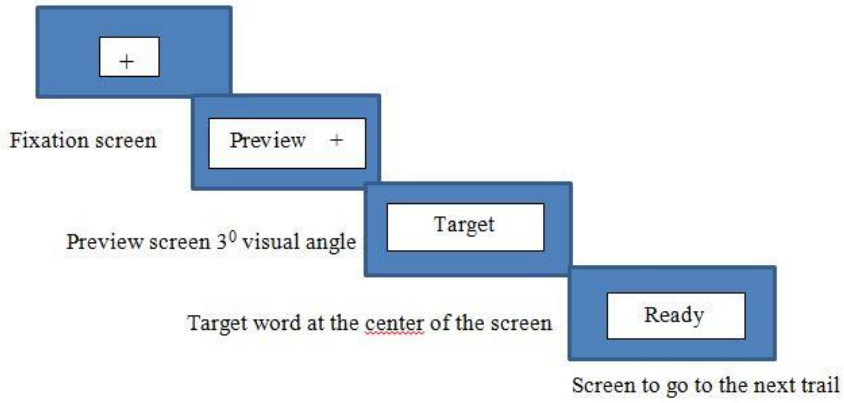

Figure1. Presentation of stimuli

Participants were presented with 10 practice trials before the experimental trials started. Each participant was presented with 120 trials for each experiment. All trials were randomized ensuring no trial repeated.

5. Results

RTs were averaged across subjects and across items.. The effect of outliers was minimized by establishing cut-offs 3 standard deviation units above and below the mean for each participant and item.

The mean and standard deviations for response time (RT) and word length (WL) are provided in Table 2. We performed the data analysis with a repeated measure analysis of variance (ANOVA). The obtained F ratio was significant (F (2, 58) = 7.902; *p*= 0.001). The post hoc analysis revealed significant difference between conditions C1 and C3 (*p*= 007.) and conditions C2 and C3 (*p*= 0.031). No significant difference was observed between conditions C1 and C2 (*p*= 0.632).

A one-way ANOVA for word length for target word across conditions revealed significant differences (df= 2, F= 16.3, *p* = 0.00) and post hoc analysis revealed significant differences in word length between condition 1and condition 2 (*p* = 0.01) as well as condition 1and condition3 (*p* = 0.01) but no significant difference was observed between condition 2 and condition 3 (*p* = 0.66).

	C1		C2		C3	
	Mean	SD	Mean	SD	Mean	SD
RT	581.4	143.45	624.39	123.9	678.21	156.83
WL	3.65	0.66	4.78	0.65	4.8	0.75

Table2. Mean Response Time and Word Length for three conditions.

6. Discussion

The focused attention model of parafoveal processing (McConkie, 1079; McConkie, Zola, Blanchard, & Wolverton, 1982; Morrison, 1984) suggests that reading proceeds through a sequential identification of words in the foveal vision and partial information about the word is obtained parafoveally. Preview benefit is recorded in many languages. The benefit is a function of the visual and phonological similarities between preview word and target word (Pollatsek, Lesch, Morris, & Rayner, 1992). Studies in Chinese (Lee, 2000; Tsai, Tzeng, Hung, Yen, 2004) observed that phonetic radicals have a privileged role in early stage of character identification and that phonological codes might be slower or less important than orthographic coding. However, studies that employed naming task (Cheng & Shih, 1988) and semantic judgement task (Perfetti & Zhang, 1988) suggested that phonological and /or orthographic preview benefit could be additive. These findings have been explained by the current reading models like the interactive-activation models (see Plaut, McClelland, Seidenberg, & Patterson, 1996; Seidenberg & McClelland, 1989)

Presentation of root letters in the preview, in the present study, resulted in shorter response time for base words as compared to derivative words. The difference between mean RTs for derivative target words and inflectional words was also found to be significant, though the difference between base word condition C1 and inflectional word condition C2 was not significant. The RT for identification of inflectional words in general was shorter than the RT for inflectional words, but the difference was not significant. It may be noted that the mean word length difference between these two conditions was however significant. On the other hand, the inflectional word condition and derivational word condition did not differ on mean word length; but there was a significant difference between the conditions on RT. Thus, one may infer that parafoveal preview benefit was there for identifying words under these conditions though derivational words seem to be processed differently. We do not know

whether seemingly more similarities between the base words (C1) and inflectional words (C2) in terms of semantics and orthographic features had an effect on the results obtained.. Though Urdu has rich derivational morphology and word formation rules are similar to Hebrew and Arabic, especially for Arabic loanwords in Urdu, findings of the study should be treated cautiously. More controlled studies may help clear the issues discussed in the present study.

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