

## **Parafoveal word processing affects saccade targeting in reading Chinese sentences**

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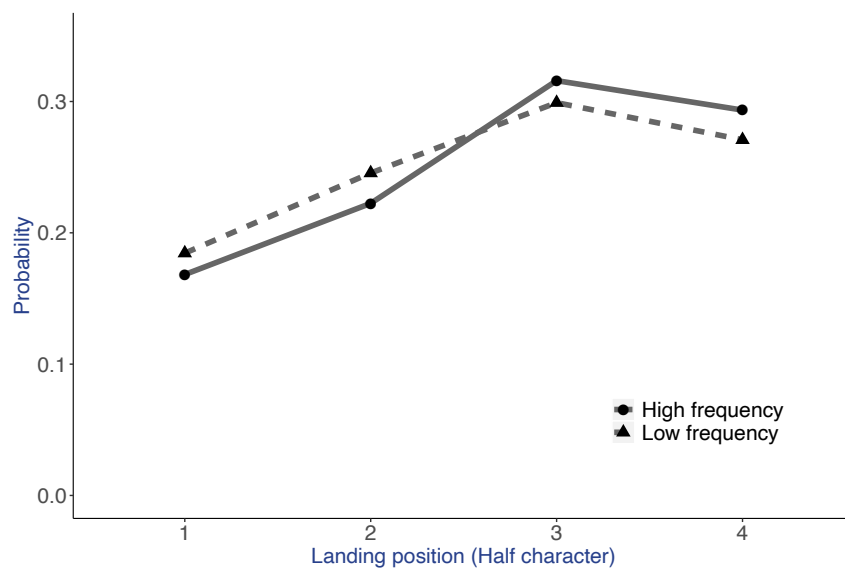
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Saccade targeting in reading alphabetic scripts with clear word boundaries has been demonstrated that the eyes are sent toward the center of the upcoming word in the sentence (McConkie et al., 1988). However, for the scripts that are short of explicit word boundaries, such as Chinese, the determinants of saccade targeting that Chinese readers adapt remains in debate. The flexible saccade eye guidance model (Yan et al., 2010) emphasized the influence of processing difficulty of parafoveal word; in contrast, the processing-based strategy (Wei et al., 2013) suggested that processing load of foveal word is the major determinant of saccade targeting. The present study aimed to investigate whether processing foveal word (word N) and parafoveal word (word N+1) affect the initial landing position of eye movements on word N+1 while reading Chinese sentences. In two eye-tracking experiments, two groups of 40 native speakers read 80 Chinese sentences which two consecutive target words (both two-character words) were embedded. Experiment 1 manipulated the frequency of the first target word (word N) and Experiment 2 manipulated the frequency of the second target word (word N+1). The frequency of word N+1 in Experiment 1 and the frequency of word N in Experiment 2 were controlled as low frequency. The frequency effects of word N and word N+1 on eye movement measures were analyzed using the (generalized) linear mixed-effect models. The results showed the word frequency effect on gaze duration and total viewing time of word N in Experiment 1 and those of word N+1 in Experiment 2. For skipping rate of word N+1, no word frequency effect was found in Experiment 1 but Experiment 2 showed a significant word frequency effect which high frequency words were skipped more than low frequency words. For initial landing positions on word N+1, the manipulation of word N frequency in Experiment 1 failed to show any effect. However, the frequency manipulation of the parafoveal word in experiment 2 exerted a reliable difference: the readers tended to move the eyes further on word N+1 of high frequency than that of low frequency. The readers also made shorter saccades entering low frequency words comparing to high frequency words (Table 1). The initial landing position curves also showed a higher proportion of initial fixations landing on the second character of the high frequency word N+1 than that of the low frequency word N+1 (Figure 1). The findings suggest that the foveal load of word N may play no crucial role on the saccade targeting on the following word N+1, which is in contradict to the processing-based strategy. In contrast, the parafoveal processing load of the previewed word affects saccade targeting behaviors. Consistent with the flexible saccade eye guidance model, lexical processing difficulty of the previewed word exerts a leftward shift in the initial landing position on a word. Whether the influence on saccade targeting results from the success of word segmentation or processing lexical features remained to be further examined.

**Table 1.** *Descriptive statistics of saccade targeting measures on word N+1*

	Experiment 1		Experiment 2	
	Initial landing position	Incoming saccade length	Initial landing position	Incoming saccade length
High frequency words	1.061 (0.246)	2.066 (0.372)	1.192 (0.235)	2.345 (0.332)
Low frequency words	1.042 (0.250)	2.008 (0.316)	1.123 (0.241)	2.248 (0.368)

Note: The frequency manipulations of Experiment 1 and Experiment 2 were on Word N and Word N+1 respectively. All measurement units are character and standard deviations are provided in parenthesis.



**Figure 1.** Initial landing position probabilities on word N+1 in Experiment 2 (Two-character target words were divided into 4 proportions.)

#### Reference

- McConkie, G. W., Kerr, P. W., Reddix, M. D., & Zola, D. (1988). Eye movement control during reading: I. The location of initial eye fixations on words. *Vision Research*, 28, 1107–1118.
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