

# **The consequences of mislocated fixations during reading**

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## THE CONSEQUENCES OF MISLOCATED FIXATIONS DURING READING

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Models of eye movement control during reading differ in terms of whether they assume strictly serial sequential processing of words in text (SAS models, like E-Z Reader, Reichle, 2011) or whether they postulate an attentional gradient that can extend over more than one word, with some parallel lexical processing (GAG models, like SWIFT, Engbert & Kliegl, 2011, and GLENMORE, Reilly & Radach, 2006). It is clear why the duration of fixations might be influenced by lexical properties, like word frequency, of currently-fixated and adjoining words from a GAG perspective. However, SAS models suggest lexical effects should be localised to the currently fixated word (although E-Z Reader contains a mechanism to account for apparent 'spillover' effects). It might therefore be concluded that clear evidence for lexical effects before the relevant word is directly fixated – 'parafoveal-on-foveal' (PoF) effects – provides a critical test of the two classes of model. However, with the suggestion that these could be attributed to 'mislocated fixations' (Drieghe et al, 2008), SAS models are also capable of modelling PoF effects. This proposal suggests (a) that a saccade occasionally misses its intended target due to oculomotor error, and (b) the reader, instead of correcting that mislocated fixation, decides to remain at the suboptimal location and nonetheless process the word they are not directly fixating. But while there is much evidence for the occurrence of mislocated fixations, there is rather less for the second postulate. As Engbert and Kliegl (2011) note, such a stay-and-process strategy lies in direct contrast to the error-correcting response that has been proposed to explain the inverted optimal viewing position (IOVP; Vitu et al, 2001) effect, with shorter initial fixation durations near word boundaries attributed to mislocated fixations triggering a fast error-correcting saccade.

The current experiment manipulated the occurrence of mislocated fixations using a novel eye movement contingent text-shift paradigm in which sentence text was moved two characters to the left or to the right during the reader's saccade from a verb to the following high or low frequency noun. In the no-shift condition, fixations falling on the noun showed a classic IOVP effect, with the duration of accurately-targeted fixations also modulated by word frequency. Following leftward text shifts (causing overshoot) fixation durations were extended somewhat, but followed the IOVP pattern and showed a frequency effect. Critically, in response to rightward shifts (generating undershoots) there was a marked reduction in fixation duration and flattening of the IOVP function, with no evidence of sensitivity to word frequency – all consistent with an immediate error correcting response and inconsistent with a stay-and-process strategy. We conclude, therefore, that the IOVP effect can be related to rapid error correction and there is no evidence in favour of a stay-and-process strategy, at least for fixations that fall short of their intended target.

### References

- Drieghe, D., Rayner, K. & Pollatsek, A. (2008). Mislocated fixations can account parafoveal-on-foveal effects during reading. *Quarterly Journal of Experimental Psychology*, 61, 1239-49.
- Engbert, R. & Kliegl, R. (2011). Parallel graded attention models of reading. In S. Liversedge, I. Gilchrist & S. Everling (eds.) *The Oxford Handbook of Eye Movements* (pp.787-800). Oxford: Elsevier.
- Reichle, E. (2011). Serial-attention models of reading. In S. Liversedge, I. Gilchrist & S. Everling (eds.) *The Oxford Handbook of Eye Movements* (pp.767-786). Oxford: Elsevier.
- Reilly, R. & Radach, R. (2006). Some empirical tests of an iterative activation model of eye movement control in reading: *Cognitive Systems Research*, 7, 34-55.
- Vitu, F., McConkie, G.W., Kerr, P., & O'Regan, J.K. (2001). Fixation location effects on fixation durations during reading: An inverted optimal viewing position effect. *Vision Research*, 41, 3513-3533.