

Predicting individual differences in the perceptual span and eye movement behavior during reading

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Background

- Previous studies using the moving window paradigm have demonstrated the size of perceptual span for skilled English readers.^{1,2}
 - 4 letters to the left & 15 letters to the right
- Measures of cognitive processing and reading skill have been shown to predict differences in the size of the perceptual span during reading.^{3,4,5}
 - e.g., reading speed, spelling ability, vocabulary size, word knowledge
- Overall reading rate is jointly determined by patterns across a number of global eye movement measures.

Current Study

To what extent are perceptual span and reading speed differences modulated by language proficiency and cognitive processing speed?

Moving Window Paradigm¹

After several failed aktmsjda, vq excrspa mmo fdvutij arut wazmevohudlj.
*
Fflnz several failed attempts, vq excrspa mmo fdvutij arut wazmevohudlj.
*
Fflnz uxmrzsk failed attempts, my excrspa mmo fdvutij arut wazmevohudlj.
*
Fflnz uxmrzsk bzfioid aktmsjda, my message was fdvutij arut wazmevohudlj.
*
Fflnz uxmrzsk bzfioid aktmsjda, vq excrspa mmo finally sent successfully.
*

102 total Sentences

3 Window Conditions [1W - 2W – No Window]
Window size varies randomly across trials

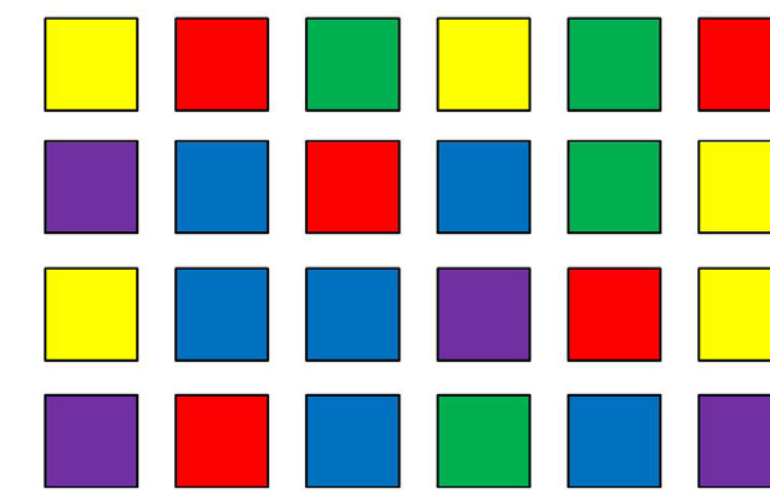
1. McConkie, G. W., & Rayner, K. (1975). The span of the effective stimulus during a fixation in reading. *Perception & Psychophysics*, 17, 578-586.
2. Rayner, K. (1998). Eye movements in reading and information processing: 20 years of research. *Psychological Bulletin*, 124, 372-422.
3. Rayner, K., Slattery, T. J., & Bélanger, N. N. (2010). Eye movements, the perceptual span, and reading speed. *Psychonomic Bulletin & Review*, 17, 834-839.
4. Veldre, A., & Andrews, S. (2014). Lexical quality and eye movements: Individual differences in the perceptual span of skilled adult readers. *The Quarterly Journal of Experimental Psychology*, 67(4), 703-727.
5. Kuperman, V., & Van Dyke, J. A. (2011). Effects of individual differences in verbal skills on eye-movement patterns during sentence reading. *Journal of Memory and Language*, 65, 42-73.
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Measures of Individual Differences

Rapid Automated Naming

- Index of processing speed and coordination⁶
- 4 types [Color - 3-digit number - letter - digit]
- $M = 28.6$ seconds ($SD = 5.4$ s)

549	475	937	323	718	291
910	252	578	615	336	808
457	063	704	796	345	311
334	851	143	622	875	712



Average Reading Rate

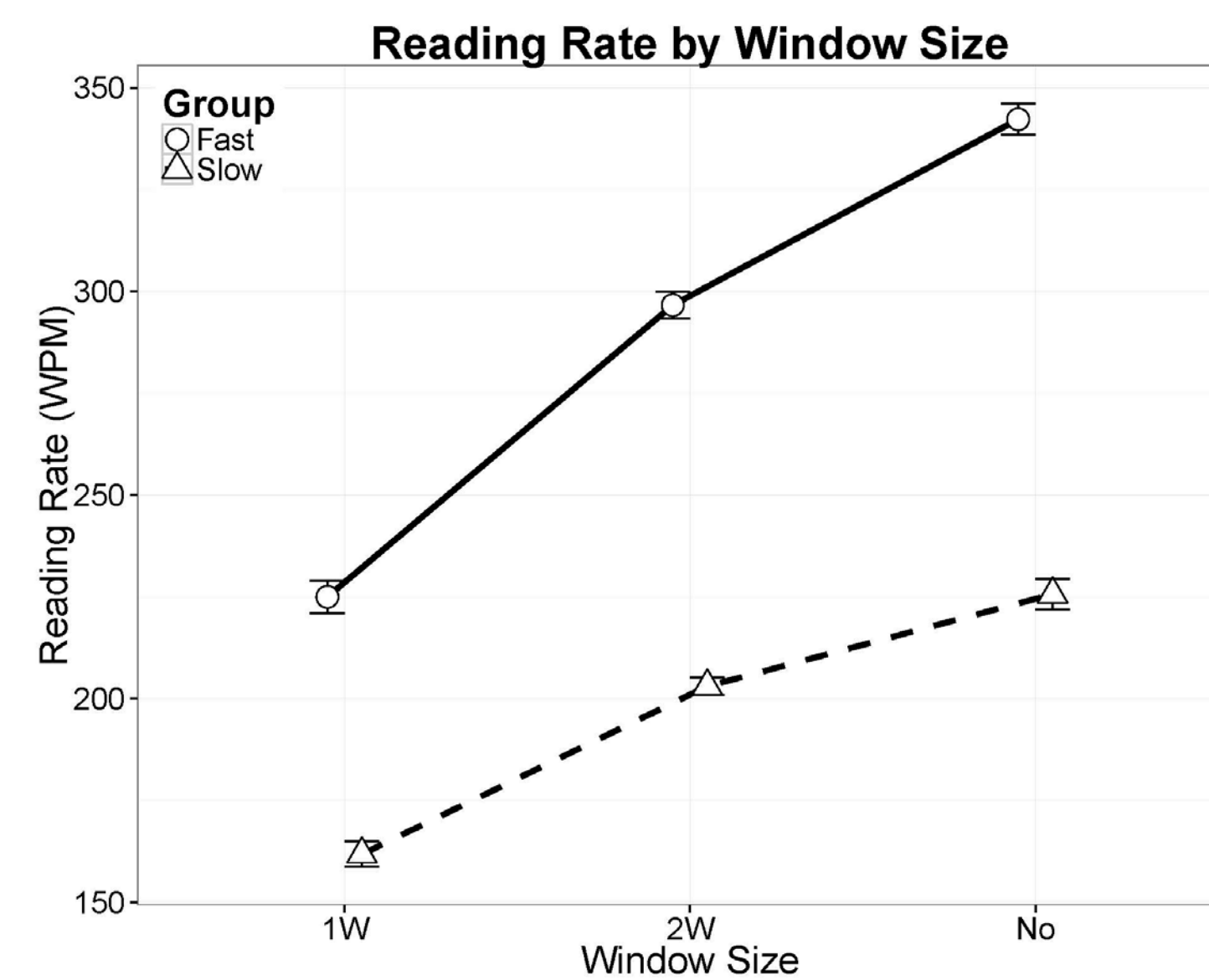
- Index of individual reading speed measured in no window condition
- $M = 340$ WPM ($SD = 104$).

Shipley Vocabulary Test

- Index of vocabulary size and language proficiency
- 40 items total
- $M = 32$ ($SD = 2.5$)

Results

N = 56



Reading Rate

- Faster readers showed a larger perceptual span
- The size of the perceptual span did not differ as a function of RAN speed or vocab score

Vocabulary Scores

Subjects with higher vocab scores

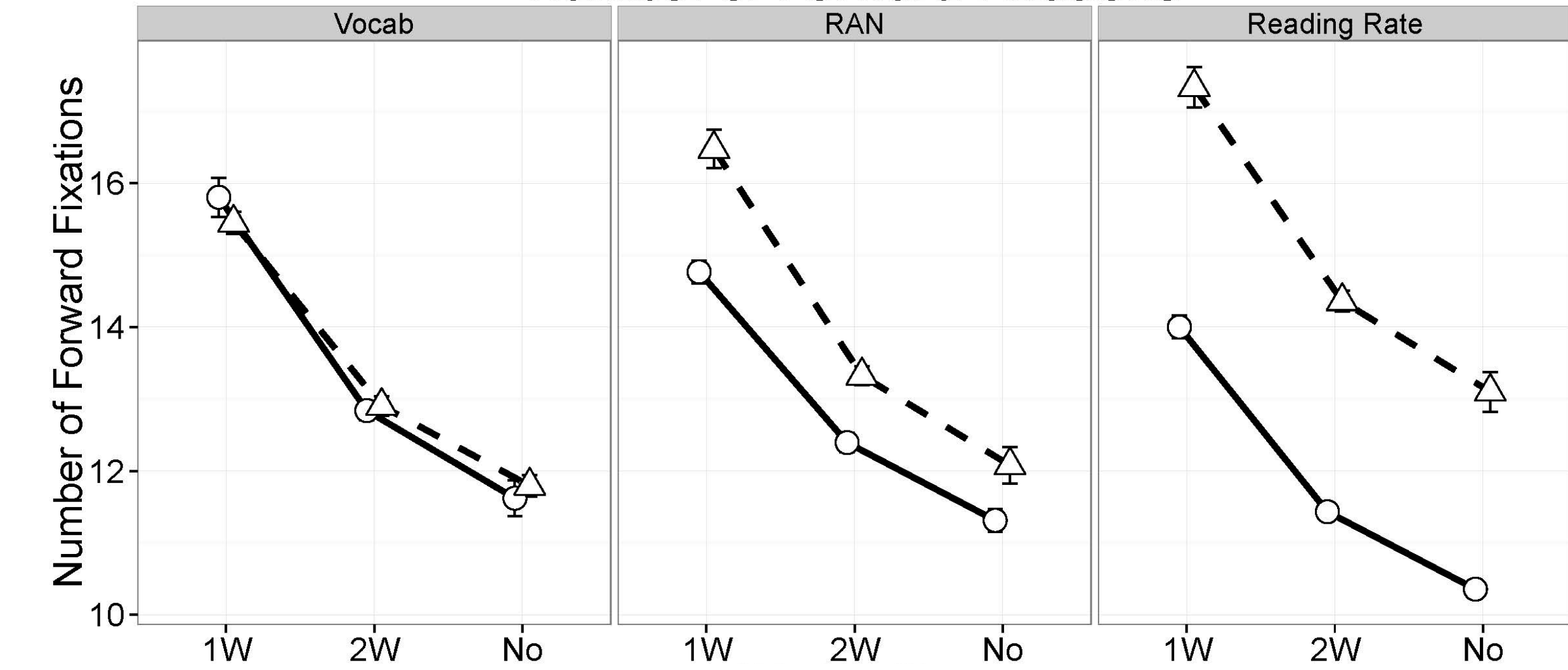
- Longer forward saccades
- More frequent regressions
- Larger increases in regressions and fixations

Average RAN Speed

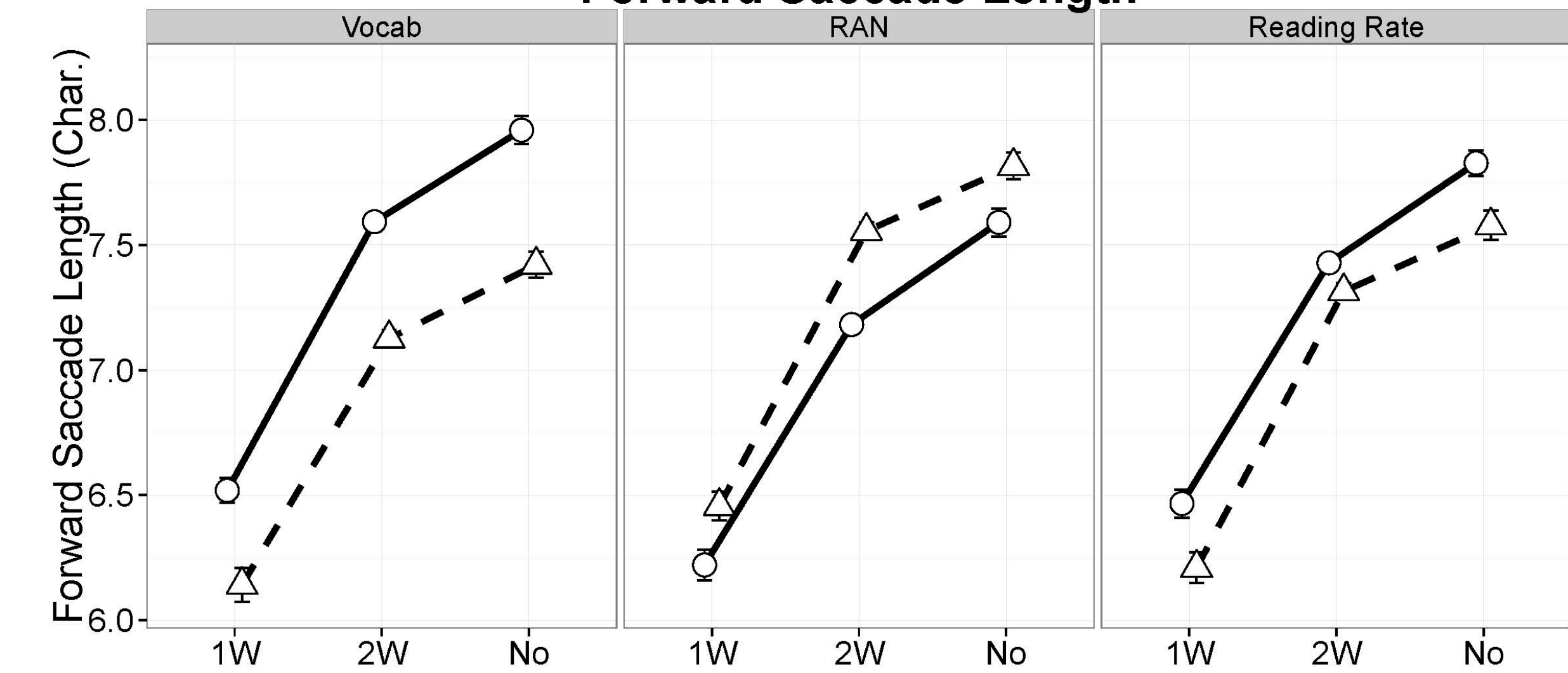
Subjects with shorter average RAN times

- Shorter forward saccades
- Fewer regressions
- Fewer fixations
- Smaller increase in fixations

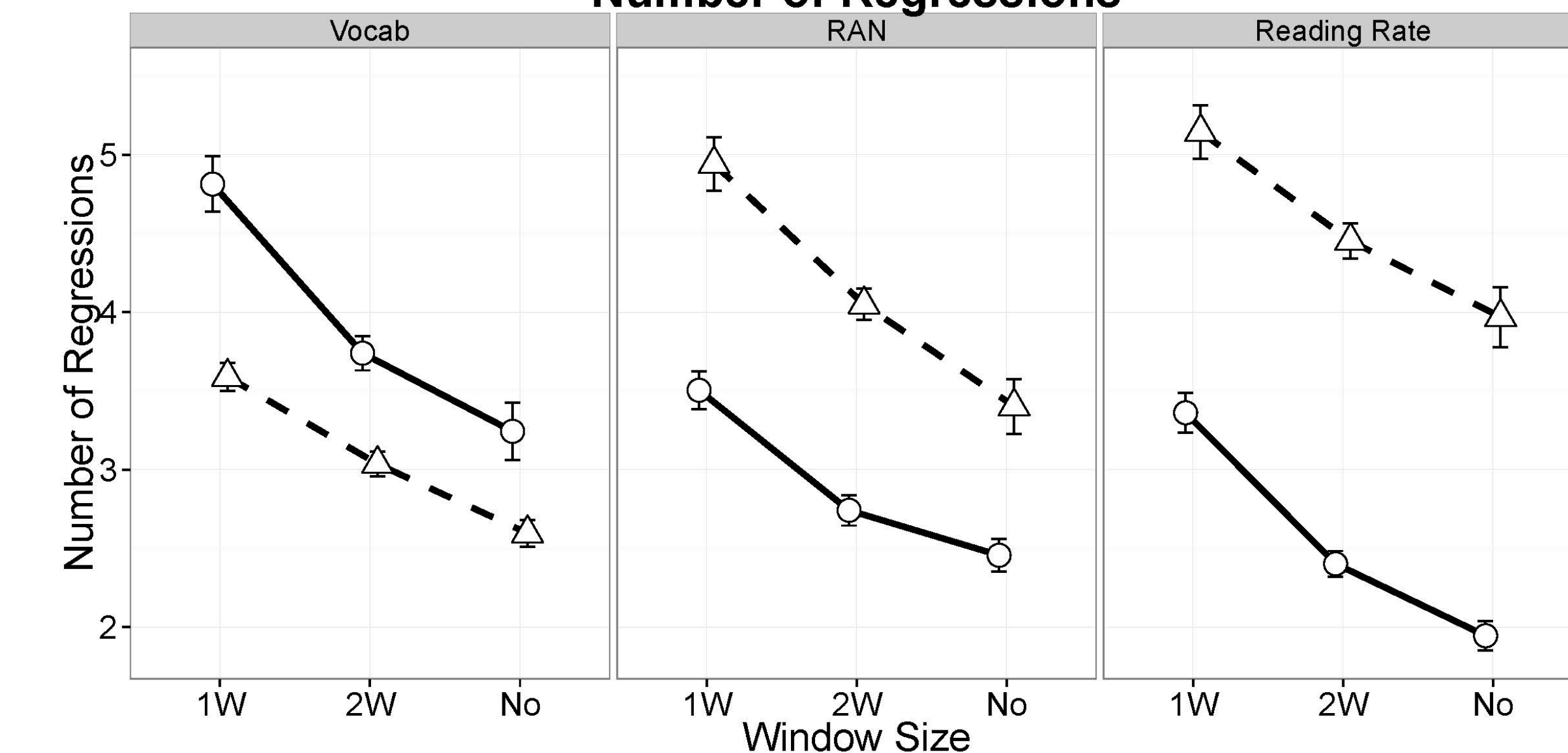
Number of Forward Fixations



Forward Saccade Length



Number of Regressions



Group ○ Higher Performance △ Lower Performance

Discussion and Future Directions

Results demonstrate individual differences in both the sources of processing difficulty and the strategic changes to global eye movement behavior

The detrimental effects of the moving window restriction were larger for more highly-skilled readers. Individual differences in balancing speed and accuracy trade-offs during reading should be more closely investigated