

Perceptual Span during Silent Reading in Russian-Speaking Adults

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Perceptual span is the number of characters that is processed within a single fixation during reading [1]. It is measured with an eye-tracking moving-window paradigm (Figure 1) as the smallest visible window allowing normal reading. In Latin-script languages, it extends 3-4 characters to the left and 14–15 to the right of fixation [1]. Since the perceptual span is influenced by the writing system (alphabetic or logographic) [2] and reading direction [3], it might also differ across writing scripts within alphabetic languages. However, its size in non-Latin alphabetic scripts remains unclear (the only existent study [4] could not define its size). We addressed this gap by examining the rightward boundary of the perceptual span in Russian, which uses Cyrillic script.

We used a moving-window paradigm with four symmetrical windows (6_6, 10_10, 14_14, 18_18, with a mask of Xs for all characters) and an unmasked condition. We recorded data of reading 125 sentences in 72 monolingual Russian adults using Eyelink 1000+, each character was 0.26° of visual angle. For the analysis, we used the data from one eye and performed a 4-stage fixation cleaning and merging in Data Viewer. Both frequentist and Bayesian analysis (for the first time in perceptual span research) were applied. We hypothesized that a 14-character window would be sufficient for normal reading.

Reading rate did not differ from the control condition in 14_14 and 18_18 in the frequentist linear mixed models with random effects of participants and trials (Figure 2), while the Bayesian analysis estimated a small negative effect for these windows relative to the control condition ($\beta = -0.02$, 95% credible interval $[-0.04, -0.00]$ for both). Moreover, 14_14 and 18_18 did not differ significantly in average fixation duration and fixation count. However, we observed that 14_14 differed from the control condition in progressive saccade amplitude ($\beta = -0.03$, $p < 0.001$), while no significant difference was observed for 18_18.

To sum up, we found that observing 14 characters to the right of the fixation point provides enough parafoveal information for normal reading rate in Russian adults. Thus, the rightward boundary of the perceptual span might be similar across Latin- and Cyrillic-script alphabetic languages. However, the perceptual span for spatial saccade planning might be wider than the span for temporal saccade execution, which is in line with the results for German [5].

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References

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Figures and Tables

Figure 1: Example of a Sentence in a Moving-Window Paradigm in a 10_10 Condition

Резкий порыв ветXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 *
 XXXXXXXXXXXXXXXетра срывает с одуванXXXXXXXXXXXXXXXXXXXXX
 *
 XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXанчиков серебристый пXXX
 *

Note. Transliteration and English translation of the sentence is *Rezkij poryv vetra sryvaet s oduvanchikov serebristyj puh* ‘A sudden gust of wind blows the silvery fluff off the dandelions’. * represents the current fixation point

Figure 2: Eye-Tracking Measures in Different Window Conditions

