Improving Saccadic Eye Movements In Young And Poor Readers
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Improving saccadic eye movements in young and poor readers

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Where to look next?

The initial saccade of experienced readers lands preferentially halfway between the beginning and the middle of words, at the preferred viewing location (PVL, Rayner, 1979)

- gaze duration, refixation probability, and mean number of fixation
- Mainly influenced by low-level visual feature processing of the next parafoveal word (McCormick et al., 1988; Radach & McCormick, 1998)
- A clean oculomotor behavior is reflected in a narrower spread of initial landing positions (ILPs), around the PVL (Joekes and Theeuwes, 2020)

Saccade Targeting Strategies

Learning to read can be a hard task for some beginners, requiring becoming more efficient in linguistic processing and to gain cognitive control of saccadic eye movements

- ILPs gradually shift towards the word center during the first years of formal reading instruction (Ducrot et al., 2013; Joseph et al., 2009; Ventouix et al., 2014)
- Poor readers and dyslexics exhibit inefficient saccade targeting strategies (Gay et al., 2014; Havelka et al., 2010; Kirby et al., 2022; Vernet et al., 2023)
- Eye-tracking training can improve saccadic eye movements in beginning children, with accurately aiming for the PVL of each word (Lehtimäki & Reilly, 2005)

AIM OF THE STUDY: examined whether the saliency of the character located at the PVL positively influences the saccadic computation system

A brighter/colored letter in a word could act as a salient signal for launching the saccade and optimize the location of the initial fixation within the word

METHOD

- Stimuli: 240 items (50 parafoveals)
- Procedure: Presentation word/brightness, Non word/brightness, Neutral parafoveals
- PVL saliency: Color, Brightness * or Neutral

RESULTS

- Change in landing site distributions
- Cluster 1: Expert reader targeting strategy
- Cluster 2: Inefficient reader targeting strategy
- Cluster 3: Cognitive reader targeting strategy

- Effect of brightness of the character located at the PVL on the location of the ILPs for proficient/average readers
- Effect of brightness/color of the character located at the PVL, on the location of the ILPs for readers with visuo-attentional/oculomotor deficits

- The peak of the landing site distribution moved toward the PVL for cluster 2 (brightness) and cluster 3 (brightness/color)

DISCUSSION

1. We demonstrated the irrelevance of enhanced PVL saliency for readers having developed automatized routines for saccade computation.
2. This manipulation had the desired effect on the LP-curves for the cluster of participants with immature (characterized by ILPs near the words’ beginning and lowest reading level scores) and inefficient saccade targeting strategy (characterized by flattened and diffuse LP-curves and visual-processing deficits).
3. We also determined that our manipulation had a positive effect on RT/gaze duration and on the mean number of fixation per word, in less proficient readers.

A brighter/colored character in a word probably acts as a salient signal for launching the saccade, helping young/poor readers to optimize their saccade targeting strategies, with ILPs shifted toward the PVL. Reducing the number of fixations also reduces the gaze durations thereby making the reading process faster.

These results suggest that attracting the eye towards the PVL could represent a new way to help reading. See Vernet et al., 2023, POSTER 6, Improving reading through visual saliency: a remedial tool for neurodevelopmental disorders