

Research presentation 6 (abstract 2/2)

Vision and everyday tasks

Eye fixations in reading: effects of luminance, contrast and print size

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Purpose: Reading involves continuous eye movements (fixation and saccades) and constant cognitive demand. The purpose of this study was to investigate the effect of contrast, print size and luminance on eye movement behaviour when reading.

Methods: A group of 23 adults (age range: 19 to 36 years) participated in the experiment. All subjects were required to read comprehensively single sentences of the Greek versions of Colenbrander Reading Cards (high, 100%, and low, 10%, contrast) at 40 cm distance. Eye movements were recorded with an infrared eye tracker (EyeLink II, SR Research Ltd). Recordings were performed at two illuminance levels (60 vs 1 lux). Data analysis included computation of the fixation duration, the number of fixations, and saccadic length. Moreover, frequency distributions of fixation durations were analysed with the ex-Gaussian fitting, a convolution of a normal and exponential distribution that can characterise the location and shape of distribution.

Results: Median fixation duration when reading high contrast text was not affected by changes in relatively large print size (from 0.9 to 0.4 logMAR), but only when letters were smaller than 0.4 logMAR. Median fixation duration was always slower when reading text of 10% compared to 100% contrast, but the difference reached statistical significance only for letters smaller than 0.4 logMAR. Luminance had a significant effect on median fixation duration at all letter sizes with the effect being more pronounced the smaller the print size of the letters. The number of fixations was not statistically significantly influenced by neither contrast and luminance nor print size. Ex-Gaussian analysis resulted in a quantitative description of the fixation duration distribution.

Conclusion: The study confirms the hypothesis that median fixation duration as well as the analysis of fixations distribution can be used as a measure of reading fluency and generally reading performance. Recording eye movements when reading could provide an efficient method in differentiating reading deficits in visuomotor versus cognitive processing mechanisms.