

Effects of emotional arousal on eye movement-based reading performance

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Purpose: Visual acuity forms the preferred test among clinicians for assessing visual function. However, since many activities of daily living rely on reading, reading performance measures have been recently used to establish a more reliable outcome of functional vision. Current clinical reading tests, although, thoroughly standardized usually result to a significant inter-individual variation in reading speed since reading performance is influenced both by visuo-motor and cognitive (i.e. linguistic, personality, learning effect) factors. The purpose of this study was to evaluate the effects of emotional arousal, induced by a text, on eye movement behaviour during reading.

Methods: Thirty six young volunteers with an average age of 27 years participated in the study. All of them were native Greek speakers, having completed secondary education. Participants had to read comprehensively a version of the short horror story “Berenice” by Edgar Allan Poe, divided in four sections which gradually progressed in levels of negative emotional intensity. The text was 0.4 logMAR (newsprint) in size at 40 cm distance. Eye-movements were recorded with an infrared eye tracker (EyeLink II, SR Research Ltd) with a sampling rate of 500Hz. Eye movement data analysis included computation of the fixation duration, the number of fixations and the frequency distribution of fixation durations. Emotional arousal was evaluated with physiological measurements (heart rate and blood volume amplitude) with biofeedback and neurofeedback system (Nexus, Mind Media B.V). Personality characteristics were evaluated with questionnaires.

Results: Tension, fear and sadness showed a statistically significant increase at the end of the experiment. Physiological measurements showed also a statistically significant difference between the first and the last trial, in heart rate and blood volume amplitude. Across the text sections, mean fixation duration showed a statically significant reduction and reading speed showed an increase. Depression level, extracted by CESD questionnaire, seems to increase the effect of emotional arousal on fixation duration.

Discussion: The study showed that a purposely designed text can be used to induce emotion arousal since both physiological measurements and questionnaires showed significant differences. Mean fixation duration and reading speed were affected by the progressive negative emotional intensity of the text sections, especially when the participant's depression level was taken into account.