



EYE MOVEMENTS CHANGE ACCORDING TO PERIPHERAL INFORMATION

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Introduction

High-speed saccadic eye movements serve the function of moving the fovea on to the part of array that we want to process in detail. The contribution of peripheral vision is essential in planning and controlling saccadic eye movements. For this reason, central information analysis and selection of next saccadic targets can affect saccades, fixation duration and time needed to complete the visual search task [1]. Methods are developing to train saccades, fixations and effective information processing via magnocellular flow using visual search task [2, 3]. Moreover, only one target is chosen to be found amongst other distractors in a visual search task. Therefore the aim of the present study was to define whether influence of peripheral information could be traced in the parameters of eye movements and fixations. Apart from this, the efficiency of the performance of visual search task was investigated.

Methods

Five individuals (age 21-23) participated in experiment. They had normal visual acuity without correction. The research was conducted in compliance with the principles of the Declaration of Helsinki.

Visual stimuli were presented at a distance of 60 cm. Each visual stimulus consisted of set of definite black Latin letters (10 targets in ten rows). The distractors differed from the target letters with colour and/or thickness, or could be the same as the target (see Fig. 1).

The task was to find and count how many times a certain letter was repeated within each set of letters. Participants were instructed to scan stimuli horizontally from row to row. Ten measurements were taken for each kind of peripheral information.

Time and accuracy of performance as well as eye movements were recorded with video-oculograph iViewX (240 Hz). Extraction of saccades and fixations from raw gaze position data was made by BeGaze program. Eye movements velocity 75°/s was chosen as saccadic threshold. Statistical analysis of the data was performed using Microsoft Excel.

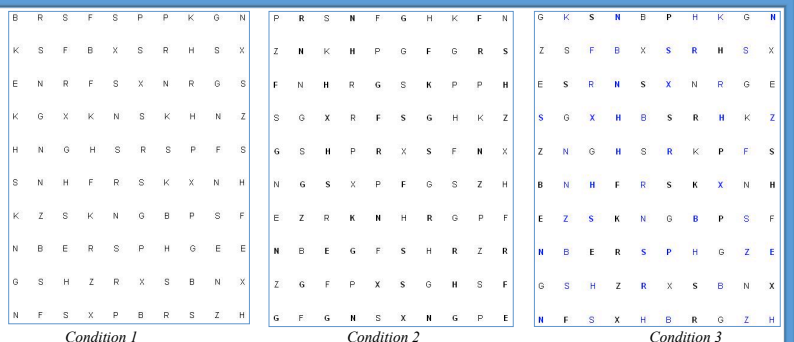


Fig.1. Visual stimulus: target and distractors are the same in condition 1; 50% of the stimuli are bold in condition 2; 50% of the stimuli are bold and 50% blue in condition 3.

Results

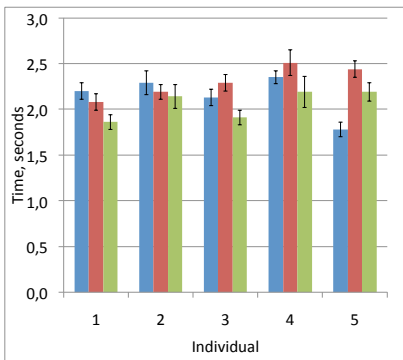


Fig.2. Average time needed to accomplish the task. The task was completed significantly faster in the condition 3.

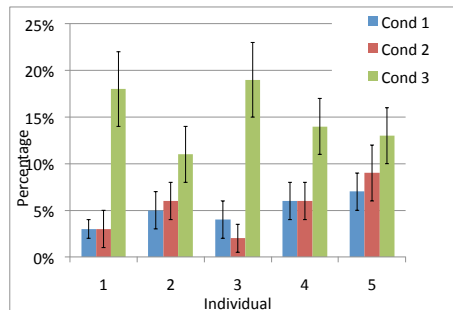


Fig.3. Number of errors made during accomplishment of the task depending on peripheral condition. Each individual is more accurate when peripheral noise is increased.

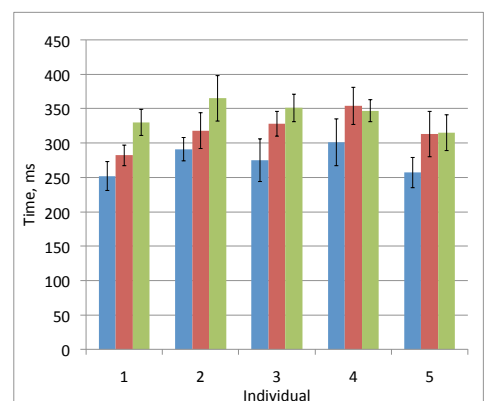


Fig.5. Average fixation durations for three different stimulus conditions. There are strong individual differences. However, mean values were independent of stimulus condition. Overall mean fixation durations varied from 210 to 278 ms.

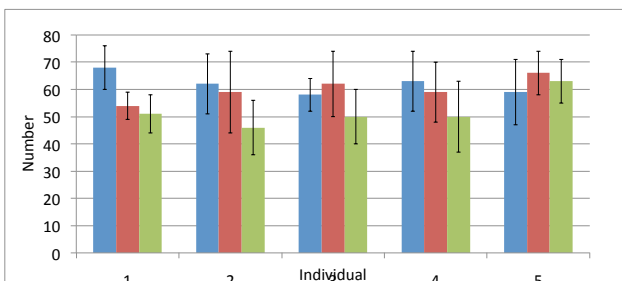


Fig.4. Average number of fixations in three different peripheral conditions. There is a tendency to have less fixations in the condition 3.

Conclusions

1. Every individual counts letters faster in the third condition, although it is not statistically significant.
2. Four out of five individuals made significantly more errors in the third condition.
3. There is a tendency for less fixations in the third condition, although it is not statistically significant.
4. Four out of five individuals have a different fixation duration in condition one and three. Third condition is more time consuming.

References

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