TRAINING SACCADIC EYE MOVEMENTS USING VISUAL SEARCH TASK

Tatjana Pladere[1], Ieva Timrote[2], Gunta Krumina[3]
University of Latvia, Department of Optometry and Vision Science, LV 1063, Riga, Latvia
E-mail: tmbox@inbox.lv

IEGULDĪJUMS TAVĀ NĀKOTNĒ
EIROPAS REĢIONĀLĀS ATTĪSTĪBAS FONDS

→ The peripheral vision plays the important role in planning and programming the next saccade during scanning the visual scene.
→ Systematic training of saccades and fixations **can serve as primary help for patients, who have problems with reading control, or have central vision loss and are forced to read using peripheral retina.**
→ The eye movement patterns in reading are similiar across a wide range of other visuomotor behaviour, for instance, in visual search.
→ The **specially constructed visual search task may be easier in use** and more effective then reading task for purposes of primary oculomotor training.
→ Our main purpose of the present research is to determine whether there exists the possibility of construction of such visual search task with peripheral visual hints that will be appropriate with reading in spatial and temporal characteristics.

Experiment and methods

→Five people (age 21-23) participated in experiments.
→ Stimuli were presented at a distance of 60 cm. Before performing visual search task the individuals were instructed to scan visual stimuli horizontally from row to row and to move gaze like in case of reading.
→Three tasks. Two types of visual search task differed in peripheral information – distractors had different color and/or thickness than the target. An individual had to find and count the specific letter in the visual search task. The third stimulus consisted of a text in Latvian which were constructed for the experiment (*see Fig. 1*). All stimuli were of the similiar structure.
→ The procedure consisted of three tasks that were repeated seven times for each individual.
→ iViewX Hi-Speed 240 Hz IR device (SensoMotoric Instruments GmbH) was used. Data was conducted with SMI BeGaze and MS Office Excel programs.

Ņemot vērā bīstamības faktu, kuģa personālam jāredz pozīcijas. Šorīt pasažieri pamodījās no skaļa un diezgan biedējošā trokšņa. Cietušās personas gribēja uzzvanīt saviem tuviem draugiem. **A**

Ņmebt vrēā ktaīsabmīs fktau, kbua plaenbsoām jerdāz pozīcbjas. Šroīt peraibaži pījāadmos no sļkba un dezabin gdšibejoā trņkšoa. Cuštbies psorbnes gbijēra uvzanzīt sebiam tiuevm dugibram. **B**

Ņoemt vrēā bbtamīaīss ftkau, kģua pālnoaersm jrdeāz pīcijzoas. Šrīot piažreasi pmdījaāos no saļka un dgazien beidjošēā trokšņa. Ctšāuies prsaoens gjrēiba unvzzaīt seavim tvieum durgieam. **C**

Figure 1. An example of three visual stimuli. (A) Reading task. A paragraph of four lines that contains 24 words. Silent reading. (B) Visual search task 1. The four lines counted 163 letters. The task was to count the number of 'B's. Peripheral cues differ with thickness from the target letters. (C) Visual search task 2. The four lines counted 163 letters. The task was to count the number of 'H's. Peripheral cues differ with thickness and/or colour from the target letter.

First results

	Visual search 1	Visual search 2	Reading
Total number of fixations	81 (22)	62 (18)	60 (20)
Mean fixation duration (ms)	226 (23)	241 (26)	254 (19)
Number of rightward fixations	60 (11)	54 (19)	53 (15)
Mean rightward fixation duration (ms)	238 (18)	244 (23)	249 (17)
Number of leftward fixations	21 (8)	8 (4)	7 (5)
Percentage of leftward fixations (%)	26 (6)	13 (4)	12 (4)
Mean leftward fixation duration (ms)	211 (30)	238 (28)	260 (27)
Mean saccade amplitude (°)	1.1 (0.3)	2.0 (0.5)	2.1 (0.4)

Table 1. Means and standard deviations of all individuals for the eye movement measures in three tasks. It is seen that the type of peripheral information affects saccade amplitude ($p<0.05$) but not the fixation duration in the visual search tasks and reading ($p>0.38$). Temporal parameters are similiar in all three tasks, possibly due to overlaping of bottom-up and top-down processes.

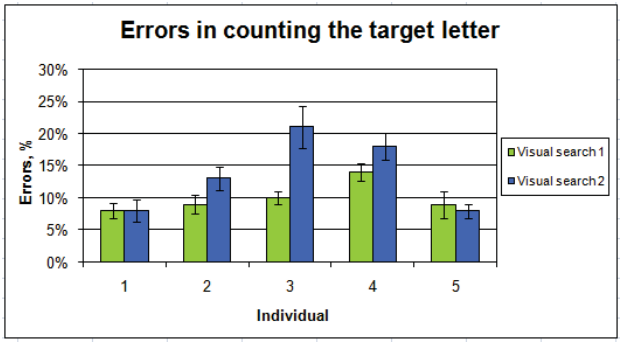

Figure 2. The percentage of errors in visual search tasks with different contribution of peripheral information. Three of five individuals made significantly more mistakes in counting letters when distractors differed in color ($p<0.01$). So the peripheral cues may influence negatively the performance of the task.

Conclusions and future work

With the help of specific peripheral hints (in this work – color) the visual search task may be designed in the way that the spatial parameters of saccadic eye movements will be appropriate with reading task. Certain experiment improvements are requirable. We should check the influency of Latvian word frequency and distribution of fixations among distractors and targets. The texts are to be adapted for younger individuals.

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