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Visual Performance of Homonymous Scotoma Patients - A Pilot Study Using Dot Counting and Comparative Visual Search Tasks Under Virtual Reality Conditions

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Purpose: To assess the visual performance in a dot counting (DC) and a comparative visual search (CVF) task in patients with homonymous visual field defects (HVFDs).

Methods: Head and eye movements were measured by infrared light based trackers (sampling rate: 60 Hz). Stimuli were presented on a large curved, tilted, conical projection screen. Subjects were seated 1.6m in front of the screen.

Size and location of absolute HVFDs were assessed by binocular semi-automated kinetic perimetry with the OCTOPUS 101 perimeter (HAAG-STREIT Inc., Koeniz, Switzerland). In the DC task, the subjects had to count 20 grey dots with restricted head movements. The stimuli were presented over 60° x 40° field of view (FOV) with fixed head position using a chin rest. In the CVF task, the subjects had to compare two shelves filled with colored objects to find the correct amount of differences in the object constellations. In this experimental set-up head movements were allowed and stimuli were presented over a 90° x 70° FOV.

9 (4 females, 5 males; age: 21-70 years) patients with HVFDs due to unilateral vascular or traumatic brain lesions with a minimum visual acuity of 10/20 and 7 (5 females, 2 males; age: 28-61 years) normal controls participated in this study.

Results: In the DC task, patients with HVFDs needed more fixations than control subjects (mean/sd 2.7±0.5 vs. 2.2±0.3) and performed longer scanpaths (mean/sd 288.6°±123.5° vs. 225°±67.8°). Furthermore, patients had more fixations in the affected hemifield as compared to the controls. In the CVF task, patients showed a higher error rate (25.5 %) than normal controls (17 %).

Conclusions: Patients with HVFDs have on average higher fixation rates and longer scanpaths and also demonstrate a higher variability of these parameters compared to normal controls.

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