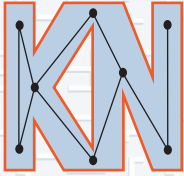


Visual Performance of Homonymous Scotoma Patients - A Pilot Study Using Dot Counting and Comparative Visual Search Tasks Under Virtual Reality Conditions

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INTRODUCTION

To assess the visual performance of patients with homonymous visual field defects (HVFDs), we used two visual tasks under virtual reality conditions.

First Task: Dot Counting → **DC** (introduced by Zihl, 1995; cf. Tant et al., 2002)

Second Task: Comparative Visual Search → **CVS** (cf. Pomplun et al., 2001)

DC: simple stimulus display
visual sampling task
more low-level vision

more complex stimulus display
CVS: visual search task
more high-level vision

Questions: Show all patients the same visual performance?

Where are the differences compared with healthy subjects?

Are the patients' performances different between the both tasks?

MATERIAL & METHODS

APPARATUS: - Curved, tilted, conical projection screen - enables a large field of view (fov) → 150° x 70° horizontal/vertical

- Subjects sat in 1.62m distance, eye level at 1.2m (Figure 1)

- Eye movement recordings with a head mounted, infrared light based eye

tracker (model: ASL-501).
- Head movement recordings (6dof) with the infrared based system ARTtrack| Dtrack
- Sample rate of both systems: 60 Hz
- Measured gaze position with an error of about ±2° of visual angle

SUBJECTS: - 9 HVFD patients (4 females, 5 males; age: 21-70 years)
detailed list of the lesions on poster: #792 / B713
- 7 healthy controls (5 females, 2 males; age: 28-61 years)

STIMULUS - DC: - 20 randomly arranged dots (60°x40° fov) presented 3 times
- dots appeared after a initial center fixation phase (5 seconds long)

- **TASK:** Count the number of dots silently and report the result!

STIMULUS - CVS: - Two cupboards filled with geometrical objects in four colors
- Cupboards included each 20 objects; Distance between them: 60° (Figure 2)
- Objects' configuration was identical except for 0, 1, or 2 target positions, where the objects' shape was different
- cupboards appeared after a initial center fixation phase (5 seconds long)
- head and eye movements allowed

TASK: Find the number of differences
(as quick and reliable as possible)!

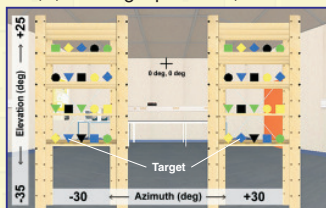


Figure 2: CVS task with two cupboards, each with four levels filled with 5 objects. One board covered about 30° of the visual field.

CONCLUSIONS

★ HVFD patients' task performance divided these into two groups with different visual performances.

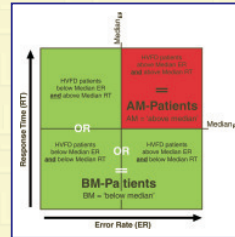
(adequat ↔ insufficient)

★ Overall, **BM-patients'** group showed no differences compared with healthy control subjects related to the task performance.

★ **AM-patients** performed the both tasks worse than control subjects.

★ **BM-patients** showed worse overall visual performance compared with controls for the more complex visual search task (CVS).

RESULTS



• Median split method divides HVFD-patients into two groups: **7 BM-Patients** and **2 AM-Patients**

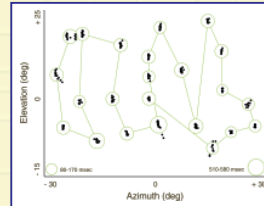
• Same patient groups obtained in both tasks

• Patients in the **AM** group have a hemianopic field deficit

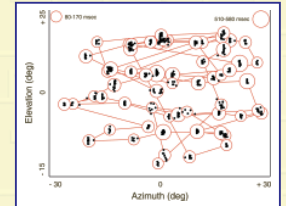
• **BM** group contained 5 quadrantanopia and 2 hemianopic scotoma patients

Scanpath example from the DC task

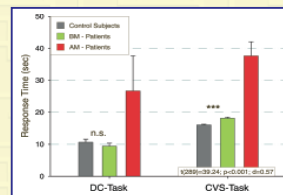
BM Patient



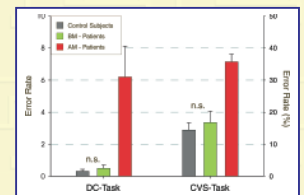
AM Patient



Task performance data as grouping parameter

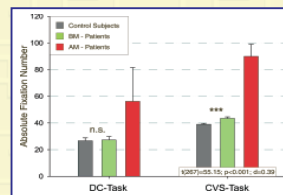


• Highly increased RT for the **AM-patients** in both tasks
• Sign. higher search time for **BM-patients** compared with the controls in the more complex search task
• No difference in the more simple task

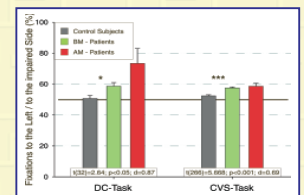


• Highly increased ER for the **AM-patients** in both tasks
• Same good task performance between **BM-patients** and controls in both paradigms
• ER in the DC task means absolute counting error

Compensatory fixational gaze behavior



• Highly elevated number of fixations for the **AM-patients** in both tasks
• Sign. more fixations for **BM-patients** compared with the controls in the more complex search task (controls performed 40 fixations to 40 geometrical objects)
• To count 20 dots **BM-subjects** and controls needed about 27 fixations



• In both tasks both groups of patients showed sign. more fixations into the affected hemifield
• Possible compensatory strategy of the patients
• **AM-patients** values are close to these of the **BM-patients**
• Controls fixations showed equal distribution

Further gaze behavior parameter

	DC-Task		CVS-Task
	Fixation Repetition (%)	Scanpath length (°)	Gaze Shift number
Controls	7.99±1.21	237.6±20.8	17.2±0.9
BM-patients	6.92±1.53	235.4±25.3	16.43±1.4
AM-patients	11.4±4.5	285.2±29.8	26.25±7.5

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