

# Differences in gaze behavior and task performance in patients with homonymous visual field defects (HVFDs)



G. Hardies<sup>1</sup>, E. Papageorgiou<sup>2</sup>, U. Schiefer<sup>2</sup> and H.A. Mallot<sup>1</sup>

<sup>1</sup>Lab of Cognitive Neuroscience, Department of Zoology, University of Tübingen <sup>2</sup>University Eye Hospital, Department of Pathophysiology of Vision and Neuro-Ophthalmology, Tübingen

## INTRODUCTION

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

**1st task:** Dot Counting → **DC** (introduced by Zihl, 1995; cf. Tant et al., 2002)

**2nd task:** Comparative Visual Search → **CVS** (cf. Pomplun et al., 2001)

simple stimulus display

more complex stimulus display

**DC:** visual sampling task  
more low-level vision

**CVS:** visual search task  
more high-level vision

**Questions:** Do all patients show the same task/gaze performance?  
Do the patients' performances differ between the both tasks?  
Where are the differences compared to healthy subjects?

## MATERIAL & METHODS



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

- Subjects sat in 1.62 m screen distance, eye level at 1.2 m

- Eye movement recordings with the head mounted ASL-501 tracker

- Head movement recordings (6dof) with the infrared based system ARTtrack| Dtrack → tracking frequency: 60Hz

**SUBJECTS:** -12 HVFD patients (8 with homonymous hemianopia, 4 with quadrantanopia; age: 22-70) and 12 healthy controls (age: 20-66)

**DC - STIMULUS:** - 20 randomly arranged dots; presented 3 times  
- stimulus size: 60° x 40°

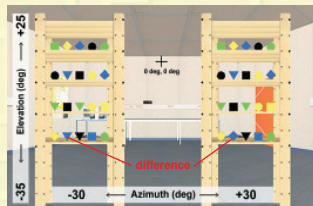
**TASK:** Count the number of all dots silently and report the result!

**Variables:** Error rate, Response time, only Eye movements

**CVS - STIMULUS:** - Two cupboards filled with geometrical objects in four colors  
- Objects' configuration was identical except for 0, 1 or 2 target positions, where only the objects' shape was different

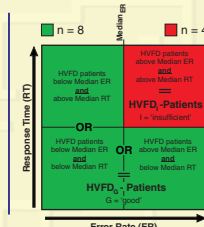
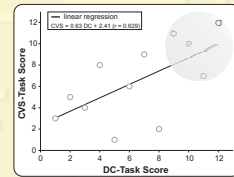
**TASK:** Find the number of differences in each of all 30 trials (as quickly and reliably as possible!)

**Variables:** Error rate, Response time, Eye movements and Head movements



## RESULTS I

### Patients' Task Performance

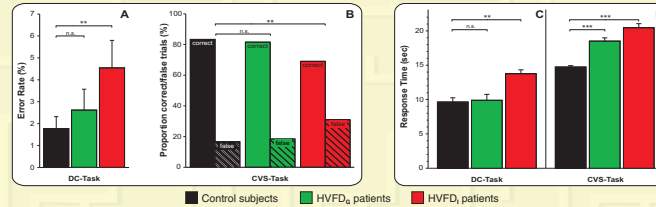


• Median Splitting to divide the patients for each task into two subgroups

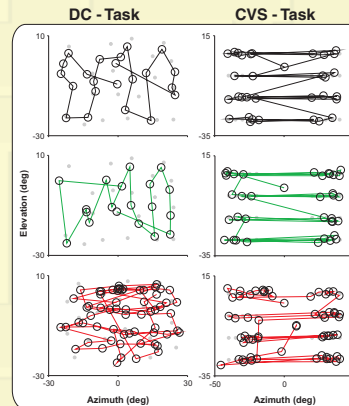
• Subgroups were identical for each task

- Score was independently calculated for each task
- Score based on ER x RT ranking (1-12)

### Task Performance Comparisons



### Scanpath Examples



**Healthy subject**

- regular, systematic scanning pattern
- accumulation of several dots into one fixational group (DC - Task)
- good balance between speed and safety

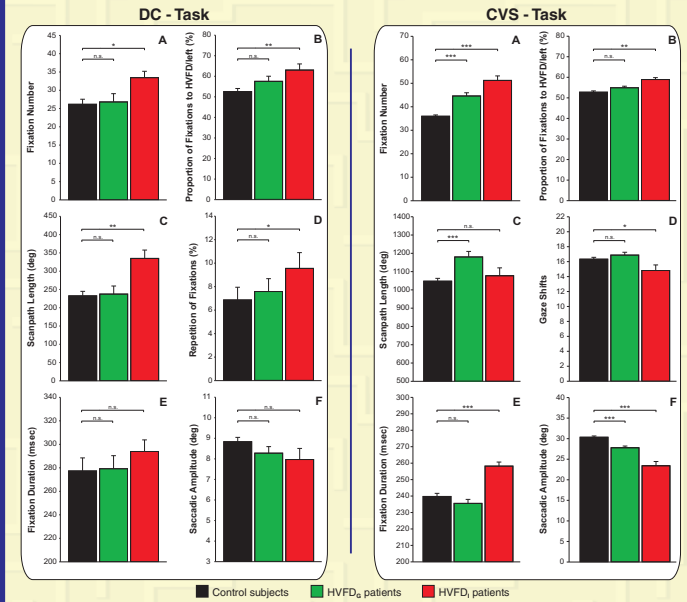
**HVFD<sub>G</sub> - Patient**

- irregular, detailed and time consuming scanning pattern
- conspicuous scanpath with a high number of refixations
- short saccadic amplitudes

**HVFD<sub>P</sub> - Patient**

## RESULTS II

### Gaze Performance Comparisons



- In all oculomotoric characteristics:
  - **HVFD<sub>G</sub>** patients performed just as well as unimpaired subjects
  - **HVFD<sub>P</sub>** patients performed worse than unimpaired subjects
- **HVFD<sub>G</sub>** patients performed more fixations and longer scanpaths compared to unimpaired subjects → functional compensation?
- For the most parameters:
  - **HVFD<sub>P</sub>** patients performed worse than unimpaired subjects

## CONCLUSIONS

### TASK PERFORMANCE

- ★ HVFD patients' collective could be divided into two subgroups based on their task performance. (**HVFD<sub>G</sub>** ↔ **HVFD<sub>P</sub>**)
- ★ Overall, **HVFD<sub>G</sub>** patients showed no differences compared with healthy control subjects.

### GAZE PERFORMANCE

- ★ DC task: Findings of Zihl (1995) and Tant et al. (2002) could be confirmed - **HVFD<sub>G</sub>** patients performed just as well as **controls**.
- ★ CVS task: **HVFD<sub>G</sub>** patients showed adapted performance compared with **controls** regarding number of fixations.
- ★ Both tasks: For the majority of gaze characteristics - **HVFD<sub>P</sub>** patients performed worse than all other subjects.

## REFERENCES

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