

DISTRIBUTION OF VISUAL ATTENTION DURING DISTRACTION: Influence of demands of the driving task and of the secondary task

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Literature reports:

Difficulty of a secondary task influences eye movement behaviour during visual distraction

More complex task lead to a higher number of off-road glances

Demands of driving situation influence eye movement behaviour during visual distraction

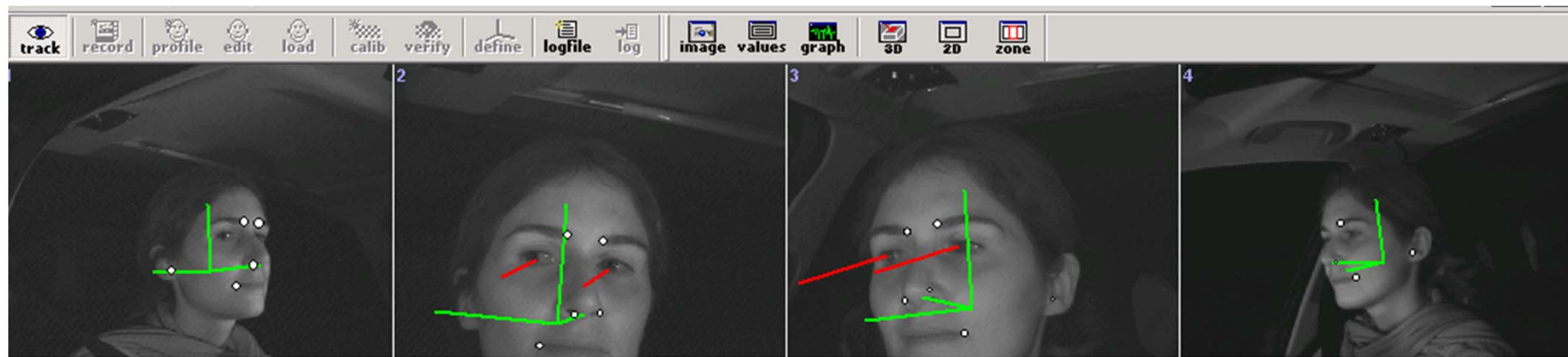
In more demanding situations more visual attention is used for road glances

During distracted driving, the distribution of attention is influenced by demands of driving as well as of the secondary task.

Do drivers adapt the distribution of attention to the demands of the driving task and to the demands of the secondary task?

What is the relative influence of both components?

Do demands of the driving task and of the secondary task influence visual attention independently or do they interact?



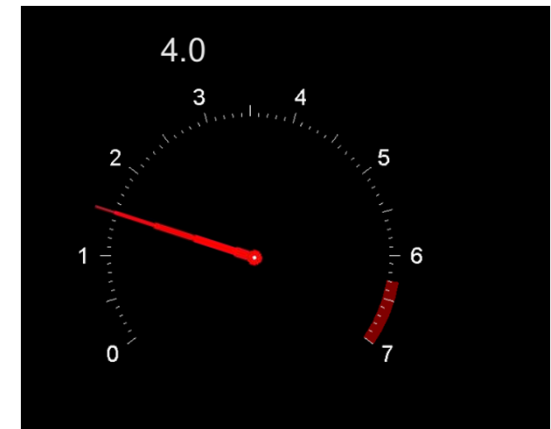
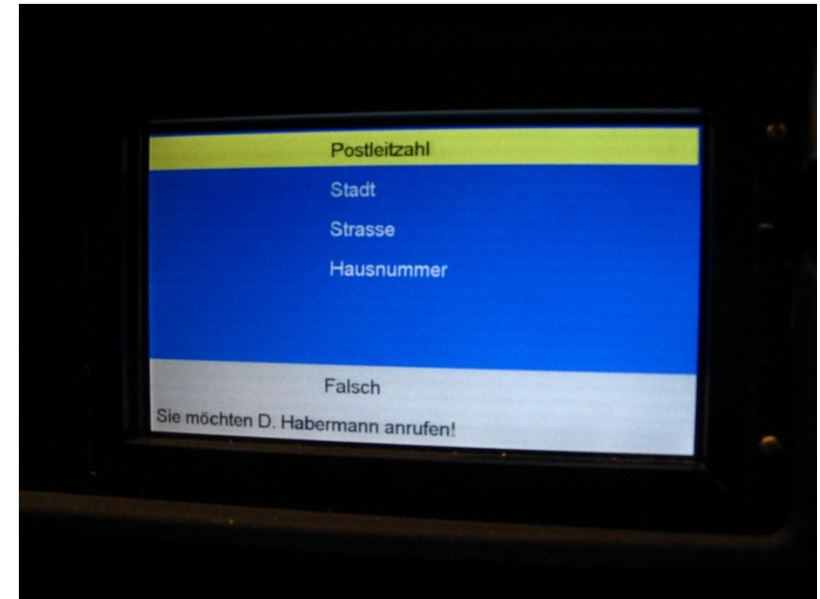
Experimental setup

- **Driving simulator study**
- **Independent variation of difficulty of driving task and demands of visual secondary task**
- **Four drives on rural roads (15 minute duration each)**
- **Analysis of eye movement behaviour as indicator for visual attention**
- **N=16 subjects**



Visual secondary tasks

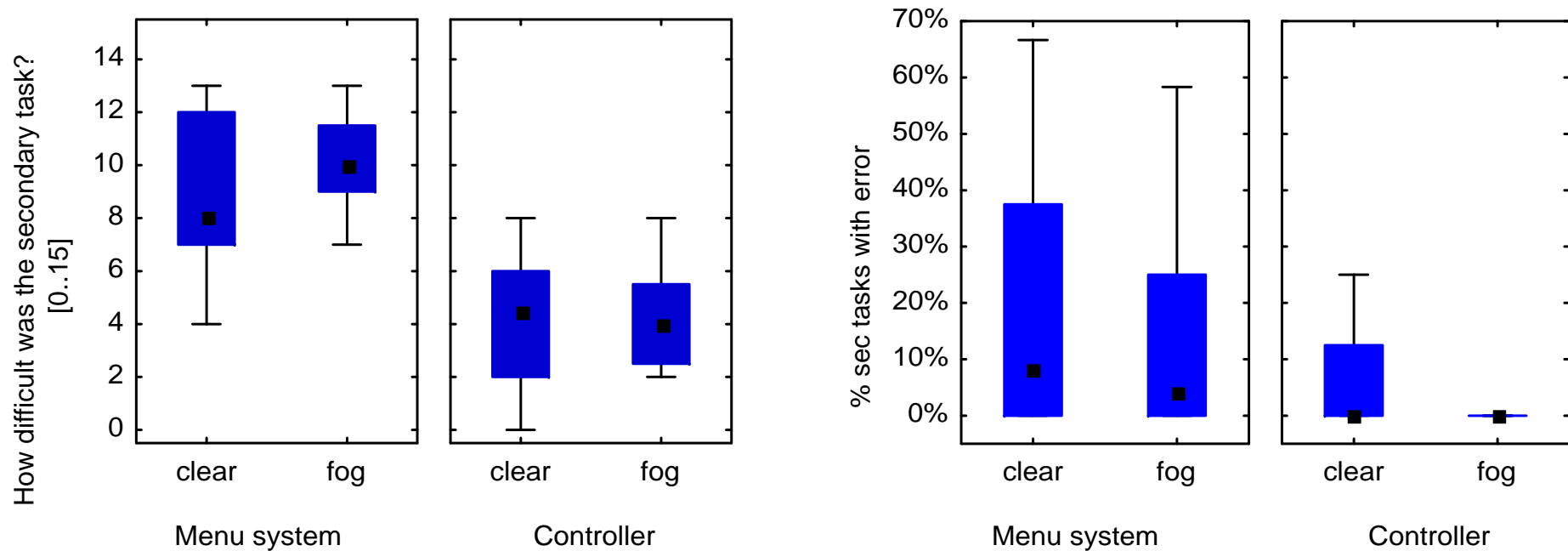
- **Presentation on display to the right hand side of the driver**
- **Hierarchical menu system**
 - **Complex task**
 - **Drivers are instructed to navigate to a certain point within the menu**
- **Controller task**
 - **Simple task**
 - **Drivers are instructed to change actual value until a given desired value is reached**
- **Difficulty of both tasks had been evaluated in pre-study**



		Long term demands of driving			
		Clear sight		Foggy	
Complexity of secondary task		simple	complex	simple	complex
Short term demands of driving	straight	4 tasks	4 tasks	4 tasks	4 tasks
	curvy 1	4 tasks	4 tasks	4 tasks	4 tasks
	curvy 2	4 tasks	4 tasks	4 tasks	4 tasks
Drive number		1	2	3	4



Complexity of secondary tasks



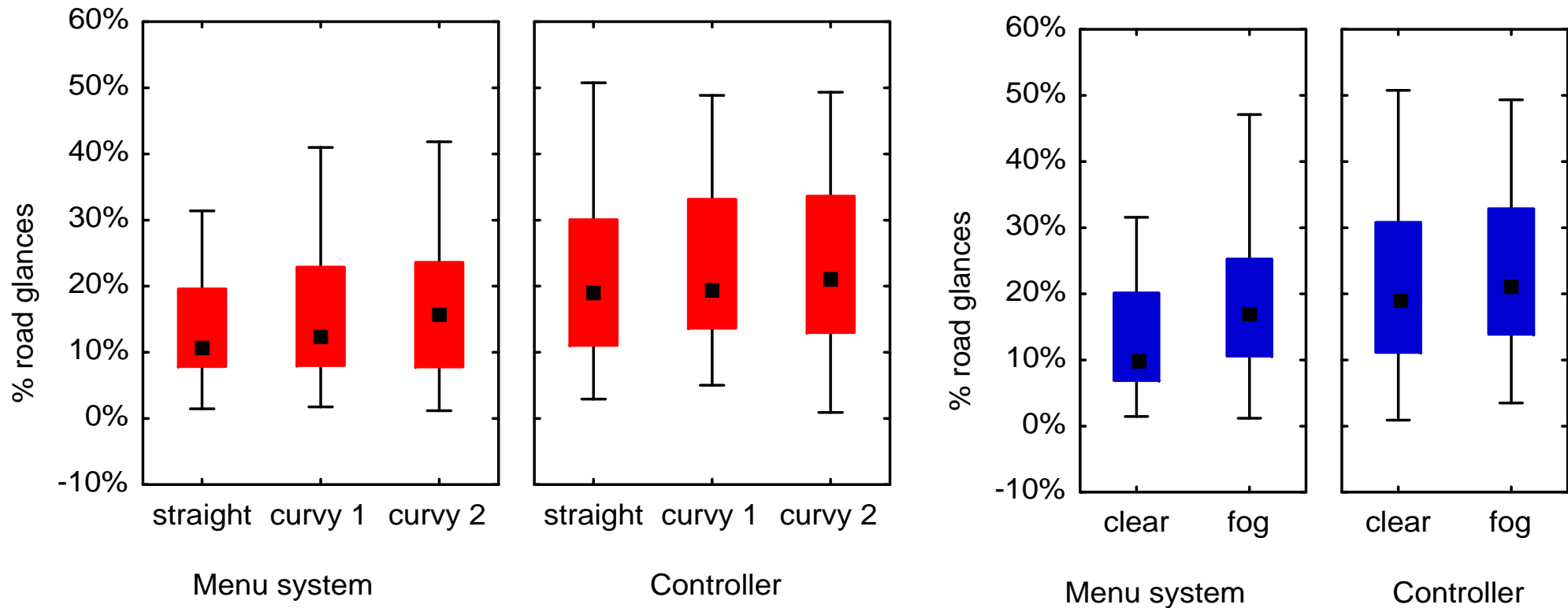
Subjective rating:

Secondary task $F(1,15)=97.4, p<0.001$

Error rate:

Secondary task $F(1,15) = 7.04, p < 0.05$

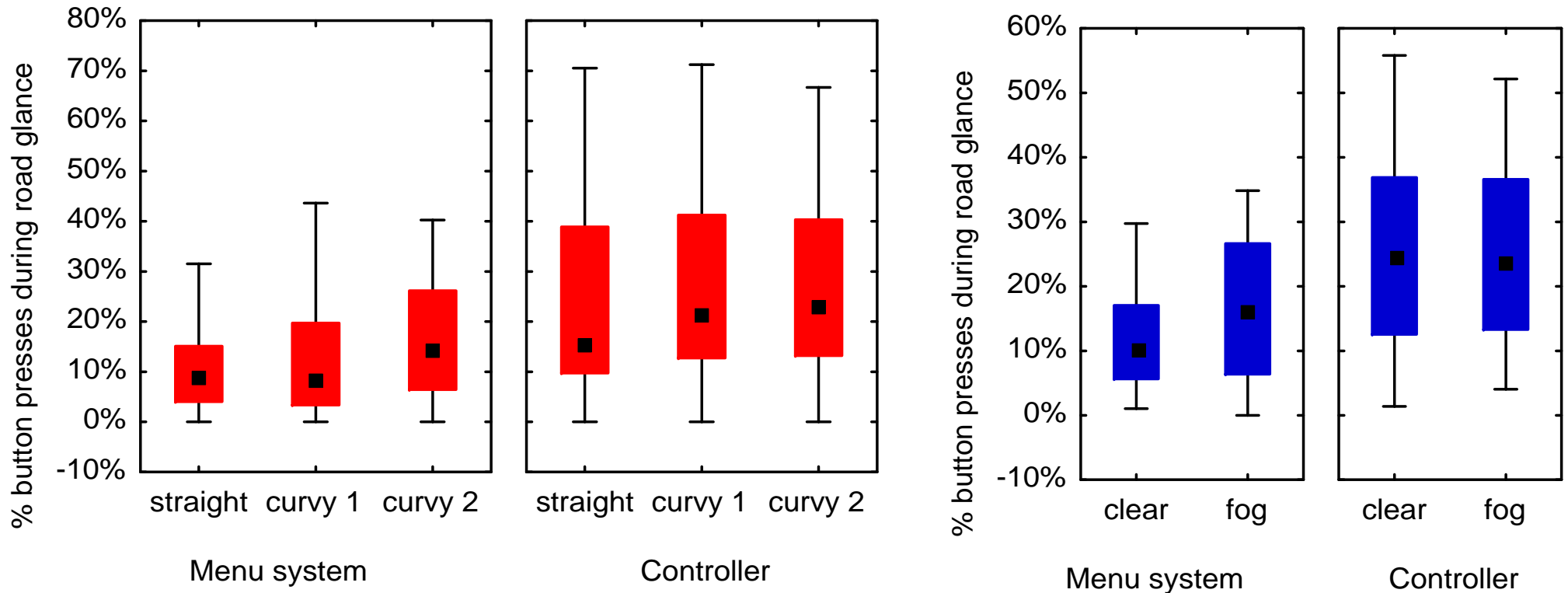
Influence on gaze behaviour



Percent road centre:

Secondary task $F(1,15)=9.18, p<0.01$	Effect size: 0.81
Curviness $F(2,30)=7.43, p<0.01$	Effect size: 0.92
Sight condition $F(1,15)=3.23, p=0.092$	Effect size: 0.39

Relation between gaze and task execution



% button presses during road glances:

Secondary task $F(1,15)=17.79, p<0.001$ Effect size: 0.98

Curviness $F(2,30)=5.49, p<0.01$ Effect size: 0.81

Sight condition $F(1,15)=2.15, p=0.163$ Effect size: 0.28

- **The two secondary tasks differ subjectively and objectively in their difficulty**
- **With the complex secondary task, drivers direct less attention to the road and perform less button presses while looking onto the road**
- **In more demanding driving situations (curves) drivers allocate more attention to the road**
- **The influence of long term driving demands (fog vs. clear visibility) is less pronounced**
- **There are no interactions between demands of the driving task and of the secondary task**

Drivers adapt their distribution of attention to the demands of the driving as well as of the secondary task.

Both components influence attention independent from each other.

The influence of the driving situation is larger than the influence of the secondary task.

Results are limited to driving situations with low and medium situational demands.

Thank you for your attention!

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