

# OBJECTIVE DROWSINESS MONITORING TO ASSESS FITNESS FOR DUTY

Clémentine FRANÇOIS<sup>1</sup>, Thomas HOYOUX<sup>1</sup>, Thomas LANGOHR<sup>1</sup>, Jérôme WERTZ<sup>2</sup>,  
Jacques G. VERLY<sup>1</sup>

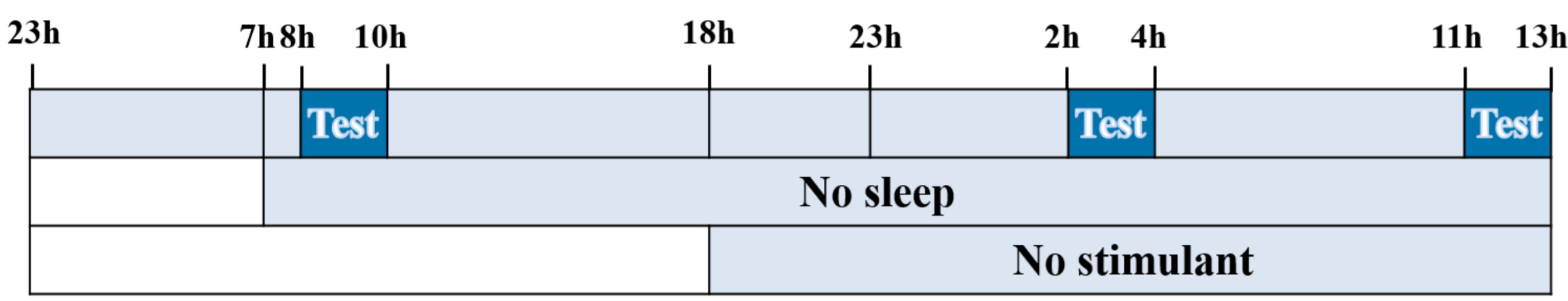
<sup>1</sup>INTELSIG Laboratory, Dept. of Electrical Engineering and Computer Science, University of Liège, Liège, Belgium

<sup>2</sup>Phasya s.a. Company, Angleur, Belgium

## Objective

Drowsiness is characterized by impairments of performance that can lead to disastrous accidents, in particular in all types of transportation and high-risk industrial plants. Therefore, it is crucial to be able to measure the ability of a person to perform correctly and safely a critical task based on his/her level of drowsiness (LoD). We have thus developed a drowsiness monitoring system based on images of the eye, called photooculography (POG), that determines whether a person is fit for duty.

## Data acquisition



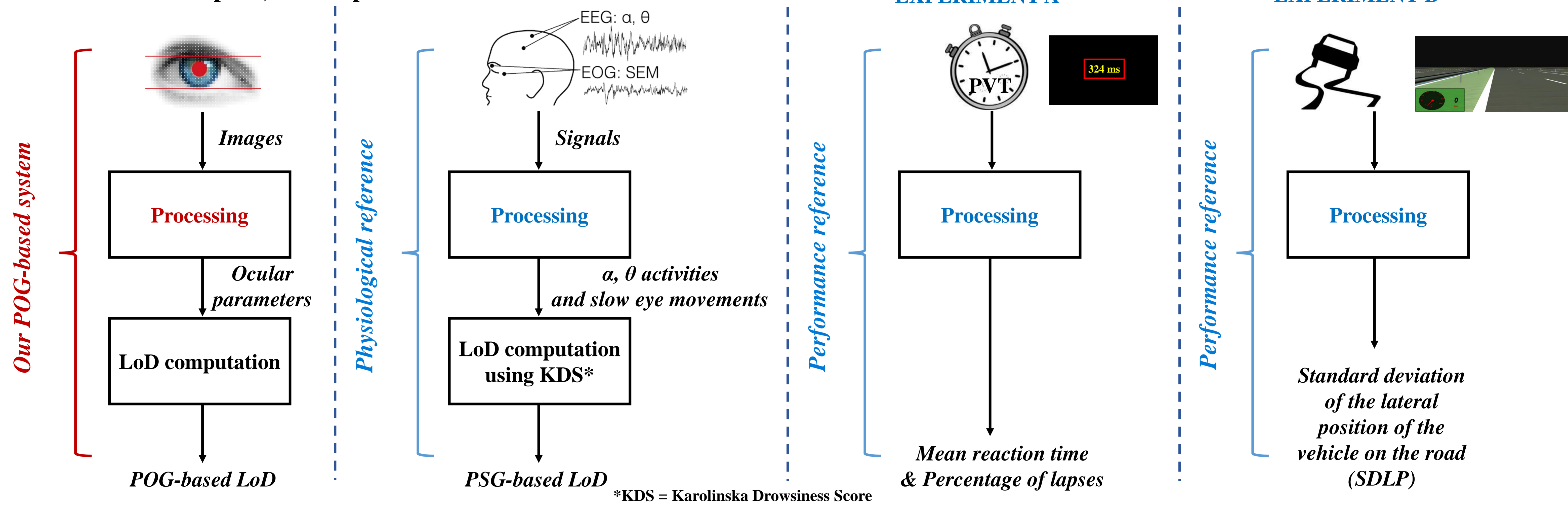
Experiment A	Experiment B
<ul style="list-style-type: none"> <li>27 participants (12 M, 15 F, mean age of 24.3 years, range of 19-32 years)</li> <li>Test = PVT* (duration of 10 minutes)</li> </ul>	<ul style="list-style-type: none"> <li>12 participants (6 M, 6 F, mean age of 24 years, range of 21-33 years)</li> <li>Test = Driving in a simulator (duration of around 45 minutes)</li> </ul>

Protocol approved by ethics committee of University.

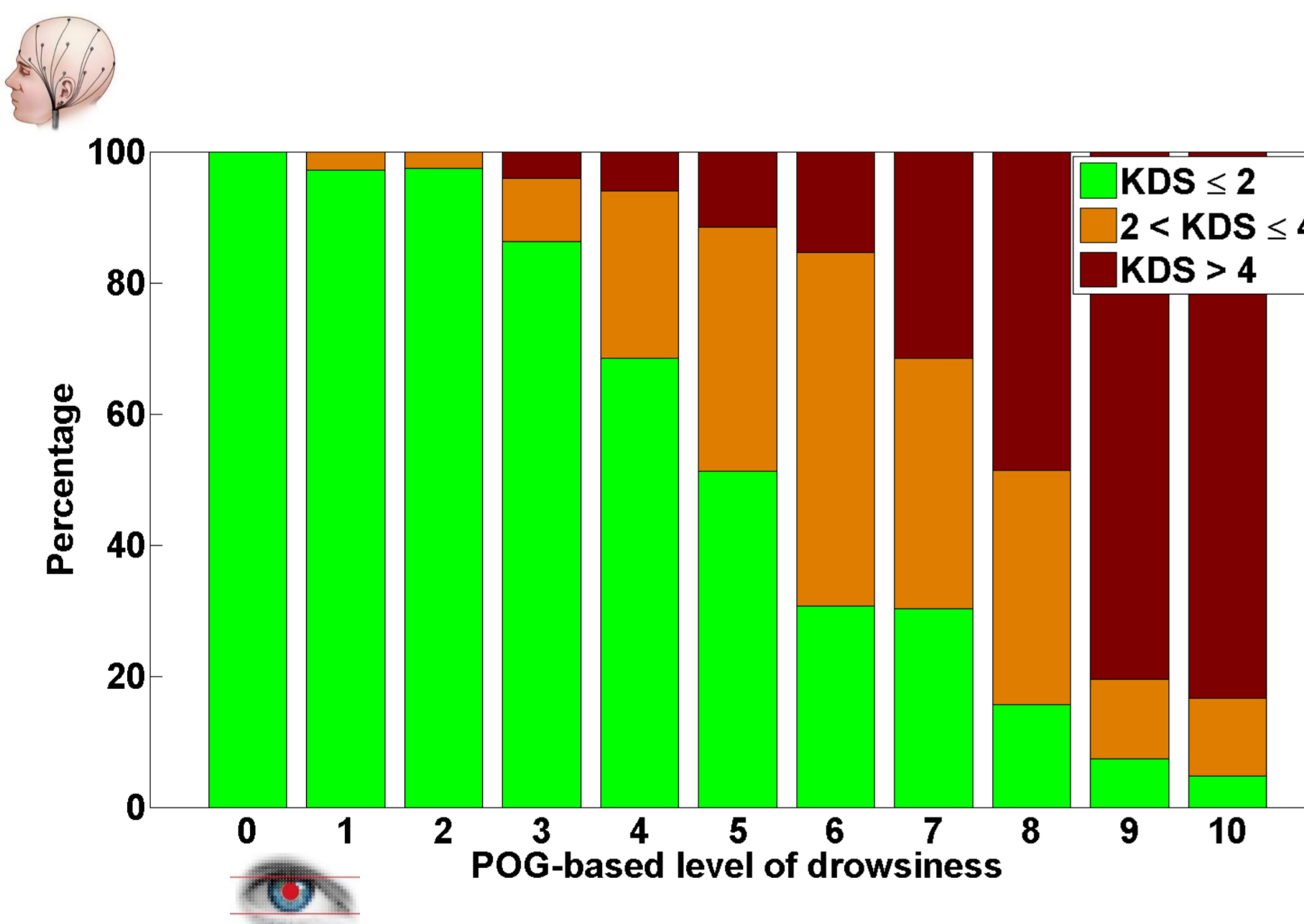
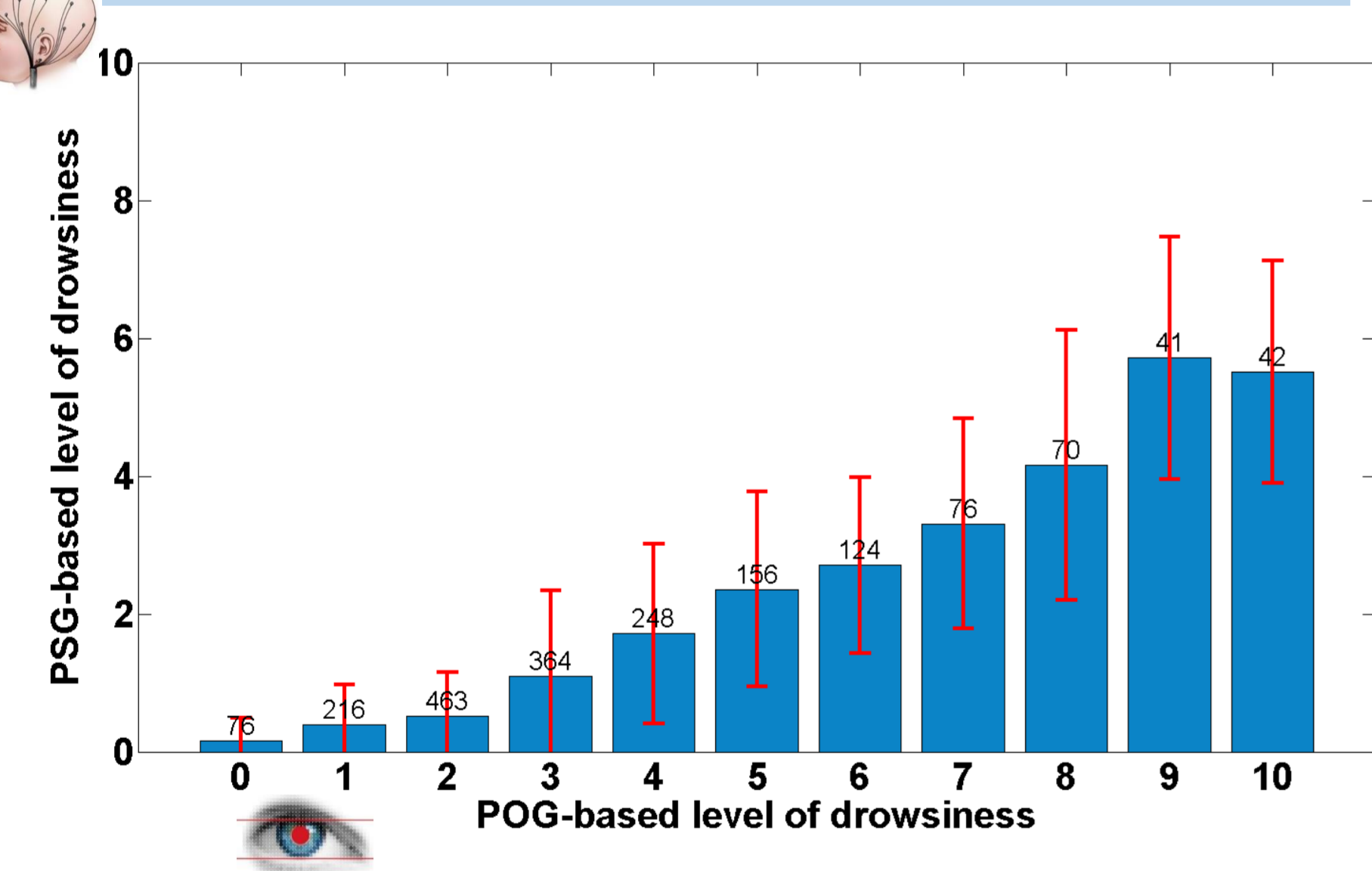
\*PVT = Psychomotor Vigilance Task

## Methods

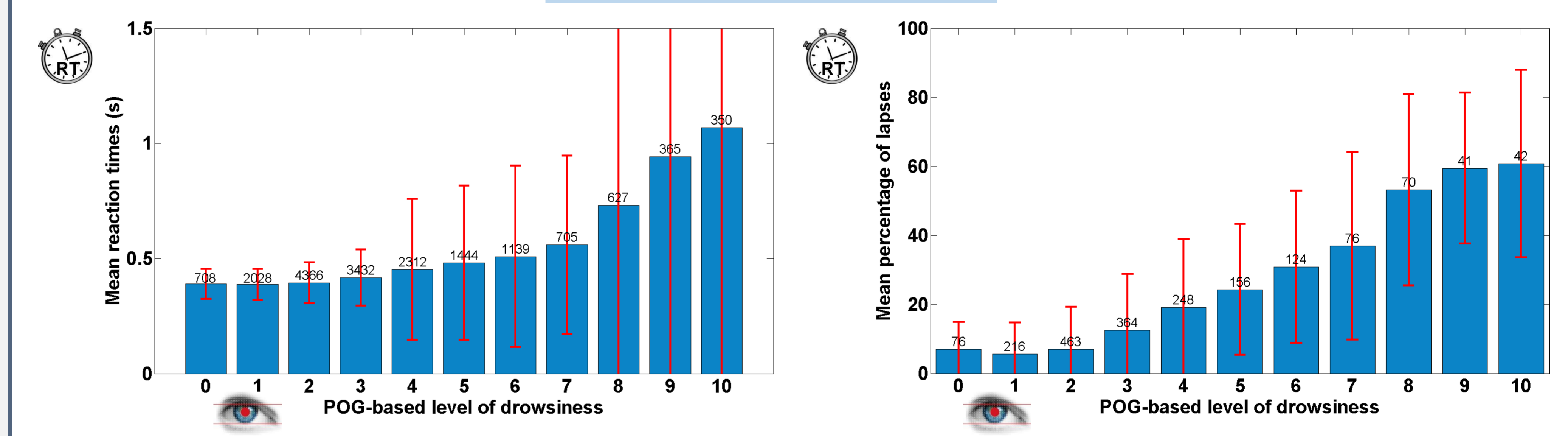
For each 1 minute epoch, we computed:



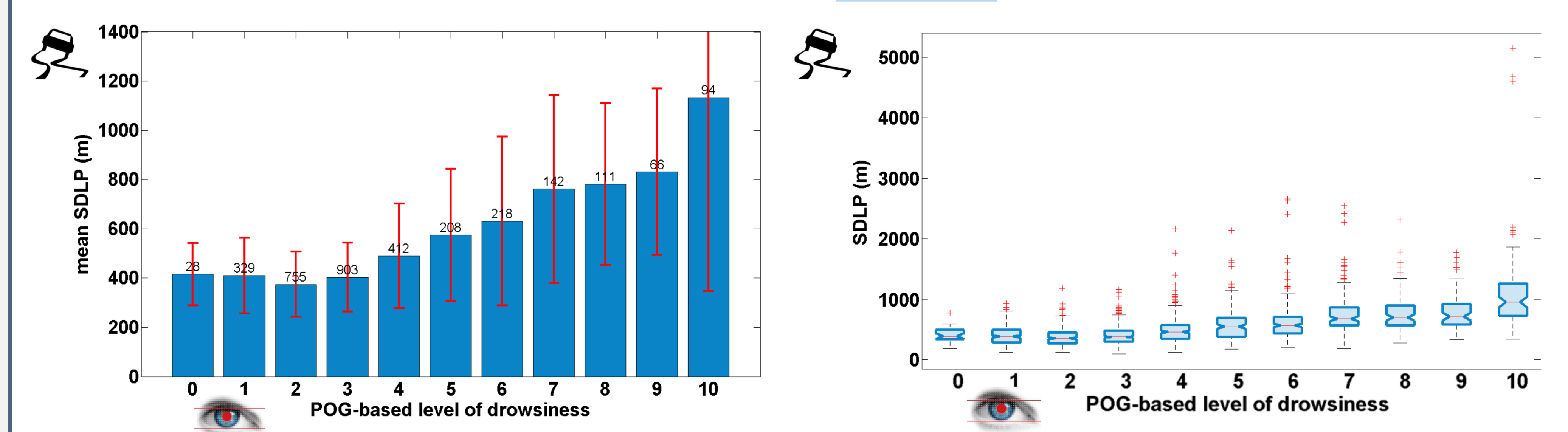
## Results POG vs PSG



## Results A



## Results B



## Conclusion

The results show that the POG-based LoD is in concordance with the physiological reference PSG-based LoD. In addition, the POG-based LoD is strongly correlated with the performance decrements observed during the experiments. This study thus indicates that our POG-based drowsiness monitoring system is able to reliably and objectively detect when a person is too drowsy to properly perform a critical task. This system is thus promising to assess fitness for duty.