SOMNOLENCE QUANTIFICATION SYSTEM
IN TERMS OF REACTION TIMES AND LAPSES

Clémantine FRANCOIS¹, Jérôme WERTZ¹, Murielle KIRKOVE¹, Jacques G. VERLY¹
¹ INTELSIG Laboratory, Dept. of Electrical Engineering and Computer Science, University of Liège, Liège, Belgium

Objective

Somnolence is known to be a major cause of various types of accidents [1], and ocular parameters are recognized to be reliable physiological indicators of somnolence [2]. We have thus developed an experimental somnolence quantification system that uses images of the eye to automatically determine a level of somnolence on a numerical scale.

The aim of this study is to show that the level of somnolence determined by our system is well related to the level of performance of subjects accomplishing three reaction-time tests in different sleep deprivation conditions.

Data acquisition

[Table not shown]

- 27 participants (12 M, 15 F, mean age of 24.3 years, range of 19-32 years)
- Test = reaction time (RT) test (duration of 15 minutes)
- Approved by ethics committee.

Results (1)

For each minute of test, we computed:
- mean reaction time
- percentage of lapses (lapse = RT > 2s or no answer)
- level of somnolence (determined by our system).

Results (2)

The level of somnolence determined by our system based on images of the eye is well “correlated” with the level of performance of a subject accomplishing a task. We have indeed shown that, in the case of a reaction-time task,
- mean reaction times and percentages of lapses increased with levels of somnolence determined by our system;
- a threshold of 5 on our scale of somnolence (from 0 to 10) is the best for predicting lapses.

Our somnolence quantification system has thus significant potential for predicting performance decrements due to somnolence and, ultimately, for preventing somnolence-related accidents.

Conclusion

Acknowledgments

- Région Wallonne (Belgium): for financial support;
- Sleep Laboratory (CETES), University Hospital of Liège (Belgium): for expertise, assistance, and use of facilities.

References


Contact: cfrancois@ulg.ac.be

EMBC 2014; Chicago, USA; 26-30 August 2014