DEVELOPMENT AND VALIDATION OF AN AUTOMATIC REFERENCE POLYSOMNOGRAPHIC SYSTEM FOR QUANTIFYING DROWSINESS

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Objective

Drowsiness is a major cause of various types of accidents [1]. Therefore, preventing such accidents is a critical issue of safety and public health. Since polysomnography (PSG) is considered as the “gold standard” for sleep [2], we have developed and validated a new, automatic PSG-based system for quantifying drowsiness. This system is primarily intended to be used as a reference for the validation of non-PSG-based drowsiness monitoring systems. The objective of this study is to show that the level of drowsiness produced automatically by our system is in excellent accord with that produced visually/manually by experts.

Data acquisition

- 24 participants (11 M, 13 F, mean age of 22.7 years, range of 19-32 years)
- Test = Psychomotor Vigilance Test (duration of 10 minutes)
- Protocol approved by Ethics Committee of university.

Methods

Each 20 second epoch was processed in two distinct ways:

**AUTOMATICALLY**

1. EEG: α, θ
3. Classification tree
4. Level of drowsiness using KDS* [4]

**VISUALLY**

1. EEG: α, θ
3. Classification tree
4. Level of drowsiness using KDS* [4]

1) Comparison between automatic and visual/manual extractions of features
2) ROC curve in comparison to the visual processing for different values of \( \lambda_{auto} \)
3) Correlation between automatic level of drowsiness and percentage of lapses (\( R=0.43)\)

Results

This study shows that our automatic PSG-based system has the potential
1. to become a promising reference for drowsiness quantification, and
2. to help scoring experts save time.

Moreover, this system could also be used as a diagnostic tool for people with excessive daytime sleepiness (EDS) which may be due to sleep disorders.

Conclusions

References


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WorldsleeP 2015; Istanbul, Turkey; 31 October – 3 November 2015