Automatic identification of sleep and wakefulness using single-channel EEG and respiratory polygraphy signals for the diagnosis of obstructive sleep apnea

Titre	Automatic identification of sleep and wakefulness using single-channel EEG and respiratory polygraphy signals for the diagnosis of obstructive sleep apnea
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Résumé en anglais	Polysomnography (PSG) is necessary for the accurate estimation of total sleep time (TST) and the calculation of the apnea-hypopnea index (AHI). In type III home sleep apnea testing (HSAT), TST is overestimated because of the lack of electrophysiological sleep recordings. The aim of this study was to evaluate the accuracy and reliability of a novel automated sleep/wake scoring algorithm combining a single electroencephalogram (EEG) channel with actimetry and HSAT signals. The study included 160 patients investigated by PSG for suspected obstructive sleep apnea (OSA). Each PSG was recorded and scored manually using American Academy of Sleep Medicine (AASM) rules. The automatic sleep/wake-scoring algorithm was based on a single-channel EEG (FP2-A1) and the variability analysis of HSAT signals (airflow, snoring, actimetry, light and respiratory inductive plethysmography). Optimal detection thresholds were derived for each signal using a training set. Automatic and manual scorings were then compared epoch by epoch considering two states (sleep and wake). Cohen's kappa coefficient between the manual scoring and the proposed automatic algorithm was substantial, 0.74 ± 0.18, in separating wakefulness and sleep. The sensitivity, specificity and the positive and negative predictive values for the detection of wakefulness were 76.51% ± 21.67%, 95.48% ± 5.27%, 81.84% ± 15.42% and 93.85% ± 6.23% respectively. Compared with HSAT signals alone, AHI increased by 22.12% and 27 patients changed categories of OSA severity with the automatic sleep/wake-scoring algorithm. Automatic sleep/wake detection using a single-channel EEG combined with HSAT signals was a reliable method for TST estimation and improved AHI calculation compared with HSAT.
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