

Evaluation of a Portable Monitor for Staging Sleep

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Introduction:

An accurate tool for the objective collection of sleep data over many nights in a wide population could have important implications in sleep research and clinical practice. The ability to discriminate between sleep stages beyond simple sleep/wake measures may be especially useful in the objective assessment of sleep quality. A simple, easy-to-use portable device for detecting sleep stages has been developed. The system utilizes dry fabric sensors that are integrated into a headband that wirelessly transmits sleep data to a base station for processing in real time. Sleep stages are scored automatically by a neural network. The aim of the current analysis was to compare the sleep stage measures derived from polysomnography (PSG) with measures from the wireless system (WS).

Methods:

Participants:

- 10 adults (4 female)
- 33.7 years old (± 10.7 ,SD)
- No sleep complaints

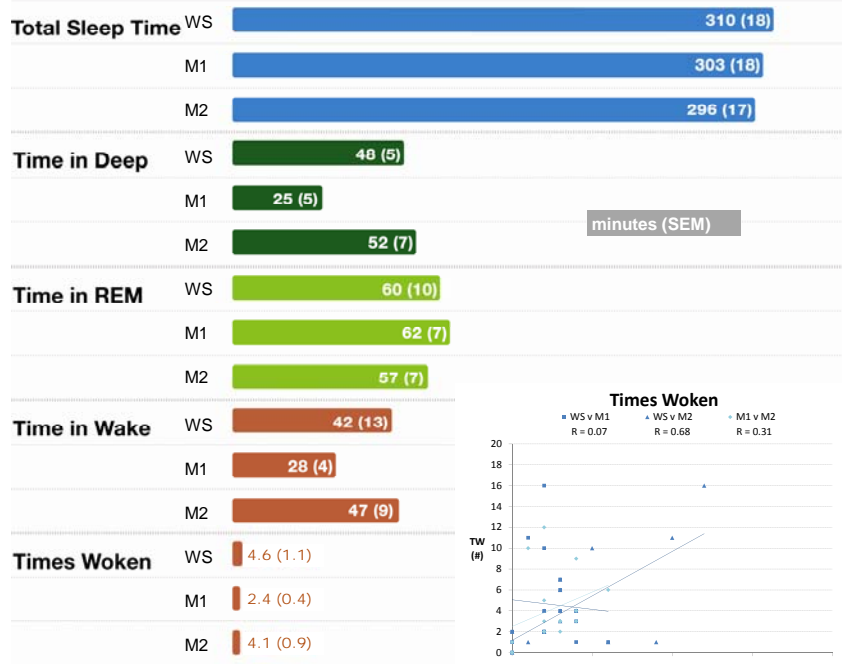
Study Protocol:

- Sleep in the laboratory at the participant's habitual bedtime
- Concurrent measurement of PSG and WS
- PSG data collected with Cadwell Easy II PSG, sampled at 200 samples per second
- WS data were sampled at 128 samples per second
- Sleep records were scored blinded to WS by 2 trained technicians (M1 and M2) according to Rechtschaffen & Kales
- Sleep records were scored automatically by the WS
- 6 subjects contributed two nights of recordings and 4 subjects one night, resulting in 16 total records.
- The neural network was designed to distinguish light (Stages 1&2), deep (Stages 3&4), REM and wakefulness. Visual sleep stage scores were grouped into the same categories for analysis.
- Inter-rater agreement was performed on summary statistics of sleep parameters on a 30-second epoch-by-epoch basis for agreement/disagreement of sleep stage assignment.
- Times Woken is number of awakenings lasting 2 minutes or more.
- Time in Wake is the same as WASO

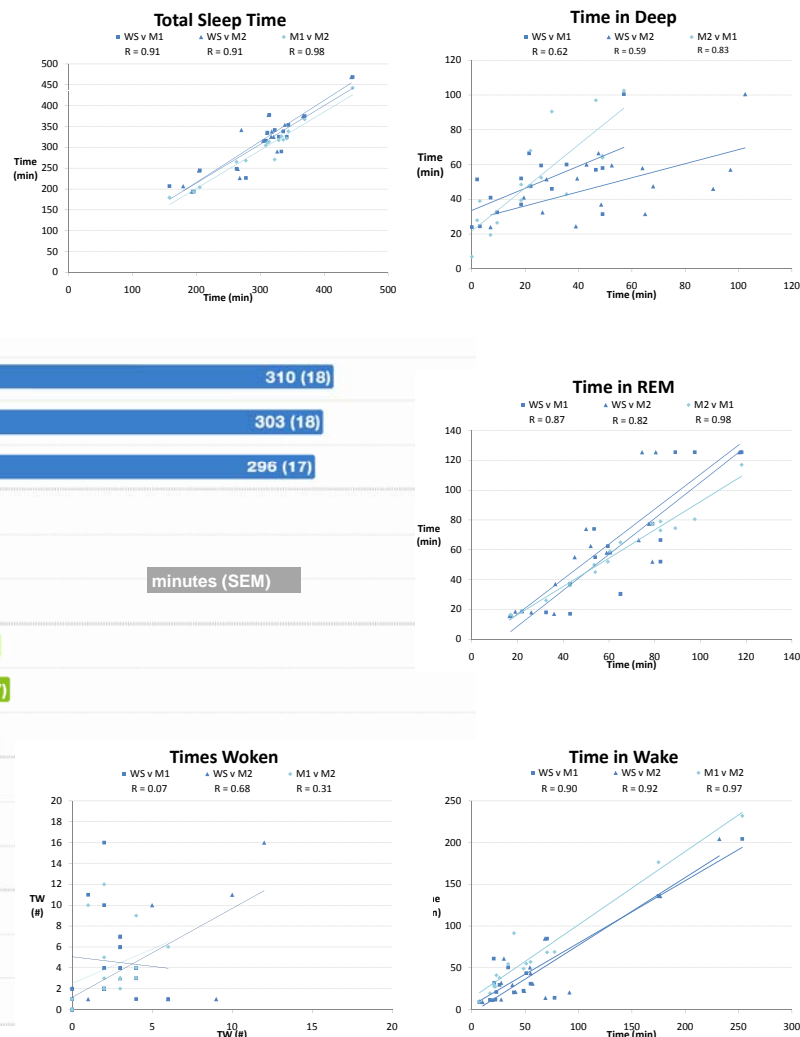


Results:

Sleep summary measures were similar for the visual scorers and the wireless system. The finding that M1 and M2 differed with each other on some measures is consistent with previously reported findings of disagreement among scorers⁽¹⁾. Correlations for most individual subject scores were high between visual scorers and the wireless technology.



(1) Norman et al. Sleep. 2000;23:901-8



Conclusion:

The wireless system shows promise as an accurate and easy to use portable method for measuring sleep stages related to sleep quality.

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