Total Sleep Time Estimated By Actigraphy Correlates With Polysomnography-Derived Sleep Time In Commercial Drivers

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Rationale

When polysomnography (PSG), the gold standard for identifying sleep, is unavailable, actigraphy, a simpler tool, is recommended to estimate total sleep time (TST)[1]. Identifying commercial drivers with short sleep durations using actigraphy may help target interventions to reduce the risk of vehicular accidents.

Subjects

We solicited participants using internet advertisements.

Inclusion criteria: age 18 to 65y; residence within 40 miles of our Sleep Center; possession of a valid commercial driver's license.

Exclusion criteria: current use of continuous positive airway pressure, bi-level positive airway pressure, or supplemental oxygen; nocturnal hypoxia due to another illness; inability to complete protocol.

Methods

We conducted actigraphy and unattended, in-home, Type-II PSGs (Embla®, Broomfield, CO) which include full EEG monitoring, assessment of airflow, oximetry, respiratory effort, eye movement and chin EMG. Subjects reported the time they went to bed, approximate sleep onset latency and wake-up time on the morning after the recording. We used these reports in conjunction with actigraphy to label sleep start and end times and estimate sleep onset latency (SOL)[2]. We compared TST, sleep efficiency (SE), SOL and wake after sleep onset (WASO) from actigraphy against the same data derived from PSG.

Results

Among 77 participants, 72 (94%) were male, 53% were Caucasian and 44% were African-American. Mean±SD age was 43.4±9.1y. Actigraphy-derived TST correlated strongly with PSG-measured TST, while actigraphy-derived SE, SOL and WASO correlated weakly to PSG (see Table 1) among 69 subjects with complete data.

Bland-Altman analysis (Figure 1) showed that actigraphy-derived TST is more precise (note less vertical scatter) when TST≥6 hours. On average, actigraphy overestimated TST by 24 minutes.

Table 1 Spearman Rank correlation coefficients, Actigraphy and PSG, N= 69

	TST	SE	SOL	WASO
Spearman	0.64	0.35	0.26	0.15
p-value	<.0001	0.003	0.53	0.22

Figure 1 Bland-Altman Analysis, Actigraphy versus PSG
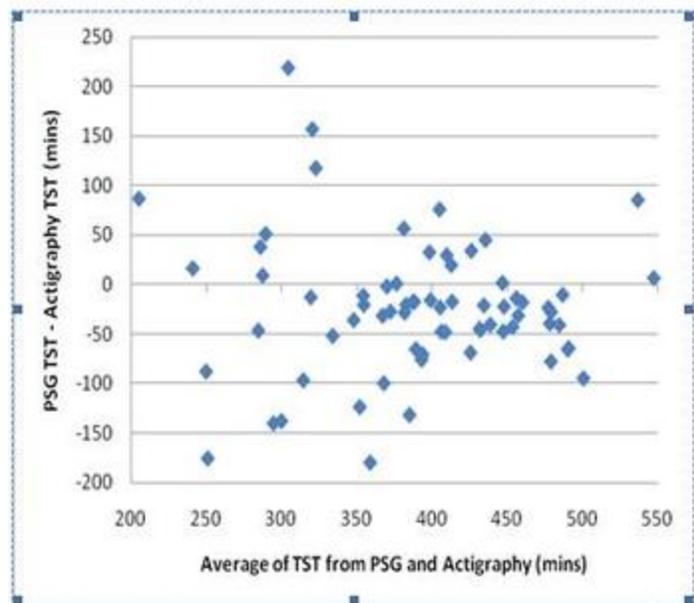
Conclusions

Actigraphy overestimated TST by an average of 24 minutes among commercial drivers. Future analyses should account for night-to-night variability and record actigraphy over several nights.

References

1. Morgenthaler T, et al. Practice Parameters for the Use of Actigraphy in the Assessment of Sleep and Sleep Disorders: An Update for 2007. SLEEP 2007:30.

2. Werner, H., et al. Assumed rates between Actigraphy, diary, and questionnaire for children's sleep patterns. Arch Pediatr Adolesc Med 2008:162.