Assessing sleep quality in low back pain: the validity of portable instruments.

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AIMS

We aimed to identify an objective measure of sleep quality that can be used to assess patients with LBP in naturalistic settings.

Specifically we wanted to determine the criterion validity of the BodyMedia SenseWear Armband and the Actigraph for measuring sleep parameters by comparing the instrument recordings of sleep/wake to those of Polysomnography (PSG).

A secondary aim was to investigate whether the additional physiological measures provided by the Armband increase the accuracy of sleep parameters compared with accelerometer alone (i.e. Actigraph).

METHODS

Included patients were aged between 18 and 79 years and had a primary complaint of LBP. Patients were excluded if they spinal surgery within the preceding 6 months, were previously diagnosed with a sleep disorder for which they were receiving care or were receiving care for a mental health condition.

Each participant had wake/sleep epochs recorded by the Armband and Actwatch and also with PSG, (the criterion measure), while sleeping overnight in the sleep laboratory of the Woolcock Institute of Medical Research, the University of Sydney, Australia. Total sleep time (TST) was calculated as the total number of minutes scored as sleep; sleep onset latency (SOL) was calculated as the total number of minutes scored as awake beyond lights out prior to sleep onset; sleep efficiency (SE) was calculated as the ratio of minutes spent asleep to total minutes in bed; and wake after sleep onset (WASO) was calculated as the total minutes scored as awake after sleep onset.

Statistical analysis

Criterion validity was determined by calculating epoch-by-epoch agreement, sensitivity and specificity and prevalence and bias-adjusted kappa (MBKA) for sleep versus wake between both instruments and PSG (table 1). The relationship between PSG and the two instruments was assessed using intraclass correlation coefficients (ICC 2, 1), scatter plots and regression analysis (table 2, figure 1).

RESULTS

Fifty patients participated in the study. The majority (92%) of the sample had chronic LBP with a mean (SD) pain intensity of 4.12 (1.92) on a 0-10 scale. Twenty-eight participants (56%) were seeking care for their LBP. The sample’s mean (SD) weight was 76.7 (20.94) kg, with a body mass index of 25.7 (5.21) kg/m². A sleep physician diagnosed 4 (8%) participants with severe obstructive sleep apnea (OSA), 3 (6%) participants with moderate OSA, and 18 (36%) participants with mild OSA. The mean (SD) time spent in bed during the PSG recording was 7.13 (1.20) hrs, with mean (SD) total sleep time of 6.02 (1.03) hrs, mean (SD) sleep onset latency 15.19 (14.23) mins, mean (SD) wake after sleep onset of 47.30 (35.76) mins and overall sleep efficiency of 84.5%.

The Armband and Actwatch are both highly sensitive and moderately specific in detecting sleep/wake in patients with LBP. The criterion validity, as reflected in the ICC values, are similar for the Armband and Actwatch but varied across the sleep parameters from excellent validity for measures of total sleep time, good validity for measures of sleep efficiency and wake after onset to poor validity for sleep onset latency. With exception of few outliers, the scatter plots and regression analyses in Figure 1 are consistent with the ICC analyses; again showing that the two instruments have a similar relationship with PSG, but the strength of the relationship varied substantially across the four continuous sleep measures. There was no evidence that the Armband had greater criterion validity than the Actwatch with the 95% CI for the PABAK and ICC statistics overlapping.

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