Sleep Medicine 63 (2019) 3–4

Contents lists available at ScienceDirect

Sleep Medicine

journal homepage: www.elsevier.com/locate/sleep

Letter to the Editor

Accuracy of one-night actigraphy for estimating sleep in patients with sleep apnea☆

To the Editor,

Actigraphy is used in insomnia and chronobiologic alterations by analyzing movement data for several days [1]. However, the use of actimetry in patients with obstructive sleep apnea (OSA) is not fully established since there are still conflicting data [2–4]. The purpose of our study was to better ascertain whether actimetry could be effective in detecting sleep in OSA and thus would be helpful to complement home respiratory polygraphy [5]. We studied the agreement between sleep parameters simultaneously determined by a widely used commercially available actimeter (Camntech Ltd; Cambridge, United Kingdom) and full polysomnography

Table 1
Comparison of sleep parameters between polysomnography (PSG) and actigraphy.

Parameters	Group		Total (n = 104)	Degree of OSA severity (events/h)		
				Mild: AHI < 15 (N = 25)	Moderate: AHI 15–30 (N = 34)	Severe: AHI > 30 (N = 45)
Sleep latency, min	PSG	Mean ± SD	25.1 ± 29.2	17.8 ± 18.6	31.7 ± 34.6	24.2 ± 29.1
	Actimetry	Mean ± SD	15.2 ± 22.7	6.9 ± 15.5	20.7 ± 29.8	15.6 ± 18.60
		P-value[a]	<0.001	0.016	0.020	0.139
		ICC	0.51 (0.28; 0.67)	0.04 (−1.18; 0.5)	0.7 (0.43; 0.86)	0.15 (−0.56; 0.53)
	Bland - Altman	*Bias*	*9.90*			
		ULoA; LLoA	*68.76; -48.94*			
		% within LoA	*92*			
Total sleep time, min	PSG	Mean ± SD	381.7 ± 81.4	397 ± 61.2	380 ± 83.3	374.6 ± 89.8
	Actimetry	Mean ± SD	404.5 ± 67.9	425.4 ± 54.7	400.9 ± 64.9	395.7 ± 75.3
		P-value[a]	0.001	0.023	0.066	0.068
		ICC	0.78 (0.67; 0.85)	0.8 (0.54; 0.91)	0.84 (0.69; 0.92)	0.72 (0.49; 0.85)
	Bland -Altman	*Bias*	*−22.79*			
		ULoA; LLoA	*102.3; -147.9*			
		% within LoA	*98*			
Wake after sleep onset, min	PSG	Mean ± SD	82.51 ± 63	69.08 ± 44.5	70.3 ± 55.5	98.7 ± 73.9
	Actimetry	Mean ± SD	63.4 ± 41.9	51.3 ± 38.8	57.6 ± 33.8	74.6 + 46.9
		P-value[a]	0.006	0.069	0.421	0.032
		ICC	0.63 (0.45; 0.75)	0.71 (0.34; 0.87)	0.32 (−0.35; 0.66)	0.67 (0.4; 0.82)
	Bland -Altman	*Bias*	*19.07*			
		ULoA; LLoA	*128.23; -90.1*			
		% within LoA	*95*			
Sleep efficiency, %	PSG	Mean ± SD	77.2 ± 15.7	81.3 ± 11.1	77.4 ± 15.9	74.7 ± 17.5
	Actimetry	Mean ± SD	83.1 ± 10.7	87.3 ± 8.7	82.9 ± 10.7	80.9 ± 11.2
		P-value[a]	<0.001	0.008	0.039	0.013
		ICC	0.71 (0.58; 0.81)	0.76 (0.44; 0.89)	0.73 (0.45; 0.86)	0.67 (0.4; 0.82)
	Bland -Altman	*Bias*	*−5.89*			
		ULoA; LLoA	*18.91; -30.70*			
		% within LoA	*98*			
Arousal - Fragmentation index	PSG	Mean ± SD	30 ± 18.8	13.8 ± 6.5	23.8 ± 7.8	43.7 ± 19.6
	Actimetry	Mean ± SD	39.8 ± 20.5	30.8 ± 16.7	36.10 ± 18.4	47.6 ± 21.5
		P-value[a]	<0.001	<0.001	0.002	0.266
		ICC	0.47 (0.22; 0.64)	0.25 (−0.7; 0.67)	−0.09 (−1.18; 0.46)	0.25 (−0.36; 0.59)
	Bland - Altman	*Bias*	*−9.84*			
		ULoA; LLoA	*35.57; -55.26*			
		% within LoA	*94*			

SD = standard deviation.
ICC = Interclass correlation coefficient.
Bland-Altman: *ULoA* = Upper *limit of agreement (Bias + 1.96*SD)*; *LLoA* = *Lower limit of agreement (bias - 1.96*SD)*; *% within LOA*: *percentage of points within the limits of agreement*.
[a] Wilcoxon signed-rank test for comparisons between PSG and Actimetry.

☆ Supported by: The Spanish Ministry of Economy and Competitiveness (PI14/00416 and PI17/01068).

https://doi.org/10.1016/j.sleep.2019.05.007

(PSG) in 25 patients with mild (5–14 events/h), 34 with moderate (15–30 events/h) and 45 with severe (>30 events/h) OSA. As shown in Table 1, when patients (n = 104) were analyzed, considerable differences between PSG and actigraphy values were observed in all sleep variables evaluated. Furthermore, when analyzing data according to OSA severity, significant differences were found in sleep efficiency, arousal-fragmentation index and sleep latency (both except for level of severe OSA). Similarly, differences were found for total sleep time in mild OSA and for wake after sleep onset in severe OSA. Interclass correlation coefficients showed a particularly poor concordance in sleep latency and arousal-fragmentation index. Bland-Altman analysis (Table 1) showed underestimation or overestimation of the sleep variables. Wake/sleep periods showed good accuracy (78%), and sensitivity (96%) but poor specificity (29%). Therefore, actigraphy identified the sleep period relatively well but was unable to properly discriminate wake period. Such significant differences were not modified when sleep efficiency data were analyzed for three different threshold settings in actimetry (20, 40 and 80 activity counts). In conclusion, interpreting one-night actimetry data in patients with OSA should be carried out cautiously. Our novel results suggest that, at least in its current state of development, actigraphy adds little in improving sleep assessment in OSA.

Conflict of interest

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: https://doi.org/10.1016/j.sleep.2019.05.007.

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2 May 2019
Available online 25 May 2019