

Comparison of the Medibyte® portable monitor with polysomnography for recording limb movements in sleep



Queen's UNIVERSITY

Mary Jane O'Donovan¹, Helen Driver², Linda McLean¹, & Trisha Parsons¹

¹School of Rehabilitation Therapy, Queen's University and ²Kingston General Hospital

Introduction

A key supportive feature in the diagnosis and measurement of the severity of Restless Legs Syndrome (RLS) is the presence of periodic limb Movements (PLMs).

Objective assessment of RLS lacks convenient, efficacious methods to evaluate PLMs outside of the sleep laboratory.

Portable monitors have been developed to screen for obstructive sleep apnea (OSA) at home and may be useful for PLM measurement.

Objectives

To establish whether the auxiliary EMG channel of a type 3 portable monitor, validated for screening of OSA (Driver *et al*, 2011), could be utilized to accurately record PLMs, and to assess the reliability in comparison with PSG.

Methods

Study 1

Due to a lower than recommended EMG sampling frequency, the Medibyte® (250 Hz) was compared to standard surface EMG (1000 Hz), for recording of repeated contractions of bilateral tibialis anterior in a sample of 5 healthy females, mean age 24.6 years (± 6.6).



Figure 1. Participant setup for Study 1.

Study 2

The portable monitor was tested simultaneously with full PSG in overnight sleep studies at Kingston General Hospital in 23 participants, mean age 56.1 yrs (± 13.6), referred for screening of sleep disorders.

- Leg movements were recorded linking right and left leg electrodes in a single channel on the PSG and the portable monitor.
- Both records were scored for respiratory events and leg movements.
- Leg movements (LM) and PLM were scored in wake and sleep based on American Academy of Sleep Medicine criteria (2007) for both the PSG and portable monitor studies. LM were not counted when they occurred within 0.5 seconds of an apnea or hypopnea.
- A PLM sequence was defined as a minimum of four LM separated by a minimum of 5 seconds and a maximum of 90 seconds.
- The periodic limb movement index (PLMI) was calculated as the number of PLM recorded/ total recording time (#/hr).

Results

Study 1

Comparison with EMG showed that the portable monitor accurately recorded 100% of tibialis anterior contractions (60/participant).

Study 2

The mean PLMI (wake and sleep) by PSG was 17.8 ± 22.16 ; Portable Monitor was 20.6 ± 22.1 (NS)

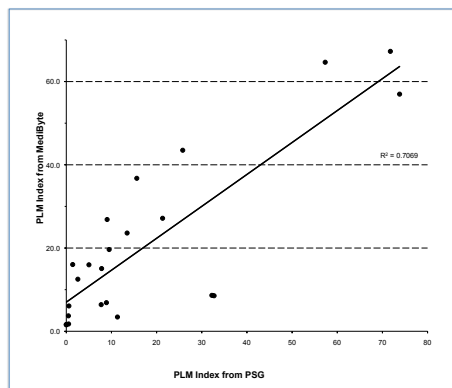


Figure 2. Correlation of PSG PLMI with Medibyte® PLMI

- Intraclass Correlation Coefficient between the two measures for absolute agreement was 0.84.
- Bland-Altman analysis showed a mean difference between the portable monitor and PSG of 2.9 ± 12.12 with 95% limits of agreement in PLMI of 26.6 to -20.9.
- This large standard deviation and limits of agreement interval reflects the small sample size and the great variation in PLMI.
- Since there is generally an under-reporting bias of the apnea-hypopnea index (AHI) by portable monitors, lack of recognition of hypopneas might have been a source of the higher number of PLMs scored using the portable monitor.

	PLM cutoff of 5		PLM cutoff of 11		PLM cutoff of 25			
	False	True	False	True	False	True		
4	14	6	7	3	4		Positive	
1	4	3	7	2	14		Negative	
		93.3%		70.0%		66.7%		Sensitivity
		50.0%		53.8%		82.4%		Specificity

Figure 3. Sensitivity & Specificity of the portable monitor PLM counts at various cutoffs for RLS diagnosis

Conclusions

The Medibyte® EMG channel accurately records muscle contractions. These preliminary data suggest that there may be sufficient agreement between the PLMI collected by Medibyte® compared with PSG to support the use of the portable monitor for measurement of PLMs.

Future Considerations

More participants are being recruited to increase sample size.

References

Driver HS, Pereira E, Bjerring K, Toop F, Stewart S, Munt P, & Fitzpatrick M. Canadian Respiratory Journal 2011; 18 (3) 137-143.

Iber C, Ancoli-Israel S, Chesson A, Quan SF. The AASM Manual for the scoring of sleep and associated events: rules, terminology and technical specifications. 1st ed. Westchester, IL: American Academy of Sleep Medicine; 2007

Correspondence: odonovan.m.j@queensu.ca