# CASE REPORT

# Actigraphy in the Assessment of Nighttime Eating Disorders: Two Case Reports

Monica Martoni, MS, Miranda Occhionero, MD, PhD, Lorenzo Tonetti, MS
Manuela Biagi, MS, Alessia Spinelli, MS, and Vincenzo Natale, MD, PhD

Two patients referred to a Sleep Disorders Centre complaining of insomnia and nightly binging at multiple nocturnal awakenings. Both patients completed a sleep evaluation protocol, during which their sleep was monitored by actigraphy for 7 consecutive nights. We calculated sleep measures removing all eating episodes occurred during the night (Sleep Without Eating Episodes; SWEE). Taking into account the SWEE actigraphic parameters, the 2 cases proved to be actigraphically very different, recommending different therapeutic approaches. Actigraphy could be a helpful tool in the assessment of a patient complaining of sleep disruption associated with nocturnal eating. **(Sleep and Hypnosis 2009;11(2):58-61)**

*Key words:* Actigraphy, insomnia, nighttime eating disorders, sleep without eating episodes

## INTRODUCTION

Abnormal eating during the main sleep episode, typically characterized by a prolonged period of fasting, has been categorized as either sleep-related eating disorder (SRED) or night eating syndrome (NES). Recently the American Academy of Sleep Medicine (1) has introduced the Diagnostic Criteria for Sleep-Related Eating Disorder in the revised International Classification of Sleep Disorders (ICSD-2). SRED is characterized by recurrent episodes of involuntary eating and drinking during arousals from nighttime sleep with adverse consequences among which insomnia for sleep disruption.

As for sleep assessment, in the last decade actigraphy has been extensively used both in clinical and research fields, providing a reliable measure of sleep patterns in normal, healthy adult populations and in patients suspected of certain sleep disorders (2). As for nighttime eating disorders, actigraphy has been used to assess sleep quality in NES patients (3), and it has proven to be useful in assessing response to therapy with SRED patients (4).

In this paper we present the case of 2 patients referred to the Service for Behavioral Treatment of Sleep Disorders of the Department of Psychology, University of Bologna, complaining of insomnia and

nightly binging at multiple nocturnal awakenings.

## CASE REPORTS

Both patients completed a 3-weeks sleep evaluation protocol under the supervision of accredited specialists. This protocol included a semi-structured sleep interview aimed at assessing the most common comorbid conditions for insomnia. To assess the presence of depression and/or anxiety, patients filled in the Spielberg State-Trait Anxiety Inventory (5) and the Zung Depression Rating Scale (6). During the second week of the evaluation process patients were actigraphically recorded for 7 consecutive nights.

The Basic Mini-Motionlogger (MML; Ambulatory Monitoring, Inc., Ardsley, New York, USA.) was used. The hardware of the actigraph consists of a piezoelectric accelerometer with a sensitivity of ≥0.01 g. The sampling frequency is 10 Hz. Filters are set to 2–3 Hz. MML was initialized for zero crossing, and was initialized to collect data in 1 min epochs. MML data files were analyzed by Action W-2 software (Ambulatory Monitoring, Inc.). For the MML, Action W-2 identified each epoch as sleep or wake using the mathematical model validated by Cole et al. (7).

Patients were asked to push the event-marker button on the actigraph when they were ready to go to sleep and immediately on awakening, as well as to fill in a sleep diary every day within 30 minutes of the last morning awakening. Using event-marker points and diary information, automatic scoring was checked by a scorer to rightly set the time spent in bed.

We focused on comparisons of five sleep measures: total sleep time (TST), sleep onset latency (SOL), sleep efficiency (SE), number of wake episodes > 5 minutes (NA>5), and mean motor activity during the night (MA). TST is the sum (in minutes) of all sleep epochs between sleep onset and sleep end.

SOL is the interval (in min) between light off and sleep start. SE is the ratio of the total sleep time to time in bed multiplied by 100. MA is the mean number of movements within one minute.

Usually, these actigraphic measures are calculated during all of time in bed, that is the time in minutes between light off and sleep end. We also calculated these sleep measures removing from the previous analysis all eating episodes occurring throughout time in bed. In this way we introduced the Sleep Without Eating Episodes (SWEE) in order to assess sleep quality without eating occurrences.

Data collection was originally performed with informed consent.

## CASE 1.

A 25-years-old female patient presented with complaints of sleep disruption problem during the last ten years. She reported nightly binging at multiple nocturnal awakenings with loss of control over consumption associated to a daytime food restriction and tiredness. Medical history was unremarkable apart from an uncertain subsyndromal seasonal affective disorder. Scores obtained from the questionnaires are: STAI (Trait Scale): 40; Zung Depression Rating Scale: 26. These scores fall within a normal range.

Figure 1 shows the actigram relative to the case 1. The main sleep parameters were: TST= 400.86 min; SE = 87.06%; SOL = 8 min; NA>5 = 2,71; MA = 24.57. Sleep is clearly interrupted by nocturnal awakenings (imputable to eating episodes). Sleep is characterized by low sleep efficiency, high nocturnal mean motor activity and high number of awakenings longer than 5 minutes compared to the cut off values recently suggested in order to separate normal sleepers and insomnia patients (8). However, considering Sleep Without Eating Episodes (SWEE), SE% and MA improved (respectively 95.86% and 6.86) falling within the cut-off values (8).
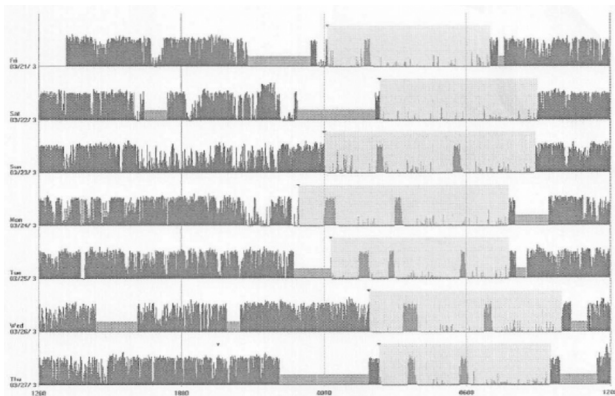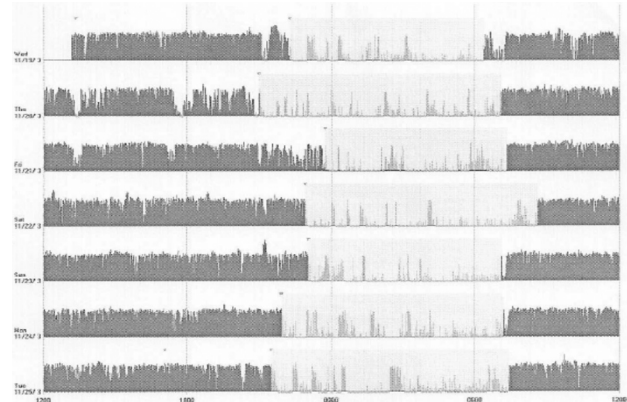
**Figure 1. Actigram of the case 1**



**Figure 2. Actigram of the case 2**

## CASE 2.

A 32-years-old female patient presented with recurrent insomnia complaints during the last eleven years, occasionally treated with benzodiazepine (alprazolam, triazolam, lormetazepam). She reported compulsory night eating with loss of control over consumption associated to a daytime food restriction. During nocturnal awakenings she reported to be sometime as "half asleep, half awake". Body weight significantly changed several times over the last years (until ± 30 kg.). Medical history was unremarkable apart from an urticaria treated sometimes with cortisones. Scores obtained from the questionnaires are: STAI (Trait Scale): 59, Zung Depression Rating Scale: 55 Both scores were above the normal range, meaning the presence of anxiety and mild depression.

Figure 2 shows the actigram relative to the case 2 (she was drug free during actigraphic registration). The main sleep parameters were: TST= 395.43 min; SE = 73.74%; SOL = 11 min; NA>5 = 8.29; MA = 34.37. Also in this case sleep is clearly interrupted by nocturnal awakenings (associated to eating episodes) and it is characterized by low sleep efficiency, high nocturnal mean motor activity and high number of awakenings longer than 5 minutes (8). Considering SWEE, SE% and MA maintained bad values (respectively 84.14% and 18.86) (8).

The difference between the two patients presented clearly emerged taking into account actigraphic parameters relative to SWEE. Case 1 (with no SWEE alterations) was successfully treated with Cognitive Behavioural Therapy (CBT) focused on eating disorders, without drug use. Case 2 (with SWEE impairment associated) required pharmacological treatment in addition to CBT.

## DISCUSSION

We described the assessment of two cases of nighttime eating disorders, which are quite rare, using actigraphy, poorly adopted in assessing these disorders.

We proved that sleep quality without eating occurrences could be useful for choosing the therapeutic approach. To this end we proposed to consider the SWEE actigraphic parameters.

In this context actigraphy could be a helpful and economic tool in the assessment of a patient complaining of sleep disruption associated with nocturnal eating.

## REFERENCES

1. *American Academy of Sleep Medicine. International Classification of Sleep Disorders: Diagnostic and Coding Manual. 2nd ed. Westchester, IL: American Academy of Sleep Medicine, 2005.*

2. *Morgenthaler T, Alessi C, Friedman L et al. Practice Parameters for the Use of Actigraphy in the Assessment of Sleep and Sleep Disorders: An Update for 2007. Sleep 2007;30:519-529.*

3. *O'Reardon JP, Ringel DL, Dinges DF et al. Circadian Eating and Sleeping Patterns in the Night Eating Syndrome. Obes Res. 2004; 12: 1789-1796.*

4. *Provini F, Albani F, Vetrugno R et al. A pilot double-blind placebo-controlled trial of low-dose pramipexole in sleep-related eating disorder. Eur J Neurol 2005;12:432-436.*

5. *Spielberger CD, Gorsuch RL, Lushene R, Vagg PR, Jacobs GA. State-Trait Anxiety Inventory. Palo Alto: Consultant Psychologists Press, 1983.*

6. *Zung WW. A Self-Rating Depression Scale. Arch Gen Psychiatr. 1965;12:63-70.*

7. *Cole RJ, Kripke DF, Gruen W, Mullaney DJ, Gillin JC. Automatic sleep/wake identification from wrist activity. Sleep 1992;15:461-469.*

8. *Natale V, Plazzi G, Martoni M. Actigraphy in the Assessment of Insomnia: A Quantitative Approach. Sleep 2009;32:767-771.*