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Are Actiwatch Recordings Useful in the Diagnosis and Treatment of Attention Deficit Disorder and Hyperactivity?

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Abstract

Attention deficit hyperactivity disorder has been investigated in numerous research studies ranging from incidence levels to the identification of the pervasiveness of the hyperactivity. However, the comorbidity of ADHD and sleep disturbance has been under investigated. Additionally, in some clinics, the data from the actigraphic monitoring is used to inform decisions about treatment. This study focused on the examination of actigraphic data from clinical cases, collectively in statistical analyses and individually in graphical analysis. Measure of sleep minutes, sleep start times, wake minutes, and activity levels were gathered from actigraphic recordings in five participants aged 10 to 18 years; data from two or the five participants that was complete was used in the study. Each participant was a patient of the clinic and informed consent was obtained. The results indicated elevated activity scores during the daytime and at night, comparatively, to same aged peers norms with sleep and psychological disorder diagnoses. There was considerable variability in sleep time and sleep efficiency scores in the three adolescent actigraphic recordings. All aggregated summary data and individual graphical analyses will be presented within the context of the sleep and child psychiatric literature.

Keywords: Actiwatch; Pediatric sleep; Attention deficit disorder; Hyperactivity

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Child and adolescent sleep are both qualitatively and quantitatively different from the other stages of the life cycle (i.e., fetus, infant, adult, older adult) [1,2]. The optimal sleep duration is typically long, approximately 9-10 hours for adequate sleep quality. The mid-morning and/or mid-afternoon naps have disappeared and the child/adolescent have sleep intervals that include all stages of sleep. Notably, the sleep architecture of deep sleep and REM episodes changes in late adolescence, marking a resemblance to the organization of adult sleep1,4. Relevant concerns related to sleep stem from behavioral (e.g., limit setting disorder) and physiological (e.g., extended wake at bedtime/"transient insomnia", confusional arousal, insomnia). During puberty empirically identified characteristics of sleep include: Sleep need of 9-10 hours does not change across the adolescent span (aged 10-17 years), slow wave sleep (SWS) decreases about 40% across span of 10-17 years increased daytime sleep tendency at mid-puberty (age 13-14 years) [1,3,4].

Sleep is determined by daily oscillations with a threshold for the onset of sleep and threshold for sleep cessation (Process C) and the accumulation of wakefulness driving a sleep propensity (Process S) [5]. This physiologic process of sleep is desynchronized from imposed environmental cues [1]. Further, timing of the sleep interval within the adolescent's circadian rhythm delays around 11-12 years (less mature participants in studies exhibited less of a delay). In real world application, the environmental cues range from prominent schedule constraints of school start times, evening homework demands, evening athletic practices and competitions to those imitated by the adolescent (texting, video game laying, television/DVD viewing) [3].

Attention Deficit/Hyperactivity Disorder (ADHD) is the most commonly diagnosed disorder to childhood affecting approximately 4% of school age children the United States [6]. In a large scale cross-sectional study substantial association between sleep disordered breathing and measures of inattention and hyperactivity in the groups of children diagnosed with Attention Deficit Disorder [7,8]. It is concluded that cognitive changes measured in adults with sleep disorders of breathing would be prominent in untreated children with sleep disorders of breathing. The research examining the influence of excessive sleepiness on academic performance is due to cognitive impairments [6]. Appendices 1 and 2 contain diagnostic questions for sleep disordered breathing and inattention/hyperactivity in children. With clinical symptoms of marked significance in children, assessment and treatment are essential.

While observation and self-report measures are standard in many fields including medicine, childhood and adolescent sleep all-night studies and daytime nap studies are standard in the assessment and treatments planning for sleep disturbances in children and adolescents. Parent self-reports are a main source and approach agreement with output from standard sources [9,10]. However, the use of mobile measurements of sleep actiwatches (that are validly related to all night PSG studies) is common. Some intervention with feedback from daytime movement measured from an actiwatch have reduced symptom presentations in children/adolescents diagnosed with ADHD. Five or more nights of actiwatch measure of sleep are necessary for children and adolescents [4,10-12].

A treatment design of baseline, treatment, no treatment was used in a biofeedback study of activity level in child/adolescent participants with ADHD successfully. This single case design is used in both

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	Baseline :		**Treatment:**	
	Participant 1	Participant 2	Participant 1	Participant 2
Sleep Onset	2245	0113	2320	2302
Sleep Onset Latency				
Wake Up	1050	0418	0740	0800
Sleep Efficiency	75.60	74.20	87.46	85.50
Fragmentation Index	40.0	46.30	26.40	25.50
Napping	yes 9 naps/day 2-10 pm of 10 m or greater	yes 17 naps/day 2-9 pm of 10 m or greater	yes 3 naps 2-10 pm of 10 m or greater	yes 5 naps/day 2-9 pm of 10 m or greater
Note: 1 = Average value for the week				

Table 1: Summary of Actiwatch Sleep Variables at Baseline and Treatment Weeks [1].

research and clinical applications. Differences in motor activity level on and off methylphenidate versus placebo medication release in children diagnosed with ADHD have been found. The Actiwatch measure uses and accelerometer to measure movement as an indication of activity [13,14]. The settings on the actiwatch can measure the onset and stop of sleep by comparing measured activity to algorhythms in the software. Further, settings such as number of minutes mobile andfragmentation index give specific information about the extent of movements [13].

To investigate the utility of actiwatch measurements in the assessment and treatment of ADHD specific to medication use, a single case design of one week baseline and one week treatment was set up.

Method

Participants

Two participants that were referred for actiwatch measurement to aid in the assessment and treatment of their condition were asked to be in this study. Both informed consent from both parents and informed assent were obtained. Participant 1 (C.J.) is a 13 year old male and participant 2 (S.C.) is a 16 year old male.

Instruments

Both participants completed a standard sleep history interview and requested to log their sleep using a standard sleep log. A full explanation of the Actiwatch (Phillips) was given that included the necessity to constantly wear the actiwatch and safeguard it.

Procedure

Both participants logged their sleep for one week. Following this, each wore the Actiwatch for two weeks with the first week a baseline and the second week was the treatment measurement. Actiwatch measurements of sleep start, sleep end, number of wake ups after sleep onset, number of minutes in awake after awake, number of minutes of mobility, number of minutes of immobility. Each participant was placed on starting dose of methylphenidate medication during week 2–the treatment week.

Results

All sleep variables were summarized and are listed in Table 1 for each participant at baselines and at treatment. Both patients napped excessively.

Conclusions

The poor fragmented sleep of each patient was mildly improved as evidenced by reductions in fragmentation index and increases in sleep efficiency. Findings are presented Table 1. These qualitative findings are based on two-week interval and are to be accepted with caution. The participants' physical health, degree of structure or unstructured environment that is so influential to ADHD symptomology [15], and emotional factors vary, and while this is a representative, random sampling, it may not be characteristic of the participant's lifestyle. Also, the patients were not taking their medication during the Actiwatch measurements, thus, the findings both confirm the diagnosis of ADHD (based on the Clinician's judgement) and the utility of the medication and behavioral management treatment (here, again based on the Clinician's judgement). The sleep difficulties may have been caused by the medications for ADHD [16].

Improvements in participant's sleep quality were mild and the values were not in the acceptable range by Cognitive Behavioral Therapy Insomnia Treatment program standards (i.e., 85%). However, the reduction in the amount of napping that seemingly stemmed from insufficient sleep reflects improvement in sleep quality. Additionally, the number of minutes sleep reflected in the sleep efficiency indexes are suggestive of improvement in sleep as well.

The utility in Actiwatch measures are varied and this approach to examing the impact of prescribed medication for ADHD on sleep proved to be positive [4,14]. Qualitative data reflecting the changes between baseline and treatment week will provide the sleep specialist with evidence data points helpful in assessment e.g., to corroborate ADHD diagnosis, confirm the medication effects) [15,17]. It is recommended that this approach be considered more often in these complicated cases.

References

1. Carskadon MA, Acebo C (2002) Regulation of sleepiness in adolescents: update, insights, and speculation. Sleep 25: 606-614.
2. Terman LM, Hocking A (1913) The sleep of school children: Its distribution according to age and its relation to physical and mental efficiency. Journal of Educational Psychology 4: 138-147.
3. Dahl RE (1996) The impact of inadequate sleep on children's daytime cognitive function. Semin Pediatr Neurol 3: 44-50.
4. Acebo C, Sadeh A, Seifer R, Tzischinsky O, Wolfson AR, et al. (1999) Estimating sleep patterns with activity monitoring in children and adolescents: how many nights are necessary for reliable measures? Sleep 22: 95-103.
5. Akerstedt T, Hume K, Minors D, Waterhouse J (1998) Experimental separation of time of day and homeostatic influences on sleep. American Journal Physiological Regulation Integration Comprehensive Physiology 43: 1162-1168.
6. Martin NC, Piek JP, Hay D (2006) DCD and ADHD: a genetic study of their shared aetiology. Hum Mov Sci 25: 110-124.
7. Chervin RD, Archbold KH, Dillon JE, Panahi P, Pituch KJ, et al. (2002) Inattention, hyperactivity, and symptoms of sleep-disordered breathing. Pediatrics 109: 449-456.
8. Busby K, Firestone P, Pivik RT (1981) Sleep patterns in hyperkinetic and normal children. Sleep 4: 366-383.
9. Sadeh A (2008) Commentary: comparing actigraphy and parental report as measures of children's sleep. J Pediatr Psychol 33: 406-407.

10. Owens JA, Maxim R, Nobile C, McGuinn M, Msall M (2000) Parental and self-report of sleep in children with attention-deficit/hyperactivity disorder. Arch Pediatr Adolesc Med 154: 549-555.

11. Carskadon MA, Dement WC, Harvey K, Anders TF (1978) Adolescent maturation and changes in sleep tendency: Preliminary report. Sleep Research 7: 127.

12. Carskadon MA, Dement WC (1979) Effects of total sleep loss on sleep tendency. Percept Mot Skills 48: 495-506.

13. Tryon WW, Tryon GS, Kazlausky T, Gruen W, Swanson JM (2006) Reducing hyperactivity with a feedback actigraph: initial findings. Clin Child Psychol Psychiatry 11: 607-617.

14. Uebel H, Albrecht B, Kirov R, Heise A, Döpfner M, et al. (2010) What can actigraphy add to the concept of labschool design in clinical trials? Curr Pharm Des 16: 2434-2442.

15. Chervin RD, Archbold KH, Dillon JE, Panahi P, Pituch KJ, et al. (2002) Inattention, hyperactivity, and symptoms of sleep-disordered breathing. Pediatrics 109: 449-456.

16. Journal of Attention Disorders (2013). Special Issue: ADHD and Sleep Disorders.

17. Uebel H, Albrecht B, Kirov R, Heise A, Döpfner M, et al. (2010) What can actigraphy add to the concept of labschool design in clinical trials? Curr Pharm Des 16: 2434-2442.

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