Sleep problems are very common during childhood and constitute a source for major concern to parents and professionals. These problems tend to be persistent and associated with daytime behavior problems and parental distress.

Seeking professional help is usually based on parental perception that their child has a sleep problem. In most clinical settings, the child’s sleep assessment is solely based on parental reports. Parental reports may rely on realistic perceptions of the child’s sleep characteristics; however, their accuracy may be compromised by situational and subjective factors. Previous studies have suggested that parental perceptions and reports on their children’s sleep may be influenced by factors such as unrealistic expectations and interpretations, lack of developmental knowledge, socioeconomic status, demographic factors, and broader cultural norms, beliefs, and attitudes. A major limitation is that parents become aware of many events during the night (e.g., night wakings) only if the child signals and requires attention; therefore, their knowledge may be significantly influenced by the child’s tendency to signal. Recently, Gregory et al. concluded that assessing sleep using exclusively the sleep items of the Child Behavior Checklist, which is one of the most popular parental reports on children’s behavior problems, is insufficient for assessing sleep and should be combined with other sleep assessment methods.

The limitations of parental reports on children’s sleep become more prominent in preschool children, who develop increased capacity for independent falling asleep and resuming sleep following night wakings. In comparison to infants and toddlers, preschool children are, therefore, less likely to signal and require help, and their parents are less likely to be aware of these events during the nights. However, this picture may be different in preschool children with special clinical presentation who are more likely to signal. For instance, preschool children are very vulnerable to nighttime fears and nightmares. Furthermore, it has been recently demonstrated that preschool children with nighttime fears are more likely than controls to wake up at night and signal and require parental assistance to resume sleep.

The purpose of the present study was to assess the accuracy of parental reports on a brief questionnaire assessing sleep patterns in preschool children and to examine to what extent this accuracy is related to the presence of a clinical sleep-related issue (nighttime fears). The comparison of reported sleep was made against actigraphy-based sleep measures.
our knowledge, this is the first study assessing the correspondence between objective and subjective sleep assessment tools comparing clinical and healthy control groups of preschool children. We hypothesized that the reports of parents of children with nighttime fears would be more accurate than reports of parents of control children because children with nighttime fears require increased parental involvement during the night.

METHODS

Participants

Children and their parents were recruited from the local kindergarten system by informing them about a service for children with nighttime fears (NTF) and inviting parents of children with no fears to volunteer as well. The clinical group of children with severe NTF consisted of 109 preschool children (64 boys and 45 girls between the ages 4 and 6 years, mean age 58.91 months; SD 8.32). Inclusion criteria for the clinical group were: (a) NTF ≥ 2 months; (b) NTF exerted significant adverse impact on the child and family; (c) NTF requiring parental intervention ≥ 2 nights per week to comfort the child. NTF was determined solely by parent reports during the screening and intake interviews.21

The control group included 30 healthy children from the same age group who did not meet criteria for NTF (16 boys and 14 girls, mean age 58.93 months, SD 7.62 months). There were no group differences on any of the demographic variables.21 Exclusion criteria for both samples were: (a) major health or neurological-developmental problems; (b) concurrent psychiatric treatment; (c) concurrent psychotherapy or similar interventions. Additional information on the participants is available in earlier publications.21,22

Measures

Brief Child Sleep Questionnaire (BCSQ)
The BCSQ provides information on children’s sleep habits and problems. The questionnaire’s items were derived from the Brief Infant Sleep Questionnaire (BISQ)23 and from the Sleep Habits Questionnaire (SHQ).24 The BISQ was developed and validated as a brief infant sleep screening tool for clinical and research purposes.23 Measures of internal consistency (Cronbach α) for the SHQ scales range between 0.72 and 0.82.24 The parents were instructed to refer to their child’s sleep during the past week. The items assessed sleep time, total sleep duration during the night, number of night wakings, and total time awake during the night.

Actigraphy

Actigraphy is based on a small device that resembles a wristwatch that can be worn by the child for a substantial period of time and monitor sleep-wake patterns in the child’s natural sleep environment.25-27 The parents were instructed to attach the device (Mini Motionlogger, Ambulatory Monitoring Inc.) to their child’s non-dominant wrist for a period of one week, during the evening before bedtime and to remove it in the morning after rise time. The actigraph collected data in 1-minute epochs. Sleep measures were derived from the raw data using the validated Sadeh algorithm.28 Because of compliance problems and technical issues, actigraphy data were available for ≥ 4 nights in 88% percent of the children. For the rest of the sample, actigraphy data were available in 4.5%, 3%, and 4.5% for 1, 2, or 3 nights, respectively.

Actigraphic measures included: (1) sleep onset time; (2) sleep period—total sleep period from sleep onset to morning rise time; (3) number of night wakings (lasting ≥ 5 min); (4) wake time after sleep onset (WASO)—total time of wakefulness during the night.

Family Background Information Questionnaire

This questionnaire includes 25 questions covering demographic and developmental data. This questionnaire has been extensively used in previous studies.10,21,24

Procedures

The study was approved by the departmental ethical committee and the Chief Scientist of the Israeli Ministry of Education. After signing the informed consent, parents completed the questionnaires. Parents were interviewed about nighttime fears. Parents were instructed to attach the actigraph to children’s non-dominant wrist every evening before bedtime for a period of one week.

Data Analysis

Data analysis included the following components: (a) between-groups comparison of the actigraphy versus reported sleep discrepancies; (b) within-group correlations between actigraphy and reported sleep measures and comparison of the correlations between the groups using Fisher r to z transformations; and (c) discriminant analysis to assess the ability of actigraphic and reported sleep measures in predicting the clinical status (clinical versus control group) of the children. Because not all measures met normal distribution criteria, we used nonparametric methods, including Spearman correlations, univariate sign test for paired comparisons, and Wilcoxon rank sum test.30

RESULTS

Statistically significant and strong correlations were found between actigraphic and reported sleep schedule measures (sleep period and sleep onset time) in both groups (Table 1). The correlation for sleep period was significantly higher in the control group. In both groups, significant strong correlations between actigraphic and reported sleep measures were found for sleep onset time and sleep period. In both groups the correlations for night wakings and WASO were low and insignificant.

In considering the discrepancies between actigraphic and reported sleep measures (Table 2), it was clear that parents in both groups underestimated sleep onset time and overestimated sleep period. In the control group, parents also significantly underestimated the number of night wakings and WASO. With the exception of WASO, the discrepancies in the control group were significantly larger in the control group than the clinical group.

To assess whether parental nighttime fear-management strategies (e.g., cosleeping vs. limited presence near their child) affected the correspondence between actigraphy and reported
sleep in the clinical sample, a new variable was composed based on a method used in a previous study.\textsuperscript{21} Children were divided into 2 groups: cosleeping (i.e., children who, upon waking at night, fell asleep again in their parents’ room and stayed there either throughout the night or for a limited time) and limited presence (i.e., children who, upon waking at night, fell asleep again with limited parental presence near their own bed). However, the results revealed that the fear-management strategies had no effect on the correspondence between actigraphy and reported sleep.

Discriminant analysis was conducted separately for each group to examine how well equivalent reported and actigraphic sleep measures predicted group classification. Actigraphic sleep measures explained 11.6% of the variability and provided 60.8% correct group classifications. The reported sleep measures explained 31.8% of the variability and provided 81.2% correct group classifications.

**DISCUSSION**

To the best of our knowledge, this is the first study assessing the correspondence of sleep measures between actigraphy and parental sleep questionnaire, comparing a clinical group of preschool children with severe nighttime fears to healthy controls. The results of our study suggest that: (a) there are general discrepancies between reported and actigraphic sleep measures; and (b) the presence of a clinical sleep-related problem may have significant impact on the correspondence between reported and objective measures of sleep.

With regard to the sleep schedule measures, correlations between actigraphic and reported measures were relatively high and significant (range: 0.54-0.89). However, significant discrepancies existed between actigraphic and reported sleep measures in both groups. For instance, actigraphy estimated sleep onset time to be, on average, 50 or 75 minutes later than reported in the clinical and control groups, respectively. The discrepancies between actigraphic and reported sleep measures were significantly higher in the control group, suggesting that parents of children with nighttime fears are more accurate because of their higher involvement with the child around bedtime and during the night.\textsuperscript{21}

When sleep quality measures are considered, poor correlations between actigraphic and reported measures were found for the number of night wakings and WASO in both groups.
without sleep disorders, there was good correspondence in sleep time assessment; however, in the sleep disturbed and the handicapped children, significant discrepancies existed between measures derived from PSG and actigraphy. The discriminant analysis revealed that the reported sleep measures were better predictors of group classification (clinical versus control) in comparison to the equivalent actigraphic measures. This is not surprising considering the fact that parents decide to seek clinical help on the basis of their own perceptions regarding their child’s sleep, regardless of how biased these perceptions may be.

The results of our study highlight the limitations of studying sleep in young children with exclusive reliance on parental reports. Parental knowledge about sleep quality is very limited, and the accuracy of this knowledge is significantly influenced by the clinical context. In other words: the differences between the actual sleep quality of clinical versus control children may not be as large as manifested by parental reports. The parents of children with nighttime fears are much more likely to be involved with their child during the night (e.g., in different forms of cosleeping), and are therefore more likely to report more accurately on sleep-related events.

Our findings suggest that conclusions based on parental reports on children’s sleep can be biased or misleading. However, parental reports are very informative in providing valuable information on behavioral consequences of sleep-wake patterns and the presentation of clinically relevant manifestations such as nighttime fears and their management. Actigraphy can play a substantial complementary role in providing a more objective picture that is not affected by the clinical context and perceptual biases. Therefore, it is recommended that both methods be used as complementary sources in the evaluation of sleep in clinical and research settings.

REFERENCES


ACKNOWLEDGMENT

The authors are thankful to Ornit Arbel for coordinating and managing the study and to the participating families.

SUBMISSION & CORRESPONDENCE INFORMATION

Submitted for publication February, 2013
Submitted in final revised form May, 2013
Accepted for publication June, 2013
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DISCLOSURE STATEMENT

This was not an industry supported study. The authors have indicated no financial conflicts of interest. The research was supported by the Israel Science Foundation (Grant # 1047/08 to Avi Sadeh).