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Original Article

The Children's Report of Sleep Patterns: validity and reliability of the Sleep Hygiene Index and Sleep Disturbance Scale in adolescents

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ABSTRACT

Objective: Sleep is critical for adolescent health and well-being. However, there are a limited number of validated self-report measures of sleep for adolescents and no well-validated measures of sleep that can be used across middle childhood and adolescence. The Children's Report of Sleep Patterns (CRSP) has been validated in children aged 8–12 years. The purpose of this study was to examine the psychometric properties of the CRSP, a multidimensional, self-report sleep measure for adolescents.
Methods: The participants included 570 adolescents 13–18 years, 60% female, recruited from pediatricians' offices, sleep clinics, children's hospitals, schools, and the general population. A multi-method, multi-reporter approach was used to validate the CRSP. Along with the CRSP, a subset of the sample completed the Adolescent Sleep Hygiene Scale (ASHS), with a different subset of adolescents undergoing polysomnography.
Results: The CRSP demonstrated good reliability and validity. Group differences on the CRSP were found for adolescents presenting to a sleep or medical clinic (vs. a community sample), for older adolescents (vs. younger adolescents), for those who regularly napped (vs. infrequently napped), and for those with poor sleep quality (vs. good sleep quality). Self-reported sleep quality in adolescents was also associated with higher apnea–hypopnea index scores from polysomnography. Finally, the CRSP Sleep Hygiene Indices were significantly correlated with indices of the ASHS.
Conclusions: The CRSP is a valid and reliable measure of adolescent sleep hygiene and sleep disturbances. With a parallel version for middle childhood, the CRSP likely provides clinicians and researchers the ability to measure self-reported sleep across development.

1. Introduction

Sleep is a universal, basic drive that contributes to optimum physical and cognitive functioning, as well as overall well-being in adolescents. The consequences of insufficient sleep in adolescents include poorer academic performance [1,2], difficulty with emotion regulation [3], increased risk of injury or accidents [4], and weight gain [5]. A number of factors intersect to contribute to insufficient sleep in adolescents, including a biological phase delay, increased homework and extracurricular activities (including jobs), social demands, caffeine use, technology use, and, most notably, early school start times [6–9]. While sleep is known to change from childhood through adolescence [10], there are currently no published self-report measures of sleep that can be used in both school-aged children (8–12 years) and adolescents (13–18 years). The purpose of this study was to examine the psychometric properties of the Children's Report of Sleep Patterns (CRSP) in adolescents.

Along with the need to have a longitudinal self-report measure of sleep in pediatrics, it is important to have a well-validated self-report measure of adolescent sleep for several reasons. First, objective measures of sleep (i.e., polysomnography or PSG and actigraphy) do not capture the adolescent's perceived sleep, especially in terms of sleep quality or sleep hygiene. The subjective report of sleep quality is important to measure, with one meta-analysis demonstrating that sleep quality was more strongly associated with school performance than actual sleep duration [11]. Second, parents are often less accurate when reporting on an adolescent's subjective experience of

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health and well-being [12], with this likely including the subjective report of sleep quality. For example, in a study assessing sleep complaints in pediatric brain tumor survivors using subjective sleep measures, the concordance between parent and child report ranged from fair to good [13], while the concordance between parent and adolescent report was poor [14]. Third, parents become less involved with bedtime routines and bedtimes as children get older. For example, one study found only 5% of parents set a bedtime in adolescents [9], while a more recent study highlighted the decline of parent-set bedtimes from 33% at age 13 years down to 0% at age 18 years [15].

While several adolescent self-report measures exist, none have been validated to be used in both middle childhood and adolescence. The CRSP was developed to fill the void of self-report measures of sleep in middle childhood (8–12 years) [16]. Items were developed based on other validated measures of sleep for children and adolescents, as well as the input of pediatric sleep experts. Due to a lack of measures that have been validated in both age groups, we examined the psychometric properties of the CRSP in adolescents with the goal of a validated self-report measure of sleep that could be used across development for children and adolescents aged 8–18 years.

1.1. Hypotheses

The purpose of this paper was to present the preliminary psychometric properties of the CRSP in a large sample of adolescents. We hypothesized that the CRSP would demonstrate adequate reliability and validity in adolescents aged 13–18 years. In particular, we expected that adolescents from the clinical sample (sleep disorders, asthma, and cancer) would have poorer self-reported sleep habits (i.e., more caffeine use, more activities in the hour before bed, more electronics use in the hour before bed, and more likely to sleep somewhere other than their own bed) and more self-reported sleep problems (i.e., bedtime worries, restless legs syndrome symptoms, insomnia, and parasomnias) than the healthy comparison sample. We further hypothesized that due to increasing academic, social, and extracurricular demands, older adolescents would have poorer sleep habits than the younger adolescents.

2. Methods

2.1. Participants

The study participants included 570 adolescents (13–18 years) who were enrolled in research studies in the following settings: (1) pediatric sleep clinics at two separate children's hospitals, (2) outpatient clinics and inpatient units of a children's hospital for oncology patients, (3) two independent Australian schools, and (4) an Internet-based sample of adolescents, including those with asthma (categorized in clinic group) and those without asthma (categorized in community group). Approval from each institutional review board was obtained, in addition to informed consent/assent from all participants. Data were collected from 2008 through 2014, across all seasons.

Data on nonparticipants were unavailable for the Australian school and Internet-based participation subgroups. In the Children's Hospital of Philadelphia (CHOP) sleep clinic, five adolescents refused participation – three due to participant burden and two with no reason provided. In the Children's of Alabama sleep clinic, no adolescents refused participation. Finally, in the oncology clinics, 44 adolescents refused participation; of those, 22 were passive refusals (e.g., no parent available for consent, patient was incapacitated, etc.), and 22 were active refusals (e.g., parent/child declined). Participants in the final sample were 60% female, had a mean age of 14.8 ± 1.4 years, and were 89% Caucasian. Complete demographic information is provided in Table 1.

2.2. Measures

While all participants completed the CRSP, additional measures were administered per each site's study protocol (see Table 1).

2.2.1. Children's Report of Sleep Patterns

A total of 570 participants completed the CRSP, a 76-item questionnaire that includes three modules (Sleep Patterns, Sleep Hygiene Index, and Sleep Disturbance Scale) [16]. Sleep Patterns includes bedtimes, wake times, sleep-onset latency, and sleep schedule variability, with questions asked about last night, typical weekdays when the child is in school, and typical weekends/holidays when the child is not in school. Additional questions deal with night waking frequency, night waking duration, naps, and subjective sleep quality with the time frame of "most days." While sleep scheduling variables are likely to change from weeknights to weekend nights, sleep continuity/quality is less likely to change. The Sleep Hygiene Index contains questions about caffeine use, activities before bed, sleep location (where the child falls asleep and wakes up), and electronics used in the hour before bed. The Sleep Disturbance Scale consists of questions about bedtime fears/worries, symptoms of restless legs syndrome, parasomnias, and insomnia. Participants were asked to answer questions from the Sleep Hygiene Index and Sleep

Table 1
Demographic information and measure completion by site.

	Sleep Clinics[a]	St Jude	Australia Schools	Internet Asthma	Internet Non-Asthma	Total
Study Enrollment						
Approached	85	127	–	–	–	–
Declined	5	44	–	–	–	–
Participated	80	83	158	120	129	570
Mean Age (SD)	14.98 (1.55)	15.28 (1.68)	14.27 (1.04)	15.00 (1.43)	15.03 (1.46)	14.84 (1.44)
Gender						
% Male	48.8	55.4	10.8	48.3	52.7	40.0
% Female	51.2	44.6	89.2	51.7	47.3	60.0
Race/Ethnicity						
% Caucasian	37	80.2	–	80.8	84.4	88.7
% Other	63.3	19.8	–	19.2	15.6	11.4
Measures (*n*)						
Test–Retest CRSP	–	24	33	–	–	57
ASHS	–	28	–	–	–	28
PSG	78	–	–	–	–	78

Abbreviations: SD, standard deviation; ASHS, Adolescent Sleep Hygiene Scale; PSG, polysomnography.
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