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Comparison of Sleep Questionnaires in the Assessment of Sleep Disturbances in Children with Autism Spectrum Disorders

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Abstract

Background and purpose—The purpose of this study was to compare two parent completed questionnaires, the Modified Simonds & Parraga Sleep Questionnaire (MSPSQ), and the Children's Sleep Habits Questionnaire (CSHQ), used to characterize sleep disturbances in young children with autism spectrum disorders (ASD). Both questionnaires have been used in previous work in the assessment and treatment of children with ASD and sleep disturbance.

Participants and methods—Parents/caregivers of a sample of 124 children diagnosed with ASD with an average age of six years completed both sleep questionnaires regarding children's sleep behaviors. Internal consistency of the items for both measures was evaluated as well as the correlation between the two sleep measures. A Receiver Operating Characteristics (ROC) curve analysis was also conducted to examine the predictive power of the MSPSQ.

Results—More than three quarters of the sample (78%) were identified as poor sleepers on the CSHQ. Cronbach's alpha for the items on the CSHQ was 0.68 and Cronbach's alpha for items on the MSPSQ was 0.67. The total scores for MSPSQ and CSHQ were significantly correlated ($r = .70$, $p < .01$). After first identifying the poor sleepers based on the CSHQ, an area under the curve was 0.89 for the MSPSQ. Using a cut off score of 56 on the MSPSQ, sensitivity was .86 and specificity was .70.

Conclusions—In this sample of children with ASD, sleep disturbances were common across all cognitive levels. Preliminary findings suggest that, similar to the CSHQ, the MSPSQ has adequate internal consistency. The two measures were also highly correlated. A preliminary cut off of 56 on the MSPSQ offers high sensitivity and specificity commensurate with the widely used CSHQ.

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Keywords

Autism spectrum disorder; sleep disturbance; sleep disturbances; sleep questionnaires; Children's Sleep Habits Questionnaire; Modified Simonds and Parraga Sleep Questionnaire

1. Introduction

Autism Spectrum Disorders (ASD), such as Autistic Disorder, Asperger Disorder, and Pervasive Developmental Disorder, Not Otherwise Specified, affect up to one in 110 children (1) Core features of ASD include deficits in social interaction and communication as well as repetitive and restrictive patterns of behavior. In addition to these core diagnostic features, children with ASD frequently present with a host of associated behavioral issues. On parent report, sleep disturbances are estimated to occur in 30–86% of this group of children. (2–6) Studies comparing children with ASD to their typically developing counterparts have demonstrated significantly higher rates of sleep disturbances in ASD. (7–10) The sleep disturbances identified have primarily been dyssomnias, including delayed sleep onset, difficulty maintaining sleep with night wakings, early morning waking, and decreased total sleep time. Although earlier study samples included children with ASD with co-occurring developmental delays or intellectual disabilities, recent reports of children with ASD and typical cognitive development reported sleep disturbances in 73–82% of the ASD group compared to approximately 50% in typically developing comparison groups. (7, 11) Hence, children with ASD, but without intellectual disability, also appear to have higher rates of sleep disturbances. In a recent report of young children ranging from two to five years, reports of sleep disturbances were found in a group of children with ASD at a rate of 53%, 46% for children with developmental disability, and 32% for children with typical development. (12) Collectively, previous work supports the conclusion that children with ASD are at high risk for sleep disturbances at a level beyond what is observed in their typical counterparts or those with developmental disabilities.

Given the prevalence of ASD and the often co-morbid presence of sleep disturbances, appropriate assessment methods for these sleep disturbances in children with ASD are needed. Research thus far has assessed these sleep disturbances primarily via parent report on various sleep questionnaires or sleep diary measures. A recent review of general pediatric sleep questionnaires makes a strong argument for the development of psychometrically valid instruments to move the field of pediatric sleep medicine forward as a whole. (13) One commonly employed sleep questionnaire for children included in this review is the Children's Sleep Habits Questionnaire (CSHQ) (14) This questionnaire has been used in children ranging from preschool age through school age. (14, 15) Furthermore, it has been used in previous research in ASD. (7, 9, 16) This measure is currently used across the 17 North American sites of the Autism Treatment Network (ATN) to systematically assess for and characterize sleep issues in a large sample of children enrolled in the ATN. Spruyt and Gozal (13) described the necessary steps towards the development of psychometrically sound measures. The sequential steps outlined included : 1) purpose of the tool; 2) research question; 3) response format; 4) generate items; 5) pilot; 6) item-analysis non-response; 7) structure; 8) reliability; 9) validity; 10) confirmatory analyses; and 11) standardize and develop norms. The CSHQ was assessed to satisfy five of the 11 steps towards psychometric validity (Steps 1, 2, 3, 8 & 9 above). (17) Another sleep questionnaire, the Simonds and Parraga Sleep Questionnaire (18), has been less widely used in ASD. However, it was modified (MSPSQ) and used by Wiggs and colleagues (4, 19, 20) in both descriptive studies examining sleep patterns and as a treatment outcome measure in children with a range of developmental disabilities including children with ASD. However, closer inspection of the previous work reveals varying versions of the questionnaire have been used. For example,

the instrument was subjected to a factor analysis in a study of children with Down's Syndrome, but only 12 items were included in this analysis of 91 participants (21) while Maas et al. (22) use all items but employed a 7 point scale as did Wiggs and Stores (4). Nonetheless, this measure achieved comparable steps towards psychometric validity as the CSHQ, as outlined in the Spruyt and Gozal review (17), and in fact was assessed to meet the additional fourth step of generation of items. The MSPSQ has strong potential for clinicians to more easily address sleep disturbances in children with ASD, as it probes for more qualitative information about the nature of sleep disturbances compared to the CSHQ. In particular, items inquiring about children's night wakings, parasomnias, and sleep disordered breathing are more detailed and specific. For example, two of the CSHQ questions related to parasomnias are: "Child awakens during the night screaming, sweating, and inconsolable," and "Child awakens alarmed by a frightening dream." These same questions on the MSPSQ are "Wakes during the night screaming in terror. Anxiety may be so bad that sweating, gasping or trembling may happen. This usually happens during the first half of the night. He/she is not aware of their surroundings and will not remember it the next day," and "Wakes in the night complaining of nightmares or frightening dreams and seems quite anxious. This usually happens in the last half of the night." This added detail helps the clinician differentiate between agitated night wakings and physiological nightmares and sleep terrors.

Additionally, the MSPSQ includes several items inquiring about previous attempts to treat sleep disturbances as well as parents' perception of their child's disturbances. This allows for an assessment of parents' histories of addressing sleep disturbances as well as willingness to attempt new interventions. Additionally, open-ended questions are included that inquire about others impacted by the child's sleep disturbances, as well as family history of sleep disturbances. Both the CSHQ and MSPSQ were of particular interest to us given their prior use in ASD. The goals of the current study were to further assess the reliability and validity of these two measures in an ASD sample. Specifically, we extended previous work by 1) developing similar subscales for the MSPSQ as previously reported for the CSHQ; 2) determining the internal consistency of the two measures in a relatively large sample of children with ASD; 3) examining the convergent validity between the MSPSQ and the CSHQ; and 4) determining the predictive validity of the MSPSQ in identifying children with ASD and co-occurring sleep disturbances.

2. Methods

2.1 ASD Subjects

A total of 124 subjects with ASD (mean age = 6.58 years, SD = 3.73, range 2–16 years) completed the study. There was a preponderance of males (86.3%) compared to females. The study was approved by the University of Pittsburgh Institutional Review Board and all families signed study consent forms prior to participation. Diagnoses were established based on Diagnostic and Statistical Manual-IV Text Revision (23) (DSM-IV-TR) criteria and corroborated by the Autism Diagnostic Observation Schedule (ADOS). (24) Eighty-eight children (80.8%; N=122) were diagnosed with Autistic Disorder while the remaining children met criteria for autism spectrum disorder (Pervasive Developmental Disorder [PDD, NOS], Not Otherwise Specified, or Asperger Disorder). ADOS algorithm scores for the participants with Autistic Disorder ranged from 14–24 while the scores for autism spectrum disorder ranged from 8–12. To characterize the level of functioning, either the abbreviated battery of the Stanford Binet Intelligence Scales: Fifth Edition (SB:FE) (25) or the Mullen Scales of Early Learning AGS Edition (26) was administered. The mean standard cognitive score for those diagnosed with Autistic Disorder was 77.45 (SD = 23.40; range 47–127; N=71) while the mean for those with autism spectrum disorders was 79.91 (SD = 23.88; range 47–124; N=33). There were no significant differences in the cognitive

score distributions for those with Autistic Disorder compared to those diagnosed with PDD, NOS, or Asperger Disorder ($\chi^2 = 23.29$ P-value=.895).

2.2 Study Measures

Children's Sleep Habits Questionnaire (CSHQ)(14)—The CSHQ is a parent-report questionnaire originally designed to screen for sleep problems in children 4 to 10 years of age that has been subsequently validated in preschool children. (13) The abbreviated version for preschool and school-aged children was used in this study and is comprised of 39 items, including eight items where parents respond to open-ended questions and 31 items that inquire about sleep problems that respondents rated as occurring “usually” (5–7 nights per week), “sometimes” (2–4 nights per week), or “never/rarely” (0–1 night[s] per week) and corresponded to scores of 3, 2, and 1, respectively. In addition to the frequency ratings for each question, a “yes” or “no” response to the question “Is this a problem?” was completed. The raw scores for all frequency ratings were summated to determine the total sleep disturbance score, with a higher score reflecting more significant sleep disturbances (possible scores range from 31–93).

The methods used to score the CSHQ in this sample were identical to what is outlined in the scoring instructions provided by the developers of the questionnaire. For our study, we used the total score of 41 to classify a child as a “poor sleeper,” as has been suggested by Owens et al. (14) The psychometric properties of the CSHQ has been evaluated in both a community and clinic sample by Owens, Spirito, and McGuinn (14) and test-retest reliability assessed across two weeks was found to be acceptable (range 0.62 to 0.79). In this same study, the CSHQ was found to have adequate internal consistency for both samples ($\alpha = .68$ and $.78$, respectively). The individual items of the CSHQ were also able to consistently differentiate the responses of the two groups of non-problem sleepers from the community sample and the clinic sample of problem sleepers, showing the measure's validity. The CSHQ has eight subscales: bedtime resistance; sleep onset delay; sleep duration; sleep anxiety; night wakings; parasomnias; sleep disordered breathing; and daytime sleepiness.

Modified Simonds & Parraga Sleep Questionnaire (MSPSQ). (18, 20)—The Simonds and Parraga Sleep Questionnaire was originally developed to screen for sleep disturbances in 5–18 year olds (18) A modified version of the Simonds & Parraga Sleep Questionnaire used by Wiggs and colleagues for use with individuals with intellectual disability (4, 19, 20) was also administered in this study. The questionnaire is comprised of 51 items and consists of two parts. Part 1 includes items related to the quantity and quality of sleep, while Part 2 asks more detailed questions specific to sleep disorders. We used the five-point scoring used by Wiggs and Stores (19) and included 36 of the 51 items that were amenable to a Likert scale scoring. (18, 27) The other 15 items were important clinical questions, but were either yes or no questions (e.g., “Does your child have a room of their own?”) or open ended questions (“e.g., If your child will not go to bed or settle to sleep what do you do about it?”). The 36 items included in the scoring tapped into common sleep problem categories to include bedtime resistance/struggles, sleep onset delay, parasomnias, sleep disordered breathing, sleep anxiety, and daytime sleepiness. Consistent with Wiggs and Stores (19) the convention for scoring the 36 frequency items was: never = 1; about once a month = 2; a few times a month = 3; once or twice a week = 4; and many times a week or daily = 5. Hence a range of 36–180 is possible on the quantitative items. The measure ends with a few additional questions aimed at gathering further measures about previous treatment for sleep disturbance as well as how it impacts other family members sleep. An item is also included that asks “in your opinion does your child have a sleep problem” where a yes and no response is recorded by the parent. This qualitative section was added to assist in directing treatment.

Wiggs and Stores (19) reported the test-retest reliabilities for a two week period to be .83 to 1.0. In a larger study of 345 individuals with intellectual disability, Maas et al. (22) found the internal consistency of the items of the MSPSQ to be good (Cronbach's $\alpha = .80$). Maas et al. (22) also evaluated the convergent validity of the MSPSQ with a similar measure, the Sleep Disturbance Scale for Children (SDSC), and found a correlation ($r = .79, p < .001$) showing adequate validity. The MSPSQ has been reported to be acceptable to parents. (19)

Based on the eight subscales developed by Owens and colleagues for the CSHQ (14) (Table 1), MSPQ items were classified into one of seven factors. The MSPQ does not have a sleep duration factor as the only question about duration was open ended about hours slept. The factors and items for the CSHQ and MSPSQ are shown in Tables 1 and 2, respectively. Many items on the MSPSQ were similar to those on the CSHQ and were categorized based on the existing classification of subscales on the CSHQ. The items on the MSPSQ that did not directly correspond to an item on the CSHQ were examined by the authors with expertise in sleep and consensus was easily reached regarding the assignment of each of the items to subscales.

2.3 Statistical Analysis

Data analyses were conducted using PASW Statistics 18. (28) Data on the two sleep questionnaires were complete for all participants for inclusion. There were missing diagnostic data for two cases, cognitive data for 20 cases and for 19 cases there were missing data for the qualitative question about parents' opinions of whether their children had sleep problems. Descriptive statistics were conducted to establish sample characteristics. Cronbach's alpha was calculated to determine the internal consistency of the items for both sleep measures. Pearson product correlations were calculated to examine the convergent validity of the MSPSQ and CSHQ subscales and of the total scores. A Receiver Operating Characteristics (ROC) Curve was conducted with the MSPSQ to determine the predictive power of this sleep measure. Correlations were also used to determine the possible association between cognitive levels and total scores on the two sleep measures.

3. Results

3.1 Sleep Measure Scores

Table 3 provides means and standard deviations of the scores on the factors for both the CSHQ and MSPSQ. For the CSHQ, the mean total score was 49.06 (SD = 8.95, range 35 to 73). The mean total score for the MSPSQ for this sample was 67.12 (SD = 15.23, range 38 to 104). Of the total sample, 78% (N=97) were identified as having a sleep disturbance based on the recommend total cutoff of 41 for the CSHQ (14) Of this group of children identified as poor sleepers on the CSHQ, their mean MSPSQ score was 71.24 (SD=14.16).

3.2 Internal Consistency of Sleep Measures

The Cronbach alpha coefficients for the CSHQ indicated modest internal consistency between items in each of the eight subscales ($\alpha = .68$). The inter-item reliability coefficients for the MSPSQ factors were lower than their corresponding CSHQ factors ($\alpha = .67$) reflecting modest internal consistency as well. Table 4 provides Cronbach's alpha for the factor scales for the two sleep measures which ranged from .19 to .66 on the MSPSQ and .40 to .80 on the CSHQ.

3.3 Convergent Validity between the MSPSQ and the CSHQ

Convergent validity was assessed by correlating the subscales of the CSHQ with the newly created MSPSQ factors and total scores. Table 5 provides these correlations. The correlation for the total scores of the two measures was .70 ($p = .01$). These correlations for all

corresponding subscales were statistically significant, but many other subscales of the two measures were also strongly correlated.

3.4 MSPSQ Predictive Validity

Finally, the sensitivity and specificity for the MSPSQ were examined using the Receiver Operator Characteristic (ROC) curve. First, poor sleepers were identified using the CSHQ total score with a cut off of 41. (14) The CSHQ total score classified 97 children, or 78% of the sample, as “poor sleepers.” Using this criterion, the area under the curve was determined and shown to be 0.89 with a 95% confidence interval (0.82, 0.95), indicating a good level of predictive power for the MSPSQ on group status. Using a cut off of 56 for the total score on the MSPSQ, sensitivity was .86 and specificity was .70. Further, with a cut off of 56 or above, the agreement between the two sleep measures was 89.7%. That is, 87 of the 97 poor sleepers were identified as poor sleepers on both measures.

3.5 Agreement between Parent Endorsed Sleep Disturbance and Sleep Questionnaires

As noted in the description of the MSPSQ, the final section of the questionnaire includes a qualitative question asking parents to endorse whether or not they think their child has sleep problems with a “yes” or “no” response. This was available for 105 of the 124 subjects. We evaluated the agreement between this response and the cut-off scores established for the two sleep questionnaires. For the CSHQ, using the cut-off score of 41, there was 59.5% agreement for poor sleepers, meaning 50 parents endorsed poor while 84 had total scores on the CSHQ indicating poor sleep. The agreement was higher for “good” sleepers at 90.5% (19 parents endorsed good sleep and 21 were identified as good sleepers). For the MSPSQ, using a cutoff of 56, there was 63% agreement for poor sleepers (51 parents endorsed poor sleepers while 81 poor sleepers were identified using the total score). Conversely, for good sleepers, there was 95.8% agreement, with 23 parents endorsing good sleepers and 24 good sleepers identified on the MSPSQ.

4. Discussion

In this sample of children with ASD, 78% were identified as having a sleep problem based on the cutoff score on the CSHQ. This is consistent with what has been reported by Couturier et al. (7) but is more than the 66% reported by Souders et al. (9); both studies also used the CSHQ in a sample of children with ASD. This group of poor sleepers, based on the CSHQ cutoff, had a MSPSQ mean total score of 71.24 and a standard deviation of 14.16. The internal consistency findings of the subscales for the CSHQ in our sample were similar to what the developers reported. (14) The inter-item reliability of the MSPSQ subscales devised were slightly lower than for the CSHQ. This is not fully surprising as the factors used were based on what had been developed for the CSHQ, which was normed on samples of typically developing children, not children with ASD. However, internal consistency was acceptable. Moreover, the total scores of the CSHQ and MSPSQ were highly correlated. All seven corresponding subscales were also significantly correlated (bedtime resistance, sleep onset delay, sleep anxiety, night waking, parasomnias, sleep disordered breathing, daytime sleepiness). As the MSPSQ did not have items for sleep duration (rather, this was collected in non-quantitative questions), there was not a subscale on this measure. However, other unrelated subscales were also correlated, suggesting possible overlap in the presumed separate items of the subscales. This may also suggest co-occurring sleep disturbance and the interrelation between the types. For example, it is not surprising that daytime sleepiness is correlated with sleep duration and night waking. Other correlations are less easily explained. Inter-correlations of the different scales were also described for CSHQ. (14) In contrast to the subscales we imposed on the MSPSQ modeled after the CSHQ, both exploratory and confirmatory factor analyses yielded a five factor structure in a large sample

of children with intellectual disability of mixed etiology.(22) However, several of the factors were similar and included snoring, daytime sleepiness, complaints related to sleep, sleep apnea, and anxiety relating to sleep. The internal consistency of these factors showed a stronger range Cronbach's α .57 to .82 compared to a wider range in our sample (.19–.80). With a larger sample consisting only of children with ASD, an exploratory factor analysis of MSPSQ may predict a different clustering of symptoms. Based on these findings along with results from the ROC analysis, the MSPSQ may well be an alternative for assessing sleep disturbance in children with ASD. A preliminary cutoff of 56 offers high sensitivity and specificity commensurate with the widely-used CSHQ. Another advantage of the MSPSQ is the metric, which is based on a five point scale compared to the three point scale of the CSHQ. This provides a wider range in the MSPSQ total score, which is an advantage for treatment studies.

A clinical advantage of the MSPSQ is that there are more qualitative items which are highly relevant to the development of behaviorally-based treatment planning. For example, the MSPSQ includes items such as whether a child has their own room, who else is present in the room, and probes about the details of a bedtime routine. Additionally, the MSPSQ probes for information about specific sleep disturbances such as night wakings (i.e., inquiring about what the child does when he/she awakens), and includes a greater number of more specific parasomnia and sleep-disordered breathing items than the CSHQ. For children with ASD, who often present with heterogeneous levels of functioning and a wide variety of behaviors, this qualitative information may present great assistance to clinicians in treating these behaviors. The MSPSQ also offers seven final open-ended questions that probe for information on parents' history of treating their children's sleep behavior, parents' perception of children's sleep disturbances, others who are impacted by children's sleep disturbances, family history of sleep disturbances, as well as a final question probing for any additional information to share. Each of these items may serve as a useful prompt for discussion between clinicians and families regarding the nature of children's sleep disturbances as well as a springboard for treatment planning.

The agreement between the cut off scores on the sleep questionnaires and parent endorsement of their child having or not having a sleep disturbance is interesting. Results for the two measures were very similar. Agreement was around 60% for poor sleepers and 90–96% for agreement regarding good sleepers. Hence, parents are more likely not to endorse sleep disturbance despite completing the questionnaire resulting in an elevated total score. This may speak to parents' lack of knowledge about typical and atypical sleep, which has been documented previously. (29, 30) For parents of children with ASD, it is possible parents attribute their child's sleep issues to ASD and are not amenable to treatment.

At this point, our findings should be considered preliminary in light of the limitations of the study. First this study included a relative small sample size which precluded more extensive evaluation of the psychometrics of the measures. Stability of the measure was not evaluated as parents completed the measure only once. Our sample is made up of a young age range and a large percentage of participants were assessed to be functioning significantly below average with respect to cognitive ability. Hence, generalization of our findings is narrow. However, sleep disturbances occurred across all levels of functioning and there appeared to be no association between sleep disturbances and cognitive level. Rather, as others have reported, sleep disturbances occur regardless of cognitive level in ASD. (7, 11) This is in contrast to earlier thoughts that poor sleep may be related to lower cognitive functioning in individuals with ASD. Given the limitations of this study, larger studies further evaluating the psychometric properties of the MSPSQ are warranted before wider adoption of its use can be supported with this population. These larger pediatric samples should include children without ASD but clinically significant sleep disturbances, community samples

without sleep disturbances, and then samples with well characterized children with ASD. Further studies should explore the relationship between the MSPSQ and other more objective methodologies such as actigraphy and polysomnography. This will offer additional data on the validity of this parent report measure. Despite the lack of larger reliability and validity studies on the MSPSQ in ASD, it is one of few parent report sleep questionnaires used in ASD and ID and shows promise for assessing sleep disturbances in these populations. These findings add to our knowledge about the psychometric qualities of the MSPSQ and offer a preliminary cutoff for children with ASD.

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Table 1**Factors for Items on CSHQ**

Item Number	
Bedtime Resistance	
B5	Child goes to bed at the same time at night *
B7	Child falls asleep alone in own bed *
B8	Child falls asleep in parent's or sibling's bed
B9	Child needs parent in the room to fall asleep
B10	Child struggles at bedtime (cries, refuses to stay in bed, etc.)
B12	Child is afraid of sleeping alone
Sleep Onset Delay	
B6	Child falls asleep within 20 minutes after going to bed *
Sleep Duration	
B14	Child Sleeps too little
B15	Child sleeps the right amount *
B16	Child sleeps about the same amount each day *
Sleep Anxiety	
B9	Child needs parent in the room to fall asleep
B11	Child is afraid of sleeping in the dark
B12	Child is afraid of sleeping alone
B26	Child has trouble sleeping away from home (visiting relatives, vacation, etc.)
Night-waking	
B21	Child moves to someone else's bed during the night (parent, brother, sister, etc.)
B29	Child awakes once during the night
B30	Child awakes more than once during the night
Parasomnia	
B17	Child wets the bed at night
B18	Child talks during sleep
B19	Child is restless and moves a lot during sleep
B20	Child sleepwalks during the night
B22	Child grinds teeth during sleep (your dentist may have told you this)
B27	Child awakens during the night screaming, sweating, and inconsolable
B28	Child awakens alarmed by a frightening dream
Sleep Disordered Breathing	
B23	Child snores loudly
B24	Child seems to stop breathing during sleep
B25	Child snorts and/or gasps during sleep
Daytime Sleepiness	
B32	Child wakes up by him/herself *
B33	Child wakes up in negative mood
B34	Adults or siblings wake up child

Item Number	
B35	Child has difficulty getting out of bed in the morning
B36	Child takes a long time to become alert in the morning
B37	Child seems tired
B38	Child has appeared very sleepy or fallen asleep following: watching TV ^{**}
B39	Child has appeared very sleepy or fallen asleep following: riding in the car ^{**}

* Item reverse-scored for analysis

** Item reverse-scored and recoded for analysis

Table 2**Factors for Items on MSPSQ**

Item Number	
Bedtime Resistance	
5	How often does your child resist or struggle with you around bedtime?
33	Doesn't want to go to bed because he/she is afraid
35	Insists on sleeping somewhere else instead of his/her bed.
38	Insists on bedtime rituals (e.g. bedtime story) before sleep
50	Reluctant to go to bed
Sleep Onset Delay	
6	How long does it take your child to fall asleep at night?
Sleep Anxiety	
33	Doesn't want to go to bed because he/she is afraid
34	Expresses fear that if he/she goes to sleep they might die
35	Insists on sleeping somewhere else instead of his/her bed
37	Needs security object (e.g. teddy bear) before he/she goes to sleep
38	Insists on bedtime rituals (e.g. bedtime story) before sleep
Night-waking	
10	How often does your child wake up during the night?
12	How long does it usually take your child to fall back asleep?
Parasomnia	
21	Talks in sleep
22	Walks in sleep
23	Grinds teeth in sleep
24	Bangs head at night
25	Has quick movements of arms or legs during sleep (e.g. kicking, jump, arm flailing)
26	Moves around a lot in bed during sleep (restless sleep)
27	Bites tongue during sleep
30	Wets bed during sleep
31	Wakes in the night complaining of nightmares or frightening dreams and seems quite anxious. This usually happens in the last half of the night.
32	Wakes during the night screaming in terror. Anxiety may be so bad that sweating, gasping or trembling may happen. This usually happens during the first half of the night. He/she is not aware of their surroundings and will not remember it the next day.
49	Sweats a lot during sleep
Sleep Disordered Breathing	
28	Snores loudly during sleep
29	Seems to repeatedly stop breathing for periods of time lasting up to 30 seconds during sleep
46	Sleeps with head tipped right back
47	Breathes through mouth rather than nose when asleep
48	Complains of headaches on waking up
Daytime Sleepiness	
43	Seems drowsy during the day, but can stop himself/herself from sleeping
44	During the day, appears more active than other children

Table 3

Subscale Means and Standard Deviations

	Min	Max	Range	M	SD	95% CI	
						Lower	Upper
CSHQ							
Bedtime Resistance	6	18	12	9.35	3.40	8.77	9.91
Sleep Onset Delay	1	3	2	1.84	0.85	1.70	2
Sleep Duration	3	9	6	4.65	1.84	4.33	5
Sleep Anxiety	4	11	7	6.26	2.06	5.90	6.64
Night Waking	3	9	6	4.57	1.62	4.27	4.88
Parasomnia	7	16	9	9.59	1.95	9.27	9.96
Sleep Disordered Breathing	3	9	6	3.47	0.90	3.32	3.64
Daytime Sleepiness	8	22	14	12.53	3.45	11.99	13.14
Total Score	35	73	38	49.06	8.95	47.57	50.6
MSPSQ							
Bedtime Resistance	5	25	20	12.5	5.33	11.56	13.43
Sleep Onset Delay	1	5	4	2.45	1.07	2.26	2.65
Sleep Anxiety	5	21	16	10.46	4.23	9.68	11.17
Night Waking	2	10	8	4.73	2.19	4.34	5.12
Parasomnia	11	36	25	18.57	5.44	17.59	19.55
Sleep Disordered Breathing	5	16	11	7.88	3.09	7.33	8.43
Daytime Sleepiness	2	10	8	5	2.46	4.57	5.45
Total Score	38	104	66	67.12	15.23	64.52	69.72

Table 4

Cronbach alphas for subscales of the CSHQ and MSPSQ

	Number of Items in Factor	Coefficient α
CSHQ		
Bedtime Resistance	6	.80
Sleep Onset Delay	1	--- *
Sleep Duration	3	.80
Sleep Anxiety	4	.48
Night Waking	3	.67
Parasomnia	7	.40
Sleep Disordered Breathing	3	.62
Daytime Sleepiness	8	.74
MSPSQ		
Bedtime Resistance	4	.66
Sleep Onset Delay	1	--- *
Sleep Anxiety	5	.48
Night Waking	2	.490
Parasomnia	11	.51
Sleep Disordered Breathing	5	.36
Daytime Sleepiness	2	.19

* Subscale has only one item.

Table 5

Pearson Correlations for CSHQ and MSPSQ subscales & Total Scores

MSPSQ CSHQ	Bedtime Resistance	Sleep Onset Delay	Sleep Anxiety	Night Waking	Parasomnia	Sleep Disordered Breathing	Daytime Sleepiness	MSPSQ Total
Bedtime Resistance	.39**	.15	.24**	.31**	.36**	.03	.16	.45**
Sleep Onset Delay	.24**	.64**	.15	.25**	.21*	.14	.05	.32**
Sleep Duration	.33**	.35**	.05	.47**	.33**	.12	.20*	.50**
Sleep Anxiety	.45**	.11	.34**	.19*	.28**	.11	.17	.41**
Night Waking	.37**	.22*	.25**	.65**	.52**	.10	.21*	.57**
Parasomnia	.24**	.04	.14	.38**	.80**	.21*	.28**	.58**
Sleep Disordered Breathing	.03	.13	.01	-.09	.07	.47**	.12	.15
Daytime Sleepiness	.21*	.14	.04	.17	.14	.20*	.22*	.29**
CSHQ Total	.49**	.34**	.25**	.50**	.55**	.29**	.33**	.70**

*
p .05**
p .01