

Children Sleep Habits Questionnaire (CSHQ): Psychometric validation in Indian School Children

R Narendhran, Bhavneet Bharti, Prahbjot Malhi

Advanced Pediatric Centre, Postgraduate Institute of Medical Education & Research, Chandigarh, India

Indian J Sleep Med 2008; 3.3, 102-106

Abstract

Objective: Validity studies on scales of sleep-related habits and problems for pediatric population are few, and cross-validation with Indian population has not been reported. This study was designed to assess the psychometric properties of a parent-rated measure of sleep habits i.e. Children Sleep Habits Questionnaire (CSHQ) in Indian school going children

Methods: Cross-sectional data were examined for 371 primary school going children from Pre - Nursery to 3rd class. Reliability testing and psychometric validation using principal component analysis was carried out.

Results: Our study cohort achieved a mean score of 49.35 (S.D. 7.6). Though CSHQ scale items had a good overall internal consistency (Cronbach's alpha 0.77), its subscales had poor reliability. Data analysis conducted by excluding the youngest school children (class Pre-Nursery) significantly improved the internal consistency alphas of the various subscales, indicating better reliability of CSHQ subscales in the older age groups in our setting. On comparison with Visual Analogue Scale (VAS) for global sleep rating, CSHQ showed good concurrent validity. Construct validity of CSHQ was evaluated by principal factor analysis which extracted 8 underlying latent factors (with eigen value >1) matching original CSHQ domains. However, these latent factors explained only 48.2% of total variance in the data. Principal Component Analysis (PCA) of CSHQ in our study cohort also favors shortening of original 33-item scale to a shorter 23-item scale with better acceptability for parents.

Conclusions: The CSHQ is a reliable and internally consistent scale, and it is useful optional tool for assessing sleep problems in Indian school children.

Keywords: Sleep Habits, Sleep related problems, Childhood, Validity, Parent ratings Questionnaire.

Interest is growing in systematic screening and evaluation of sleep habits and sleep problems in children in order to improve the management of sleep disorders and their consequences¹⁻⁵. This has prompted increasing use of sleep-related scales as important outcome measures in health research.^{6,7,8}

Address for Correspondence:

Dr Bhavneet Bharti

Department of Pediatrics, Advanced Pediatric Centre,
Postgraduate Institute of Medical Education &
Research, Chandigarh
Phone :91- 0172-2755315, 9914208327,
Fax number : 91-0172-2744401
Email:bhavneetb@yahoo.com.

However, unlike objective measures of a patient's medical condition, sleep-questionnaire items are defined as the parents' subjective perception and reaction to their child's sleep status. Despite, widespread use of already available small number of published scales for measuring sleep habits and sleep related problems in pediatric population, the psychometric properties and validity of these scales have been occasionally studied, particularly with regard to cross-validation in populations other than scale development samples.⁹ Furthermore, it is one of the least investigated health issues for school going children in India and recognition of lack of standardized screening tools has fuelled the need for reliability testing and validation of currently available sleep questionnaire

in Indian setting.¹ Therefore, we carried out this study to validate the CSHQ as a tool to objectively identify sleep habits and sleep related problems in school going Indian children.

Methods

This was a descriptive cross-sectional study. The sample composed of pre-nursery through third class students in a school in North India. Any child with a chronic illness, seizure disorder or lack of consent by the guardians or parents was excluded. There were 435 pupils in the school in the age group of 3 to 9 years. Parents were requested to complete the questionnaire while they waited for their turn on the parent teacher meeting days. They were given the option of filling English version or the translated and validated Hindi version (Forward – backward translation) of the questionnaire. The investigators supervised the parents filling questionnaire to clarify their doubts about items and their responses in the questionnaire. They were also allowed to take home the questionnaire and return later if they wished. If the parents of some children missed a particular meeting, attempt was made to contact them during the next meeting taking the help of the class teacher. Staggering of the questionnaire distribution was done over a period of nine months so that nearly 50 students were done at each parent teacher meeting. A consent form describing the study and requesting participation accompanied each questionnaire. After the parents signed the consent form, they were enrolled for the study. A reminder was sent through the children 2 weeks later for the parents who did not return the questionnaire.

Tools: The Children's Sleep Habits Questionnaire (CSHQ)

The CSHQ is a retrospective, 33-item abbreviated parent questionnaire that has been used in a number of studies to examine sleep behavior in young children. Parents were asked to recall sleep behaviors occurring over a "typical" recent week. Items were rated on a three-point scale: "usually" if the sleep behavior occurred five to seven times/week; "sometimes" for two to four times / week; and "rarely" for zero to one time/week. Some items were reversed in order to consistently make a higher score indicative of more disturbed sleep. CSHQ items are conceptually grouped into eight subscales reflecting the following sleep domains: 1) Bedtime Resistance, 2)

Sleep Onset Delay, 3) Sleep Duration, 4) Sleep Anxiety, 5) Night Wakings, 6) Parasomnias, 7) Sleep- Disordered Breathing, 8) Daytime Sleepiness. Total Sleep Disturbance score included all items of the eight subscales, but consisted of only 33 items because two of the items on the Bedtime Resistance and Sleep Anxiety subscales were identical.

Baseline demographic data included parent's age, education, socioeconomic status, caste, religion, residential accommodation and family organization. Specific child variables that were studied included sex, birth order, educational standard and number of siblings.

Parents were asked to place a mark through a horizontal line (100 mm single item visual analogue scale) to indicate how much satisfied they were at present with the sleep behavior of their child. Line anchors were "Not satisfied at all" (marked as 0%) and "Fully satisfied" (100%). This 100mm line was divided into 10 equal parts by placing vertical lines each of which is further assigned a value of 10-90% from left to right.

Statistical Analysis

Descriptive data were summated using univariate statistics. Cronbach's α was calculated to find out the internal consistency reliability of CSHQ in our study cohort. The scale was further validated using factor analysis in our study setting. All analyses were performed by using the Statistical Program for Social Sciences (SPSS) for Windows, version 10.0. All statistical significance was set at $P < 0.05$.

Results

Of the total 435 questionnaires distributed, only 371 were available for the analysis (Response rate of 85%). Most of the parents (97.8%) had filled the questionnaire in English. Sixty parents did not give their consent and did not return the questionnaire even after repeat reminder 2 weeks later. Four children were excluded because of the associated chronic medical conditions / antiepileptic medications. Demographics of the study children are shown in the Table 1

Item analysis of CSHQ

The 33 CSHQ sleep disturbance items are conceptually grouped into 8 subscales reflecting various domains

shown in Table 2. Sleep onset delay subscale with only one item has not been shown. The table summarizes the total and various subscale CSHQ scores in the study cohort.

Table 1: Demographic Characteristics of Study sample

Total Number	371
Male: Female	223: 148
Mean age	4.7 ± 1.57 years
Joint: Nuclear family	162:209
Class	
Pre Nursery	98 (26.4%)
Nursery	112 (30.2%)
Kindergarten	56 (15.1%)
Class 1-3	105 (28.3%)

Table 2: Descriptive score pattern & Internal consistency of CSHQ & Subscales

Subscales (No of items)	Mean score± S.D	Median	Cronbach's alpha*
Bedtime resistance (6)	11.08 ± 2.75	12	0.66/0.74
Sleep duration (3)	3.33 ± 0.71	3	0.50/0.78
Sleep anxiety (4)	6.74 ± 2.03	6	0.57/0.75
Night wakings (3)	3.48 ± 0.87	3	0.14/0.72
Parasomnias (7)	8.08 ± 1.45	7	0.44/0.68
SDB (3)	3.15 ± 0.53	3	0.41/0.75
Daytime sleepiness (8)	12.26 ± 3.14	12	0.67/0.72
TOTAL CSHQ	49.35 ± 7.60	49	0.77/0.72

* Cronbachs alpha- with and without Prenursery children

Reliability of CSHQ

The internal consistency of CSHQ was determined by calculating Cronbach's alphas for the total scale as well as its 7 subscales (Table 2). The Cronbach's alpha for the entire CSHQ was 0.77 suggesting thereby the homogeneity of scale in reliably reflecting sleep problems in our study setting (minimum cut-off for Cronbach's alpha is 0.70). The various Cronbach's alphas for the 7 subscales of CSHQ (excluding one-item Sleep Onset delay subscale) are shown in the table 2. As is evident from the table, none of the subscales, had acceptable Cronbach's alphas of 0.70 or above suggesting lack of homogeneity in subscale items to reliably reflect the construct underpinning each subscale in the study cohort.

On the other hand, reanalysis of various subscales excluding youngest school children (class Pre-Nursery) significantly improved the internal consistency alphas of the various subscales to 0.72, 0.78, 0.75, 0.72, 0.68, 0.75, 0.72 respectively in the same order, indicating better reliability of CSHQ subscales in the higher classes in our setting.

Validity of CSHQ

Face and content validity

This questionnaire is already extensively used in other settings where its reliability and validity have been convincingly proved by various investigators. All the items included in the questionnaire are easily interpretable, understandable and relevant to the sleep behavior and sleep related concerns routinely voiced by parents in routine clinical practice. Parents enjoyed completing the CSHQ and teachers thought it appropriate for the age group.

Concurrent Validity

The mean (±SD) Visual Analogue Scale (VAS) satisfaction rating by parents in our studied group was 8.2 (±1.75); median and mode VAS ratings were 9 and 10 respectively. Parent's VAS satisfaction ratings of their child's sleep were negatively correlated with scores on CSHQ subscales of sleep duration ($r = -0.2$, $p < 0.01$), day time sleepiness ($r = -0.15$, $p < 0.01$), parasomnias ($r = -0.12$, $p < 0.05$) and sleep onset ($r = -0.11$, $p < 0.05$) and total score ($r = -0.16$, $p < 0.01$). To simplify, parents' satisfaction with their children's sleep quality on VAS closely mirrored the results achieved on CSHQ- that is- lower scores (or better quality of sleep) on total CSHQ scale, as well as subscales of sleep duration, daytime sleepiness, parasomnias, and sleep onset duration signaled higher satisfaction ratings by parents on VAS.

Construct Validity of CSHQ

Sleep scores among different classes: When total scores on CSHQ were compared among three class groups, Pre-Nursery and Nursery children were reported by parents to have significantly lower quality of sleep as compared to KG children. This difference however disappeared at higher classes. The subscale scores of bedtime resistance, sleep anxiety, daytime sleepiness were

found to be significantly different across three groups of class grades namely Group1 (Pre-Nursery + Nursery); Group 2 (Kindergarten KG); and Group 3(class grades 1-3). Posthoc analysis by Tukey's HSD revealed that Kindergarten children showed a significantly less bedtime resistance as well as sleep anxiety scores compared to nursery and Pre-Nursery children. Also, Kindergarten children had significantly higher daytime sleepiness scores compared with classes 1, 2, and 3. There was no significant difference between night wakings scores, Parasomnias and sleep disordered breathing scores among the different grades of classes.

Factor analysis of CSHQ

Principal Component Analysis of CSHQ was also carried out to further validate the CSHQ in our study setting. Overall Kaiser Meyer Olkin measure of sampling adequacy was 0.74 (minimal required cut-off 0.60) suggesting good overall adequacy of the correlation matrix (i.e. all individual items in CSHQ are showing some statistical weightage). The significant KMO qualifies the CSHQ for further PCA evaluation. The total number of factors extracted by PCA using eigenvalue cut-off of >1 was 8 explaining 48.2% of total variance in the data. The number of factors yielded by factor analysis of 33-item CSHQ exactly matches the number of subscales originally present in the CSHQ. However, the validity of CSHQ is somewhat dampened by the fact that the 8 factors yielded by PCA collectively explained only a mediocre variance of 48% in total study cohort. Moreover, using Catell's Scree Test, the truly useful factors are the ones which fall on the descending limb of Scree plot before it levels off. In this regard, the number of useful factors on simple eyeballing can be easily restricted to 4 as shown in the Figure 1. This further lowers the construct validity of CSHQ in our study. On further scrutinizing the rotated matrix components, there are 6 factors under which at least 3 or more items are loading significantly (i.e. a minimal factor loading of 0.4 or more). Finally after PCA, only 23 items of original 33-item CSHQ under 6 different factors would offer equivalent information as original scale in our setting. The first latent factor generated by PCA and having highest eigenvalue of 4.34 (explaining variance of 13.15%) contained 6 items, all originally described in daytime sleepiness subscale of CSHQ. The second factor with highest eigenvalue of 2.36 (variance 7.17%) contained 3 items all originally included in bedtime resistance

subscale of CSHQ. Factor 3 in PCA had 5 items (one originally from bedtime resistance, one from sleep onset delay subscale and 3 from sleep duration subscale). However theoretically it seems logical to club all these 5 items together as all of them relate to sleep cycle alterations (both in timing and duration). Last three factors in PCA mirrored parasomnias, night waking and sleep disordered breathing subscales of original CSHQ. To conclude, PCA of CSHQ in our study cohort favors shortening of original 33-item scale to a shorter 23-item scale with better acceptability for parents.

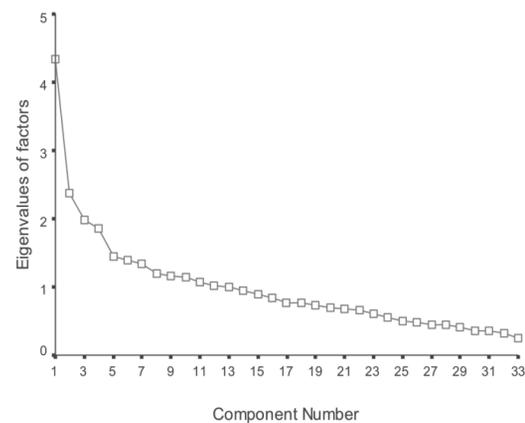


Figure 1 : Scree Plot evaluation of various factors

Ceiling and floor effects

Three of the subscales in CSHQ namely sleep duration, night waking and sleep disordered breathing had shown flooring effect as their mean scores closely approximated the minimum score limits. However none of the subscales of CSHQ had ceiling effect in current study.

Discussion

To the best of our knowledge, this is the first study from India where a sleep specific Children Sleep Habits Questionnaire (CSHQ) scale has been used as well as validated to decipher the little known patterns and problems of sleep in young school going children.

As per as summary frequency rating of CSHQ items is concerned, our study cohort achieved a mean score of 49.35 (S.D. 7.6). which is about 7 points less than the community based sample of the US school going children in the age group of 4-12 years. However their clinic based sample had higher scores of 68.4 with S.D of 13.7.² Though Cronbach's alphas for individual

subscales were not significant, overall CSHQ had acceptable reliability coefficient in our study sample. Further excluding the 96 children who were aged below 4 years, the internal consistency coefficients improved significantly for the subscales as well. The original CSHQ scale had also been used for US children in the age group of 4- 12 years thereby confirming its utility mainly in children beyond the age of 4 years. Although the CSHQ should not be used to make definitive sleep disorder diagnoses, both the total score and individual subscale score could be utilized to identify children with sleep disturbances, and highlight sleep domains which warrant further clinical evaluation. In addition, Principal component analysis in our study suggests that CSHQ can further be truncated to only 23 items. This will certainly improve the compliance of completing questionnaire by the parents in the busy outpatient clinics especially in the developing countries. Moreover, simple Visual Analog Scale (VAS) also could be used to screen for general sleep hygiene as parents' satisfaction with their children's sleep quality on VAS closely mirrored the results achieved on CSHQ.

The limitations of this study must be considered in evaluating the suitability of this scale. As in any parent report measure, the role of both parental and retrospective bias in completing the scale must be considered. Despite data suggesting that parental report is reasonably accurate for identifying many types of sleep disturbances when compared to objective data such as polysomnography and actigraphy, parents of older children, in particular, may not always be aware of any difficulties in initiating and maintaining sleep. Data from a survey of almost 500 pediatric health care providers suggests that practicing physicians inadequately screen for sleep problems, especially in middle childhood.¹⁰ Thus, a parent-report survey such as the CSHQ could provide a relatively simple tool for identifying problematic sleep in the context of a well child encounter, for example.

In summary, our results show that CSHQ is a valid and reliable tool. It is a useful sleep screening instrument to delineate sleep habits and identify problematic sleep domains in school-aged children. Additional studies should address the use of the CSHQ in other populations, in order to provide further evidence of its utility in a variety of Indian settings.

References

1. **Bharti B**, Malhi P, Kashyap S. Patterns and problems of sleep in school going children. *Indian Pediatr.* 2006;43:35-38.
2. **Liu X**, Liu L, Owens JA, Kaplan DL. Sleep patterns and sleep problems among schoolchildren in the United States and China. *Pediatrics.* 2005;115:241-249.
3. **Stein MA**, Mendelsohn J, Obermeyer WH, Amromin J, Benca R. Sleep and behavior problems in school-aged children. *Pediatrics.* 2001;107:E60.
4. **Thiedke CC**. Sleep disorders and sleep problems in childhood. *Am Fam Physician.* 2001;63:277-284.
5. **Neveus T**, Cnattingius S, Olsson U, Hetta J. Sleep habits and sleep problems among a community sample of schoolchildren. *Acta Paediatr.* 2001;90:1450-1455.
6. **Owens JA**, Dalzell V. Use of the 'BEARS' sleep screening tool in a pediatric residents' continuity clinic: a pilot study. *Sleep Med.* 2005;6:63-69.
7. **Owens JA**, Spirito A, McGuinn M. The Children's Sleep Habits Questionnaire (CSHQ): psychometric properties of a survey instrument for school-aged children. *Sleep.* 2000;23:1043-1051.
8. **Chervin RD**, Hedger K, Dillon JE, Pituch KJ. Pediatric sleep questionnaire (PSQ): validity and reliability of scales for sleep-disordered breathing, snoring, sleepiness, and behavioral problems. *Sleep Med.* 2000;1:21-32.
9. **Mohammadi M**, Ebrahim A, Mir Farhad G, Reza A, Shervan S, Babak G. Reliability and validity of persian version of "BEARS" pediatric sleep questionnaire. *The Indian Journal of Sleep Medicine.* 2008;3:973.
10. **Mindell JA**, Moline ML, Zendell SM, Brown LW, Fry JM. Pediatricians and sleep disorders: training and practice. *Pediatrics.* 1994;94:194-200.