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ORIGINAL ARTICLE

Validity and reliability related to the Persian version of the Children's Sleep Habits Questionnaire

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Abstract

Considering insomnia as a common health issue, it is essential to access valid assessment tools for sleep evaluations and research in all societies. For this purpose, we aimed to evaluate the cross-cultural validation and psychometric properties of the Persian version related to the Children's Sleep Habits Questionnaire "CSHQ" in Iranian children. This study was conducted on 300 parents of primary school children aged 7–12 years in Kashan city. Reliability was assessed using Cronbach's alpha coefficient. Construct validity was evaluated by factor analysis. The Spearman correlation coefficient was also applied to examine the convergence and divergence validity. The Cronbach's alpha coefficient was 0.80 for the entire questionnaire. There was a positive correlation between the results from CSHQ and Bear's. The range of convergence validity was 0.4 to 0.86. The range of divergence validity was 0.006 to 0.66. Factor analysis showed that eight factors had the special value (with eigenvalue >1), which means that the 33 questions are summarized in eight dimensions. Our findings imply good reliability and validity of the CSHQ in the Iranian society.

Key words: BEARS Questionnaire, Children Sleep Habits Questionnaire, Iran, reliability, validity.

INTRODUCTION

One-third of our lives is spent asleep. As sleep helps reduce stress and anxiety and helps people to recover energy, it results in not only increased focus and consistency of senses, but also enjoyment of daily activities. Thus sleeping should not be considered a waste of time.[1,2] Inadequate sleep causes neurological, behavioral and physiological changes. Moreover, it is associated with academic failure and reductions in daily performance in the classroom.[3,4] Children with sleep problems experience emotional and cognitive issues like depression, anxiety, cognitive dysfunction, and disabilities in learning and mental development.[5–10] Sleep problems are common among adolescents and young people, and most problems are mostly unknown and incurable. Various studies have reported different findings about the prevalence of sleep problems. The results vary from only 1–4% among children aged 5–11 years in one study,[11] to 25–40% in other studies.[12] Such a difference might be due to the applied methodologies such as interviews, various questionnaires, and lack of valid and reliable sleep study tools.[11] Various questionnaires have been developed so far to evaluate sleep issues. Among the questionnaires, the Children's Sleep Habits Questionnaire (CSHQ) has been applied more than any other in different countries. To our knowledge, there is no validated scale to assess sleep habits among Iranian children. The primary objective of this study was to validate

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the CSHQ and report its psychometrics for clinical and research purposes in Iran.

METHODS

Children's Sleep Habits Questionnaire

The CSHQ, designed by Judith A Owens in 2000, is a retrospective questionnaire for parents, and was used in a number of studies to assess sleep problems in children aged 4 to 12 years. CSHQ focuses on the prevalent sleep disorders in this age group including dysomnia (difficulty falling asleep or staying asleep), parasomnia (sleepwalking, talking, night terror, bed wetting, restless leg syndrome, etc.) and breathing disorders in sleep. Items are related to the following scale: "Usually", if it occurs 5 to 7 times a week; "Sometimes", if it occurs 2 to 4 times a week; and "Rarely", if it occurs ever or once a week.[13]

Translation

At first, the permission for translation and use of the questionnaire in Iran was obtained from the instrument developer. The questionnaire was translated from English into Persian using a standard method including steps forward, steps back and pre-test by two bilingual physicians apart from the original translators to be perfectly convertible into each other from conceptual and linguistic views. Content validity was evaluated via three specialists' views and suggestions about the content area. To assess face validity, a focus group was assigned with 15 parents and their perspectives were applied for better understanding of the questionnaire. Finally, a panel of expert physicians reviewed the final translation and its cultural and linguistic equivalence was accepted.

Participants

According to the guidelines of the validity and reliability, 8 to 12 samples were required for each question, and in our study 300 samples were considered via random cluster sampling.[14]

After obtaining permission from the ministry of education, the list of public and private schools for girls and boys in Kashan city (one of the central cities of Iran) was prepared for 87 elementary schools across the city, 14 primary schools, which included seven boy's schools and seven girl's schools were randomly selected. Then, in each school seven students from each grade were randomly selected and evaluated according to eligibility criteria for the study. The questionnaires were explained for participants. Also, confidentiality of their information and voluntary participation were expressed. Overall, 470 questionnaires were distributed so that 300 were completed questionnaires, 60 questionnaires were excluded due to failure, and 110 questionnaires were not returned. Inclusion criteria were the absence of severe stress over the past year (due to the death of immediate family or immigration), lack of great emotional and academic failures in life, and not suffering from a disease that requires hospitalization or serious and long-term treatment based on parents' reports and student health records.

For collecting data, the researcher met parents of selected children together in one session as a group in coordination with the director of the school, and consent forms were given to participants and the aim of the study was explained to them. Then, the questionnaires were distributed between 300 parents and were completed by the mothers.

Additional measures

BEARS test

The BEARS test is a convenient screening tool for the primary care settings to find common sleep issues in children. Item bodies five original sleep domains including bedtime problems, excessive daytime sleepiness, awakening during the night, regularity and duration of sleep problem and snoring in children 2–12 years.[15] A positive answer to these questions is a sign of a child's sleep problems and prompts the physician to extract more information. Mohammadi *et al*. (2008) reported good reliability and validity for the Persian version of this scale.[16] This questionnaire was used in our study to better estimate convergent validity.

Test–retest reliability

The Cronbach's alpha coefficient was used to evaluate the questionnaire's internal consistency. To examine test–retest reliability, the questionnaires were twice distributed among 30 parents within 2–4 weeks. The results were assessed by intra class correlation coefficient (ICC).

Validity

In this study, we assessed validity by several methods as content validity, Construct validity, Convergent and divergent validity.

Content validity

Instructions were prepared by evaluating questions. It included, and considered the design of the questionnaire and the need to adapt to the conditions prevailing in the education system and culture of Iran. Then, experts (three psychiatrists) were asked to select one of the options A (no relation, score 1), B (slightly related, score 2), C (very relevant, score 3), D (quite related, score 4) for each question according to the objectives of designing the questionnaire to determine the degree of correlation of each question with children's sleep habits. Furthermore, they were also asked to state other conditions related to sleep habits of children that have been not considered in the questionnaire.

Explanatory factor analysis

We used varimax rotation to better identify the factors. The Spearman correlation coefficient was also used to examine the construct validity, which is composed of two parts "convergence and divergence".

Convergent validity

To calculate the convergence validity of the first dimension (resistance in going to bed) in the CSHQ questionnaire that includes questions 1–6, correlation between each question and the total score of the first dimension (resistance in going to bed) was obtained using the Spearman correlation coefficient.

Divergent validity

Correlation was examined between questions related to one dimension, and other dimensions. In other words, the correlation coefficient between one question and other dimensions should be less than the correlation coefficient between the question and its dimension.

Statistical analysis

Data were analyzed using SPSS software package (version 16). Internal consistency of the questionnaire was estimated through calculating Cronbach's alpha, estimating reliability assessment of the questionnaire by Intraclass Correlation Coefficient (ICC) was used to assess test–retest reliability. Factor analysis was performed by Exploratory factor Analysis (EFA), estimation of Spearman correlation coefficients between subscales of the questionnaires, and calculation of Content validity Index.

Table 1 Frequency and percentages of sex and age of children

Number		Percent	Frequency	Variable
Male	22 (37%)	19.7	59	7 years
Female	37 (63%)			
Male	18 (27.3%)	22	66	8 years
Female	48 (72.7%)			
Male	22 (37%)	22	66	9 years
Female	44 (63%)			
Male	26 (53%)	16.3	49	10 years
Female	23 (47%)			
Male	12 (46.2%)	8.7	26	11 years
Female	14 (53.8%)			
Male	21 (61.8%)	11.3	34	12 years
Female	13 (38.2%)			

Table 2 Mean and standard deviation of dimensions of the Children's Sleep Habits Questionnaire (CSHQ)

Name of domain	Min	Max	Mean	SD
Resistance to going to bed	6	18	10.2	2.84
Delay in sleeping time	1	3	1.88	0.87
Sleeping duration	3	9	4.8	1.7
Sleep anxiety	2	6	2.9	1.29
Night walking	3	9	3.6	1.09
Parasomnia	7	20	11	2.02
Sleep breathing disorders	3	9	3.4	1.06
Daytime sleepiness	8	22	12.6	2.9
Sleep habits	33	76	47.8	8.1

SD, standard deviation.

RESULTS

In this study, 300 children, including 44.7% boys and 55.3% girls, were evaluated. The mean age was 9.08, and 19.7%, and 22% of them were respectively 7 and 8 years old. Also, 22%, 16.3%, 8.7%, and 11.3% of subjects were respectively 9, 10, 11, and 12 years old. Table 1 shows the descriptive characteristics and Table 2 shows mean and standard deviation of dimensions of CSHQ.

Internal consistency

Cronbach's alpha coefficient was 0.80, so that removing each item had no significant change in alpha. The range of Cronbach's alpha coefficient among the questions was 0.5 to 0.74. Cronbach's alpha coefficients relating to different domains were as follows: resistance to going to bed 0.57, sleep duration 0.54, sleep anxiety 0.63, night

Table 3 Intraclass correlation coefficient in the Children's Sleep Habits Questionnaire (CSHQ)

Name of domain	ICC	95%CI
Resistance to going to bed	0.82	0.71–0.9
Sleep duration	0.64	0.40–0.81
Sleep anxiety	0.78	0.61–0.88
Night walking	0.51	0.74–0.19
Parasomnia	0.54	0.26–0.75
Sleep breathing disorders	0.71	0.51–0.84
Daytime sleepiness	0.82	0.71–0.9
Total	0.88	0.82–0.93

CI, confidence interval; ICC, intra class correlation coefficient.

walking 0.5, parasomnia 0.69, sleep breathing disorders 0.74 and daytime sleepiness 0.64.

Intraclass correlation coefficient

The Intra-class correlation index (coefficient ICC) was calculated through re-test on 30 children after 2 to 4 weeks to estimate reliability of CSHQ. ICC coefficients for different domains were as follows: resistance to going to bed 0.82, sleep duration 0.64, sleep anxiety 0.78, night walking 0.51, parasomnia 0.54, sleep breathing disorders 0.71, and daytime sleepiness 0.82. Table 3 shows ICC coefficients. In each of the eight domains, the coefficient was 0.88, which confirms the repeatability of this test.

Convergent and discriminate and content validity

In this study, the correlation coefficient between the BEARS and CSHQ questionnaires was calculated using Spearman correlation coefficients. The correlation coefficient between the two measurements was 0.335 ($P < 0.01$). There is a positive correlation between the results from BEARS and CSHQ. (Table 4).

Table 5 presents content validity of CSHQ and convergence and divergent validity of CSHQ are showed in Table 6.

Construct validity:

Factor analysis related to children's sleep habits questionnaire

Before conducting the factor analysis, it is necessary to meet the following assumptions:

1. The index of sampling adequacy "Kaiser-Meyer-Olkin (KMO)" should be at least 0.6. It is better to be higher than 0.6.
2. The result of Bartlett's test should be statistically significant.
3. The factor load of each question should be 0.3 at least in the factor matrix and the rotated matrix. It is better to be higher than 0.3.
4. Any factors should belong to at least three questions.
5. Factors should have enough validity.

The results of KMO and Bartlett's test for the correlation matrix of children's sleep habits are shown in Table 7.

As can be seen in Table 6, the value of KMO is above 0.6, and the significant level of Bartlett's test is less than 0.001. Therefore, implementing factor analysis based on the correlation matrix in the sample groups would be justified. To determine questions composed of several factors, three major criteria are considered: (i) special value, (ii) proportion of variance explained by each factor, and (iii) graph rotated for special values is called Scree. The sloping design, which is the graph of special value for 33 questions related to children's sleep habits, is shown in Figure 1.

Through the sloping design it can be inferred that the first factor had a significant contribution to the total variance of the variables, and is distinct from the contribution of other factors. In the next step, based on special value, and the percentage of variance and slope design, nine factors have been a basis for final characteristics. The findings indicated that one of nine factors only included one case, and there was a lack of sufficient reliability to use it as a subcategory. Finally, eight factors were determined. To achieve definitions of factors, the coefficient equal to 0.3 was considered a quorum of factor load. Thus, based on the results of the factor analysis and the indicators mentioned, of all the questions, eight factors were extracted with a special value greater than 0.4 and the overall 57.595% of the variance is explained. To obtain a meaningful construct, it is necessary to transfer factors extracted using varimax rotation to the new axes. The following can be inferred from the data matrix:

1. The first factor has a strong correlation with the 4 questions, and "resistance to going to bed" is named, and also includes questions 1, 2, 5, 6;
2. The second factor has a strong correlation with the 2 questions, and "delay in sleep time" is named, and also includes questions 4, 7;
3. The third factor has a strong correlation with the 3 questions, and "sleep duration" is named, and also includes questions 8, 9, 10;

Table 4 Relation between the subscales of BEARS and the Children's Sleep Habits Questionnaire (CSHQ) questionnaires

	Bedtime problem	Excessive daytime sleepiness	Awakening during the night	Regularity and duration of sleep	Sleep disordered breathing	Total
Resistance to going to bed	0.214**	0.095	0.049	0.094	0.038	0.149**
Sleep onset delay	0.070	0.008	0.156**	–0.198**	0.067	–0.042
Sleep duration	0.112	0.106	0.222**	–0.158*	0.035	0.127
Sleep anxiety	0.064	0.051	0.012	0.088	0.040	0.086
Night walking	0.130*	0.199**	0.248**	–0.068	0.100	0.189**
Parasomnia	0.160**	0.229**	0.250**	0.043	0.144*	0.225**
Sleep breathing disorders	0.114	0.103	0.125**	0.113	0.309**	0.128
Daytime sleepiness	0.162**	0.310**	0.164**	0.026	0.026	0.298**
Total	0.276**	0.307**	0.268**	0.008	0.116	0.335**

*P value < 0.05; **P value < 0.001.

Table 5 Results of evaluating the overall content of children's sleep habits questionnaire

Line	List of experts	Quite or very relevant questions (n)	Unrelated or slightly related questions (n)	Unanswered questions (n)	Total questions (n)	Quite or very relevant questions to total number of questions (CVI %)
1	Specialist A	33	0	0	33	100
2	Specialist B	33	0	0	33	100
3	Specialist C	29	4	0	33	80

Mean = 96%.

Table 6 Convergence and divergent validity of Children's Sleep Habits Questionnaire (CSHQ)

Dimensions of questionnaire	Number of questions	Convergence range	Number of correlation >0.4	Convergent validity percent	Discriminate validity
Resistance to going to bed	6	0.4–0.75	6	100	0.01–0.48
Delay in sleeping time	1	1	1	100	0.009–0.46
Sleep duration	3	0.53–0.8	3	100	0.004–0.51
Sleep anxiety	2	0.82–0.83	2	100	0.02–0.66
Night walking	3	0.86–0.6	3	100	0.004–0.28
Parasomnia	7	0.4–0.71	7	100	0.006–0.4
Sleep breathing disorders	3	0.64–0.79	3	100	0.01–0.39
Daytime sleepiness	8	0.4–0.72	8	100	0.01–0.35

4 The fourth factor has a strong correlation with the 2 questions, and "sleep anxiety" is named, and also includes questions 11, 12;
5 The fifth factor has a strong correlation with the 4 questions, and "night walking" is named, and also includes questions 13, 14, 15, 19;
6 The sixth factor has a strong correlation with the 6 questions, and "parasomnia" is named, and also includes questions 16, 17, 18, 20, 21, 22;
7 The seventh factor has a strong correlation with the 3 questions, and "sleep breathing disorders" is named, and also includes questions 23, 24, 25;

Table 7 KMO and Bartlett's test of sphericity as a result of the correlation matrix for children's sleep habits questionnaire

KMO		0.755
Bartlett's test of sphericity $P < 0.001$	Approximate χ^2	
	d.f.	528
	Significance	.000

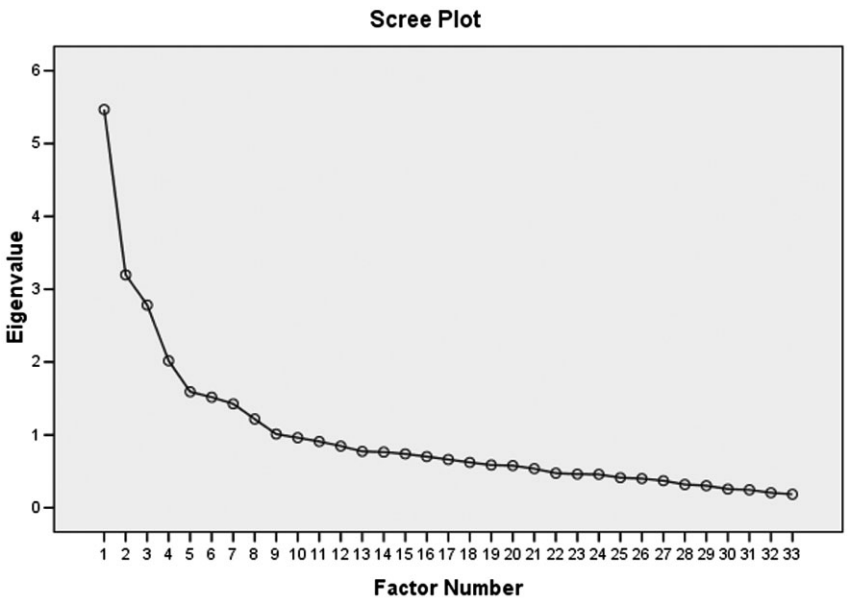

Figure 1 Plot of Eigenvalues.

8 The eighth factor has a strong correlation with the 9 questions, and "daytime sleepiness" is named, and also includes questions 3, 26, 27, 28, 29, 30, 31, 32, 33.

DISCUSSION

The CHSQ was primarily developed as a screening tool. The findings showed that the Persian version of the questionnaire is an acceptable instrument for identifying patterns of sleep and its disorders in school-aged children. According to the results, Cronbach's alpha coefficient was 0.80 for the entire questionnaire. The coefficient demonstrated high reliability for Iranian children. Owens *et al*. showed Cronbach's alpha coefficient of 0.68 (the range of Cronbach's alpha was 0.36 to 0.70 for the dimensions of the questionnaire).[13] Li H *et al*. in China also indicated Cronbach's alpha coefficient of 0.80 for the whole questionnaire so that the range of Cronbach's alpha was 0.49 to 0.72 for the dimensions of the questionnaire.[17] In Germany, Schlarb *et al*. demonstrated Cronbach's alpha coefficient of 0.68. The range of Cronbach's alpha was 0.23 to 0.70.[11] In Portugal, Filipe Gloria *et al*. obtained Cronbach's alpha coefficient of 0.78 for all the questions and a range of 0.44 to 0.74 for the dimensions of the questionnaire.[18] In the United States (USA), Cronbach's alpha coefficient was 0.80 for the entire questionnaire.[13] In the study of Narendhran *et al*. in India, Cronbach's alpha coefficient was 0.70 for the entire questionnaire, and the range of Cronbach's alpha was 0.14 to 0.67.[19] As a result, internal consistency was higher in groups that had more sleep disorders. Also, the American sample was more heterogeneous than ours and the Chinese samples. This is likely due to the lower reliability of the US sample. Differences in the studies may also be the result of assessing the questions in different groups of children. Similar studies showed that the number of study population has no influence on Cronbach's alpha coefficients.

Cultural and geographical differences between different populations should not be ignored in assessing children's sleep habits through the CSHQ questionnaire. In other words, various standardized versions based on language, culture and customs of different nations may not yield similar results. In our study, groups of children studied were healthy, and a comparison has not been made with people with sleep problems. Content validity, convergence and divergence validity, and factor analysis were used to calculate the validity. Convergence validity of the questionnaire was nearly 100% in all domains. Therefore, the questionnaire had appropriate validity to evaluate children's sleep habits, and questions of each dimension were able to measure the same dimension. Regarding divergence validity, although the correlation coefficient was not less than 0.4, it was lower than the convergence validity of a dimension considered, and in all of the cases, divergence validity of each question with other dimensions was less than the convergence validity of each question with its dimension. That is, the questionnaire is able to relatively separate dimensions from

others, and is acceptable. This can be due to parents' low literacy, lack of proper understanding and resolution of some questions, and the parental mental state at the time of answering questions. Also, correlation results of CSHQ and full BEARS ($P < 0.001$) showed the convergence of this questionnaire in measuring a single phenomenon. The correlation emphasized the same direction of scales in measuring a single phenomenon. Thus, there was a positive correlation between the results from BEARS and CSHQ. The adjustment correlation coefficient of Bonferroni was used and alpha was divided into 54 divisions so that alpha was significant ($P < 0.001$). The mean content validity was also determined to be approximately 96% by the panel of experts.

To assess internal consistency for this questionnaire, all correlation coefficients between dimensions of CSHQ were significant in the level of 0.001 ($P < 0.001$), but three cases were significant in the level of 0.05 ($P < 0.05$). The highest correlation was seen between the dimensions "resistance to going to bed" and "sleep anxiety". The internal agreement was good. Since the sampling adequacy index" KMO" in this data was 0.775, and the value of Bartlett's test was 2863 ($P = 0$), data were suitable for explanatory factor analysis. Findings of explanatory factor analysis showed that factors had a special value higher than 1, which means that the 33 questions were summarized in eight dimensions. The Scree Plot indicated that in the first eight factors, the slope is steep, but then the slope is uniform and constant. Eight factors can explain 57.595% of the total variance (changes in the observation) while Narendhran *et al*. (2008) showed 48.2% of the total variance. This means that summarizing the 33 questions in eight domains of the tool in Iranian culture is better than India. Our findings implied good reliability and validity of the CSHQ in the Iranian society.

Suggestion

One of the limitations of this study is that sleep disorders may not be well evaluated despite the efforts of parents to respond correctly to questions. Therefore, we suggest collecting data using observational studies, such as a polysomnography and actigraphy.

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