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Reliability and construct validity of the Children's Sleep Habits Questionnaire in Chinese kindergartners

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ABSTRACT

The Children's Sleep Habits Questionnaire (CSHQ) is widely used in clinical settings to screen for sleep problems in children aged 4–10 years. Existing studies on children in different cultures have included children across a wide age range and results have raised questions about CSHQ's psychometric quality. Our study addressed some of the limitations of existing studies by focusing on Chinese children within a much narrower age range of 4–5 years old. We tested the reliability and construct validity of the CSHQ in children living in Shanghai, China. Parents (mothers: 93%) of a random selected sample of kindergarten children aged 4–5 years ($N = 171$; 46.8% boys; one target child per family) from Shanghai, China provided data on their children's sleep behaviors. CFA and EFA were conducted using Mplus 7.3. Weighted least squares with mean and variance adjusted (WLSMV) were used as the estimation method in Mplus, due to the ordinal nature of item responses. Our analyses showed that, similar to most existing studies, the eight subscales of CSHQ had low internal consistency, with Cronbach's alphas ranged from .11 (Night Waking) to .62 (Daytime Sleepiness). CFA failed to confirm the 8-factor structure. EFA suggested that a six-factor structure should be extracted. Subsequent CFA with a newly identified set of items from CSHQ led to the exclusion of two uninterpretable factors, leaving four factors with 28 items: Bedtime Behaviors ($\alpha = .59$), Sleep Behaviors ($\alpha = .62$), Morning Wakings ($\alpha = .69$), and Daytime Sleepiness ($\alpha = .67$). The four factors represented some improvement to the psychometric quality of the CSHQ. Based on our findings and those from other studies, we concluded that the CSHQ should be used with great caution.

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Introduction

The Children's Sleep Habits Questionnaire (CSHQ) is a frequently used parent survey to screen 4- to 10-year-old children's sleep problems.¹ It has 48 items assessing the child's sleep behaviors at night and throughout the day and four write-in questions on the child's bed time, amount of time the child sleeps each day (nighttime sleep and naps), the duration between the time the child wakes up at night and returns to sleep, and the time of the day the child wakes up in the morning. The CSHQ is organized under five scales: Bedtime (one write-in question and 12 items on bedtime routines), Sleep Behavior (one write-in question and 18 items on nighttime sleep behaviors), Waking During the Night (one write-in question and three items on frequency of night wakings, whether child goes back

to sleep without help), Morning Waking (one write-in question and eight items on waking up in the morning, mood after waking up, as well as appetite for breakfast), and Daytime Sleepiness (seven items on naps, sleepiness during different daytime activities).

Although the CSHQ is organized under the aforementioned five scales, it also uses 33 of the 48 items to form a different set of eight subscales: Bedtime Resistance (6 items), Sleep Onset Delay (1 item), Sleep Durations (3 items), Sleep Anxiety (4 items), Night Wakings (3 items), Parasomnias (7 items), Sleep Disordered Breathing (3 items), and Daytime Sleepiness (8 items). Note that two items (afraid of sleeping alone and needs parent in room to fall asleep) load on two subscales: Bedtime Resistance and Sleep Anxiety. The 8-subscale structure is commonly used in research testing the reliability and construct validity of the CSHQ.

In evaluating the internal consistency of the 8-subscale structure of the CSHQ, studies conducted in different societies (e.g., China, Germany, Israel, the Netherlands, Portugal, and the US) have

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similarly shown poor-to-very poor internal consistencies in some subscales.^{2,3} Typically, existing studies have found that of the eight subscales, no more than one has a Cronbach alpha coefficient higher than .70. For instance, in an early study on school-age children's sleep problems in China and the United States, Liu, Liu, Owens and Kaplan reported that the internal consistency of some of the CSHQ subscales was as low as .49.⁴ In a recent study on 2816 Chinese children aged 2–7 years of age, Liu, Wang, Tang, Wen and Li (2014) reported that none of the eight subscales had a Cronbach's alpha coefficient higher than .65.⁵ In a study on 98 1st–6th grade children in Israel, Tzchishinsky, Lufi and Scochat (2008) reported that some of the subscales' had Cronbach's alpha coefficients to be as low as .28 (Parasomnias), .46 (Sleep Disordered Breathing), and .49 (Night Waking).⁶

As these studies included children of different ages, from different countries, with and without clinical sleep problems, such low internal consistencies have raised concerns about the psychometric qualities of the subscales and the overall utility of these subscales. Consequently, some studies simply used the overall scale in data analysis, which reduces the potential contribution of this instrument in understanding the different aspects of children's sleep behaviors.⁷

In evaluating the construct validity of the CSHQ, existing studies have typically focused on the 8-factor structure as well. Again, existing studies have failed to confirm the 8-factor structure. Different studies have reported different factor structures. For instance, Sneddon, Peacock and Crowley suggested that a four-factor solution (Sleep Initiation, Sleep Distress, Transition to Waking, and Sleep Duration) using 24 of the 48 items was more appropriate than the 8-factor structure.⁸ Their study focused on young American children aged 2–5 years of age. Similarly, Waumans et al. found that the 8-factor structure did not fit the Dutch sample of 1145 children aged 4–10 years.³ They instead recommended that four items be deleted and three items to load on two factors, and the rest of the items be rearranged to form a four-factor solution. However, the authors did not specify the proposed four factors.

Recently, Liu and colleagues tested the construct validity of the CSHQ among 2816 Chinese children aged 2–7 years of age.⁵ They concluded that in order to maintain the 8-factor structure, the items from the original subscales needed to be shifted (i.e., items that were originally used to form one particular subscale had to be moved into a different subscale). Another study by Ren, Wang, Phull, and Zhang on 912 non-clinical Chinese children aged 6–12 years of age showed that the CSHQ data on children's sleep problems was conceptually more dimensional than categorical.⁹ They reported that the 8-factor subscales fell into three dimensions: bad sleep habits, which includes the combination of two subscales from the eight subscales (bedtime resistance and sleep anxiety), problems about sleep disorders, which includes three subscales from the eight subscales (night waking, parasomnias and sleep disorder breathing), and problems about sleep time and daytime napping, which includes three of the eight subscales (i.e., daytime sleepiness, sleep onset delay and sleep duration).

Overall, the existing literature shows that the CSHQ can be a good screening tool for sleep problems in clinical settings, but more research is needed to determine the reliability and construct validity of the CSHQ, especially with a narrower age range and within a non-western cultural context.¹⁰ One issue with the existing studies might have to do the wide age ranges of the samples. Therefore, in the current study, we tested the reliability and construct validity of the CSHQ in 4-to-5-year old children randomly selected from kindergarten classrooms in Shanghai, China.

Method

Sample

Upon receiving approval from the Changning Institute of Education, Changning District of Shanghai, China, the following

steps were used to identify the sample and to gather data for the current study. In September of 2014, we randomly selected 23 classrooms from three kindergartens in the Changning District of Shanghai, China for sampling. There were 622 children (Boys: 50%), including 284 4-year olds (Boys: 48.9%) and 338 5-year olds (Boys: 50.9%). From the 622 children, we randomly selected 180 children for the current study. The homeroom teacher of each selected child passed a sealed envelope containing the study information and a questionnaire to the child's parents. The parents were instructed to seal and return the questionnaire in a provided envelope. Overall, the questionnaires for 171 children (Boys: 46.8%) were returned (return rate: 95%). Overall, data on 83–4 years old and 88 5-years old were obtained and 93% of the informants were the children's mothers.

Measures

Demographics

The parent provided data the child's gender, birthplace, birth order, as well as the age at which the child moved to Shanghai (if applicable). The child's age in months was calculated based on his/her date of birth and the date of the survey data collection. The 171 children ranged in age from 4 years 1 months (49 months) to 5 years 11 months (71 months), with an average of 60.5 months ($SD = 6.7$), including 91 (53%) girls and 80 (47%) boys. The girls were 49–71 months old ($M = 59.6$, $SD = 6.6$) and the boys were 49–71 months as well ($M = 61.6$, $SD = 6.7$). The two groups did not differ in average ages, $t(169) = 1.97$, $P > .05$. Half (48.54%) were 4 years old and 51.46% were 5 years old. Most children (78.82%) were the only child of the household. The parent also provided data on age, marital status, weight, height, number of people in household, education level, birth place and employment status of mother and father. Each parent's monthly earning was reported on a 7-point Likert scale (1 = ¥0–1000, 4 = ¥3001–4000, 7 = ¥10,001 or more). Most of the children were from two-parent households. Most of the parents worked full time. Over 80% of the mothers and 85% of the fathers had at least a college level education. Over half of the mothers and nearly 80% of the fathers made ¥5000 or more monthly.

Sleep behaviors

The parent completed the Chinese version of Children's Sleep Habits Questionnaire (CSHQ-C). As mentioned earlier, it has 48 items and 33 of them are used to form eight subscales. Items on the CSHQ focused on the sleep habits and behaviors of young children at night and in the day time. All items, except four items on daytime sleepiness, are measured with a 3-point Likert scale (1 = Rarely, 2 = Sometimes, and 3 = Usually). Four items in the daytime sleepiness subscale are measured with a 3-point Likert scale (1 = Not Sleepy, 2 = Very Sleepy, and 3 = Falls Asleep). Items that describe good sleep behaviors are reverse-scored so that higher scores indicate more sleep problems.

Data analysis plan

To evaluate the internal consistency of the CSHQ, we examined the Cronbach's alphas of each subscale and the overall scale. Alphas based on our sample were then compared with those in the initial psychometric study by Owens et al.¹ and several other recent studies based on samples from different countries. The purpose was to comparatively evaluate the reliability of subscales and the overall scale of this study, with other studies serving as the references.

To examine the construct validity of the CSHQ, we performed confirmatory factor analysis (CFA). Three CFA models were fitted to the data, including: (1) the model that reflects the factor structure as presented in the questionnaire (i.e., 48 items organized under five

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