



## Original Article

# Psychometric properties and population-based score distributions of the Japanese Sleep Questionnaire for Preschoolers



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## ABSTRACT

**Objective:** We aimed to present psychometric properties and describe the score distributions of the Japanese Sleep Questionnaire for Preschoolers (JSQ-P), a guardian-reported survey questionnaire for assessing sleep disturbances and problematic sleep habits among preschool children.

**Methods:** Guardians of 2998 toddlers in three communities and guardians of 102 patients diagnosed with sleep disorders in two clinics completed the JSQ-P.

**Results:** Exploratory factor analysis (EFA) revealed the 10 domains of the JSQ-P to be similar to our previous small-scale study and confirmed the robustness of the JSQ-P. The JSQ-P showed acceptable internal consistency;  $\alpha$  coefficients ranged from 0.622 (insufficient sleep) to 0.912 (restless legs syndrome [RLS], motor) for the community sample and 0.696 (insufficient sleep) to 0.959 (RLS, motor) for the clinical sample. The score differentiations between the community and clinical samples associated with RLS, obstructive sleep apnea syndrome (OSAS), morning symptoms, parasomnias, excessive daytime sleepiness, and daytime behaviors were demonstrated in our study. The distributions of percentile T scores for each sub-scale and age and gender differentiation of scores also were evaluated.

**Conclusions:** We confirmed that the JSQ-P is a valid and reliable instrument to evaluate Japanese sleep habits using a large population-based sample. The JSQ-P may be useful in both clinical and academic settings.

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## 1. Introduction

Sleep disturbances are common in children, ranging from 25% to 40% among preschool-aged children and adolescents [1–3]. According to a questionnaire-based study among children aged 6 months to 6 years, obstructive sleep apnea syndrome (OSAS) was estimated to affect at least 1–3% [4]. Moreover, the prevalence of restless legs syndrome (RLS) is reported to be 1.9% in children ages 8–11 years [5]. However, sleep problems in children remain underrecognized at the primary care level despite the relatively high prevalence of sleep disorders [6–9].

Sleep disturbances can have a profound effect on children. Studies have described the association between insufficient sleep and behavioral and affective disorders, as well as suboptimal school performance secondary to impairment of attention [10,11]. In

addition, sleep disturbances may be misconstrued as possible cognitive impairment [12]. Touchette et al. [13] also reported that children between the ages of 2 and 6 years who had short sleep duration patterns were more likely to demonstrate hyperactivity impulsiveness and lower cognitive performance at the age of 6 years. Therefore, early identification and management of children with sleep problems may prevent future functional impairment.

Several screening questionnaires for sleep disturbances have been developed for clinical and research purposes in Western countries. Owens et al. [14] introduced the Children's Sleep Habit Questionnaire (CSHQ), a parent- or guardian-reported questionnaire probing problematic sleep domains in school-aged children between the ages of 4 and 10 years. The CSHQ constitutes 35 items divided into eight domains: bedtime resistance, sleep-onset delay, sleep anxiety, night waking, parasomnias, sleep-disordered breathing, and daytime sleepiness. It has been commonly used in Western countries [15,16] but also in Asia, including Japan [17–19]. Goodlin-Jones et al. [20] also reported on the validity of the CSHQ

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in toddlers and preschool children aged 2–5.5 years. Similarly the Sleep Disturbance Scale for Children [21], Pediatric Sleep Questionnaire [22], and Omnibus Sleep Problems Questionnaire for School-aged Children [23] also have been used to assess sleep problems in children.

However, these instruments were originally developed in consideration of the Western sleep culture and may not be entirely appropriate for the Japanese sleeping conditions and sleep culture. First, Japanese children have been described to have poor sleep habits, including delayed sleep onset and short sleep duration compared to other countries [24]. A recent cross-cultural study also reported that the sleep duration of children in Japan was the shortest among 17 countries [25]. In addition, parents were less likely to regard these situations as serious [24]. This relatively low consideration of sleep hygiene can potentially produce unique sleep characteristics in Japan. Second, there are cultural differences in sleep environments. Based on the National Survey, approximately half of all young individuals including children sleep on a Japanese-style bed called a futon, which is a thin mattress made of a cotton pad, placed directly on the floor [26]. Sleeping on a futon facilitates the movement to another individual's futon. Moreover, bed or room sharing is more prevalent in Japan compared to other countries, particularly in toddlers and preschool children [27]. Children who sleep in their own rooms account for only 3% in Japan, with 88% reportedly sleeping in their parents' room [24]. Thus these unique Japanese sleeping habits and conditions require a sleep culture assessment different from the Western questionnaires.

We recently developed a valid and reliable questionnaire to screen for signs of sleep disorders and problematic sleep habits, which can be easily applied to Japanese preschool children [28]. In our study, research clinicians with extensive experience in assessing and treating pediatric sleep disorders constructed 76 items based on preexisting questionnaires, such as the CSHQ and on the *International Classification of Sleep Disorders*, second edition (ICSD-2). Items included symptoms of sleep disorders, such as OSAS and RLS, as well as sleep habits. When designing the initial questionnaire, clinicians and researchers asked 10 parents or guardians of children with sleep disorders and eight women ages 22–40 years to ensure that the sentences were correct and were not awkwardly phrased. Participants completed our questionnaire by rating on 6-point frequency and 6-point intensity Likert scales. After considering missing values and the variance of responses, the 6-point intensity rating scale was chosen. Although other instruments typically are rated on a smaller number point frequency scale (e.g., CSHQ has a 3-point frequency rating), the Japanese culturally avoid explicit responses and tend to respond moderately. Thus a 6-point scale circumvented any midpoints and provided a suitable range of responses. To enhance the reliability and efficiency of the scales, items with extreme mean scores, high skewed values, a restricted range of responses, or a high number of missing data were removed from the initial pool of items. The remaining items were analyzed using exploratory factor analysis (EFA). The final 10 subscales consisting of 39 items were named the Japanese Sleep Questionnaire for Preschoolers (JSQ-P) and its reliability measured by  $\alpha$  coefficient was 0.67–0.99 [28]. The validity was confirmed by a comparison of subscale scores of community and clinical samples.

The validity and reliability of the JSQ-P was evaluated in our previous study, but it was conducted on a small sample; in addition, the distribution of scores was not included due to a relatively small study population (community sample size, 86; clinical sample size, 32). To effectively apply questionnaire-based screening in clinical practice, information regarding standardized scores is essential. Therefore, our study aimed to: (1) examine the robustness of factor structure in a large sample, (2) test its reliability

and concurrent validity, (3) describe the distribution of scores of the JSQ-P in Japanese preschool children, and (4) confirm the age and gender difference of the score distribution.

## 2. Methods

The study protocol and questionnaire were approved by the Human Research Ethics Committee of the Institutional Review Board at Osaka University Hospital.

### 2.1. Participants

All guardians provided informed consent for our study. Participants were enrolled from the community and clinics. The community group initially consisted of 2998 guardians of preschool-aged children. We recruited guardians from three different groups for our study: private kindergarten, nursery school, and recipients of regular physical examinations at the age of 3 years. The kindergarten sample was taken from a private kindergarten affiliated with the University in Tokyo, which likely reflected a higher socioeconomic status, according to the National Survey of Household Expenditure for Children's Education [29]. The nursery school sample was composed of children attending 19 public nursery schools located in Osaka, which typically consists of a low or middle socioeconomic class with a 2-income household. These two samples appeared to encompass all socioeconomic groups, but children who did not attend kindergarten or nursery school and instead remained with a stay-at-home parent were excluded. To eliminate this sample bias, we also conducted surveys when children received their physical examination. Our sample consisted of children who received government-regulated regular physical examinations at the age of 3 years, which were conducted by the public healthcare center in the Osaka prefecture.

The clinical group initially consisted of 102 preschool-aged children seeking treatment at the pediatric sleep clinics of Osaka University Hospital and Osaka Kaisei Hospital in Osaka, Japan. All participants met diagnostic criteria for either a primary or secondary diagnosis of sleep disorder, including OSAS, RLS, insomnia, nocturnal enuresis, and night terrors.

### 2.2. The Japanese Sleep Questionnaire for Preschoolers

The JSQ-P consists of 39 items classified into 10 domains according to psychometric condition, namely OSAS, RLS-sensory, RLS motor, morning symptoms, sleep habits, parasomnias, insufficient sleep, daytime excessive sleepiness, daytime behaviors, and insomnia or circadian rhythm disorders.

Participants completed the JSQ-P by rating on a 6-point intensity Likert scale, in which a score of 6 referred to strongly agree/true/applicable and 1 referred to strongly disagree/agree/false/inapplicable. Higher scores indicated greater signs of sleep disorders or deleterious sleep habits with the exception of two items, which served as reverse items to confirm response consistency and respondents' correct understanding of both syntax and rating method. Reversed items were rescored prior to analysis.

### 2.3. Procedure

In the clinical group, clinicians handed out questionnaires, which were collected onsite from the guardians following completion. In the community group teachers or nurses distributed the questionnaires, which were collected onsite from the guardians following completion. All submitted surveys remained completely anonymous and did not include any personal information that might identify the respondent or their child.

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