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The Development and Psychometric Properties of the Children's Sleep Assessment Questionnaire in Taiwan

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Purpose: To develop and examine the validity and reliability of the Children's Sleep Assessment Questionnaire (CSAQ) for school-aged children in Taiwan.
Design and Methods: We used a cross-sectional study design with stratified random sampling. Pairs of children and parents were recruited from a school-based sample of third- and fourth-grade students, enrolling 362 child and parent pairs. The content validity, construct validity, convergent validity, internal consistency, and inter-rater reliability of the CSAQ were assessed.
Results: The CSAQ comprised three parts: sleep hygiene, sleep quality, and sleep disturbance. Sleep hygiene showed a moderate intra-class correlation coefficient (0.37–0.66) between children and parents. Results of exploratory factor analysis suggested a four-factor structure model for sleep quality with 64.9% of variance and a two-factor structure for sleep disturbance with 57.7% of variance. These two models also demonstrated good fit with the confirmatory factor analysis.
Conclusions: The CSAQ is a valid and reliable instrument for assessing sleep problems in school-aged children.
Practice Implications: Both clinicians and researchers can use the CSAQ to screen or elucidate the children' sleep problems.

SLEEP PLAYS A pivotal role in the health and well-being of children. Insufficient sleep can impede metabolic function and lead to obesity in school-aged children (Cespedes et al., 2014; Spruyt, Molfese, & Gozal, 2011). Moreover, insufficient sleep can result in excessive daytime sleepiness, impaired attention, and impaired concentration, as well as problems with learning (Kopasz et al., 2010), behavioral and emotional regulation (Hansen, Skirbekk, Oerbeck, Wentzel-Larsen, & Kristensen, 2014; Pesonen et al., 2010), cognitive performance (Ferri et al., 2010; Gruber et al., 2010; Wang, Wang, et al., 2013; Wang, Xu, et al., 2013), and school performance (Li et al., 2013). Therefore, children's sleep affects not just physical growth but also behavior, cognitive function, and school performance.

Unfortunately, sleep problems are common among school-aged children in various cultures. The incidence of sleep problems ranges from 23.8% to 43.0% among Chinese (Li et al., 2013; Wang, Wang, et al., 2013; Wang, Xu, et al., 2013), Finnish (Simola et al., 2012), and American

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school-aged children (Surani et al., 2015). Recent studies have also revealed that daytime sleepiness occurs in over 62% of school-aged children (Li et al., 2013). This high prevalence indicates that sleep problems are an important modern social issue for child health.

Polysomnography is the gold standard of objective sleep biophysiological changes (Marcus et al., 1992; Uliel, Tauman, Greenfeld, & Sivan, 2004). Actigraphy is also an objective measure of rest/activity cycles (Waldon et al., 2016). However, they both fail to qualify the subjective experience of sleep quality or sleep hygiene, such as difficulty waking in the morning or daytime sleepiness. Moreover, needed sleep hours are different in different people. Thus, the individual's objective sleep quantity may be good, but subjective experience may be bad. If we obtain both objective and subjective data to assess sleep, we will not only know the sleep biophysiological changes or rest/activity cycles but also know the individual's subjective perception. Thus, both objective quantity and subjective quality are important for sleep assessment. A self-report measure to assess children's subjective experience of sleep problems is therefore needed.

Sleep problems in children are multifaceted, covering multiple domains. The best predictor for sleep change, such as reduced sleep length and circadian shift, is age (Iglowstein, Hajnal, Molinari, Largo, & Jenni, 2006). The most marked reduction in sleep duration occurs when children attend primary school. Since bedtimes become increasingly delayed, yet morning rising times remain fixed (Li et al., 2013). In Chinese society, children's academic performance is emphasized, which often requires extra classes after school. Children spend more time on their studies, adversely affecting their sleep–wake habits and sleep duration (Li et al., 2014). These differences suggest that sleep problems are driven not only by biological processes but are also influenced by social and cultural factors (Li et al., 2010). Thus, sleep assessment, reflecting sleep's multidimensional nature, is necessary for school-aged children.

Based on existing literature (Meltzer et al., 2013; Orgilés, Owens, Espada, Piqueras, & Carballo, 2013; Yolton et al., 2010), a multidimensional children's sleep assessment tool should include three components: sleep hygiene, sleep quality, and sleep disturbance. Sleep hygiene refers to lifestyle and environmental factors that affect an individual's sleep quality (Meltzer et al., 2013; Yolton et al., 2010). Sleep quality refers to quantitative sleep patterns, night waking, waking in the morning, and daytime sleepiness (Drake et al., 2003; Meltzer et al., 2013). Sleep disturbances refer to behaviors that occur only during sleep, such as snoring or sleepwalking (Meltzer et al., 2013). Currently, no multidimensional questionnaire on sleep assessment exists for school-aged children in Taiwan.

Secondary, parents may be unaware of certain aspects of children's sleep hygiene (e.g., exposure to second-hand smoke or daytime caffeinated beverage consumption). Children reported more caffeine consumption than parents did (Meltzer et al., 2013). Additionally, approximately 40% of parents are not aware of children's difficulties in sleep-onset latency, night waking, or poor sleep quality (Meltzer et al., 2013). Therefore, sleep hygiene and quality reported by children may be more accurate than parental reports. By contrast, status of sleep disturbances is best reported by the parent as an observer (Meltzer et al., 2013). For example, snorers may not know they are snoring during sleeping. Thus, assessments that rely solely on parent- or child-reported questionnaires may result in incomplete information. Both perspectives are necessary for a complete picture. However, currently available multidimensional assessment tools on children's sleep rely exclusively on either parent- or child-reported questionnaires. Only few measures include both parents' and children's reports (Lewandowski, Toliver-Sokol, & Palermo, 2011; Spruyt & Gozal, 2011). To our knowledge, the Children's Sleep Habits Questionnaire (CSHQ) (Owens, Spirito, & McGuinn, 2000) is the most commonly used tool in child sleep science in Chinese societies. However, CSHQ is a parent-reported measure and does not examine children's sleep hygiene.

Because of the need for a comprehensive self-report measure of Taiwanese school-aged children's sleep, we developed the Children's Sleep Assessment Questionnaire (CSAQ). The CSAQ includes three components – sleep hygiene, sleep quality, and sleep disturbance – with reports from both parents and children. We proposed that the CSAQ will provide a holistic picture of children's sleep. The purpose of this study was to describe the development of the CSAQ and examine the CSAQ's reliability and validity in measuring sleep problems in Taiwanese school-aged children.

Methods

Developing Initial Items

The CSAQ focuses on children's sleep problems. The initial scale and items were developed on the basis of previous literature (Meltzer et al., 2013; Orgilés et al., 2013; Owens et al., 2000; Yolton et al., 2010) and the researchers' clinical experience. The questionnaire comprised three parts, chosen for their ability to identify sleep problems or insufficient sleep. Part one, "sleep hygiene" concerns social and cultural factors, such as lifestyle and environmental sleep factors that influence children's sleep quality. Thus, sleep hygiene includes indices of diet, exercise, electronics use, sleep routine, and the environment. Part two, "sleep quality" includes bedtimes, wake times, sleep latency, night waking frequency in varying situations, difficulty waking in the morning, and daytime sleepiness in different situations (in school, during short car rides, while doing homework, and while watching television). Part 3, "sleep disturbance" includes parasomnias and sleep-disordered breathing. The original scale comprised three parts with a total of 44 items: 16 items for sleep hygiene, 20 items for sleep quality, and 8 items for sleep disturbances. Literature showed that sleep