Original Article

Reliability and Validity of the Turkish Version of "Brief Infant Sleep Questionnaire and Daily Sleep Log"

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Abstract

Sleep problems are quite common in children in all over the world and it is important to screen these problems. The objective of this study is to determine the reliability and validity of Turkish version of Brief Infant Sleep Questionnaire (BISQ) and Daily Sleep Logs (DSL) by comparing the measures of the two tools. Standard method (translation and back translation) for the process of translation of original BISQ and DSL questionnaires into Turkish language was used. It was tested among 15 mothers for understanding, its'clarity and uniformity of expected response. The final version of Turkish translated forms were approved by expert panel with consensus agreement. Sixty volunteer mothers and their 0-36 month's old children who visited a well-child outpatient department of a pediatric hospital participated in this study. A significant correlation was found between BISQ measures and those of DSL. Test-retest measures of the seven variables of BISQ demonstrated medium and high correlations (.35 – .85) and significant ($p < .000$) relationships were noted. No significant statistical differences ($p > .05$) were found between test-retest (paired sample t test) scores of BISQ measures. Similar results of the two consecutive tests proved the stability of BISQ. The findings supported the reliability and validity of the Turkish version of BISQ and DSL as a tool to assess sleep in infants and toddlers in clinical settings as well as in research.

Key words; Infants, Toddlers, Sleep Problem.

Introduction

Humans spend about *one-third* of her/his live asleep. In his original hierarchy of needs five-stage model, Maslow noted that sleep is a vital need among the biological and physiological needs (Leod Mc 2016). Sleep is a maturational process which *evolve rapidly during* the *first year* of *life*. Sleep problems distrupt the family life and are often a major trouble for parents and health professionals, especially in the first three years (Acebo 2005). Sleep patterns and sleep problems of infants and toddlers have been examined inmany countries (Brockman and Urschitz 2016).

Sleep problems are highly prevalent in young children, occurring in approximately 20% to %30 of infants and toddlers and occur across cultures (Mindell J et al., 2009). In these infants and children, prevalence of difficulties in falling asleep is around 10-29 % and frequent night wake up is around 15-25 %. The ratio of these problems differs depending on the childhood phases of maturity (Burns and Grove 2005, Lewina 2002, Öner and Barut 2009). According to the worldwide studies on infant sleep problems, high ratios were found to be 36-41% in Australia, 10-30% in the USA, 11% in Thailand, 15-35% in New Zealand and 76% in China (France and Blampied 1999, Sadeh 2010) In infants and children, sleeping problems are defined mostly as; difficulty in falling asleep, night wake ups (might be accompanied by crying) and sleep irregularities after two months. Sleep problems such as bedtime struggles and night wake ups are some of the most common behavioral problems encountered in the first 3

years of life (Sadeh 2003). Sadeh reports that if the night awaking problems are not treated in the early stage of life, these problems may persistent and can last into adulthood (Sadeh 2004). Critical risk/protective factors for sleep problems have been defined including health literacy, TV in the room, feeding, close contact and arousing activitiesat bedtime, intolerance for infant crying, co-sleeping, maternal depression and infant temperament. Cross-cultural differences have been noted both for infant sleep problems and parents' perceived distress by those problems (Field 2017). Bathory et al. (2016) implemented a study on "Infant Sleep and Parent Health Literacy". They enrolled 557 caregivers of 9-month-old children; 49.6% reported having a TV in the room where their child sleeps; 26.6% did not have regular naptimes nor bedtimes. Median sleep duration was 2.3hours (daytime), and 9.0 hours (night) (30.2% low daytime; 20.3% low nighttime sleep duration). Children of parents with low HL were more likely to have a bedroom TV and low night time sleep. Among the sleeping problems, inappropriate sleeping habits and consequently in adequate sleeping time is reported to be a common public health problem among children (Spruyt and Gozal 2011). Biological and cultural determinants and the interaction between these two factors affect the sleep behavior and its development (Hiscock 2010). Maturational, intrinsic, constitutional, biological, temperamental and medical factors influence the infant sleep. Parents' beliefs, expectations, emotions and behaviors related to infant sleep are influenced by their socio-cultural and environmental context. Besides the infant's age and developmental characteristics and its own sleep patterns, personality and psychopathology of the parents'influence the infant sleep (Sadeh 2009). In their study, Hiscock and Wake (2002) investigated sleep problems in new born infants. In this study 12 % of the mothers said that their children's sleep problem was continuous and 19 % of them reported that the problems reoccurred. It was observed that mothers, who have children with sleep problems, were relatively more depressed (Hiscock 2002).

According to recent literature on parenting and infant sleep, the link between parental behaviors and infantsleep is the most immediate and direct path of a transaction model (Sadeh and Tikotzky 2009). In their study Sadeh and Mindell (2009) determined that the best predictors of nighttime sleep were those related to bedtime interaction, although sleep location was found to be significantly related to sleep outcomes, this relationship was predominantlymediated by parental behavior. Moreover, especially for families with limited living space where parent/child room- or bed-sharing cannot be avoided but theparental behavior at sleep initiation, with allowing thechild to fall asleep independently being link tolonger night sleep duration in our population of childrenwith short sleep duration (Yu and et al., 2017). In another study implemented by Sadeh and Mindell (2009), study results indicate substantial cross-cultural differencesin sleep patterns in young children. Some study results reveal that sleep problems of children were not defined and investigated properly, and therefore, frequently ignored (Chervin and et al., 2001). Owens (2001) conducted a study to assess academic pediatricians' knowledge, screening, evaluation, treatment practices, and attitudes regardingsleep disorders among children in a large community-based sample. In this study only 16.5% and 18.2% of the pediatricians reported not screening routinely for sleep disorders in infants and toddlers respectively, but 43.9%of them declared that theyscreenedin adolescents. More than 20 % of the pediatricians reported that they never investigated the sleep problems of infants and children during a routine evaluation (Brokmann and Urschitz 2010). Sadeh, Mindell and Rivera (2010) implemented a study on "My child has a sleep problem: A cross-cultural comparison of parental definitions". They reported the need to further explore the role of demographic and cultural variablesin definingsleep problems, and parents' behaviors in seeking treatment for infant sleep problems (Sadeh and Mindell 2015). In another study implemented by Sadeh et al. (2016), study results suggest that parents of sleep-disturbed infants appear to have lower tolerance for infant crying, which may be a predisposition underlying their excessive involvement in soothing their infants to sleep which may lead to the development of sleep problems (Sadeh and et al., 2016).

Nurses as the closest health professional with parents, can identify sleep problems at the early stages of infanthood, in either health institution or during home visits. Sleep pattern disturbance is a well known nursing diagnosis in the context of Nanda Nursing Diagnosis Classification System (Carpenito 2004). Pediatricians and nurses need tools to identify infant sleep

problems and to help the concerning parents so that they could be aware of the needs of their infants/children. There are too many diagnostic or epidemiological tools in assessing pediatric sleep and sleep problems. Lomeli et al. (2008) reported Brief Infant Sleep Questionary (BISQ), Sleep Disturbance Scale for Children (SDSC) and Pediatric Sleep Questionnaire (BSQ) in their critical review of the sleep scales designed for child. Spruytand Gozal (2010), in their study examined published and unpublished instruments used to investigate or evaluate sleep problems in children. They determined that only a few of them were valid and standardized and had appropriate psychometric criteria. Although taking family history is the most important step in identifying the type and source of the sleep problem, the use of brief screening tools is another key point in providing of screening services by health care providers. Among these tools, BISQ (Brief Infant Sleep Questionnaire) is the only questionnaire which identifies infanthood sleep problems (Spruyt and Gozal 2011). The BISQ includes specific questions about infant daytime and night-time sleep patterns, and a range of sleep-related behaviors. Bedtime routines and sleeping arrangements such as bed sharing and room sharing are also assessed in this questionnaire. BISQ was developed by Sadeh in 2004. Later in 2009 the form was expanded by Sadeh and his friends in which the expanded BISQ was used (Sadeh 2009). Sadeh tested the reliability of the form by comparing actigraph records and and Daily sleep logs reported by mothers. Sadeh (2004) also tested the form in terms of stability in time and reliability through test-retest method. The following BISQ measures 1) the child wakes > 3 times per night; 3) nocturnal wakefulness is >1 hour; or 3) the total sleep time is < 9 hours were the basic criteria used to define poor sleepers (Sadeh 2004).

The aim of the present study was to translate and test the reliability and validity of the Turkish Version of Brief Infant Sleep Questionaire (BISQ) and Daily Sleep Logs (DSL).

Methods

Participants

Methodological study was implemented in a governmental child hospital in the city of İzmir, Turkey. Data was gathered in healthy child outpatient department between February and June 2011**.** The participants of the study covered 60 volunteer mothers and their 0-36 month's old children. Among the mothers who attented this unit for routine controls, immunization, check-up and hearing screening of their newborn babies and who accepted to cooperate and willing to take part in the research, were included in the study. The mean age of the children was 8.6 ± 10.35 months (range= 0- 36), 40% of the children was girls and, 60% was boys. *Mothers* had a mean *age* of 27.6± 4.3 *years* (*range = 19-36*).

Instrument

Data was gathered by using BISQ and DSL which were originally developed by Sadeh (2004) for measuring screening sleep problems among children for diagnostic purposes. The BISQ is consisted of the following seven variables as sleep measures; 1) nocturnal sleep duration 3) day time sleep duration 3) number of night awakenings 4) duration of waking during the night hours 5) nocturnal sleep onset time 6) settling time 7) total sleep duration (Sadeh et al., 2004). Completion of the BISQ required 5-15 minutes.

Measures included in DSL are as follows; 1) nocturnal sleep duration 3) day time sleep duration 3) number of night awakenings 4) duration of waking during the night hours 5) nocturnal sleep onset time 6) settling time 7) total sleep duration. Sadeh (2004) suggested clinical cutoffs for the instrument. If the child wakes up more than 3 times a night or stays awakened more than one hour or sleeps less than 9 hours during a day (24 hours) could be considered having sleep problem. In order to determine the daily measures, average of the total values of seven days and nights were calculated (Sadeh 2004). On the day that they visited the outpatient department mothers completed the BISQ (pretest) in the hospital and they completed DSL as a sleep diary, 24 hours a day 7 days a week period constantly by observing her child at home. Three weeks after they brought back DSL and completed BISQ as post test in the hospital.

Total sleep duration was measured by adding nocturnal sleep duration to the day time sleep duration and then duration of wakefulness during the night hours was subtracted from the total. Moreover daily sleep duration was measured by dividing total weekly sleep duration by seven.

Data Analysis

In the research, for the data analysis Statistical package for Social Sciences programme (SPSS

version 16.0 for Windows.SPSS Inc.) was used. Kendall's W was used to assess the trend of agreement among the experts for content validity (Lomelí and et al., 2008) To determine test-retest reliability, Pearson Correlation Coefficient, Paired Sample t Test and K Related Sample t Test were used to compare the average of sleep measures. To compare the average of BISQ (pre-test), BISQ (post –test) and the DSL measures, One-Way Variance Analysis was used. Values less than .05 were considered not statistically significant.

Ethics of the study

Written permission to translate the BISQ and the DSL into Turkish was obtained from Sadeh by e-mail (personal communication). Written approval was also obtained from Ege University, Faculty of Nursing Ethics Committee and from the hospital authorities to carry out the study. An informed consent form including information about the purpose of the study, the length of time it would take to complete and their rights was signed by the participants. Participants were assured that the questionnaire was anonymous, participation was voluntary and they could with draw from the research at anytime and the data collected would be kept confidential (Erefe 2002).

Data collection

The primary author administered the questionnaires to each mother in a private room while they were waiting for the examination of their child in the healthy child department of the hospital. BISQ were filled by the mothers as a pre-test and the researcher gave the DSL questionnaire tothem and requested them to complete it each day and night for a week period observing her child at home and hand it to the researcher in 3 weeks time (Sadeh 2004). BISQ was completed again by the mothers as a post test when they returned back the DSL during that meeting at the hospital. Full completion of the BISQ and the DSL was the criterion for inclusion in the study (Erefe 2002).

Translation Procedures

The aim of cross-cultural translation is to achieve equivalence between two different languages and the process covers content, semantic, technical, criterion, or conceptual equivalence. For the translation process four steps were used. Translate-back translate method was used for the extend of language equivalance of BISQ and DSL. Translation into Turkish and back-translation was employed according to WHO guidelines (Tamara 2009). Two forms were translated into Turkish independently by the two investigators, one pediatrician and one nurse academician. Two experts in public health nursing compared the two manuscripts and gave positive feedback. The investigators reviewed the translated forms and any uncertainities regarding terminology were handled through discussions between the translators and the researchers, and finally the Turkish forms were prepared. A bilingual native speaker who was a specialist in English linguistics and who did not take part in the first step translated them back to English. The equivalence of the back-translated scale in English with that of the original scale was examined by all the translators and the investigators. When the process was concluded, forms were reviewed by Sadeh and found to be acceptable andrelevant to original ones (Flaherty and et al., 1988).

The final Turkish version was reviewed by nine faculty members (expert panel) to assess the suitability and clarity of its language, intelligibility, and understandability. The experts rated each statement representing one of the seven parameters of the BISQ and those of DSL by using a content validity index form (CVI). The experts rated each statement on a four –point scale (4=very relevant, 3=relevant with some adjustment to phrasing, 3= only relevant if profoundly adjusted and 1= not relevant (Sadeh and et al., 2016). Finally, the total CVI of the Turkish version of BISQ and DSL was found to be 0.89-1. It is necessary to pre-test the instrument on the target population. To ensure this, 15 mothers who would not be eligible for the main study, filled the questionnaires. Minor changes in wording were made and final forms showed no linguistic problems and finally content and face validity of the Turkish version of the BISQ and DSL were satisfactory.

Results

Reliability analysis

Reliability analysis for this study are presented in two components; 1) Assessment of test-retest reliability of BISQ, 3) evaluation of the correspondence of sleep measures between BISQ and DSL. The basic distribution of BISQ measures (Pre-test, Post-test) and the DSL in the total sample are shown in Table 1.

Table1: DSL, BISQ (Pre-test) and BISQ (Post-test) average values

	Daily Sleep Logs Mean SD	Pre-test (BISQ) Mean SD	Post-test (BISQ) Mean SD	p
Sleep-onset time, (hour)	22.48 ± 1.07	21.53 ± 4.03	21.20 ± 4.66	.72
Settling time, rating (min.)	0.50 ± 0.22	0.68 ± 0.32	0.70 ± 0.39	.03*
Night awakenings	2.03 ± 1.1	2.50 ± 1.14	2.41 ± 1.10	.005
Nocturnal wakefulness,(min.)	0.82 ± 0.53	1.08 ± 0.77	1.04 ± 0.86	.32
Nocturnal sleep Duration	8.51 ± 1.83	7.17 ± 1.91	7.56 ± 1.79	.000
Daytime sleep duration	3.08 ± 2.089	4.67 ± 3.17	4.39 ± 2.83	.000
Total Sleep Duration	11.60 ± 3.96	10.11 ± 1.59	10.17 ± 1.63	.65

To find out whether there were any differences between the measures, the averages were compared. The results of the analysis reflected differences between some measures derived from the BISQ (Pre-test), BISQ (Post-test) and DSL. Settling time derived from DSL was earlier than those derived with the BISQ (Pre-test) and BISQ (Post-test). Mothers reported significantly less night awakenings on DSL than BISQ (Pre-test) and BISQ (Post-test). The nocturnal sleep duration derived from DSL was longer than those derived from BISQ (Pre-test) and BISQ (Post-test). Daytime sleep durations derived from DSL were shorter than those derived from BISQ (Pre-test) and BISQ (Post-test). No statistically difference were found between the average of derived measures from BISQ (Pre-test), BISQ (Post-test) and DSL such as; sleep-onset time, nocturnal wakefulness and total sleep duration.

Test-retest reliability of BISQ

Pearson correlations were calculated for the sleep measures gathered from repeated administrations of BISQ. Strong and moderate positive significant correlations (.35 – .85) ($p < .000$) were found between the repeated sleep measures for nocturnal sleep duration ($r = .85$), daytime sleep duration ($r = .85$), number of night wakings ($r = .83$), duration of nocturnal wakefulness ($r = .63$), nocturnal sleep-onset time ($r = .75$), settling time ($r = .35$), and total sleep duration ($r = .49$). All correlations were significant at $p < .000$ level. To test whether there were any differences between the average of repeated measures, the pre-test and post-test results were compared by using Paired Sample t Test. The test results reflected no significant difference between the measures derived from the pre-test BISQ and post-test BISQ.

Table 2. BISQ (Pre-test) and BISQ (Post-test) correlation values

	Pre-test(BISQ)	Post-test(BISQ)	Pair sample t test		Correlation		BISQ -Sadeh(2004)		
			t	p	r	p	Mean _ SD	r	p
Sleep-onset time,h	21.53 ± 4.03	21.20 ± 4.66	.82	.410	.75	.000	20.61± 1.09	.95	.0001
Settling time,rating	0.68 ± 0.32	0.70 ± 0.39	- .29	.766	.35	.006	0.48± 0.31	.94	.0001
Night awakenings	2.50 ± 1.14	2.41 ± 1.10	1.00	.321	.83	.000	3.21± 2.47	.88	.0001
Nocturnal wakefulness,(h)	1.08 ± 0.77	1.04 ± 0.86	.388	.699	.63	.000	0.61± 0.64	.95	.0000
Nocturnalsleep Duration	7.17 ± 1.91	7.56 ± 1.79	1.62	.110	.57	.000	9.35± 1.40	.82	.0001
Daytime sleep duration	4.67 ± 3.17	4.39 ± 2.83	1.32	.190	.85	.000	2.25± 0.79	.89	.0001
Total Sleep Duration	10.11 ± 1.59	10.17 ± 1.63	- .39	.694	.49	.000	11.61± 1.57	NA	NA

Table 3. Pearson Correlations Between- methods (BISQ-Post-test and DSL)

Measures	r	p
Sleep-onset time, h	- .26	.159
Settling time, rating (min.)	.51	.003
Night wakings	.85	.000
Nocturnal wakefulness,(min)	.81	.000
Nocturnal sleep duration	.90	.000
Daytime sleep duration	.58	.001
Total Sleep Duration	.68	.000

Stronger significant correlations were determined between the BISQ (Post-test) and DSL regarding sleep measures related to number of night awakenings (r = .85), duration of nocturnal wakefulness (r = .81) and nocturnal sleep duration (r = .90). Moderate significant correlations were obtained between the BISQ (Post-test) and DSL regarding sleep measures related to daytime sleep duration (r = .58), settling time (r =.51), and total sleep duration (r = .67). All correlations were significant at $p < .000$. But no significant correlation was obtained between the BISQ (Post-test) and DSL in terms of sleep measure related to sleep-onset time (r = -.264, $p \geq .159$).

Discussion

The current study aimed to determine the reliability and validity of the Turkısh Version of BISQ and DSL that could be used in Turkish health services. The results of the study demonstrated the reliability, validity and applicability of the BISQ and DSL for screening sleep problems among infants and young children.

The stability of a measure is the extent to which the same scores are obtained when the instrument is used with the same people on separate occasions (Polit and Beck 2014). Assessments of stability are derieved through test-retest reliability procedures. In this study we administred BISQ to the mothers in two occasions in a three weeks period, and then the scores were compared. Reliability coefficients from repeated administrations of the BISQ ranged from .35 to .85 (Table 2). The higher the value, the more reliable (stable) is the measuring instrument.

Table 3 shows that sleep measures obtained demonstrated strong and moderate (.35 – .85) significant correlations ($p < 0.000$) and showed the stability of the mothers in completing the tests in reporting their childrens'sleep characteristics and sleep problems.

Significant correlations ascertained the stability of BISQ and showed that the mothers' reports did not change over time. This suggests that the use of Turkish version of BISQ is undoubtedly reliable and valid for screening sleep problems among infants and young children. Sadeh (2004), in his study, also obtained strong and significant correlations between the repeated sleep measures of BISQ ranging from .83 to .95 (Table 2). When we compared the Turkish version of BISQ (Pre-test) and BISQ (Post-test) correlation values with those reported in Sadeh's study, it became clear that stronger correlations were found in the original form in comparison to the Turkish version. Mothers'cultural characteristics and also attitudes, moods, knowledge and some other factors in the family could have relatively modified the measurements between the original and the Turkish form (Sadeh 2004).

Table 3 shows the correlations between the corresponding and related sleep measures derived from the BISQ and DSL. Stronger significant correlations were obtained between the BISQ (Post-test) and Daily sleep logs regarding sleep measures related to number of night wakings (r = .85), duration of nocturnal wakefulness (r = .81), nocturnal sleep duration (r = .90). Moderate significant correlations were obtained between the BISQ (Post-test) and DSL regarding sleep measures related to daytime sleep duration (r = .58), settling time (r =.51), and total sleep

duration (r = .67). All correlations were significant at p < .000. But no significant correlation was obtained related to sleep - onset time (r = -.264). According to studies implemented in many countries, approximately 20% -30% of familes have problems with sleep on-set delay in their childrens' first 2 or 3 years of life (Sadeh and et al., 2009). Sadeh (2004), in his study, also calculated correlations between corresponding or related sleep measures derived from the BISQ, the actigraphic data, and the daily sleep logs (Sadeh 2004). He found significant correlations between BISQ, and DSL measures related to number of night wakings (r = .83), sleep-onset time (r = .61) and nocturnal sleep duration (r = .27). It is clear that those infants' and childrens' sleep is influenced by parenting factors such as personality, beliefs, expectations, emotions and behaviors (Sadeh 2009). Cultural and environmental factors such as socio-cultural norms, values, socioeconomic factors, media influences and physical conditions are also related to infant sleep problems (Hiscock and Wake, 2010). The correspondence or incompatibility in the correlations of sleep measures derieved in two studies may result to the above mentioned factors of different countries.

Significant correlations obtained between the BISQ and DSL measures demonstrated a moderate degree of correspondence between measures derived from the BISQ and those derived from the DSL. DSL is a more time and attention demanding sleep measurement diary, but BISQ is a sleep measurement questionnaire which demands no time to determine the sleep problems among the infants and young children. According to these results, in assessing sleep problems among children using BISQ could be more practical comparing to DSL.

In conclusion, the results of this study support the reliability and validity of BISQ. It could be used as a tool for assessing and infants' and toddlers' sleep problems by the doctors and the nurses. Children suspected with sleeping problems could be referred for further clinical examination. Further studies in large sample size in primary health care services and in the hospital clinics are needed to confirm the findings.

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