Adaptation and validation of the Sleep Quality Scale among Saudi population (A-SQS)

Mohammed Alghamdi, PhD

Department of Education Science, University College -Tarabah, Taif University, P.O.Box 888, Taif 21974, Saudi Arabia

ABSTRACT

Introduction: The quality of sleep has a significant impact on an individual's health and overall well-being. Given the variability of factors that impact sleep quality and their varying degrees of significance between individuals, the utilization of a self-report approach becomes necessary. The Sleep Quality Scale (SQS) is a widely used self-report measure designed to evaluate sleep quality. It consists of six distinct techniques and encompasses a total of 28 items. The aim of this study was to translate and validate the SQS in the Saudi population.

Materials and Methods: A cross-sectional approach was applied to evaluate the reliability, validity, and cross-cultural suitability of the Arabic adaptation of the Sleep Quality Scale (A-SQS) in a sample consisting of 402 individuals, with 33.9% representing females.

Results: The test-retest reliability was found to be significant, with a coefficient of 0.88 at a 15-day interval. Additionally, the principal component factor (PCF) analysis revealed five factors, that accounted for 56.29 % of the total variance. The Cronbach's alpha coefficient was 0.90 for internal consistency.

Conclusion: This result determined that the A-SQS possesses a valid and reliable 5-factor structure when applied to the Saudi population. These therefore renders the scale a valid and reliable instrument in both clinical practice and clinical research.

KEYWORDS:
Reliability, sleep quality scale, validity, Saudi Arabia

INTRODUCTION

One of the key functions of sleep is to allow the body to rest and restore energy. Sleep disorders or insufficient sleep contribute to physical and mental health problems as well as affect the quality of life.[1-3] In addition, sleep is an individual experience influenced by factors such as age, gender, dietary habits, and overall physical and psychological well-being. The assessment of sleep quality is crucial as its components and significance vary among individuals.[4] Therefore, sleep quality measurements are essential not only in clinical practise but also in research.[3] A diagnosis of insomnia is primarily based on the evaluation of self-reported symptoms, according to the International Classification of Sleep Disorders, third edition (ICSD-3) Sateia [5], and the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) Reynolds III and O'Hara [6], the sleep diary has become a standard tool to assess the patient's self-reported insomnia perception. The use of structured and semi-structured clinical interviews to assess sleep is becoming more common in clinical practice.

Several instruments have been improved in order to explore sleep quality among individuals and its possible influencing factors. For instance, Pittsburgh Sleep Quality Index (PSQI) [4], the Stanford Sleepiness Scale (SSS) [7], and the Sleep Quality Scale (SQS).[3] Even though objective tools, for example the multiple sleep latency test (MSLT), are effective in diagnosing individuals' sleep quality, previous studies reported that they are not as convenient and reasonable as self-reported scales.[8-9] In addition, technical training is needed and it is expensive as well as requires much time for measuring and reporting data. Moreover, one of the difficult points is testing sleep quality because a lot of equipment is required for this process.[3] On the other hand, sleep scales have multidimensional features, for example SQS is able to evaluate sleep quality from multiple perspectives to comprehensively reflect the association between sleep and other psychological variables, for example well-being and depression.[10] In addition, Differ sleep quality experiences can be assessed by self-report methods, for example, sleep diary, sleep log, and sleep questionnaire, and attempt to measure both quantitative and qualitative features of sleep.[11] Therefore, these subject methods are inexpensive, easily administered, and appropriate for large surveys.

Yi et. al. reported that some sleep quality scales have been utilised before but demonstated numerous limitations for example, few all-inclusive assessment scales, items that are unassociated with sleep quality, or they exclude necessary items.[3] Moreover, few scales provide a total score.[3] The SQS was developed in South Korea in 2006, in order to measure the sleep status of individuals in the past month. It is one of the most popular self-report sleep quality scales. The SQS has a 28-item assessment of the sleep quality of individuals across six factors/domains: daytime dysfunction, restoration after sleep, difficulty in falling asleep, difficulty in getting up, satisfaction with sleep, and difficulty in maintaining sleep. The SQS demonstrated satisfactory reliability in a Korean sample population.[3]

In terms of usage, SQS has commonly been used in English and other languages. In South Korea, SQS was developed and used for two samples. The initial sample consisted of 629

This article was accepted: 23 July 2025
Corresponding Author: Mohammed Alghamdi
Email: mo.ghamdi@tu.edu.sa

people between the ages of 18 and 59 who were residing in the community. The second sample consisted of 110 subjects who were university students and had completed four years of education, 43.1% were male and 56.9% were female, with an average age of 20.6 years. SQS, which consisted of 28 questions and six covariates, explained 62.6% of the overall variance. The construct validity of the SQS score was validated by a significant difference (t=13.8, p=0.000) between insomniacs and normal participants. Cronbach's alpha coefficient demonstrated a high level of internal consistency, with a value of 0.92. Additionally, the test-retest reliability was found to be strong, as indicated by a correlation coefficient of 0.81 across a 2-week interval.[3]

In China, the SQS was used for 522 Chinese people aged from 18 to 56 years old. The result illustrated that the new version of SQS included 23 items across four factors/domains. The four factors were difficulty in getting up (2 items), difficulty in falling asleep (5 items), sleep recovery (6 items), and daytime dysfunction (10 items). In addition, men had lower scores on the element pertaining to the difficulty in initiating sleep, while displaying greater scores on the aspect related to sleep recovery, in comparison to women.[12]

In Indonesia, the SQS was administered to 90 cancer patients aged 18 to 65 years. The result demonstrated the same original instrument SQS 28 items, with six factors. The authors presented that the Indonesian QSQ version had an adequate level of internal consistency and stability and can be used for both clinical and general population.[13]

In Turkish, a cross-cultural adaptation of SQS study were conducted by Dereli M et. al , to determine the validity and reliability of the Turkish version of SQS in 238 adults aged from 18-65; 152 (63.9%) were female, and 86 (36.1%) were male.14 The findings of the study indicate that the SQS is a valid and reliable tool that may be effectively employed for assessing the sleep quality of Turkish adults who are in good health.

In Saudi Arabia, several studies were conducted in order to evaluate the sleep quality. For example, a cross-sectional study among 440 university students, to assess the association between poor sleep quality and physical inactivity using PSQI.[15] Another study in Saudi Arabia evaluated the sleep quality and academic performance among 95 medical students using PSQI. The results illustrated that poor sleep was prevalent in 63.2% of students; it was higher among students who were physically inactive and spent more time on screens Moreover, results showed that poor sleepers demonstrated significantly higher academic performance compared to adequate sleepers (p=0.04).

In addition, the PSQI was used to assess the sleep quality during COVID-19 for 790 Saudi population. The results demonstrated that poor sleep quality was reported by 54.4% and 55.5% of respondents in the two groups, respectively. Female gender and marital status were linked to lower overall PSQI, sleep quality, sleep distribution, sleep latency, and daytime dysfunction.[16]

The aim of this study was to evaluate the psychometric properties of the Arabic version of the QSQ and identify patterns of sleep quality in the Saudi population.

MATERIALS AND METHODS

The Sleep Quality Scale (SQS), which consists of 28 items, assesses six domains of sleep quality: daytime symptoms, sleep restoration, problems initiating and maintaining sleep, difficulty waking, and sleep satisfaction. The developers hoped to create a scale that could be used as a general, efficient measure suitable for evaluating sleep quality in a variety of patient and research populations. Respondents indicate how frequently they exhibit certain sleep behaviours using a four-point Likert-type scale (0 = "few," 1 = "sometimes," 2 = "often," and 3 = "almost always"). Scores on items from factors 2 and 5 (restoration after sleep and sleep satisfaction) are reversed before being tallied. Total scores range from 0 to 84, with higher scores indicating more severe sleep issues. 3, conducted a psychometric evaluation and discovered an internal consistency of 0.92 and test-retest reliability of 0.81. The SQS is highly correlated with the Pittsburgh Sleep Quality Index results. The insomnia sample scored significantly higher than the controls, indicating good construct validity. The subscales and their items are listed in Table I.

Translation

The Sleep Quality Scale (SQS) was translated from English to Arabic and then back to English by another translator. In the current study, a Brislin's back-translation model was used.[17] The scale was then administered in small groups to ensure that all items were clear and understandable. Four Saudi psychologists fluent in both English and Arabic were involved in the translation process in this study. Following that, the experts were asked to look for inconsistencies and changes to the original item, as well as to assess whether the items were suitable for measuring sleep quality among Saudis. There have been no changes made to fit the scale items with the Saudi context. The final scale was administered to 30 participants (15 males and 15 females) to determine how clear and understandable the scale was. The participants were asked whether the items were readable and understandable. The current study made use of the final version of the Arabic Sleep Quality.

Procedure

The researcher, who is a native Arabic speaker, collected questionnaires via the internet using an online survey. After 15 days, 38 participants were tested for test-retest reliability of the total scale score and both subscales on the first and second test.

Data Analysis

Using SPSS version 22.0 software, data analyses were performed on 403 participants with complete data. The A-SQS scale structure was evaluated using factor analysis. Cronbach's coefficient was calculated to assess the A-SQS scale's internal consistency. Pearson's correlation coefficient was calculated to investigate test-retest reliability as well as correlations between the subscales and the overall A-QSQ scale score.

RESULTS

Participants in this study were 402 Saudi male and females aged from 18 to 59 years old (mean= 33.76 ± 8.37). To represent the Saudi population, participants were recruited from different regions in Saudi Arabia. Participants included individuals of both genders with varying educational backgrounds. All participants volunteered to participate in this study. Table I describes participants' characteristics for the sample of this study.

Factor structure (Principal Components Analysis (PCA))

The 6 factors produced in the study data did not fit the structure advocated. Therefore, the total scores of the QSQ scale were obtained by summing across all items. Following this, a test of normality was carried out. Multivariate normality of the items was assessed statistically on Mardia's normalized estimate of multivariate kurtosis in the form of the critical ratio of kurtosis in the output. An exploratory factor analysis of the scale was performed using the principal components method with Equamax rotation. Initially, the sampling adequacy and sphericity were tested; the Kaiser-Meyer-Olkin (KMO) value was 0.897, exceeding the value of 0.6, while the value of Bartlett's test of sphericity was statistically significant ($p<0.0001$), supporting the factorability of the correlation matrix. These two tests showed that the data were suitable for factor analysis. A 5-factor solution resulted and explained 56.29% of the variance Table II. SQS was developed using item and factor analysis on items with content validity. SQS, composed of 28 items and five factors, accounted for 56.29 % of the total variance. remaining 27 items and omit one item No.(10) (poor sleep gives me headache) because the loading was less than 0.35, and the total variance became only 55.47. A 5-factor structure incorporating is more appropriate with a minimum loading of 0.35; 1-Day time dysfunction (DD) that includes 11 items (11, 14,15,17,19,21,22, 23,24, 26, 28). 2-Restoration after sleep (RA) that include (6) items (8,13,16,18,20,27) 3-Difficulty in getting up (DG) that include (2) items (12, 25) 4-Difficulty in maintaining sleep (DI) that include (5) items (1,2, 3,5,6) 5-Difficulty to sleep after getting up at night (DM) that include(3) items (4,7,9). Table II below presents the 5-factors structure.

Internal consistency

In order to examine the internal consistency of the A-QSQ scale, Cronbach's alpha was used. The alpha scores are presented in Table III below. The minimum acceptable reliable score of the scales of only two items is 0.50. The scores of the A-QSQ scale ranged from 0.58 to 0.88.

Confirmatory Factor Analysis (CFA) with path diagrams

The validity and reliability of the A-QSQ scale was tested. It was then important to determine the fit of the A-QSQ model (Table IV). The results of the CFA for the adapted A-QSQ scale as presented in Figure 1 show a good fit between the data (N=402) and the measurement model. The measurement model has a chi-square of 397,793 $p<0.000$. The ratio of the relative chi-square to its degree of freedom, χ 2/df, was 1.447. The data revealed that the fit statistics for the revised measurement model is good compared to the hypothesised measurement model. All of the fit indicators in Table III, the CFI=0.954 and TFI=0.962, fulfil the threshold of 0.90, the standard deemed important for model fit. Nevertheless, the root-mean-square error of approximation (RMSEA=0.033) indicated a good fit of the hypothesised model. As a result of a good fit based on the goodness-of-fit indices, this model has to be revised.

Test-retest reliability

Test-retest reliability was computed to confirm that the Arabic QSQ was constant across time. Twenty-three male and female participants were again recruited after 15 days to complete the scale. The results demonstrated that the correlations between the test and retest were strong, with a total score of .88. The test-retest reliability of the four clusters ranged from .90 for 'DD', .90 for 'RA'.84 for 'DF', .96 for 'DI' and .92 for 'DM'. These findings suggest that the Arabic QSQ scale has acceptable reliability over time.

DISCUSSION

This study found that the A-SQS, as a self-report measurement can be used to assess the sleep quality among Saudi Arabic populations. The items of the A-SQS were clear and understandable for an Arabic-speaking population, and the participants reported no difficulty in understanding or

Table I: Demographic characteristics of the participants (N=402)

Characteristic	n (%)	Mean (SD)
Total sample (N = 402)		
Age (years)		33.76 (8.37)
Gender		
Men	269 (66.9)	
Women	134 (33.1)	
Education level		
High School	107 (26.7)	
Undergraduate	224 (55.7)	
Postgraduate	71 (17.6)	
Statue/Occupation		
Student	118 (29.2)	
Employed	229 (57)	
Unemployed	56 (13.8)	
Marital status		
Single	144 (35.8)	
Married	259 (64.2)	

Table II: A-SQS subscales and their loadings

N	Items	Component A-SQS new subscales				
		DD	RA	DG	DI	DM
11	Poor sleep makes me irritated	.763				
14	Poor sleep makes me lose my appetite	.701				
15	Poor sleep makes hard for me to think	.663				
17	Poor sleep makes me lose interest in work or others	.660				
19	Poor sleep causes me to make mistakes at work	.636				
21	Poor sleep makes me forget things more easily	.630				
22	Poor sleep makes it hard to concentrate at work	.598				
23	Sleepiness interferes with my daily life	.570				
24	Poor sleep makes me lose desire in all things	.465				
26	Poor sleep makes me easily tired at work	.428				
28	Poor sleep makes my life painful	.409				
8	I feel refreshed after sleep		.791			
13	My sleep hours are enough		.774			
16	I feel vigorous after sleep		.732			
18	My fatigue is relieved after sleep		.648			
20	I am satisfied with my sleep		.630			
27	I have a clear head after sleep		.623			
12	I would like to sleep more after waking up			.714		
25	I have difficulty getting out of bed			.545		
1	I have difficulty falling asleep				.667	
2	I fall into a deep sleep				.598	
3	I wake up while sleeping				.570	
5	I wake up easily because of noise				.469	
6	I toss and turn				.459	
4	I have difficulty getting back to sleep once I wake up in middle of the night.					.839
7	I never go back to sleep after awakening during sleep					.807
9	I feel unlikely to sleep after sleep					.518

Table III: Internal consistency of the A-QSQ scale

No	Factors	Items	Cronbach's alpha
1	Day time dysfunction (DD)	11	0.889
2	Restoration after sleep (RA)	6	0.818
3	Difficulty in getting up (DG)	2	0.588
4	Difficulty in maintaining sleep (DI)	5	0.632
5	Difficulty to sleep after getting up at night (DM)	3	0.715
total		27	0.90

Table IV: Goodness-of-fit indices for the A-QSQ model

Goodness-of-fit indices	E-service quality model
χ 2	397.793
DF	275
χ 2/DF	1.447
RMR	0.053
RMSEA	0.033
CFI	0.934
AGFI	0.910
NFI	0.911
IFI	0.971
TFI	0.962

Note: RMR: Root Mean Square Residual; RMSEA = Root-Mean-Square Error of Approximation; CFI = Comparative Fit Index; AGFI: Adjustment Goodness Fit Index ; NFI = Normed Fit Index; IFI = Incremental Fit Index.

reading the items. Moreover, to maximise generalisability, the participants – both males and females – were recruited from different population regions within Saudi Arabia, with ages ranging from 18 to 65 years, and of differing education levels.

In addition, this study assessed the psychometric properties the A-SQS and the factor analysis yielded a revised 27-item version with five factors, including daytime dysfunction, restoration after sleep, difficulty in falling sleep, difficulty in maintaining sleep, difficulty to sleep after getting up at night. The range of score is from 0 to 81, with a higher score showing a lower sleep quality.

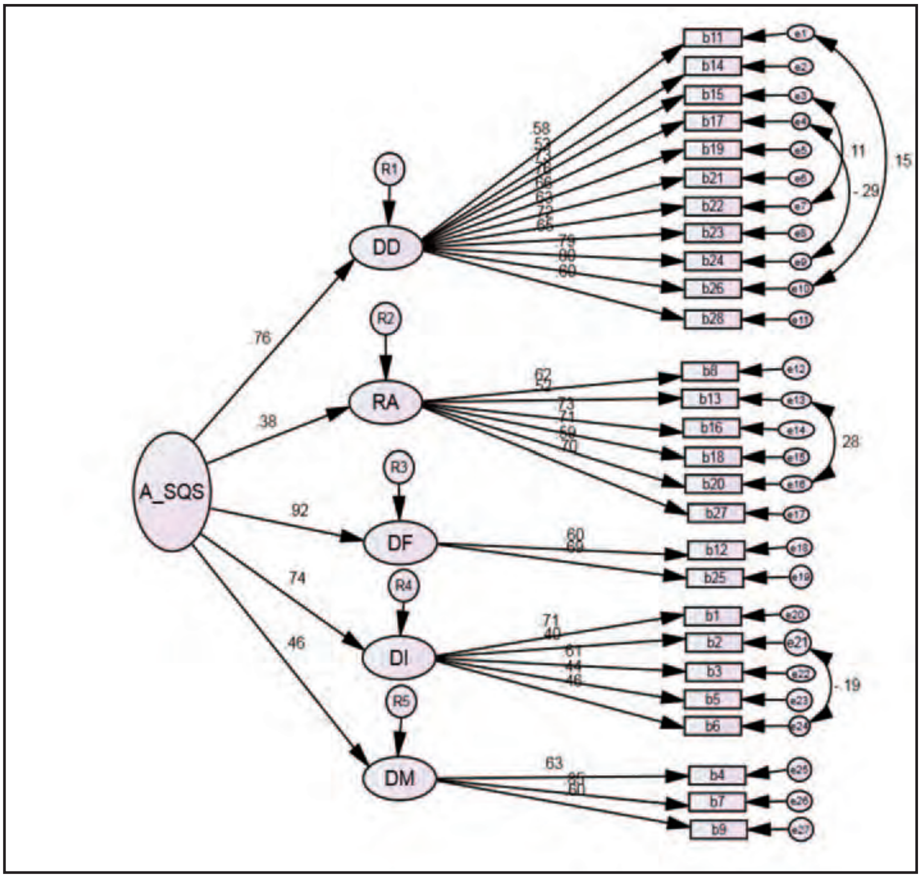

Fig. 1: Parameter estimates for the sample (N=402)

The original SQS had a 6-factor structure, with factors for example, Satisfaction with Sleep and Difficulty in Falling Asleep, which are not retained as distinct domains in the A-SQS. Notably, the A-SQS merges or redistributes several items, potentially reflecting culturally specific patterns in the perception and experience of sleep. For example, Difficulty in Falling Asleep and Difficulty Maintaining Sleep in the original scale appear consolidated into two broader categories: DI and DM in the A-SQS. In addition, the factor "Satisfaction with Sleep" from the original (3) items was not retained as an independent domain in the A-SQS, possibly due to overlapping variance with other constructs for example, Restoration After Sleep. Therefore, the A-SQS offers a psychometrically acceptable structure for the Saudi context, and the reclassification of items and change in the number of factors support questions about cross-cultural construct equivalence.

In factor one day time dysfunction, item number 11(Headache due to poor sleep) was omitted because of low minimum loading of 0.3. This factor has 11 items with an appropriate loading and internal consistency, and this result consist with Yi H et. al,study and supports the poor sleep and daytime dysfunctions related.[3] In the current study, restoration after sleep factor includes six items compared with SQS which has only four items. Items "satisfaction with sleep " and " deep sleep" from the satisfaction with sleep factor in SQS moved in restoration after sleep factor in A-SQS with internal consistency of 0.818 and a goodness of fit indices. Therefore, this factor is accepted regarding name and items because satisfaction with sleep meaning and restoration after sleep related to a concept of good sleep, according to a study, which reported that perceived calmness of sleep and sleep efficiency formed an index of sleep quality.[18]

On the other hand, the third element of the A-SQS in the present study consisted of a limited set of two items only that pertained to the challenge of getting up. Zwick WR et. al argues that for interpretation to be relevant, a component should consist of a minimum of three items.19 The selection of this component was based on the observation that those who experienced bad sleep encountered challenges in waking up after sleep, as noted by Yi H et. al,.[3] Additionally, it has been established that sleep continuity is closely associated with sleep quality, as highlighted by another two studies.[18,20] Therefore, it will be imperative to develop additional resources pertaining to the difficulty of getting up after sleep in future study endeavors.

The current study identified five items for the factor "difficulty in maintaining sleep," showing adequate loadings and reliability. This is consistent with Yi H. et al[3]., although their SQS version included only two items; the A-SQS expanded this factor by adding three additional items. Moreover, study by DJ B et. al.[4], reported that normal subjects, for example depressives, disorders of initiating and maintaining sleep, and disorders of excessive somnolence correlated.[4] Therefore, in this study, items "difficulty falling asleep, wake up while sleeping, wake up easily because of noise, toss and turn, and fall into a sleep" including in this factor. The final factor in this study A-SQS "difficulty to sleep after getting up at night," has three items with an appropriate loading from 0.51 to 0.83 and internal consistency 0.71. Two items came from factor three, "difficulty in failing asleep" in the SQS study, while one item from factor four " difficulty in getting up". The items in this factor consisting with both meaning and statistical validity and reliability. This finding is supported by Yi H et. al,, a study which incorporated a greater number of items such as challenges associated with waking up and experiencing numerous dysfunctions during the day can be attributed to poor sleep. Therefore, the concept validity was established using a similar approach to the prior scales or questionnaires.

In the current study, the assessment of reliability was conducted using two distinct methodologies. Initially, it is important to note that the Cronbach's alpha coefficient for homogeneity yielded a value of 0.90, signifying a substantial level of internal consistency. In addition, the findings of the confirmatory factor analysis revealed the anticipated factor structure consisting of three elements. The adequacy of the 5-factor structure is supported by the favourable fit indices, including the RMSEA and standardised RMR. Furthermore, the study also assessed the test-retest reliability to determine the consistency of the repeated measures. The correlation coefficient of 0.88 provides empirical evidence supporting the instrument's high level of stability.

One further constraint of this research is the examination of outcomes across several studies investigating the composition of the A-SQS. The applications exhibit inconsistency in various dimensions, including socioeconomic class, gender, levels of education, and sample size. However, it is important to note that the study's sample size consisted of 402 participants. It is worth mentioning that a sample size of ≥300 or more is generally considered adequate for conducting a confirmatory factor analysis on a population model.

The A-SQS employed a methodical approach in conducting a cross-cultural study, ensuring that sociocultural variations were taken into account when adapting the instruments. In this study, the A-SQS applied to the general population in Saudi Arabia. Furthermore, it should be noted that the individuals involved in the study might not experienced any overtly stressful situations. Moreover, it appears that there is a lack of easily accessible, detailed data regarding sleep quality within the Saudi population. Nevertheless, it is widely recognised that the quality of sleep can be impacted by a multitude of circumstances, including but not limited to lifestyle choices, job schedules, levels of stress, and availability of healthcare resources. Hence, future research endeavours ought to encompass Saudi individuals from many circumstances and locations, employing a combination of qualitative and quantitative methodologies to comprehensively investigate the multidimensional nature of the A-SQS.

Furthermore, while the study appropriately emphasizes cultural adaptation, it does not sufficiently investigate how specific cultural factors unique to Saudi Arabia—for example prevalent lifestyle patterns, typical work schedules (e.g., late-night work or prayer routines), or social norms regarding sleep and rest—may influence both actual sleep quality and respondents' interpretation of scale items. A deeper analysis of these contextual influences is critical to ensure that the A-SQS accurately captures culturally embedded experiences of sleep and wakefulness. Without this exploration, there is a risk of cultural oversimplification, which could limit the scale's ecological validity and generalizability within the local context. Moreover, prior research in Middle Eastern contexts suggests that factors, for example, high rates of caffeine consumption in the evening, gender-specific roles and obligations, and environmental conditions (e.g., urban noise or heat) can significantly shape sleep behaviours and perceptions. Addressing these variables in the adaptation process could improve the cultural sensitivity and psychometric fidelity of the instrument.[21-22]

While the study offers preliminary evidence for the utility of the A-SQS in assessing sleep quality, its reliance solely on self-reported data is a notable limitation. Self-report measures are inherently subjective and may be influenced by factors, for example mood, memory bias, or individual interpretation of sleep experiences. In contrast, objective measures, for example polysomnography and actigraphy provide quantifiable and physiologically based assessments of sleep parameters. Several studies using these methods have revealed discrepancies between perceived and actual sleep quality—particularly in populations with insomnia or other sleep disorders, where individuals often underestimate or overestimate their sleep duration and efficiency.[21,23] Without a comparison to such objective benchmarks, it is difficult to determine the extent to which the A-SQS reflects actual sleep behaviour versus subjective perception. Including such validation would greatly strengthen the interpretive power and generalizability of the study's findings. Moreover, future research should consider longitudinal methodologies to assess the predictive validity of the A-SQS and to capture changes in sleep quality across different life stages or contexts.

In addition, the sample size of 23 participants for the test-retest reliability analysis aligns with other preliminary scale validation studies that have used similarly small samples to estimate temporal stability (e.g., Carmines & Zeller, 1979). While a larger sample would strengthen generalizability, the observed reliability coefficient provides an initial indication of the A-SQS's consistency over time.

CONCLUSION

In summary, the A-SQS version has inadequate psychometric qualities for the six subscales as documented in the original SQS. In the present work, the A-SQS demonstrated a five-factor structure that exhibited satisfactory psychometric qualities. The A-SQS version has demonstrated efficacy as an assessment tool in clinical care settings and has the potential for versatile application. Moreover, this culturally tailored version of the Arabic Sleep Quality Scale (A-SQS) offers a specific tool for assessing sleep quality among individuals in Saudi Arabia and other Arabic-speaking populations. In addition, future research should include cross-national validation studies to evaluate the scale's psychometric properties across diverse Arabic-speaking populations. Such work is essential to ensure the tool's broader utility and cultural fairness, and, Future studies should adopt a mixed-methods approach to better capture participants' perspectives, particularly during the early stages of cultural adaptation and scale refinement.

CONFLICT OF INTEREST

The authors have no conflicts of interest.

ACKNOWLEDGEMENTS

None.

FUNDING

None declared.

REFERENCES

1. Alapin I, Fichten CS, Libman E, Creti L, Bailes S, Wright J. How is good and poor sleep in older adults and college students related to daytime sleepiness, fatigue, and ability to concentrate? Journal of psychosomatic research 2000; 49(5): 381-90.
2. Iliescu EA, Coo H, McMurray MH, et al. Quality of sleep and health-related quality of life in haemodialysis patients. Nephrology Dialysis Transplantation 2003; 18(1): 126-32.
3. Yi H, Shin K, Shin C. Development of the sleep quality scale. Journal of sleep research 2006; 15(3): 309-16.
4. DJ B. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res 1989; 28: 193-213.
5. Sateia MJ. International classification of sleep disorders. Chest. 2014; 146(5): 1387-94.
6. Reynolds III CF, O'Hara R. DSM-5 sleep-wake disorders classification: overview for use in clinical practice. American Journal of Psychiatry 2013; 170(10): 1099-101.
7. Shahid A, Wilkinson K, Marcu S, Shapiro CM. Stanford sleepiness scale (SSS). In: STOP, THAT and one hundred other sleep scales. Springer; 2011: 369-70.
8. Cook J, Rumble M, Plante D. Identifying subtypes of Hypersomnolence Disorder: a clustering analysis. Sleep Medicine 2019; 64: 71-6.
9. Edéll-Gustafsson UM, Kritz EI, Bogren IK. Self-reported sleep quality, strain and health in relation to perceived working conditions in females. Scandinavian journal of caring sciences. 2002; 16(2): 179-87.
10. Ayas N, Skomro R, Blackman A, et al. Obstructive sleep apnea and driving: A Canadian Thoracic Society and Canadian Sleep Society position paper. Canadian respiratory journal. 2014; 21(2): 114-23.
11. Gentili A, Werner DK, Kuchibhatla M, Edinger JD. Test-retest reliability of the Pittsburgh sleep quality index in nursing home residents. Journal of the American Geriatrics Society. 1995; 43(11):1317-8.
12. Chen S, Sun L, Zhang C. Adaptation and validity of the Sleep Quality Scale among Chinese drivers. PLoS one 2021; 16(11): e0259813.
13. Andas AM, Effendi C, Setyarini S. Validity and reliability test on sleep quality scale (SQS) instruments in Indonesia version on cancer patients. International Journal of Research in Pharmaceutical Sciences. 2020; 11(4): 7275-80.
14. Dereli M, Kahraman T. Validity and reliability of the Turkish version of single-item Sleep Quality Scale in healthy adults. Sleep Medicine 2021; 88: 197-203.
15. Mahfouz MS, Ali SA, Bahari AY, et al. Association between sleep quality and physical activity in Saudi Arabian University students. Nature and Science of Sleep 2020: 775-82.
16. Alharbi AS, Alshahrani SM, Alsaadi MM, Al-Jahdali HH, Wali SO, BaHammam AS. Sleep quality and insomnia during the COVID-19 lockdown among the Saudi public: a cross-sectional study. Saudi medical journal 2021; 42(4): 384.
17. Brislin RW. Back-translation for cross-cultural research. Journal of cross-cultural psychology 1970; 1(3): 185-216.
18. Åkerstedt T, Hume K, Minors D, Waterhouse J. The subjective meaning of good sleep, an intraindividual approach using the Karolinska Sleep Diary. Perceptual and motor skills 1994; 79(1): 287-96.
19. Zwick WR, Velicer WF. Comparison of five rules for determining the number of components to retain. Psychological bulletin 1986; 99(3): 432.
20. Åkerstedt T, Hume K, Minors D, Waterhouse J. The meaning of good sleep: a longitudinal study of polysomnography and subjective sleep quality. Journal of sleep research 1994; 3(3): 152-8.
21. Al-Hazzaa HM, Abahussain NA, Al-Sobayel HI, Qahwaji DM, Musaiger AO. Lifestyle factors associated with overweight and obesity among Saudi adolescents. BMC public health 2012; 12: 1-11.
22. BaHammam AS. Sleep medicine in Saudi Arabia: Current problems and future challenges. Annals of thoracic medicine 2011; 6(1): 3-10.
23. Kaplan KA, Hardas PP, Redline S, Zeitzer JM, Group SHHSR. Correlates of sleep quality in midlife and beyond: a machine learning analysis. Sleep medicine 2017; 34: 162-7.