NÖRO PSİKİYATRİ ARŞİVİ
ARCHIVES OF NEUROPSYCHIATRY

RESEARCH ARTICLE

Article No: 61

Arch Neuropsychiatry 2026;63:387–392
https://doi.org/10.29399/npa.29240

Validity and Reliability of the Turkish Version of the Brief Pittsburgh Sleep Quality Index

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ABSTRACT

Introduction: The present study aimed to examine the psychometric properties of the Brief Pittsburgh Sleep Quality Index (B-PSQI) in a Turkish adult population.

Methods: The sample included 296 adults: 163 healthcare professionals at Silifke State Hospital (Sample 1) and 133 individuals applying for a health committee report (Sample 2).

Results: Confirmatory factor analyses confirmed the unidimensional structure of the B-PSQI in both samples. The B-PSQI scores were highly correlated with the PSQI scores in both samples, with r values of 0.905 and 0.925. The B-PSQI scores also demonstrated strong correlations with the Insomnia Severity Index scores in Sample 1 (r=0.774) and Sample 2 (r=0.762). Furthermore, B-PSQI scores were positively correlated with depressive and anxiety symptoms. The reliability of the scale was acceptable, with Cronbach's alpha and McDonald's omega values exceeding 0.70. A score of ≥4 on the B-PSQI provided the optimal balance between sensitivity (85.0% and 95.9%) and specificity (89.3% and 85.7%) for detecting individuals with poor sleep quality.

Conclusion: The current findings suggest that the B-PSQI is a valid and reliable instrument for assessing sleep quality among Turkish adults. Further research in diverse populations is warranted to corroborate these findings.

Keywords: Adult, reliability, sleep quality, Turkish, validity

Cite this article as: Ünsal Mavi C, Akdağ B, Kök B, Öztürk EÖ, Aydemir Ö. Validity and reliability of the Turkish Version of the Brief Pittsburgh Sleep Quality Index. Arch Neuropsychiatry 2026;63:387–392. doi: 10.29399/npa.29240

INTRODUCTION

Sleep disturbances represent a significant and growing public health concern due to their adverse effects on both physical and mental health (1). They exacerbate medical and neuropsychiatric conditions and diminish overall quality of life (2–5). Furthermore, disturbed sleep impairs daytime functioning (6) by compromising cognitive processes such as inhibitory control, episodic memory, working memory, and problem-solving (7,8). Sleep disturbances are also associated with an elevated risk of occupational and traffic accidents (9–12). Timely detection and management of sleep problems are therefore critical. Polysomnography remains the "gold standard" for objective sleep assessment. However, its use is constrained by high cost, technical complexity, and the requirement for laboratory-based monitoring by trained personnel (13,14). In addition, because it typically spans only one or a few nights, polysomnography may fail to capture an individual's habitual sleep patterns and cannot fully account for subjective sleep experiences (15). Consequently, self-report questionnaires have become indispensable tools for evaluating habitual sleep in both clinical and population-based settings, offering a more practical and cost-effective alternative.

Highlights

- **B-PSQI is a practical tool for evaluating habitual sleep.**
- **The PSQI is a valid and reliable instrument in Turkish adults.**
- **A score of ≥4 on the B-PSQI effectively detects individuals with poor sleep quality.**

Among these, the Pittsburgh Sleep Quality Index (PSQI) is the most widely applied instrument for assessing sleep quality in clinical and non-clinical populations. The PSQI is a 19-item questionnaire that evaluates sleep quality over the previous month (16). Since its development, numerous studies have confirmed the validity of the PSQI across diverse populations, including Turkish samples (17). Nevertheless, debate persists regarding its factor structure and dimensionality (18). Moreover, the length of

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Received: 10.09.2025, **Accepted:** 04.01.2026, **Publication Date:** 26.03.2026

the PSQI and its relatively complex scoring system pose challenges for both administration and respondent burden, limiting its practicality in certain contexts. To address these limitations, Sancho-Domingo et al. (15) introduced the Brief Pittsburgh Sleep Quality Index (B-PSQI), a six-item version that retains five key components (see "Measures" section for details). The present study aimed to examine the psychometric properties of the B-PSQI in a Turkish adult population.

METHODS

Procedure

In previous research, translation and back-translation procedures were conducted for the Turkish version of the PSQI (17). These steps were not repeated in the present study, as the B-PSQI consists of a subset of six items selected from the original 19-item PSQI.

Participants

The appropriate sample size for factor analysis is generally determined either by the total number of cases or the subjects-to-variable (STV) ratio. In terms of the STV ratio, Hair et al. recommend at least 20 cases per item (19). Based on these criteria, we concluded that the minimum required sample size for this study would be 100 participants.

The total sample comprised 296 adults, divided into two groups: healthcare professionals employed at Silifke State Hospital (n=163; Sample 1) and individuals applying to the hospital for a health committee report (n=133; Sample 2).

Data collection among healthcare professionals was conducted using a paper-and-pencil questionnaire. Exclusion criteria for this group included a diagnosis of psychosis, bipolar disorder, or intellectual disability. Eligible healthcare professionals reviewed an informational sheet, provided informed consent, and subsequently completed the questionnaire.

Following the standard process, individuals applying for a health committee report underwent a psychiatric assessment by a psychiatrist. Exclusion criteria in this group included psychosis, bipolar disorder, autism spectrum disorder, or intellectual disability, as determined during the psychiatric evaluation conducted as part of the health committee assessment. For individuals applying for a health committee report, data were collected via an online questionnaire. Eligible individuals accessed the questionnaire via a QR code, reviewed an informational sheet, provided informed consent, and subsequently completed the questionnaire.

Instruments

The Pittsburgh Sleep Quality Index (PSQI) is one of the most widely used instruments for evaluating sleep health in both clinical and non-clinical populations. It contains 24 items: 20 rated on a 4-point Likert scale (0–3) and four open-ended questions. Of these, 19 items are self-reported (15 rated and four open-ended), while five require input from a bed or room partner. Only the self-reported items are used in the quantitative assessment of perceived sleep quality. The open-ended responses are also scored as structured categorical values (0–3) based on the respondent's report (18). These 19 self-reported items generate scores for seven components: subjective sleep quality, sleep latency, sleep efficiency, sleep duration, sleep disturbances, use of sleep medication, and daytime dysfunction (16). Component scores are summed to yield a global score ranging from 0 to 21, with higher scores reflecting poorer sleep quality. A global score above five indicates "poor" sleep quality (20).

The Brief Pittsburgh Sleep Quality Index (B-PSQI) is a measure developed as a shortened version of the PSQI (15). It comprises six items, including "During the past month, when have you usually gone to bed at night?", "During the past month, when have you usually gotten up in the morning?", "During the past month, how long has it usually taken you to fall asleep each night?", "During the past month, how many hours of actual sleep did you get at night?", "During the past month, have you had trouble sleeping because you wake up in the middle of the night or early morning?", and "During the past month, how would you rate your sleep quality overall?". These six items are grouped into five components: sleep quality, night awakenings, sleep efficiency, hours of sleep, and sleep latency. Each component is scored on a 4-point Likert scale (0–3), and the total score, ranging from 0 to 15, reflects overall sleep quality, with higher scores indicating poorer sleep (15).

The Insomnia Severity Index (ISI) consists of seven items that assess insomnia symptoms, satisfaction with sleep, and the impact of sleep problems on quality of life (21). Items are rated on a 5-point Likert scale (0–4), resulting in a total score ranging from 0 to 28. Higher scores indicate greater severity of insomnia-related difficulties and associated daytime impairment (22). The ISI has demonstrated reliability and validity for use in the Turkish population (23).

The Patient Health Questionnaire-9 (PHQ-9) is a nine-item measure designed to assess depressive symptoms (24). Its items correspond to the diagnostic criteria for major depression in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). Respondents rate the frequency of each symptom over the preceding two weeks on a 4-point Likert scale ranging from "0=not at all" to "3=nearly every day." The total score can vary from 0 to 27. Higher scores indicate more severe depressive symptoms. The PHQ-9 has been confirmed as a reliable instrument for assessing depression in the Turkish population (25).

The Generalized Anxiety Disorder-7 (GAD-7) is a seven-item self-report measure designed to assess anxiety severity during the preceding two weeks (26). Each item is rated on a 4-point Likert scale ranging from "0=not at all" to "3=nearly every day." The total score can vary from 0 to 21, with higher scores indicating greater severity of anxiety symptoms. The GAD-7 has been validated as a reliable and appropriate tool for use in the Turkish population (27).

Statistical Analysis

All statistical analyses were conducted using Jamovi version 2.6.44. Data distribution was evaluated through skewness and kurtosis values, supplemented by visual inspection of box plots and histograms to assess normality. To examine the unidimensionality of the B-PSQI, the confirmatory factor analyses (CFA) were performed using the weighted least squares mean and variance-adjusted (WLSMV) estimation method, which is more appropriate for ordinal and skewed data than traditional maximum likelihood approaches (28). Model fit was evaluated using the chi-square statistic and the root mean squared error of approximation (RMSEA). A non-significant chi-square and an RMSEA value below 0.08 were considered indicative of good model fit (29). However, given that the chi-square statistic is highly sensitive to sample size, a significant result does not necessarily imply model rejection (30). Therefore, additional indices were examined, including the comparative fit index (CFI), Tucker-Lewis index (TLI), goodness-of-fit index (GFI), and standardized root mean square residual (SRMR). A model fit was considered satisfactory if CFI, GFI, and TLI values were ≥0.95, and SRMR values were ≤0.05 (31). Concurrent validity was assessed by calculating Pearson's correlation coefficients between the B-PSQI, PSQI, ISI, PHQ-9, and GAD-7 scores. Receiver operating characteristic (ROC) curve analysis was performed to evaluate the diagnostic utility of the B-PSQI in identifying individuals with poor sleep quality, defined as a PSQI global score >5. Reliability was examined using Cronbach's alpha, McDonald's omega, and ordinal alpha, in addition to the corrected item-total correlations. Statistical significance was set at $p < 0.05$.

Ethics
Ethical approval was obtained from the Toros University Scientific Research and Publication Ethics Committee (Approval no: 2024/185). All procedures adhered to the principles of the Helsinki Declaration, and all participants provided either written or online informed consent.

RESULTS

Sample 1
The mean age of participants was 37.23 years (range=20–60, SD=10.38), and 73.6% were women. Regarding educational background, 96.3% held university degrees, while 3.7% had completed high school education. In terms of health status, 28.1% (n=36) reported a chronic physical condition, and 23.4% (n=30) reported a pre-existing mental health condition.

Confirmatory factor analyses (CFA) was conducted to assess the unidimensionality of the B-PSQI. Model fit indices were determined as χ^2/df=2.912 (p=0.012), RMSEA=0.109, SRMR=0.037, GFI=0.994, CFI=0.979, and TLI=0.958, suggesting unidimensionality for B-PSQI. All standardized factor loadings were statistically significant (p <0.001) and ranged from 0.610 (awakenings) to 0.816 (efficiency) (Fig. 1).

Pearson's correlation coefficients for the study variables are presented in Table 1. As expected, the B-PSQI scores were highly correlated with the PSQI scores (r=0.905, p <0.001) and ISI scores (r=0.774, p <0.001). Additionally, B-PSQI scores were positively correlated with depressive and anxiety symptoms as measured by the PHQ-9 (r=0.538, p <0.001) and GAD-7 (r=0.378, p <0.001).

ROC (receiver operating characteristic) curve analysis was conducted to evaluate the ability of the B-PSQI to distinguish individuals with poor sleep quality (PSQI >5) (Fig. 2). The AUC for the B-PSQI was 0.919 (95% CI: 0.879–0.958, p <0.001), indicating strong discriminative capacity. A score of ≥4 on the B-PSQI yielded the optimal balance between sensitivity and specificity (Youden's J=0.743), with sensitivity of 85.0% and specificity of 89.3% (Table 2).

The reliability of the scale was acceptable, with Cronbach's alpha and McDonald's omega recorded at 0.773 and 0.787, respectively. The ordinal alpha, which provides a more accurate estimate of reliability than Cronbach's alpha for ordinal response scales, was found to be 0.839. Additionally, the corrected item–total correlations ranged from 0.479 to 0.601.

Sample 2
The mean age of participants was 33.75 years (range=18–67, SD=12.64). 51.1% of the participants were women, and 62.4% held university degrees. Regarding health status, 15.8% (n=21) reported having a chronic physical condition, while 9.0% (n=12) reported a pre-existing mental health condition.

A CFA was performed to evaluate the unidimensionality of the B-PSQI. The model fit indices were χ^2/df=2.709 (p=0.019), RMSEA=0.114, SRMR=0.051, GFI=0.993, CFI=0.978, and TLI=0.956, indicating that the B-PSQI is unidimensional. All standardized factor loadings were statistically significant (p <0.001), ranging from 0.610 (awakenings) to 0.852 (latency) (Fig. 1).

Table 1 presents Pearson's correlation coefficients among the study variables. B-PSQI scores exhibited a strong correlation with PSQI scores (r=0.925, p <0.001) and ISI scores (r=0.762, p <0.001). Furthermore, B-PSQI scores were positively associated with the PHQ-9 scores (r=0.421, p <0.001) and GAD-7 scores (r=0.587, p <0.001).

ROC curve analysis showed that the AUC for the B-PSQI was 0.972 (95% CI: 0.950–0.994, p <0.001), indicating a strong ability to differentiate between individuals with poor sleep quality (PSQI >5). A score of ≥4 on the B-PSQI yielded the optimal balance between sensitivity and specificity (Youden's J=0.816), with sensitivity of 95.9% and specificity of 85.7% (Table 2).

The reliability of the scale was acceptable, with Cronbach's alpha and McDonald's omega recorded at 0.765 and 0.794, respectively. The

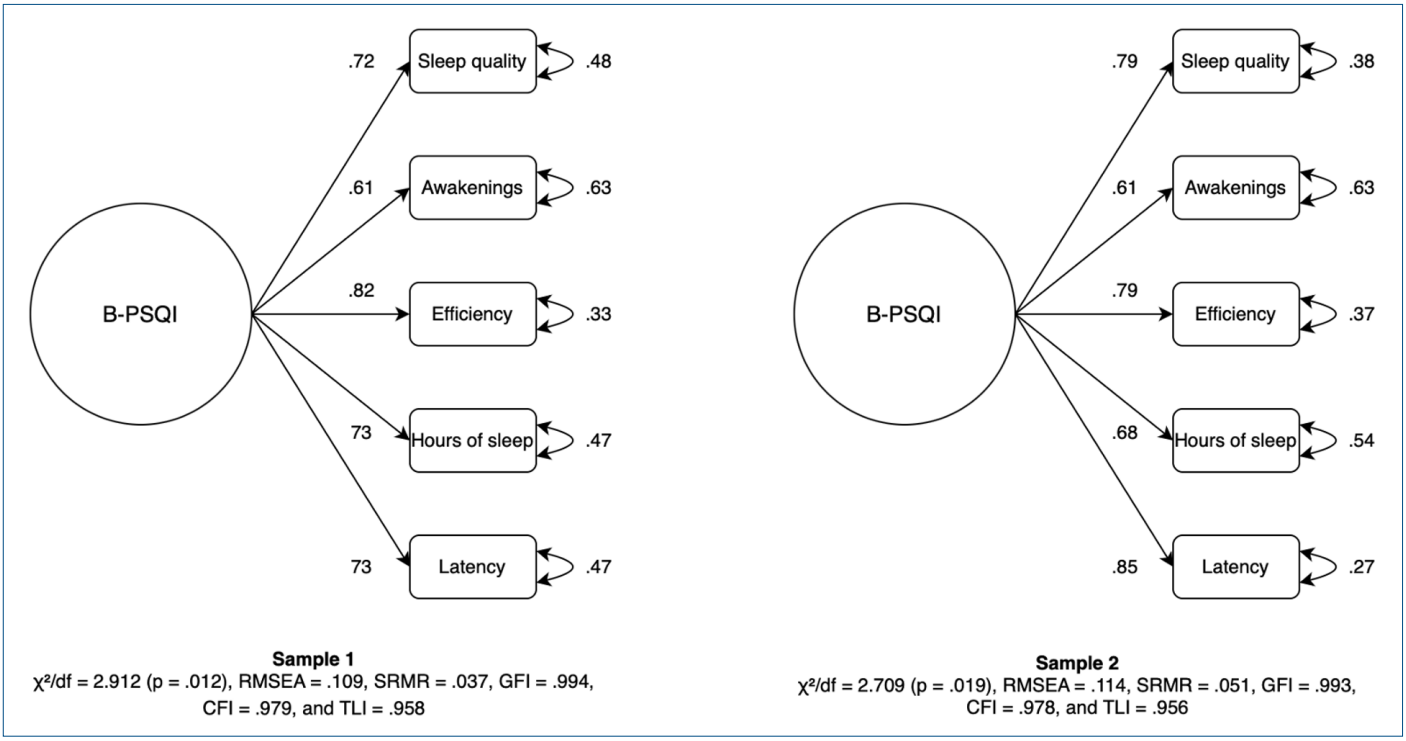

Figure 1. Standardized factor loadings of confirmatory factor analyses for the B-PSQI.

Table 1. Pearson's correlations among scale scores

	1	2	3	4	5
1. B-PSQI	-	0.925***	0.762***	0.421***	0.587***
2. PSQI	0.915***	-	0.828***	0.546***	0.671***
3. ISI	0.774***	0.805***	-	0.594***	0.355**
4. PHQ-9	0.502***	0.579***	0.636***	-	0.717***
5. GAD-7	0.513***	0.587***	0.481***	0.705***	-

***p <0.01; ***p <0.001; B-PSQI: brief Pittsburgh sleep quality index; ISI: insomnia severity index; PHQ-9: patient health questionnaire-9; GAD-7: generalized anxiety disorder-7; vertical coefficients (lower triangle) for B-PSQI show the correlation coefficients for Sample 1, while horizontal coefficients (upper triangle) represent those for Sample 2.

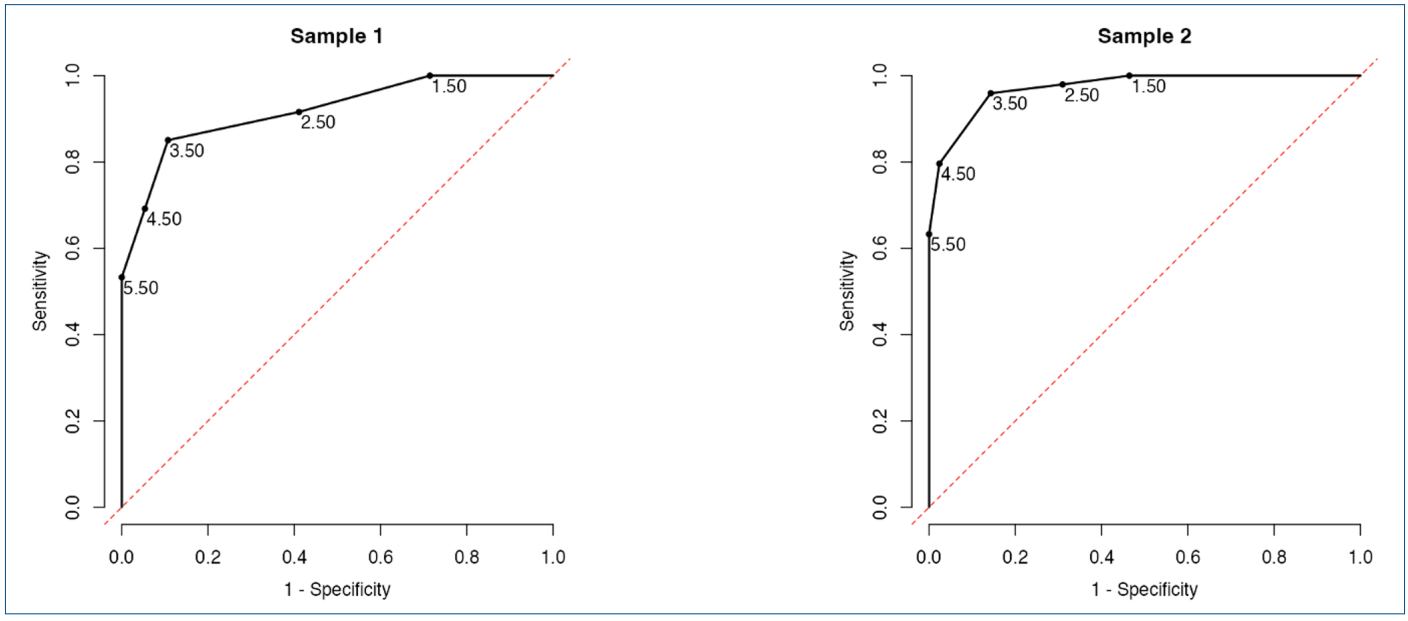

Figure 2. presents the ROC curve analyses assessing the ability of the B-PSQI in differentiating individuals with 'poor' sleep quality (PSQI >5)

Table 2. Results of ROC curve analyses

Sample 1						Sample 2					
Cut-off	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**Youden's J**	**Cut-off**	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**Youden's J**
0.50	100.0%	7.1%	67.3%	100.0%	0.071	0.50	100.0%	27.4%	44.5%	100.0%	0.274
1.50	100.0%	28.6%	72.8%	100.0%	0.286	1.50	100.0%	53.6%	55.7%	100.0%	0.536
2.50	91.6%	58.9%	81.0%	78.6%	0.505	2.50	98.0%	69.0%	64.9%	98.3%	0.670
3.50	**85.0%**	**89.3%**	**93.8%**	**75.8%**	**0.743**	**3.50**	**95.9%**	**85.7%**	**79.7%**	**97.3%**	**0.816**
4.50	69.2%	94.6%	96.1%	61.6%	0.638	4.50	79.6%	97.6%	95.1%	89.1%	0.772
5.50	53.3%	100.0%	100.0%	52.8%	0.533	5.50	63.3%	100.0%	100.0%	82.4%	0.633
6.50	44.9%	100.0%	100.0%	48.7%	0.449	6.50	38.8%	100.0%	100.0%	73.7%	0.388
7.50	34.6%	100.0%	100.0%	44.4%	0.346	7.50	26.5%	100.0%	100.0%	70.0%	0.265
8.50	26.2%	100.0%	100.0%	41.5%	0.262	8.50	18.4%	100.0%	100.0%	67.7%	0.184
9.50	18.7%	100.0%	100.0%	39.2%	0.187	9.50	16.3%	100.0%	100.0%	67.2%	0.163
10.50	10.3%	100.0%	100.0%	36.8%	0.103	11.50	8.2%	100.0%	100.0%	65.1%	0.082
11.50	7.5%	100.0%	100.0%	36.1%	0.075	13.50	6.1%	100.0%	100.0%	64.6%	0.061
12.50	6.5%	100.0%	100.0%	35.9%	0.065	14.50	2.0%	100.0%	100.0%	63.6%	0.020
13.50	3.7%	100.0%	100.0%	35.2%	0.037						
14.50	1.9%	100.0%	100.0%	34.8%	0.019						

PPV: positive predictive value; NPV: negative predictive value; the result is considered positive if the test value is equal to or higher than the cut-off.

ordinal alpha, which provides a more accurate estimate of reliability than Cronbach's alpha for ordinal response scales, was found to be 0.856. Additionally, the corrected item–total correlations ranged from 0.432 to 0.662.

DISCUSSION

Given the advantages of brief assessment instruments in both research and clinical practice, the present study evaluated the validity and reliability of the Turkish version of the B-PSQI in samples comprising healthcare

professionals and individuals seeking a hospital health committee report. The B-PSQI condenses the original 19-item PSQI into six items, reducing its length by approximately 70%. This brevity enhances feasibility while preserving strong psychometric properties. Furthermore, its simplified scoring system represents an additional advantage over the original PSQI, potentially improving applicability in routine practice (15).

Reliability was evaluated using Cronbach's alpha and McDonald's omega coefficients, with values above 0.70 generally considered acceptable (32). In this study, all reliability metrics exceeded this threshold, confirming that the B-PSQI consistently measures sleep quality in the Turkish population. In addition, ordinal alpha coefficients were 0.839 and 0.856 for Sample 1 and Sample 2, respectively, further supporting the instrument's robustness (33). These findings are consistent with those reported by Sancho-Domingo et al. (15), who observed an ordinal alpha of 0.79 in the development phase of the B-PSQI. They also demonstrated reliability in a Spanish adolescent sample, with Cronbach's alpha of 0.76 and McDonald's omega of 0.84 (34).

The model fit indices for confirmatory factor analyses generally met the desired standards, except for RMSEA. Nevertheless, prior studies have shown that RMSEA may perform poorly when evaluating structural equation models with small degrees of freedom, often leading to the rejection of models that are correctly specified or fit closely. Therefore, caution is advised when interpreting RMSEA for such models, and greater reliance should be placed on SRMR and CFI (35). Consequently, confirmatory factor analyses confirmed the unidimensional structure of the B-PSQI, indicating that it appropriately measures sleep quality as a single construct. This result aligns with prior validation studies of both the B-PSQI (15,34) and the PSQI (36).

Concurrent validity was demonstrated by the strong correlations between B-PSQI and ISI scores in both samples (r=0.774 and r=0.762). Significant correlations were also observed between B-PSQI scores and depressive and anxiety symptoms, as measured by the PHQ-9 (r=0.538 and r=0.421) and GAD-7 (r=0.378 and r=0.587), respectively. These associations are consistent with the well-established relationship between sleep disturbances and mood or anxiety disorders and are in agreement with previous findings (37,38). Importantly, the stronger correlation between the B-PSQI and ISI, compared with its correlations with the PHQ-9 and GAD-7, provides further support for divergent validity.

The diagnostic accuracy of the B-PSQI was further demonstrated through ROC curve analyses. The instrument showed excellent discriminative ability, with the AUCs of 0.919 and 0.972 for identifying individuals with poor sleep quality (PSQI >5). A score of ≥4 maximized diagnostic performance, yielding high sensitivity (85.0% and 95.9%) and high specificity (89.3% and 85.7%) for both samples. These results indicate that the B-PSQI provides diagnostic utility comparable to the full PSQI despite its shorter format. This efficiency, coupled with strong psychometric performance, highlights its potential as a practical screening tool in clinical settings where time and resources are limited.

Taken together, the findings support the B-PSQI as a valid and reliable measure of sleep quality in the Turkish adult population. Nevertheless, certain limitations should be acknowledged. The cross-sectional design precludes assessment of longitudinal changes or test-retest reliability. Additionally, the modest sample size and the focus on a limited segment of the general population may restrict generalizability. The relatively high educational attainment of participants compared with the broader population may also introduce bias. Future research should aim to replicate these findings in larger and more diverse samples, including clinical cohorts (e.g., psychosis and bipolar disorder), children, and adolescents, and should examine the instrument's stability over time.

Ethics Committee Approval: Ethical approval was obtained from the Toros University Scientific Research and Publication Ethics Committee (Approval no: 2024/185).

Informed Consent: All participants provided either written or online informed consent.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept- CÜM, BA; Design- CÜM, BA, ÖA; Supervision- CÜM, BA; Resource- CÜM, BA; Data Collection and/or Processing- CÜM, BK, EÖÖ; Analysis and/or Interpretation- BA, BK, EÖÖ, ÖA; Literature Search- CÜM, BA, BK, EÖÖ, ÖA; Writing- CÜM, BA, BK, EÖÖ, ÖA; Critical Reviews- ÖA.

Conflict of Interest: The authors declared that there is no conflict of interest.

Financial Disclosure: No financial support was declared for this study.

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