ORIGINAL RESEARCH

The Psychometric Properties of the Arabic Version of the Anxiety and Preoccupation About Sleep Questionnaire (APSQ)

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Background: Insomnia disorder is a common health condition; it has a role in increasing the possibility of developing other psychological disorders, including anxiety and depression. Anxiety and preoccupation with sleep are two examples of common cognitive factors that contribute to the development of chronic insomnia; thus, it is important to have a tool that assesses worry in insomnia. There is no comprehensive psychiatric measure to assess anxiety and preoccupation with sleep in Arabic. We conducted this study to translate, adapt, and validate the Arabic version of the Anxiety and Preoccupation about Sleep Questionnaire (APSQ), providing a reliable psychometric tool to assess concerns regarding sleep within Arabic-speaking communities.

Methods: The translation process of the scale involved several steps, including forward and backward translation. A cross-sectional study was conducted using an online survey completed by 523 participants from various Arabic-speaking countries. Psychometric analysis was performed utilizing the R software, including internal consistency, test-retest reliability, and confirmatory factor analysis. In addition, convergent and divergent against the Athens insomnia scale (AIS) and general anxiety disorder (GAD) were conducted.

Results: The Arabic-translated form of the APSQ expresses excellent internal consistency with a value of 0.91 for both Cronbach's α and McDonald's ω. The test-retest reliability of a subsample showed an excellent coefficient of 0.93 (p<0.01). A good fit of the APSQ was observed by CFI = 0.93, TLI = 0.91, SRMR = 0.05, and RMSEA = 0.1. Convergent and divergent against AIS and GAD showed statistically significant correlations of 0.85 (p<0.01) and 0.69 (p<0.01), respectively. Our sample showed a mean APSQ score of 31.28 ± 8.31, and the mean age was 23.62 ± 7.5.

Conclusion: The Arabic APSQ is reliable and valid for measuring anxiety and preoccupation with sleep in Arabic countries. Using translated APSQ for clinical diagnosis and research is currently trustworthy.

Keywords: anxiety, insomnia, sleep quality, daily performance, general health

Introduction

Insomnia disorder is a common health condition that affects a large proportion of the general population.[1] It is defined as the inability to fall asleep, stay asleep, or even poor sleep quality that interferes with life.[2] A recent systematic review during COVID-19 showed insomnia prevalence rates of 29.7% and 58.4% among the general population and university

students, respectively.[3] According to Spielman's 3P model, predisposing factors (eg hyperarousal), precipitating factors (eg stressful life event), and perpetuating factors (eg maladaptive sleep habits) interact to cause and maintain insomnia.[4,5] Cognitive factors play a key perpetuating role, as individuals with insomnia tend to have excessive cognitive arousal and sleep-related anxiety.[6,7] They may engage in unhelpful thoughts and beliefs about sleep, have an overinvestment in and unrealistic expectations about sleep needs, and catastrophize the consequences of poor sleep.[8] This cognitive hyperarousal and sleep-related anxiety lead to selecting maladaptive coping behaviors that paradoxically worsen insomnia.[8] Cognitive behavioral therapy for insomnia (CBT-I) addresses both cognitive and behavioral perpetuating factors.[9]

Chronic insomnia is believed to increase the probability of developing other psychological disorders, such as anxiety and depression, in the future. Other comorbidities, such as diabetes and hypertension, in addition to life-threatening myocardial infarction, are some examples of the subsequent related complications of insomnia.[10–12] Insomnia places a substantial financial burden on the economy, with annual costs in the US exceeding $200 billion due to decreased work output and increased absenteeism. On average, employees with insomnia symptoms are absent for 14 workdays and experience 30 additional days of reduced productivity. Considering both direct and indirect costs, the aggregate expense of insomnia is approximately $63.2 billion each year for the American workforce. Anxiety and preoccupation with sleep are two examples of common cognitive factors that contribute to the development of chronic insomnia.[13]

Tang and Harvey developed the Anxiety and Preoccupation about Sleep Questionnaire (APSQ), which was validated in 2011 by Jansson-Fröjmark. It is a 10-item scale that assesses sleep-related worries. The scale has two factors: the first factor is composed of six items that reflect concerns about the effects of poor sleep, while the second factor is composed of four items that capture fears about the lack of control over sleep. The APSQ has been evaluated for its validity and reliability, and it shows an association between anxiety and sleep quality.[14] The APSQ is a useful tool for clinicians since it can monitor the efficacy of cognitive therapy in chronic insomnia.[15]

In a study conducted in 2019, 750 participants from 14 hospitals in Spain participated in a multi-institutional, prospective, observational study that looked for the prevalence of sleep issues and their potential mediating role in anxiety and depression. The results show that 65% of women reported having sleep issues, approximately 40% reported having depression, and approximately 20% reported having anxious preoccupations. Sleeping difficulty was more common in women than in men. Depression was a predictive factor of anxious preoccupation.[16] Another study was performed in Saudi Arabia in 2019. There were 206 responses,[17] ninety-five of which (46%) provided comprehensive details about their lifestyle, academic performance, sleep quality, and mental health. The prevalence of poor sleep was 63.2% among students who were not physically active and spent more time looking at screens. Poor sleepers showed better academic performance than adequate sleepers. The prevalence of participants who reported depression, anxiety, or stress was 42%, 53%, and 31%, respectively. There were significant relationships between depression, sleep quality, anxiety, and stress.[17] These findings prove that there is a high prevalence of anxiety in the world and in different cultures. The Arab world consists of 22 countries, with a combined population of over 456 million people as of 2021. By translating, adapting, and validating the APSQ into Arabic, this study provides a reliable psychometric tool for assessing sleep-related anxiety and preoccupation in Arabic-speaking populations. Any sleep scale's elements can have different meanings in different languages, and a scale that works for one society might not be efficient for another. The aim of this study is to translate, adapt, and validate the APSQ into Arabic to provide a reliable psychometric tool to evaluate worrying about sleep in Arabic communities; thus, the scale will be available for clinical assessment and research purposes.

Methods
The Translation

Prior to the translation process, we sought and obtained necessary approvals from the developers of the APSQ, as it is a copyrighted tool. The translation procedure commenced with two bilingual medical professionals translating the APSQ scale from English to Arabic. Subsequently, a different pair of medical experts with proficiency in both languages performed a back-translation of the Arabic version into English to ensure accuracy. Following the initial translation, the newly translated English version of the APSQ was meticulously compared to the original questionnaire. This comparison and refinement process were conducted in several rounds by the collaborators to ensure that the final English translation

was consistent and accurately reflected the content of the original APSQ. Furthermore, the Arabic version of the questionnaire was piloted with a group of 30 individuals from the target demographic to assess the clarity and comprehensibility of the items. Following the pilot, feedback was collected regarding the participants' understanding of the questions and the overall flow of the questionnaire. This feedback was then analyzed, and necessary revisions were made to refine the questionnaire further, ensuring that it was both culturally appropriate and linguistically accurate for the intended population. Following this phase, the questionnaire expressed clarity, and no changes needed to be made to the form.[18] Participants who completed the pilot test were excluded from the main analyses as per our study methodology protocol.

Data Collection

The study was conducted online (in October 2023) through advertisements in various social media and messaging programs, including Twitter, Facebook, Instagram, and WhatsApp, across multiple Arabic-speaking countries: Bahrain, Saudi Arabia, Jordan, Tunisia and Jordan. Participants provided an online informed consent and filled a Google form created by the first author. The Google form included demographic data and the APSQ in Arabic form. For the validation, a sample size of 300 was enough, as the sample size followed the rule for the item-to-respondent ratio (1:30) (ie, thirty responses were needed for each item in the questionnaire).[19]

Several measures were implemented to ensure the integrity and prevent duplicate entries. Duplicate entries were monitored and addressed through various strategies, including checking for repeated patterns in responses and conducting data cleaning procedures to identify and remove any potential duplicate entries. Data quality checks were performed to identify any suspicious or inconsistent responses. The data was reviewed for patterns of random or meaningless answers, response patterns that suggested inattention or lack of effort, or any other indications of data quality concerns. These measures were taken to maintain the ethical standards of the research and ensure the reliability of the analyzed data.

Instruments
Anxiety and Preoccupation with Sleep Questionnaire (APSQ)

The APSQ is constructed and divided into two categories. First, the first one includes the first six items, which focus on determining worries about poor sleep consequences. The second category is the rest of the items, and they focus on determining worries about sleep uncontrollability. Each item is answered by choosing a number from 1 to 5, where 1 = strongly disagree and 5 = strongly agree; thus, the total ranges between 10 and 50.[14] Eighty participants were supplied with the questionnaire two times to assess the test-retest reliability for one week between the two data points.

Athens Insomnia Scale (AIS)

It is a designed self-assessment psychometric instrument for quantifying sleep difficulty based on the ICD-10 criteria. It consists of eight items: the first five items focus on induction of sleep, night awakening, final awakening, total duration of sleep, and quality of sleep, while the remaining 3 items focus on well-being, capacity of functioning, and sleepiness during the day. It has good internal consistency with a Cronbach's alpha of approximately 0.90.[20] An AIS cutoff score of 6 considered a suitable threshold for identifying individuals with insomnia symptoms.[20]

General Anxiety Disorder Scale (GAD-7)

It is a diagnostic tool comprising seven items, with choices ranging between 0 and 3, where 0 = not at all and 3 = nearly every day. The total score ranges between 0 and 21. It is validated to be availably used in two settings: primary care and the general population. It has an acceptable internal consistency with a Cronbach's alpha of 0.89.[21] A GAD-7 score equal to or exceeding 10 can be considered a suitable threshold for identifying individuals with potential cases of anxiety disorders.[20]

Ethics

Prior to the collection of data, this study was reviewed and approved by the University of Jordan (number: UOJ-REC-23-167). Informed consent was obtained from all participants. Our study fully complied with the principles outlined in the Declaration of Helsinki, ensuring that all aspects of research involving human participants were conducted in accordance with the highest ethical standards.

Statistical Analysis

We employed descriptive statistics to delineate the sample characteristics and succinctly summarize the findings. Central tendency was measured using the mean, and the standard deviation was used for variability. Describe the response distribution for categorical variables using frequencies and percentages. The score of the APSQ was compared between males and females by using the independent sample *t*-test. Statistical analysis was performed using the R Statistical Foundation (R version 4.2.2). A p value < 0.05 was considered statistically significant. The internal consistency of the Arabic version of the APSQ was assessed using two statistical measures: McDonald's omega and Cronbach's alpha. A threshold value greater than 0.75 was established as the criterion for acceptable internal consistency for the scale.[22] During the analysis, we examined each item for weak correlations with others to identify any that might be candidates for removal. However, no items exhibited weak correlations or low internal consistency. To assess convergent validity, we employed Pearson's correlation coefficient, a measure of the strength and direction of association between two variables, to evaluate the relationship between the Arabic APSQ and the AIS[23] and GAD-7. Confirmatory factor analysis (CFA) was used to examine the Arabic APSQ factor structure. CFA is a statistical technique employed to test the extent to which the observed data are consistent with a predetermined theoretical framework or model.[24] CFA was conducted using a structural equation modeling (SEM) strategy for data examination.[25] Assessment of the model's goodness of fit was performed by using multiple indicators, including Tucker–Lewis's index (TLI), comparative fit index (CFI), standardized root mean square residual (SRMR) and root mean square error of approximation (RMSEA). >0.90 values of TLI and CFI, indicating a good fit. Moreover, <0.08 for RMSEA and SRMR represents an acceptable fit.[26] The psychometric properties of the Arabic APSQ were evaluated using the Rasch model, which is a form of item response theory (IRT) analysis. This model facilitates the comparison of item difficulty and person ability on a unified scale, complementing the approaches of classical test theory. The Rasch model is a measurement model that specifically positions individuals and items on a continuum of the underlying construct being assessed.[27] It is used to find item functionality that is either good or poor and to determine the scale's working consistency among groups.

Results

A total of 523 participants were involved in our study. Eighty-one percent of them were female, and eighty-three percent were single. The mean age was 23.62 ± 7.5 years, and the mean BMI was 23.29 ± 4.78. The mean APSQ total was 31.28 ± 8.31 (Table 1). The prevalence of insomnia symptoms in our sample was 37% (95% CI 33–41%). The prevalence of anxiety symptoms in our sample was 48% (95% CI 43–52%). An independent samples *t*-test was conducted to compare the mean scores on the APSQ Total between female and male participants. The results showed that there was no significant difference between the two groups (t-score(521) = 1.47, p = 0.143, Mean difference = 1.35). Descriptive statistics revealed that the mean score for females (31.55 ± 8.41) was slightly higher than that for males (30.20 ± 7.81).

Two values were calculated to determine the internal consistency of the translated APSQ: Cronbach's α = 0.91 and McDonald's ω = 0.91. These numbers represent an excellent internal consistency value as the threshold of acceptable value is >0.75, and all items had a value of >0.75, representing accepted internal consistency values; thus, none of the items were suggested to be deleted to have higher values of internal consistency (Table 2).

Based on CFA, the goodness of fit of the model was assessed by calculating four values, TLI, CFI, SRMR, and RMSEA, and their results were 0.93 and 0.91 for CFI and TLI, respectively; both represent a good fit, as they are >0.90. Moreover, 0.05 and 0.1 for SRMR and RMSEA, respectively, indicate an acceptable fit (Table 3).

The convergent translated APSQ showed very good validity against the AIS and against the GAD-7 (Table 4). Specifically, correlation coefficients for: AIS with ASPQ Total (*r* = 0.63, p < 0.001), AIS with ASPQ Factor 1 (*r* = 0.59,

Table 1 Descriptive Results of the Sleep Preoccupation Scale (SPS)/ Anxiety and Preoccupation About Sleep Questionnaire (APSQ) n = 523

Variable	Mean	SD	Skewness	Kurtosis
Age	23.62	7.5	2.85	9.68
Ht (kg)	161.43	8.65	0.63	0.29
Wt (cm)	61.07	15.23	1.03	1.81
BMI kg/cm^2	23.29	4.78	0.72	0.52
APSQ1	2.99	1.16	−0.1	−1.01
APSQ2	3.4	1.08	−0.43	−0.62
APSQ3	3.42	1.07	−0.5	−0.54
APSQ4	2.98	1.1	−0.09	−0.84
APSQ5	3.31	1.07	−0.4	−0.56
APSQ6	3.03	1.17	−0.11	−0.96
APSQ7	3.24	1.12	−0.35	−0.7
APSQ8	3.17	1.15	−0.33	−0.72
APSQ9	2.94	1.19	0.01	−0.97
APSQ10	2.8	1.18	0.16	−0.9
APSQ Total	31.28	8.31	−0.06	−0.08
APSQ F1	19.34	5.1	−0.21	−0.15
APSQ F2	11.94	3.87	−0.02	−0.46

Notes: Results expressed as arithmetic mean and standard deviations. APSQ F1 = APSQ Factor 1 (Worries about the consequences of poor sleep). APSQ F2 = APSQ Factor 2 (Worries about the uncontrollability of sleep).
Abbreviations: AIS, Athens Insomnia Scale; GAD-7, Generalized Anxiety Disorders.

Table 2 Reliability Analysis Coefficients of the Anxiety and Preoccupation About Sleep Questionnaire (APSQ) n = 523

Scale	Cronbach's α	McDonald's ω	Intraclass Coefficient ICC
APSQ	0.91	0.91	0.93
F1 APSQ	0.87	0.87	0.88
F2 APSQ	0.84	0.85	0.89

Notes: ICC was based on a subsample of 80 participants only. APSQ F1 = APSQ Factor 1 (Worries about the consequences of poor sleep). APSQ F2 = APSQ Factor 2 (Worries about the uncontrollability of sleep).

p < 0.001), and AIS with ASPQ Factor 2 ($r = 0.57$, p < 0.001). Similarly, GAD-7 showed positive associations with ASPQ Total ($r = 0.71$, p < 0.001), ASPQ Factor 1 ($r = 0.66$, p < 0.001), ASPQ Factor 2 ($r = 0.66$, p < 0.001), and AIS ($r = 0.48$, p < 0.001).

Table 3 Confirmatory Factor Analysis of the Anxiety and Preoccupation About Sleep Questionnaire (APSQ) n = 523

Factor	Indicator	Estimate	SE	Z	p
F1	APSQ1	0.83	0.05	17.95	<0.001
	APSQ2	0.8	0.04	18.85	<0.001
	APSQ3	0.82	0.04	20.13	<0.001
	APSQ4	0.67	0.05	14.8	<0.001
	APSQ5	0.81	0.04	19.58	<0.001
	APSQ7	0.83	0.04	19.14	<0.001
F2	APSQ6	0.82	0.05	17.36	<0.001
	APSQ8	0.84	0.05	18.46	<0.001
	APSQ9	0.98	0.05	21.68	<0.001
	APSQ10	0.93	0.05	20.45	<0.001

Notes: Estimate represents factor loading. APSQ F1 = APSQ Factor 1 (Worries about the consequences of poor sleep). APSQ F2 = APSQ Factor 2 (Worries about the uncontrollability of sleep).

Table 4 Intercorrelations of the Anxiety and Preoccupation About Sleep Questionnaire (APSQ) and Convergent Validity of the Athens Insomnia Scale (AIS) and Generalized Anxiety Disorders (GAD-7)

	ASPQ Total	ASPQ F1	ASPQ F2	AIS	GAD-7
ASPQ Total	–			0.85*	0.69*
ASPQ F1	0.94*	–		0.59*	0.66*
ASPQ F2	0.90*	0.71*	–	0.57*	0.66*

Notes: Anxiety and Preoccupation about Sleep Questionnaire (APSQ) is based on the entire sample n = 523. Convergent validity of the test with Athens Insomnia Scale (AIS) and Generalized Anxiety Disorders (GAD-7) is based on subsample of 80 participants only. APSQ F1 = APSQ Factor 1 (Worries about the consequences of poor sleep). APSQ F2 = APSQ Factor 2 (Worries about the uncontrollability of sleep). *represent p values < 0.001, respectively.

Discussion

Our study aims to evaluate the psychometric properties of the APSQ. The findings support that the Arabic version of the APSQ has high validity and reliability and exhibits high internal consistency. These results suggest that the Arabic translation of the questionnaire is a valid and trustworthy tool for evaluating worry in Arabic-speaking people with insomnia.

The translated form of the APSQ has shown both reliability and validity, as proven by the alpha value and CFA for the hypothesized factor structure fitting the data well, including the following fit indices: CFI, TLI, SRMR, and RMSEA, which either meet or exceed their respective benchmarks. Thus, the suggestion of the APSQ to effectively assess an important and well-defined construct is considered.

This study has a mean APSQ of 31.2 and a standard deviation of 8.31, with an overall reliability of 0.91. The original scale, which was performed in Sweden, had a mean of 13.64, with a standard deviation of 6.4 and an overall reliability of 0.93.[14] The Turkish version of the scale had a mean of 41.19 and a standard deviation of 28.67, with an overall reliability of 0.95.[28] Our mean is lower than the Turkish and higher than the Swedish. One possible explanation for the variation between the Turkish and Swedish scales is the prevalence of insomnia, which is 12.2% and 10.5%, respectively.

Several factors precipitate the development of insomnia. The identifiable factors can be divided into 5 main categories: health, family, work-school, psychopathology, and others. Pain and medical illness represented 21.8% of all insomnia-related factors within these categories. Stress at work or school accounts for 13.4%, and major affective disorders represent 12.6% of the total factors related to insomnia.[29] The higher mean in the previous Turkish version can be attributed to the difference in the selection criteria and the study population,[28] since it includes university students who are more likely to be stressed.[30] In addition, the involvement of patients who have a major depressive disorder has an association with insomnia. Thus, the scale score correlates with the severity of insomnia.[14] However, our study sample was notably different; our sample was the general population, which might justify the reduction in our mean compared to the Turkish version.[28] The English version displays a significant variation that can be attributed to several causes.[14] For instance, COVID-19 revealed an expanded prevalence of insomnia from 25.4% to 32.2% between 2018 and 2020. This wider variation might account for our higher mean since our study was conducted after the pandemic.[31]

The observed prevalence of insomnia symptoms in our sample (37%) suggests a significant proportion of individuals experiencing sleep difficulties. This finding aligns with previous research highlighting the widespread nature of insomnia symptoms in the general population.[32–35] Further exploration of the factors contributing to the high prevalence of insomnia symptoms in our sample could provide valuable insights for developing targeted interventions and improving sleep health outcomes.

The prevalence of anxiety symptoms in our sample (48%) indicates a considerable burden of anxiety within the population studied. This finding is consistent with existing literature highlighting the pervasive nature of anxiety symptoms in various settings.[36–38] Understanding the factors associated with elevated anxiety symptoms in our sample can guide the development of effective interventions and support strategies to alleviate the impact of anxiety on individuals' well-being and daily functioning. Future research should explore potential risk factors and protective factors contributing to anxiety symptoms, considering their implications for mental health interventions.

One possible explanation for the worldwide increasing incidence of insomnia and preoccupation with sleep is the expanding use of watches/applications that track sleep. As these trackers provide an idea about sleep quality, most users look for perfectionism of sleep quality. This makes them obsessive about their sleep, resulting in insomnia and sleep preoccupation.[39]

Arabic-speaking societies and other non-English societies need further tools to assess sleep since most of the tools are available in English only.[40] Chronic insomnia has been proven to be treated with cognitive therapy, leading to a subsequent reduction in worry that can be evaluated by using the APSQ scale. Depressed patients can also benefit from the treatment of chronic insomnia.[41] Insomnia is a common health problem that varies between different societies, making it crucial to investigate disparities.

Correlations between different indices that assess different aspects can provide valuable insights into the relationships between various constructs. In the context of our study, examining the correlations between the APSQ, AIS, and GAD-7 can help us understand the interplay between sleep-related anxiety, insomnia symptoms, and general anxiety symptoms. By exploring these associations, we can gain a deeper understanding of how sleep-related anxiety may relate to insomnia and anxiety symptoms more broadly. This can contribute to our understanding of the unique contributions of each construct and shed light on potential treatment implications. Therefore, while the measures assess different aspects, investigating their correlations can provide valuable information to enhance our understanding of the complex relationships between sleep-related anxiety, insomnia, and general anxiety symptoms.

Strengths and Limitations

Our translated and validated form of the APSQ had several strengths and limitations. Starting with strength, the translation process has been through many expert people in both languages; in addition, they have medical backgrounds, which provide helpful adjustments to the translated form. The rigorous methodology involved a four-step translation process to ensure the accuracy and cultural appropriateness of the Arabic version of the APSQ. The study also employed an acceptable sample size of 523 participants from various Arabic-speaking countries, which enhances the generalizability of the findings. The analysis that has been performed to examine and validate the scale is a very beneficial test for assessing and evaluating the psychometric properties of the questionnaire. Despite its strengths, the study also has

some limitations. Using an online survey for data collection may have introduced selection bias, as individuals without internet access or those not active on social media platforms were excluded. Additionally, the study relied on self-reported assessment, which may be subject to response bias. Future studies could benefit from incorporating objective assessments, such as clinical interviews or polysomnography, to corroborate self-reported data.

Conclusions

The Arabic version of the APSQ is a reliable and valid tool for assessing sleep-related anxiety and preoccupation in Arabic-speaking populations. It can be used in clinical and research settings, and it also provides a means to monitor the effectiveness of cognitive therapy for chronic insomnia. The Arabic APSQ also opens up new research avenues, particularly in understanding sleep-related anxiety and its impact on other health outcomes. This could lead to a more holistic approach to healthcare, recognizing sleep as a key factor in overall well-being. The Arabic APSQ is not only a reliable and valid tool for measuring sleep-related anxiety and preoccupation but also a catalyst for future research and clinical practice improvements in the Arabic-speaking world.

Acknowledgments

Disclosure

The authors report no conflicts of interest in this work.

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