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Research Article

Validity and reliability of the Persian version of the Athens Insomnia Scale

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Abstract

***Background*: Insomnia is a common disorder worldwide, and is an important issue in Iranian population. The Athens Insomnia Scale is a brief questionnaire that can be used as an effective diagnostic tool. We evaluated the validity and reliability of the Athens Insomnia Scale among a population of Iranian patients. The standard forward-backward method was utilized for translating the Athens Insomnia Scale from English to Persian. Coronbach's alpha was used for calculation of internal consistency and inters correlations between the Athens Insomnia Scale subscales were calculated as well. From a subsample (n = 21) test–retest reliability was calculated. Analysis of face, content and convergent validity were conducted. Factor analysis was also performed and finally construct validity was assessed.**

***Results*: Cronbach's alpha was 0.86. The test–retest reliability was excellent (0.98). Face and content validity were confirmed. Significant correlations of the Athens Insomnia Scale with the Pittsburgh Sleep Quality Index and Insomnia severity index confirmed convergent validity. Factor analysis revealed that this scale had two factors; one known as nighttime symptoms, and another known as daytime symptoms. The reliability of the instrument was confirmed by two methods of calculating Cronbach's alpha and the test-retest method. The face and content validity was confirmed by the experts' opinion method and by calculating the content validity ratio and content validity index. Convergent validity with a strong correlation between the Athens scale score and two other standard instruments were confirmed and construct validity was confirmed using exploratory factor analysis and correlation coefficient calculation. This study did not include special populations such as children or the elderly, and it is recommended to investigate validity in these populations in future studies.**

***Conclusions*: The Athens Insomnia Scale may be an appropriate tool with good validity and reliability for screening insomnia symptoms in Persian speaking population.**

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Keywords: Insomnia, Validation, Athens Insomnia Scale

Background

Insomnia is a common disorder worldwide, and considering its high prevalence in Iran, it is an important health problem [1,2]. Insomnia is not only an important factor in reducing the quality of life [3], but also is a risk factor for physical [4-7], and psychiatric illnesses [8,9], and can even increase the risk of suicide [10]. The higher rate of car and occupational accidents in people with insomnia is also a public health concern [11,12].

Therefore, insomnia should not be considered as a simple issue. It is a serious disorder that should be diagnosed and managed as soon as possible to avoid harmful consequences and costs. Given that clinical interviewing is a costly and time consuming method, today it is very common to use questionnaires to screen insomnia. Numerous self-report scales are used for this purpose, among which the Persian versions of the Insomnia Severity Index (ISI) and the Pittsburgh Sleep Quality Index (PSQI) have been reviewed and approved [13,14]. Another scale called the Athens Insomnia Scale (AIS) was developed by Soldatos et al. [15]. This questionnaire has advantages over previous questionnaires that have led to its widespread use. The high sensitivity and specificity [16], of this tool puts it as a gold standard tool alongside the ISI [17]. In

addition, the questions posed in the AIS, which include physiological components such as drowsiness and day-to-day functional capacity, make the scale more practical than the ISI, which addresses psychological components such as sleep anxiety and satisfaction [18,19]. Due to the fact that this scale is designed based on the ICD-10 diagnostic criteria, in addition to research application, it can also have clinical practical value, and this also shows the preference of this scale over previous scales [15]. It is a brief self-report instrument, which consists of eight questions, including sleep induction, awakenings during the night, final awakening, total sleep duration, sleep quality, well-being, functioning capacity, and sleepiness during the day [15]. In spite of its potential usefulness for research and clinical purposes, the AIS do not have an authentic Persian version. The aim of the current study was to validate the Persian version of the AIS.

Methods

Participants

Participants in this study were people who referred to one of Sleep Clinics affiliated to Tehran University of Medical Sciences. The volunteers were assured about the confidentiality of the information and then informed consent was obtained.

Study measures

Athens Insomnia Scale (AIS)

The AIS is a self-assessed instrument consisting of eight questions. The first five questions of the questionnaire examine the quality and quantity of sleep and include criteria A of the ICD- 10, and the last three questions measure the daily consequences of insomnia and include criteria C of the ICD-10. If the respondent has experienced any of the sleep problems at least three times a week in the last month, she/he is asked to give a score to each of the questions on a Likert scale from 1 to 3. (0 = no problem, 1 = minor problem, 2 = considerable problem, and 3 = serious problem). The frequency and duration of insomnia in this scale is determined based on criterion B of the ICD-10. The score of the questionnaire is between 0 and 24, and a higher score indicates more severe insomnia [15]. The accepted cutoff point for the diagnosis of insomnia is 6 [20].

Insomnia Severity Index (ISI)

The ISI consists of seven questions that assess the severity of insomnia during the previous two weeks. For this purpose, the person is asked to rate the severity of the problems in starting sleep, the continuation of sleep and early morning awakenings, as well as the degree of dissatisfaction with the sleep situation, the degree of interference of these sleep problems with daily functioning, the degree that others notice the worsening of the person's functioning related to Sleep problems and the person's level of distress or worry about sleep problems should be scored from 0 to 4. The total score is obtained by adding the scores of the seven questions of the questionnaire between 0 and 28. A higher score indicates a greater intensity of insomnia [21].

Pittsburgh Sleep Quality Index (PSQI)

The PSQI assesses sleep quality over the past 1 month. This questionnaire contains 19 questions that are answered by the person himself and 5 questions that must be answered by the roommates. These 19 questions are classified into 7 items and scored on a Likert scale from 0 to 3. The PSQI items are as follows: subjective sleep quality, sleep latency, total sleep duration, sleep efficiency, sleep disorders, sleep medication use, and daytime dysfunction. The sum of the scores on these 7 items yields a total score that ranges from 0 to 21, with higher scores being associated with worse sleep quality. A total PSQI score greater than 5 indicates major problems in at least 2 components or moderate problems in more than 3 components [22].

Procedures

In the first stage the AIS was translated into Persian, then two bilingual experts translated the Persian text back into English. Finally, the back-translated version and the original version of the questionnaire were compared by two people fluent in English, and the same concept of the two questionnaires was confirmed.

Data analysis

In the second stage, the validity of the questionnaire was examined. To evaluate the face validity, 10 specialists in the field of sleep disorders were asked to comment on the apparent appropriateness, clarity and ambiguity of the selected words and the logic of the sequence of items to achieve the goals of the tool. To evaluate the content validity, the content validity ratio index (CVR) and the content validity index (CVI) were calculated. To calculate the CVR, the completion of the Lawshe table was used and Waltz and Bausell methods were used to calculate CVI. To evaluate convergent validity Pearson's correlations between the AIS scores and the scores of the PSQI and ISI were assessed. Finally, factor analysis and evaluation of construct validity were conducted. The suitability of AIS scores for factor analysis was assessed using the Kaiser–Meyer–Olkin test, and Bartlett's test of sphericity. Exploratory factor analysis and the extraction method of the principal component analysis with varimax rotation were used, and the eigen value threshold was set at 1.0.

In the third stage, the reliability of the questionnaire was evaluated. The internal consistency of the scale was assessed by the mean value of the correlation coefficients between each item score and the total score without that item, which were represented by the Cronbach's α coefficient. In addition, the test-retest reliability was evaluated with Spearman–Brown correlation coefficients.

Results

Demographic characteristics of participants

A total of 155 participants were enrolled the study and 21

of them completed the questionnaire twice to check the reliability of the scale. Ninety five (63.1%) participants were male and the mean age was 45.24 (SD =13.7) years. Most of the participants (41.9%) had higher than diploma education. Marital status was as follows: married (72.3%), single (20.6%), divorced (1.3%), and widowed (2.6%). The majority of participants in the study were not smokers (80.6%).

The mean AIS score was 9.65 (SD =5.74).

Reliability

Reliability of the Persian version of AIS was assessed by two methods:

1. Internal consistency using the Cronbach's alpha coefficient. The obtained Cronbach's alpha coefficient is equal to 0.86, which is a desirable and acceptable value. The effect of each item on the reliability of the questionnaire was investigated and the results can be seen in Table 1.

According to the results of the table, deleting any of the items does not increase the reliability of the whole test, which indicates the appropriateness of the questions.

2. Test–retest analysis: The similarity of the scores obtained from the two tests was estimated using Spearman-Brown correlation coefficient

According to the results of the analysis, the correlation of the scores of the questionnaire in test-re-test method is equal to 0.986, which is a very high correlation and is significant at the level of 0.001.

Validity

Validity of the Persian version of AIS was assessed by four methods:

1. Face validity: According to the opinions of 10 sleep medicine specialists, the impact score was calculated using the following formula. Due to the fact that the impact score of all items was higher than 1.5, the face validity of the questionnaire was assessed as appropriate.

Importance* Frequency (%): impact Score

2. Content validity:

1) Calculation of CVR: After completing the Lawshe table, the CVR was calculated using the following formula. Given that the number of professionals who have completed the table is 10 and the CVR for all items is calculated above 0.62, the questionnaire is considered to have good content validity.

2) Calculation of CVI: This index was calculated using the Waltz & Bausell method. The calculated score for all options is higher than 0.7 and indicates appropriate validity.

3. Convergent validity: To determine the convergent validity, the correlation coefficient between the AIS and the ISI and PSQI was calculated. The results can be seen in the Table 2.

Considering that all 3 AIS and ISI and PSQI have a positive

Table 1
Impact of each item on reliability

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Sleep induction	8.4533	26.357	0.534	0.357	0.854
Awakenings during the night	8.3067	26.174	0.6	0.521	0.846
Final wakening	8.68	25.83	0.577	0.437	0.85
Total sleep duration	8.48	24.359	0.715	0.559	0.832
Sleep quality	8.3467	24.966	0.776	0.645	0.827
Well-being during the day	8.38	25.324	0.654	0.611	0.84
Functioning capacity during the day	8.6133	26.105	0.614	0.551	0.845
Sleepiness during the day	8.4533	28.585	0.413	0.287	0.865

Table 2
Evaluation of convergent validity

	ISI	PSQI	Total score	psqi
ISI Pearson Correlation	1	.553**	.770**	.553**
Sig. (2-tailed)		0	0	0
N	155	155	155	155
PSQI Pearson Correlation	.553**	1	.502**	1
Sig. (2-tailed)	0		0	
N	155	155	155	155
Total score Pearson Correlation	.770**	.502**	1	.502**
Sig. (2-tailed)	0	0		0
N	155	155	155	155

**. Correlation is significant at the 0.01 level (2-tailed)

and significant correlation at the level of P <0.01, the convergence validity of the questionnaire is confirmed.

4. Construct validity and factor analysis method: There were sufficient linear combinations between the AIS item scores, as shown by the results of the Bartlett sphericity test (<0.0001).The Kaiser–Meyer–Olkin test of sampling adequacy (KMO) was 0.85. Indicating that statistical assumptions of multivariate normality are observed and the sample size is sufficient for factor analysis. (Table 3)

Exploratory factor analysis and the extraction method of the principal component analysis with varimax rotation which is an orthogonal rotation method was used, and the eigen value threshold was set at 1.0. The findings of exploratory factor analysis are presented in Table 4 and Figure 1.

Based on this, 2 factors with an eigenvalue greater than 1 were extracted, which together explain about 67% of the variance of the Athens insomnia index items one component included questions 1 to 5 (nighttime symptoms), and the other component included questions 6 to 8 (daytime symptoms) (Table 5).

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Finally, Pearson correlation method was used to evaluate the correlation between the items of the AIS and each other with the total score of the questionnaire. Based on the results, all items of the Persian version of AIS at the level of P <0.01 have a significant correlation with the total score and with 90% confidence we can say that the construct validity in the questionnaire is in a good condition.

Discussion

Based on our knowledge this is the first study to determine the validity and reliability of the AIS in Persian speaking population. The results suggest that the AIS are an authentic and suitable measure to evaluate insomnia symptoms in

Table 3
Sample size adequacy measures of the Persian version of the AIS

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.85
Bartlett's Test of Sphericity	Approx. Chi-Square	539.949
	df	28
	Sig.	0

Table 4
Variances and eigenvalues of items of the Persian version of the AIS

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.124	51.555	51.555	4.124	51.555	51.555	3.057	38.218	38.218
2	1.23	15.37	66.925	1.23	15.37	66.925	2.297	28.707	66.925
3	0.708	8.844	75.769						
4	0.593	7.415	83.185						
5	0.455	5.687	88.871						
6	0.355	4.435	93.306						
7	0.29	3.631	96.937						
8	0.245	3.063	100						

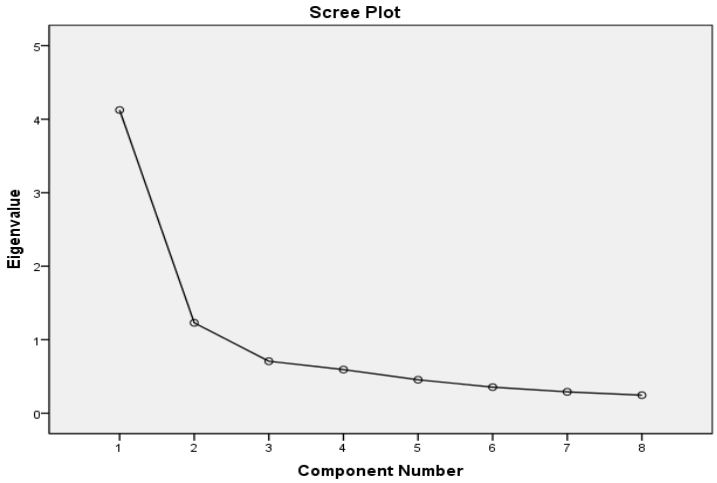

Figure 1. Rock plot of eigenvalues

Table 5
Matrix of rotated factors

	Component	
	1	2
Sleep induction	0.678	0.181
Awakenings during the night	0.814	0.098
Final wakening	0.774	0.116
Total sleep duration	0.774	0.317
Sleep quality	0.744	0.434
Well-being during the day	0.317	0.827
Functioning capacity during the day	0.284	0.81
Sleepiness during the day	0.055	0.782

this population.

In our study, Cronbach's alpha was similar to the original scale, while the mean item-total correlation was higher [15], indicating good internal consistency. The reliability coefficients of the one-week retest for the total score (0.986) were higher than the original scale [15]. All 8 AIS items had easy translation and good quality and due to the high scores that the experts considered for the items, the face validity of the tool was confirmed. Also, all the questions of the Persian version of this narration tool obtained acceptable content validity.

The AIS scores were significantly correlated with other measures assessing sleep quality or insomnia symptoms (PSQI, ISI). Consistent with previous studies [23-24], these results indicate satisfactory convergent validity. Factor analysis demonstrated two components, the nighttime symptoms and the daytime symptoms. The study of Soldatos et al. [15] and also the study of Go´mez-Benito et al. [25] showed that the whole scale emerged as a sole component. These differences can be explained by these reasons: 1) In Persian, questions that examine daytime symptoms such as performance, well-being, and sleepiness are not as objective as words used to describe nocturnal symptoms and may be more difficult to understand. 2) Those who present with more daytime symptoms and milder nocturnal symptoms may not have primary insomnia. Sleep-related movement disorders, obstructive sleep apnea, and other primary sleep disorders commonly present with this clinical picture. [25-27].

Limitations

Our sample did not include special populations such as children or the elderly. Further validation study on these groups is necessary.

Conclusions

In conclusion, the present study shows that AIS is a good tool for diagnosing insomnia in the Persian-speaking population and can be considered as a suitable screening questionnaire for insomnia symptoms.

List of Abbreviations

ISI=Insomnia Severity Index

PSQI=Pittsburgh Sleep Quality Index

AIS=Athens Insomnia Scale

ICD-10= International Classification of Diseases 10th Revision

CVR=Content validity ratio

CVI=Content validity index

SD=Standard deviation

KMO= Kaiser–Meyer–Olkin test

Ethics approval and consent to participate

Ethics Committee of Tehran University of Medical Sciences reviewed and approved the study protocol. (Ethical code: IR.TUMS.FNM.REC.1401.003).

Consent for publication

Not applicable

Availability of data and material

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

The initial idea of the research came from RH and she edited the manuscript.

Statistical analysis of the data was done by AN.

Data collection and manuscript writing were done by FJ.

RE has collaborated in data collection and manuscript editing.

MY collaborated in data collection and manuscript editing.

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