

Psychometric Properties of the Persian Translation of Pittsburgh Sleep Quality Index

Morteza Nazifi¹; Hamidreza Mokarami^{2,3,*}; Aliakbar Akbaritabar⁴; Haji Omid Kalte⁵; Amid Rahi⁶

¹Department of Educational Sciences and Exceptional Children, Semnan University, Semnan, IR Iran

²Department of Ergonomics, School of Health, Shiraz University of Medical Sciences, Shiraz, IR Iran

³Research Center for Modeling in Health, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, IR Iran

⁴Department of Social Welfare, Allameh Tabatabaie University, Tehran, IR Iran

⁵Department of Occupational Health Engineering, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, IR Iran

⁶Student Research Committee, Kerman University of Medical Sciences, Kerman, IR Iran

*Corresponding author: Hamidreza Mokarami, Research Center for Modeling in Health, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, IR Iran. Tel: +98-2182883585, Fax: +98-2182884555, E-mail: hamidreza.mokarami@yahoo.com

Received: October 22, 2013; **Revised:** December 12, 2013; **Accepted:** December 21, 2013

Background: Pittsburgh sleep quality index (PSQI) is one of the most important instruments frequently used to assess sleep quality. This questionnaire is used to assess sleep styles and quality in adults through seven dimensions.

Objectives: The study aims to investigate the reliability, validity and factor structure of the Persian version of PSQI.

Materials and Methods: A Survey method with quantitative analytic approach was used in this research. A sample of 415 employees of Kerman hospitals participated in this study and filled the questionnaire. Forward-backward method was applied to translate the questionnaire from English to Persian. The following aspects of the Persian version of PSQI were evaluated: internal consistency (using Chronbach's alpha), concurrent validity (correlation with GHQ-28), and factor structure of the questionnaire.

Results: Mean age of the participants was 35.18 years, and participants' average year of education was 15.3. The Chronbach's alpha coefficient was 0.55. According to the factor analysis, three factors were extracted accounting for 63.485% of the total variance. There was a significant correlation among different dimensions of the Persian version of PSQI. Concurrent validity analysis showed that PSQI and GHQ-28 were correlated significantly.

Conclusions: The Persian version of PSQI exerted a satisfactory validity and reliability in our sample.

Keywords: Sleep Disorders; Pittsburgh Sleep Quality Index; Reliability and Validity

1. Background

Sleep quality is an important aspect of mental and physical health in today's industrial world. Rapid population growth has brought about increasing demands for services, technology, and economic growth, which in turn turned industries into 24-hour or day-and-night working machines. Such 24-hour works need long shift working, which despite increased production and service delivery, leading to serious mental and physical problems for shift workers. Sleep disturbances are among the most problematic issues shift workers face. Shift work, especially night shifts, make individuals act against their biological clock, a condition giving rise to cumulative sleep need. Research has shown that there are two kinds of sleep disorders: first, a real decrease in sleep hours, and second, an instability and/or inconsistency in sleep hours. It seems that natural sleep includes different stages occurring at regular intervals throughout the night. The most impor-

tant type of sleep for brain restoration, the slow-wave sleep, occurs during the first five-hour of the sleep cycle, while, among shift workers, sleep is shifted to an inappropriate time of the daily cycle when hormonal activities result in an increase in waking state (1). Therefore, it is especially difficult for night workers to keep a regular sleep habit, and their sleep might be disrupted just when they are at slow-wave sleep. The later hypothesis has been verified in survey studies performed on shift workers (1) as well as in electroencephalographic researches (2). Kolagari's findings showed that more than a half of the nurses participated in his study faced difficulties falling asleep and experienced frequently wake ups during the night. The inadequate sleep amount led to feeling weakness and fatigue in these nurses (3).

Pittsburgh Sleep Quality Index (PSQI) is a 19-item self-report questionnaire which assesses sleep quality. This questionnaire is one of the most frequently used and important instruments to study sleep quality (4). Using

Implication for health policy/practice/research/medical education:

Pittsburgh sleep quality index (PSQI) is one of the most important instruments frequently used to assess sleep quality. This questionnaire is used to assess sleep styles and quality in adults. Adapting and validating PSQI for use in Iran, our research will help physicians to accurately assess sleep disorders.

Copyright © 2014, Health Promotion Research Center; Published by DOCS. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

a clinical method, seven sleep quality components are calculated regarding the participants' responses to PSQI, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime medication in the previous month. A total score is also calculated by summing the seven components (4-6). PSQI shows satisfactory reliability and validity when administered to patients with mental and sleep disorders (7) and physical illnesses (8). Knutson et al. (6) examined temporal stability of the PSQI in two year interval. Pearson correlation between total scores in two year interval was 0.68 for their total sample, 0.54 for black men, and 0.72 for black women (6). Shochat et al. (9) also examined the reliability and validity of the Hebrew version of PSQI and found a Chronbach's alpha of 0.72. Beck et al. (10) also examined psychometric properties of PSQI on patients with cancer and found a satisfactory internal consistency and construct validity. Cole et al. (11) examined factor structure of PSQI and concluded that a three-factor model achieves a higher goodness of fit compared to both single-factor and two-factor models. Burkhalter et al. (12); however, confirmed a three-factor model for PSQI through confirmatory factor analysis. No Iranian researches were found on psychometric properties of PSQI, but some articles used Persian versions of this questionnaire with their translations and just reported test-retest reliabilities based on very small samples (13). Since, sleep quality is a multi-dimensional concept and researches on the English versions of PSQI have approved its multi-dimensionality, it seems important to investigate the factor structure of the Persian version of PSQI as well.

2. Objectives

To evaluate the validity, reliability, and factor structure of the Persian version of PSQI in a sample of shift workers of hospitals of Kerman University of Medical Sciences.

3. Materials and Methods

3.1. Measures

Pittsburgh sleep quality index (PSQI) contains 19 self-report questions and subjects' responses turned into seven components using clinical method for scoring. Total score of PSQI (global sleep quality) is also calculated by summing all the seven components. In the original PSQI scoring method (4), score five is considered as a cut-off, and the scores higher than five are suggestive of one's sleep problems. As mentioned previously, several studies conducted outside Iran supported the internal consistency, temporal stability, and construct validity of PSQI. General health questionnaire-28 (GHQ-28) was developed by Goldberg and Hillier (1979), and its items were extracted based on factor analysis of the first 60-item questionnaire. This questionnaire includes four subscales of physical symptoms, sleep disturbances, social dysfunction, and severe depression (14,

15). Different studies on the validation of GHQ indicated its high reliability and validity (16-22). In Iran, a study on GHQ-28 validation was performed by Palahang et al. (23), Najafi et al. (24) and Noorbala et al. (25).

3.2. Procedure

We translated (forward translation) PSQI to Persian and then send it to occupational health and psychology experts to evaluate its content validity. The experts read our translation of PSQI and gave their comments. The purpose was to ensure that there is no ambiguity in the items, and different experts would come to a shared understanding of its items reading it. Then, backward translation was performed from Persian to English by an English language expert blinded to the content of primary questionnaire. Finally, the necessary changes were exerted on translated version of PSQI. Therefore, the Persian translation of PSQI was prepared and administered to 30 available participants to evaluate its internal consistency and item-total correlations. Results of this pilot study confirmed the internal consistency of the prepared version of PSQI. Then the questionnaires were filled by 415 participants among physicians and nurses working in hospitals of Kerman University of Medical Sciences. Finally, participants' responses were analyzed using SPSS Statistics 17.0 (USA, SPSS Inc.) and internal consistency, concurrent validity and factor structure of PSQI was obtained. We assured confidentiality in our research by analyzing the data cumulatively and anonymously.

Table 1. Demographic Characteristics of Study Sample ^a

| Characteristics, n = 415 | Results |
|--------------------------|------------|
| Gender | |
| Male | 174 (41.9) |
| Female | 241 (58.1) |
| Marital status | |
| Single | 119 (28.7) |
| Married | 296 (71.3) |
| Employment | |
| Official | 192 (46.3) |
| Contractual | 223 (53.7) |
| Working schedule | |
| Day work | 208 (50.1) |
| Shift work | 207 (49.9) |
| Second job | |
| Yes | 31 (7.5) |
| No | 382 (92.5) |
| Smoker | |
| Yes | 13 (3.3) |
| No | 385 (96.7) |
| Job title | |
| Physician | 25 (6.0) |
| Nurse | 390 (94) |

^a Data are presented in No. (%).

There were no coercions for respondents to participate in our research and to respond our questionnaires. Those individuals with depression or any other severe mental disorders, derived from history taking and in-person interviews, were excluded from the study.

4. Results

Of all participants, 174 were females (41.9%) and 241 were males (58.1%). One hundred and eight participants (26%) were single, 296 (71.3%) were married and 11 (2.6%) were divorced, widows or widowers. Mean age of participants was 35.18 years. Average education and work years were 15.33 and 11.48, respectively. Table 1 shows the demographic variables of the study population. Table 2 shows inter-correlations of the three identified factors of PSQI. According to Table 2, correlations among all subscales are significant at 0.05 levels. These findings showed that all subscales of PSQI are correlated. To investigate the factor structure of PSQI, exploratory factor analysis (EFA) was performed with a principal components analysis (PCA), a three-factor solution and varimax rotation. KMO value was 0.58, and it was significant at 0.05. These three factors altogether explained 63.485% of the total variances in responses. Table 3 shows factor loadings of each of the seven PSQI components on the three recognized factors with varimax rotation. The correlation between PSQI and GHQ-28 scores was 0.479 which was significant at 0.01 ($P \leq 0.01$).

5. Discussion

Current study focused on the translation and validation of the Persian version of PSQI. Results indicated an appropriate internal consistency (Chronbach's alpha of 0.55) for its clinically calculated seven components. These find-

ings were consistent with that of English version of PSQI (6-10). The Persian version of PSQI had also an appropriate internal consistency. Inter-correlations between the three dimensions of PSQI (Table 2) showed that different dimensions of PSQI are correlated, and each of the three dimensions assesses a relatively separate and unique concept. In the next step, exploratory factor analysis was conducted to find some evidence concerning goodness-of-fit of the three-factor model. Results showed that a clear factor structure of PSQI is obtained through principal components analysis using varimax rotation. This indicates that the three-factor model of PSQI is also applicable for the Persian version of PSQI. These findings are completely consistent with the findings obtained from factor analysis of PSQI in English speaking countries (11, 12), and that the three-factor model is applicable for the Persian PSQI too. Table 3 shows that component 5 of PSQI was loaded on both perceived sleep quality and daily malfunctioning simultaneously.

This indicates that there are some associations between the dimensions of sleep quality. The first component loaded on daily malfunctioning but did not load significantly on the perceived sleep quality. Factor analysis on the English versions of PSQI (11, 12) showed that the first component was expected to be loaded on perceived sleep quality. Two reasons can be assumed for this: first, this difference in findings is likely to be due to cultural differences in understanding the questionnaire items. For instance, Persian speakers might have found item 9 (which plays a significant role in calculating the first component) more related to sleep disturbances and have responded to it with such view. If it would be the case, the three-factor model would still be applicable to Persian culture with small modifications. Second

Table 2. Inter-Correlations between the Three Identified Factors in Pittsburgh Sleep Quality Index

| | Sleep Efficiency | Perceived Sleep Quality | Daily Malfunctioning |
|-------------------------|------------------|-------------------------|----------------------|
| Daily malfunctioning | 1 | 0.495 ^a | 0.133 ^b |
| Perceived sleep quality | - | 1 | 0.105 ^b |
| Sleep efficiency | - | - | 1 |

^a Correlation was significant at the 0.01 level.

^b Correlation was significant at the 0.05 level.

Table 3. Seven-Factor Loadings of Pittsburgh Sleep Quality Index PSQI Obtained From Varimax Rotation

| Daily Malfunctioning | | Perceived Sleep Quality | | Sleep Efficiency | |
|--------------------------|-----------------|---------------------------------|-----------------|--------------------------------|-----------------|
| Components | Factor Loadings | Components | Factor Loadings | Components | Factor Loadings |
| C7 (daytime dysfunction) | 0.782 | C2 (sleep latency) | 0.844 | C4 (habitual sleep efficiency) | 0.852 |
| C5 (sleep disturbances) | 0.447 | C5 (sleep disturbances) | 0.602 | C3 (sleep duration) | 0.801 |
| C1 (sleep quality) | 0.69 | C6 (use of sleeping medication) | 0.583 | -- | -- |

fact is that respondents might have not clearly understood how to answer the item 9. This issue can be overcome by rewriting item nine in following studies. Finally, the relatively powerful and significant correlation between the Persian version of PSQI with GHQ-28 scores indicated that PSQI shows a proper concurrent validity. That is because sleep health is reasonably related to the total mental health of individuals, also confirmed by the findings of the present study. This study aimed at adaptation and validation of PSQI for the Persian language and Iranian society. According to the results of all tests and measurements, it seems reasonable to state and conclude that the Persian version of PSQI had a proper validity and reliability in our study sample. Therefore, it is recommended to investigate sleep quality by using this index in further investigations. Of course, it is evident that using every index for measuring factors and variables of workplace health requires investigation and evaluation of its reliability and validity in that context.

Acknowledgements

The authors, hereby, express their gratitude to the hospital personnel of Kerman University of Medical Sciences for their great cooperation in conducting this research.

Authors' Contribution

Morteza Nazifi, Hamidreza Mokarami, Aliakbar Akbaritabar, Hajiomid Kalte, and Amid Rahi equally participated in the study design, data collection, analysis and writing of the manuscript.

Financial Disclosure

There are no conflicts of interests.

Funding/Support

This study was the result of a national research project financially supported by Kerman University of Medical Sciences.

References

- Lavie P, Chillag N, Epstein R, Tzischinsky O, Givon R, Fuchs S, et al. Sleep disturbances in shift-workers: A marker for maladaptation syndrome. *Work & Stress*. 1989;**3**(1):33-40.
- Walsh JK, Tepas DI, Moss PD. The EEG sleeps of night and rotating shift workers. Proceedings of a symposium on variations in work sleep schedules. *Occup Environ Med*. 1999;**20**(1):451-65.
- Kolagari S. Assessment of the prevalence of sleep disorders in educational center of shahid Beheshti University. Tehran, Iran: Shahid Beheshti University of Medical Sciences; 1997.
- Buyse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989;**28**(2):193-213.
- Beck-Little R, Weinrich SP. Assessment and management of sleep disorders in the elderly. *J Gerontol Nurs*. 1998;**24**(4):21-9.
- Knutson KL, Rathouz PJ, Yan LL, Liu K, Lauderdale DS. Stability of the Pittsburgh Sleep Quality Index and the Epworth Sleepiness Questionnaires over 1 year in early middle-aged adults: the CARDIA study. *Sleep*. 2006;**29**(11):1503-6.
- Doi Y, Minowa M, Uchiyama M, Okawa M, Kim K, Shibui K, et al. Psychometric assessment of subjective sleep quality using the Japanese version of the Pittsburgh Sleep Quality Index (PSQI-J) in psychiatric disordered and control subjects. *Psychiatry Res*. 2000;**97**(2-3):165-72.
- Carpenter JS, Andrykowski MA. Psychometric evaluation of the Pittsburgh Sleep Quality Index. *J Psychosom Res*. 1998;**45**(1):5-13.
- Shochat T, Tzischinsky O, Oksenberg A, Peled R. Validation of the Pittsburgh Sleep Quality Index Hebrew translation (PSQI-H) in a sleep clinic sample. *Isr Med Assoc J*. 2007;**9**(12):853-6.
- Beck SL, Schwartz AL, Towsley G, Dudley W, Barsevick A. Psychometric evaluation of the Pittsburgh Sleep Quality Index in cancer patients. *J Pain Symptom Manage*. 2004;**27**(2):140-8.
- Cole JC, Motivala SJ, Buysse DJ, Oxman MN, Levin MJ, Irwin MR. Validation of a 3-factor scoring model for the Pittsburgh sleep quality index in older adults. *Sleep*. 2006;**29**(1):112-6.
- Burkhalter H, Sereika SM, Engberg S, Wirz-Justice A, Steiger J, De Geest S. Structure validity of the pittsburgh sleep quality index in renal transplant recipients: a confirmatory factor analysis. *Sleep Biol Rhythms*. 2010;**8**(4):274-81.
- Behroozfar S, Zenoozi SH, Nezafati MH, Esmaeili H. [The study of the factors influencing the quality and quantity of nightly sleep in patients after coronary vassals conjunction surgery]. *J YUMS*. 2008;**16**:57-66.
- Goldberg DP, Hillier VF. A scaled version of the General Health Questionnaire. *Psychol Med*. 1979;**9**(1):139-45.
- Williams P, Goldberg DP, Mari J. The validity of the GHQ-28. *Soc Psych*. 1987;**21**:15-8.
- Mari JJ, Williams P. A comparison of the validity of two psychiatric screening questionnaires (GHQ-12 and SRQ-20) in Brazil, using Relative Operating Characteristic (ROC) analysis. *Psychol Med*. 1985;**15**(3):651-9.
- Bridges KW, Goldberg DP. The validation of the GHQ-28 and the use of the MMSE in neurological in-patients. *Br J Psychiatry*. 1986;**148**:548-53.
- Sriram TG, Chandrashekar CR, Isaac MK, Shanmugham V. The General Health Questionnaire (GHQ). Comparison of the English version and a translated Indian version. *Soc Psychiatry Psychiatr Epidemiol*. 1989;**24**(6):317-20.
- Aderibigbe YA, Gureje O. The validity of the 28-item General Health Questionnaire in a Nigerian antenatal clinic. *Soc Psychiatry Psychiatr Epidemiol*. 1992;**27**(6):280-3.
- Stansfeld SA, Marmot MG. Social class and minor psychiatric disorder in British Civil Servants: a validated screening survey using the General Health Questionnaire. *Psychol Med*. 1992;**22**(3):739-49.
- Cheung P, Spears G. Reliability and validity of the Cambodian version of the 28-item General Health Questionnaire. *Soc Psychiatry Psychiatr Epidemiol*. 1994;**29**(2):95-9.
- Goldberg DP, Gater R, Sartorius N, Ustun TB, Piccinelli M, Gureje O, et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med*. 1997;**27**(1):191-7.
- Palahang H, Nasr M, Shahmohammadi D. Epidemiology of mental illnesses in Kashan city. *Iranian J psychiatr Clin Psychol*. 1996;**2**(4):19-27.
- Najafi M, Solati-e-dehkordi SK, Forooz-bakhsh F. [The relationship between job burnout and mental health among employees of Esfahan's Center for research and production of nuclear fuel]. *JUMS*. 2000;**2**:34-41.
- Noorbala AA, Mohammad K, Bagheri Yazdi SA. [Validation of GHQ-28 in Iran]. *Hakim J*. 1999;**5**:101-10.