Research Article

Standardization and Study of Psychological Properties of the HSE Stress Questionnaire

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Abstract

Background: Job stress has recently been regarded as a risk factor for some diseases.

Objectives: In this study, we standardized the Persian version of the HSE management standards indicator tool and studied the psychological properties of the tool.

Methods: In this cross-sectional study, the Persian version of the HSE questionnaire was submitted to 429 participants who were randomly drawn from five occupational groups in Isfahan, Iran in 2014. Internal consistency, reliability, discriminative validity, and construct validity were evaluated. Predictive validity was explored with respect to the beck depression inventory (BDI). discriminant validity was explored with respect to type of occupational groups.

Results: Cronbach's alpha for the all subscales ranged between 0.53 and 0.74. In addition, the intraclass correlations for the domains ranged from 0.52 to 0.73 with a median of 0.7. The confirmatory factor analysis showed that the Persian version of the HSE questionnaire had adequate construct validity. The root mean square error of approximation, incremental fit index, and comparative fit index were 0.064, 0.9, and 0.9, respectively; moreover, other indexes were satisfactory. An analysis of variance highlighted the differences between the stress of the occupational groups (P = 0.012). A lower score on the HSE questionnaire was significantly related to a higher BDI score (r = -0.46, P < 0.001).

Conclusions: The analysis of the reliability and validity of the Persian version of the HSE questionnaire showed that it is a useful and reliable measure to analyze work-related stress.

Keywords: HSE Questionnaire, Validity, Reliability, Job Stress

1. Background

Stress is the perception of a demand that threatens to exceed a person's capabilities and resources under conditions in which the person expects a substantial differential in rewards and costs from meeting the demand (1-3). Many studies have shown that job-related stress produces high labor turnover and early retirement (4).

Given the importance of stress, especially job-related stress, there is a need for tools that can measure the various aspects of stress. This need has led researchers to create different job stress questionnaires that measure different job roles, such as the Osipow stress questionnaire, which consists of six subitems and 60 questions (5); the occupational stress index, which consists of ten subitems and 68 questions (6); the Karasek and Theorell stress questionnaires, which consist of with seven subitems and 32 questions (7); the Job Stress Survey, which consists of 30 questions (8); the occupational stress and coping inventory, which con-

sists of 11 subscales (9); Kawakami et al.'s job stress questionnaire (10); and some special inventories, like the police stress questionnaire (11), the office worker job stress questionnaire (12), the nurses' stress inventory (13), and the health professions stress inventory (14).

In some countries, identifying all the factors that pose a risk to health and wellbeing at work is mandatory so that measures can be taken at an early stage. Work-related mental illnesses are becoming one of the major causes of occupational illnesses and lost work years. In the late 1990s, the health and safety commission, the lead authority in the UK responsible for health and safety at work, conducted an extensive consultation exercise to elicit views about how work-related stress should be tackled (15). As a result, they developed the HSE management standards indicator tool questionnaire.

In recent decades, there has been an increasing focus on developing and localizing occupational stress instru-

ments in different societies. Although the HSE questionnaire has been validated for military personnel ([16]), until now, the HSE questionnaire has not been validated in the general Iranian population. Because the HSE questionnaire is shorter and more efficient than other related questionnaires.

2. Objectives

This study aimed to translate the HSE questionnaire into the Persian language and to assess the validity and reliability of the translated version of this tool.

3. Methods

3.1. Study Design

This study was based on cross-sectional data and stratum sampling in Isfahan, Iran in 2014. This questionnaire was applied to 492 individuals. Of these individuals, there were 436 males and 53 females. These samples were selected from five occupational groups: workers, employments, nurses, technicians, and assistants.

3.2. Sample Size and Software

Data was analyzed using IBM's SPSS software (version 21) and AMOS (version 18). Descriptive and analytic statistics were used. Numeric data was shown as mean and SD, and categorical variables were shown as a number and a percentage. For statistical analysis, analysis of variance (ANOVA), confirmatory factor analysis (CFA), and correlation were used. A P value less than 0.05 was considered to be significant.

The sample size calculated using ten cases for each question ($35 \times 10 = 350$) in order to produce a sufficient sample size ([17]). Additionally, in order to ensure optimal sample size, this sample size was multiplied by 1.5, so 525 questionnaires were distributed and 492 questionnaires were collected.

3.3. The Questionnaires

3.3.1. HSE Questionnaire

The HSE management standards indicator tool is a 35-item questionnaire. This questionnaire is related to seven primary stressors that were identified in the management standards for work related stress. The items are based on the best available evidence linking work design to health outcomes. The questions were classified into seven stress component domains: demands, control, managerial support, peer support, relationships, role, and change. The questions in the demands and relationships scales were scored on a five-point Likert scale from 5 to 1, and questions

in the other domains were scored from 1 to 5. This scoring method ensures that a score of 1 always represented the most unfavorable working conditions across all domains and a score of 5 always represented the most favorable conditions ([15]).

3.3.2. Beck Depression Inventory

The beck depression inventory (BDI) is a 21-item interview that measures the characteristic attitudes and symptoms of depression. Beck developed a triad of negative cognitions about the world, the future, and the self, which play a major role in depression. The BDI has a maximum score of 63; a score of 0 - 15 indicates healthiness, 16 - 30 indicates a minimal level of depression, 31 - 46 indicates mild depression, and 47 - 63 indicates severe depression ([18]). These questionnaires were provided to subjects before any procedure. In Kaviani et al.'s study in Iran, Cronbach's alpha (0.92) and an acceptable test–retest reliability (r = 0.72) were found ([19]).

3.4. Translation Validity

The HSE questionnaire was translated from English into Persian and then translated back into English by four independent translators. We compared the original and retranslated versions, and if there was any difference between them, once very slight adjustments had to be implemented. To modify the HSE to Persian, a pilot study was conducted with a small group of employees in different occupations (n = 30).

3.5. Content Validity

Content validity is the extent to which a measurement reflects the specific intended domain of content. One widely used method of measuring content validity was developed by Lawshe. This method essentially gauges agreement among raters or judges regarding how essential a particular item is. Lawshe ([20]) proposed that each subject matter expert on the judging panel should respond to the following question for each item: "Is the skill or knowledge measured by this item 'essential,' 'useful, but not essential,' or 'not necessary' to the performance of the construct?" According to Lawshe, if more than half of the panelists indicate that an item is essential, that item has at least some content validity. Greater levels of content validity exist when larger numbers of panelists agree that a particular item is essential.

The content validity index (CVI) is simply a mean of the CVR values of items retained in a validated procedure, model, test, or format. The CVI represents the commonality of judgments regarding the validity or applicability

of the final procedure, model, test or format being researched. The overall content validity is acceptable if the value of the CVR and CVI is greater than 0.7.

3.6. Statistical Analysis

3.6.1. Construct Validity

To assess the construct validity of the HSE questionnaire, we performed CFA. The CFA was evaluated using the fit indices of the chi-squared statistic, the incremental fit index (> 0.9), the root mean square error of approximation (< 0.08), and the comparative fit index (> 0.9) (21).

3.6.2. Criterion Validity

A scale has discriminant validity if it adequately differentiates or does not differentiate between groups that should differ or should not differ, respectively, based on theoretical reasons or previous research. To explore the discriminant validity of the HSE questionnaire, we carried out an ANOVA test with respect to type of occupational groups.

The predictive validity of a test or measurement tool is established by demonstrating the ability of the test or measure to predict the results of an analysis of the same data made with another test instrument or measurement tool. In this study, we evaluated the predictive validity of the BDI (22).

3.6.3. Reliability

To evaluate the repeatability of the HSE questionnaire, we used the test-retest method. To do this, 60 cases completed this instrument twice (at two-week intervals). The Pearson's and intraclass correlation (ICC) coefficients were computed to describe the relationship between the items in the domains of this measurement. To interpret the obtained coefficients, values below 0.4 were considered to have poor reliability, values above 0.7 were considered to have excellent reliability, and values between 0.4 and 0.7 were considered to have fair to good reliability. We also calculated the Cronbach's alpha to assess the internal consistency of the different domains of the HSE questionnaire.

3.7. Ethical Consideration

Approval to conduct the study was obtained from the Tarbiat Modares faculty of the medical sciences ethics committee. The participants were briefed about the aim of the study. They were assured of their privacy and also informed that they could withdraw from the study without any problem.

4. Results

4.1. Descriptive Statistics

In general, a total of 492 individuals, including 436 males (88.8%) and 55 females (11.2%), were recruited in the study. The participants were divided into two educational groups, elementary education to diploma (65.2%, n = 314) and academic (34.8%, n = 168), and five occupational groups, workers (6.7%, n = 32), nurses (3.1%, n = 15), employments (11.9%, n = 57), technicians (7.7%, n = 37), and assistants (70.5%, n = 337). The mean $\pm$ SD of age and work history were 32.2 $\pm$ 0.32 and 7.39 $\pm$ 0.31, respectively. Additionally, the median of them were 31 and 5 years, respectively.

4.2. Content Validity

The questionnaire was given to ten experts who were familiar with stress and psychology. In this study, the minimum index for CVI and CVR was reported to be 0.73 and 0.75, respectively.

4.3. Construct Validity

The CFA was conducted to assess the factorial structure of the HSE questionnaire, and the results are shown in Table 1. This was done by comparing the hypothesized model with the covariance matrix based on the empirical data. The CFA indicated excellent goodness of fit results for this data.

4.4. Discriminant Validity

In order to explore the discriminant validity of the HSE questionnaire, we performed an ANOVA for comparing the obtained mean scores of the different occupational groups. As shown in Table 2, the results indicate a statistically significant difference between occupational groups in the control, managerial support, peer support, and relationships domains of the HSE questionnaire. These findings represented a significant relationship between occupational groups and total work related stress.
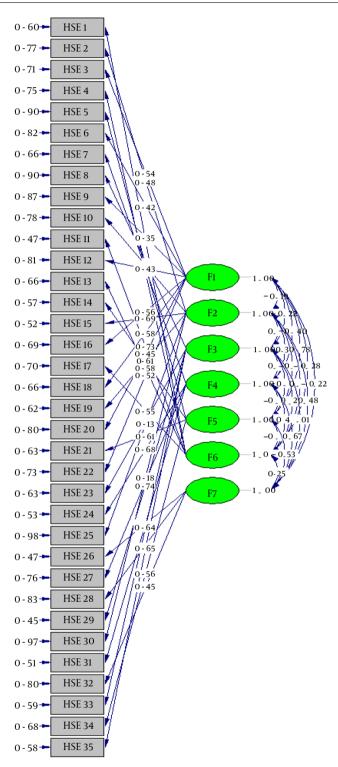
4.5. Predictive Validity

To evaluate the predictive validity of the tool, we used the BDI to measure the subjects' mental health. The calculated Pearson's correlation coefficient between the scores of the HSE and the BDI showed a significant negative relationship between the scores of these questionnaires (r = -0.46, P < 0.001).

4.6. Reliability
4.6.1. Test-Retest

The students were asked to complete the HSE twice (at two-week intervals). The results showed r = 0.73 and P < 0.001, which is good reliability index.

Figure 1. Standard Pathway Estimation of CFA

0 - 60 →	HSE 1
0 - 77 →	HSE 2
0 - 71 →	HSE 3
0 - 75 →	HSE 4
0 - 90 →	HSE 5
0 - 82 →	HSE 6
0 - 66 →	HSE 7
0 - 90 →	HSE 8
0 - 87 →	HSE 9
0 - 78 →	HSE 10
0 - 47 →	HSE 11
0 - 81 →	HSE 12
0 - 66 →	HSE 13
0 - 57 →	HSE 14
0 - 52 →	HSE 15
0 - 69 →	HSE 16
0 - 70 →	HSE 17
0 - 66 →	HSE 18
0 - 62 →	HSE 19
0 - 80 →	HSE 20
0 - 63 →	HSE 21
0 - 73 →	HSE 22
0 - 63 →	HSE 23
0 - 53 →	HSE 24
0 - 98 →	HSE 25
0 - 47 →	HSE 26
0 - 76 →	HSE 27
0 - 83 →	HSE 28
0 - 45 →	HSE 29
0 - 97 →	HSE 30
0 - 51 →	HSE 31
0 - 80 →	HSE 32
0 - 59 →	HSE 33
0 - 68 →	HSE 34
0 - 58 →	HSE 35

F1, F2, F3, F4, F5, F6, F7

0 - 54
0 - 48
0 - 42
0 - 35
0 - 43
0 - 56
0 - 69
0 - 58
0 - 73
0 - 45
0- 61
0- 58
0 - 52
0 - 55
0 - 13
0 - 61
0 - 68
0 - 18
0 - 74
0 - 64
0 - 65
0 - 56
0 - 45

1 - 00
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F1, demands; F2, control; F3, managerial support; F4, peer support; F5, relationships; F6, role; F7, change.

Table 1. Confirmatory Factor Analysis of the Seven Domains of the HSE Questionnaire

χ^2	df	P Value	RMSEA	IFI
1543.88	539	< 0.001	0.06	0.90

Table 2. The Comparison of the Different Domains of the HSE Questionnaire for the Occupational Groups

Component Domains	Occupational Group					P
	Workers	Nurses	Employees	Technicians	Assistants	
Demands						0.435
No.	32	15	57	37	334	
Mean	3.23	2.96	3.3	3.21	3.26	
SD	0.77	0.41	0.63	0.55	0.63	
Control						0.00
No.	32	15	57	37	334	
Mean	2.84	3	3.5	3.27	3.29	
SD	0.78	0.63	0.53	0.7	0.62	
Managerial support						0.006
No.	32	15	57	37	335	
Mean	3.11	2.93	3.24	2.79	3.26	
SD	0.79	0.69	0.76	0.75	0.74	
Peer support						0.036
No.	32	15	57	37	335	
Mean	3.36	3.14	3.67	3.43	3.56	
SD	0.65	0.75	0.64	0.73	0.7	
Relationships						0.047
No.	32	15	57	37	335	
Mean	3.33	3	3.55	3.34	3.54	
SD	0.92	0.48	0.67	0.82	0.83	
Role						0.214
No.	32	15	57	37	335	
Mean	4.16	4.11	4.29	4.32	4.11	
SD	0.57	0.65	0.58	0.77	0.68	
Change						0.616
No.	31	15	57	37	330	
Mean	3.11	3.09	3.34	3.23	3.29	
SD	0.93	0.8	0.79	0.84	0.77	
Job stress HSE						0.012
No.	32	15	57	37	335	
Mean	3.31	3.17	3.55	3.37	3.48	
SD	0.42	0.37	0.36	0.5	0.48	

4.6.2. Internal Consistency

We calculated the Pearson's correlation coefficients between the different domains of the HSE questionnaire. Table 3 shows the correlation matrix for the seven domains of this questionnaire. These results demonstrate that all the domains of the HSE were significantly correlated. The highest observed correlation was related to the managerial support and peer support domains ($r = 0.63$, $P < 0.001$), and the minimum significant correlation was related to the control and demands domains ($r = -0.12$, $P = 0.008$).

We also computed the ICCs to check the stability of the instrument. Table 4 shows the results of this computation. These results demonstrate that there were acceptable reliability values for all domains of the HSE questionnaire. As evident in this table, the ICCs for all domains were in the range of excellent reliability. In addition, the ICCs for the domains ranged from 0.52 to 0.73 with a median of 0.7.

The internal consistency indices for the domains of the HSE questionnaire are presented in Table 5. Based on our findings, the calculated internal consistency for some of the domains met or exceeded the minimum level of acceptable value, (i.e., 0.7) and others were moderately adequate (i.e., between 0.5 and 0.7). For the total sample, the maximum level of the obtained reliability was related to the role domain (Cronbach's alpha = 0.744).

5. Discussion

Occupational stress is associated with many problems in the workplace (23). This type of stress has been reported to be related to occupational diseases, such as high blood pressure and an unfavorable cardiovascular profile, and other health outcomes (24). Therefore, occupational stress

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Table 3. Correlation Matrix for the Different Domains of the HSE Questionnaire

Domains			Demands	Control	Managerial support	Peer support	Relationships	Role	Change
Demands	r		1						
	p								
Control	r		-0.12	1					
	p		0.008						
Managerial support	r		-0.21	0.3	1				
	p		< 0.001	< 0.001					
Peer support	r		-0.3	0.28	0.63	1			
	p		< 0.001	< 0.001	< 0.001				
Relationships	r		0.51	-0.21	-0.44	-0.48	1		
	p		< 0.001	< 0.001	< 0.001	< 0.001			
Role	r		-0.21	0.28	0.2	0.31	-0.24	1	
	p		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		
Change	r		-0.17	0.34	0.62	0.45	-0.34	0.21	1
	p		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	

is an important problem in public health. In recent years, there has been increased focus on this problem. However, because of the variation of the cultures of the people being assessed, there are several different definitions and standards for assessing occupational stress in different societies. One of the instruments that measures occupational stress is the HSE questionnaire. This questionnaire uses seven subscales to measure stress: demands, control, relationships, role, change, managerial support, and peer support. The response scales in this questionnaire use five-point Likert-type scales (15).

Because of the importance of the validity and reliability of any instrument, the aims of this study were to validate the Persian version of the HSE questionnaire and to evaluate the psychometric properties of this instrument.

To assess the reliability of the Persian version of the HSE questionnaire, we used ICC. In general, ICC values greater than 0.7 for different domains indicate the reliability of an instrument. We obtained the ICC values for the HSE questionnaire, which ranged from 0.52 for the change domain to 0.73 for the role domain. Based on these findings, the ICC values of some of the domains were excellent and the others were fair to good. The results of this study showed

Table 4. Assessing the Reliability of the Different Domains of the HSE Questionnaire

Domains	ICC	P	95% CI
Demands	0.71	< 0.001	0.667 - 0.745
Control	0.58	< 0.001	0.524 - 0.638
Managerial support	0.72	< 0.001	0.677 - 0.756
Peer support	0.7	< 0.001	0.65 - 0.738
Relationships	0.6	< 0.001	0.542 - 0.657
Role	0.73	< 0.001	0.69 - 0.765
Change	0.52	< 0.001	0.445 - 0.592

that the HSE questionnaire may be a little weak compared with other psychometric questionnaires (25-27), but the HSE questionnaire produces similar results, as seen in Azad et al.'s study on military personnel (16).

The Cronbach's alpha coefficient was satisfactory for most of the questionnaire's domains, with values of 0.7 - 0.74, except the control, change, and relationships domains, which were moderately acceptable with values of 0.52 - 0.61. Additionally, we used the Spearman-Brown coefficient. This coefficient's values are moderately acceptable, but the test–retest analysis showed better reliability than similar questionnaires (5-14).

The CFA in the present study showed adequate construct validity for the Persian version of the HSE questionnaire. This result showed that the fitted model was acceptable, and several indexes confirmed this result (21).

In this study, we used an ANOVA test to evaluate the discriminant validity in order to assess the performance of the differential dimensions of the HSE questionnaire. According to the results of this analysis, there were significant differences between the occupational groups in some of the domains. This indicates that the Persian version of this instrument has acceptable discriminant validity.

In order to test the criterion validity of scales, we conducted a predictive validity test by computing the Pearson's correlation coefficients between the scores of the BDI and HSE. We found a significant negative correlation between the scores. These findings are consistent with prior research that indicated that there is a negative association between mental health and job stress (28).

We highly recommend the HSE questionnaire for the evaluation of job stress based on the collected data and the advantages of this questionnaire (small number of questions, the use of appropriate domains, standardized evalu-

Table 5. Cronbach's Alpha and the Spearman-Brown Coefficient for the Different Domains of the HSE Questionnaire

Domain	%95CI	Cronbach's Alpha	Spearman-Brown Coefficient	Mean	SD
Demands	3.18 - 3.29	0.71	0.685	3.23	0.028
Control	3.22 - 3.34	0.57	0.591	3.28	0.029
Managerial support	3.13 - 3.27	0.72	0.754	3.20	0.036
Peer support	3.48 - 3.6	0.7	0.663	3.54	0.032
Relationships	3.40 - 3.54	0.61	0.633	3.47	0.036
Role	4.09 - 4.21	0.74	0.636	4.15	0.030
Change	3.21 - 3.35	0.53	0.496	3.28	0.036

ation of job stress, and a high level of validity and reliably).

5.1. Conclusion

The results of the research revealed the validity and reliability of the Persian version of HSE questionnaire at a very desirable level, making this tool a valid and reliable instrument for evaluating job stress.

Acknowledgments

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