Original Article

Psychometric Properties of the Persian Version of the Health Professionals Education in Patient Safety Survey

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Abstract

Background: Safe care requires acquiring special competencies. Suitable instruments are needed to evaluate such competencies. **Objectives:** This study aimed to assess the psychometric properties of the Persian version of the Health Professionals Education in Patient Safety Survey (H-PEPSS). **Methods:** A methodological study was conducted in 2020, on the students who were spending their last year of study in nursing, medicine, pharmacy, midwifery, surgical technology, and anesthesia, in the Isfahan University of Medical Sciences. The H-PEPSS was translated into Persian based on the Brislin translation model. Face validity, content validity index (CVI), and content validity ratio (CVR) were examined. The construct validity of the scale was assessed using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Cronbach's alpha coefficient and interclass correlation coefficient were also calculated as reliability criteria. **Results:** The face validity of the Persian translation of H-PEPSS was confirmed by a panel of experts, and the items' impact scores were greater than 1.5. Three items were modified, and the CVI of the scale was calculated at 0.91. Besides, the items' CVR ranged from 0.64 to 1.00. In EFA, six factors were extracted, which shows the competencies the students possessed both in the classroom and clinical setting, which then were confirmed through the CFA. All items had a factor loading value greater than 0.4. Goodness-of-fit indices were obtained: Root Mean Square Error of Approximation (RMSEA) = 0.064, Tucker-Lewis Index (TLI) = 0.922, and Comparative Fit Index (CFI) = 0.931 for the classroom and RMSEA = 0.076, TLI = 0.912, and CFI = 0.923 for clinical setting. The Cronbach's alpha of the scale was 0.936 for the classroom and 0.949 for the clinical setting. **Conclusions:** The Persian version of H-PEPSS includes six factors with 23 items. This scale is a valid and reliable instrument for assessing patient safety education in the classroom and clinical setting.

Keywords: *Health personnel, Iran, Patient safety, Psychometrics, Students, Survey*

Introduction

Patient safety (PS) is a significant indicator of quality improvement in health care systems. PS means preventing and reducing the occurrence of adverse events and consequences that might harm the patient while providing care.[1] According to the World Health Organization, 10% of the hospitalized patients experience adverse events, and this rate is 18% in the Eastern Mediterranean region, where Iran is located. It is believed that 83% of these events are preventable.[2] Annually, 134 million people in middle- to low-income countries receive unsafe care, of whom 2.6 million die. Moreover, about 15% of hospital expenditures are spent on treating safety hazards.[3]

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Despite the important role of nurses in patient care and safety,[4] a systematic review has reported that a majority of errors are made by nurses, mostly due to high workload, inadequate night sleep, and high stress.[5,6]

To improve PS, the Iran Ministry of Health and Medical Education has developed hospital accreditation standards to ensure PS and required health care centers to implement PS metrics.[7] However, some studies in Iran have shown that the status of PS indicators is unfavorable.[8,9] Providing safe care requires PS competencies. Hence, such competencies should be integrated into health professional education that prepare health care providers.[10] In particular, it should be ensured that health care students who are about to graduate and enter the health care system are eligible to provide safe care for their patients.[11] To this end, a valid and reliable instrument must be used to measure safe care competencies and ensure apposite PS training and feedback.[12]

We found 12 valid and reliable instruments in the field of PS, some of which were in Spanish or Korean[13,14] and mostly focused on students' attitudes toward PS or on the assessment of PS knowledge and attitude.[11] One of the commonly used scales of PS competence is the Health Professionals Education in Patient Safety Survey (H-PEPSS). The H-PEPSS is a self-report instrument that assesses PS competence both in the classroom and in the clinical setting. It was developed by Ginsburg *et al.* to measure health professionals' perceptions of their own PS competency at entry into practice.[10] The original scale is in English and has been translated into several other languages including Italian, Dutch, Chinese, and Turkish, and its validity and reliability have been verified.[11-16] Due to the lack of Persian instruments to assess health professionals' perceptions of their competence in PS, the present study was conducted to fill this gap.

Objectives:

This study aimed to evaluate the psychometric properties of the Persian version of H-PEPSS.

Methods

Design and study population

A methodological study was conducted from August to October 2020 in two phases including translation and evaluation of psychometric properties of the H-PEPSS.

Phase I. The translation phase

After obtaining permission from the primary designer of the H-PEPSS, the translation process was performed based on the Brislin translation model.[17] Two bilingual translators who were fluent in Persian and English performed the translation and backtranslation of the scale. Initially, the first translator who also was an expert in PS translated the original version of the scale from English into Persian. Then, the second translator, who did not know about the original scale, backtranslated the Persian translation of the scale into English. This new English translation along with the original English scale and the Persian translation was shared with a group of experts to fix the bugs and confirm the analogy of the two English versions and the congruence of the Persian translation with them.

Phase II. Evaluating the psychometric properties of the scale

This phase included assessing the face validity, content validity, construct validity, internal consistency, and the test-retest stability of the translated scale.

Face validity assessment

The face validity was examined using both qualitative and quantitative methods. Firstly, we inquired about the standpoints of 15 experts. In the qualitative method, experts were requested to check the tool items for their readability, difficulty, appropriateness, grammar, and writing style and also for any ambiguity, inconsistency, misunderstandings, and inappropriate wording. In the quantitative method, experts were invited to comment on the significance of each item according to a five-point Likert scale ranging from "5: absolutely important" to "1: not important." Then the items' impact scores were calculated via the following formula (impact score = importance × frequency [%]). Items with impact scores greater than 1.5 were retained in the scale.[18] Furthermore, for sure, the Persian translation was provided to 20 eligible students to give feedback on its content and readability and address its potential bugs. The ambiguities were then resolved based on their feedback.

Content validity assessment

The content validity was examined using both qualitative and quantitative methods. In the qualitative method, experts were asked to express their views on the comprehensibility, clarity, simplicity, importance, and necessity of the items, as well as the adequacy of the items in the tool. For the quantitative content validity, the content validity index (CVI) and content validity ratio (CVR) were calculated. To calculate the CVI, according to the Walts and Bausell method, 11 experts were requested to comment on each item in terms of simplicity, relevance, and clarity through a four-point Likert scale. Then, items with a CVI ≥0.79 were accepted, those with a CVI between 0.70 and 0.79 were revised, and those CVI <0.7 were eliminated. The average CVI of all items was calculated as the overall scale CVI (S-CVI).[19]

For CVR, which is calculated by the following formula, the same 11 experts were also commented on the necessity

of each item on a three-point Likert scale ranging from "3: necessary" to "1: not necessary." Considering the number of experts in Lawshe's table, the minimum acceptable value of CVR was 0.59.

$$CVR = \frac{ne - \frac{N}{2}}{\frac{N}{2}}$$

In this formula, ne is the number of specialists who have selected the "required" option, and N refers to the total number of specialists.[20]

Construct validity assessment

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to determine the construct validity of the Persian scale. For assessing the construct validity, participants were selected among the students of the health professions of the Isfahan University of Medical Sciences. Students who were in their last year of study in nursing, medicine, pharmacy, midwifery, surgical technology, and anesthesia and agreed to take part in the study were recruited. The sample size was calculated based on the number of items in the scale. It is recommended to select 5 to 20 subjects per item.[21] Hence, as the H-PEPSS includes 23 items, the minimum acceptable sample size is 115. However, we decided to select eight subjects per item and then multiplied it by 0.06 to compensate for the probable dropouts. The final sample size was estimated at 195. Then, we recruited 195 ones for assessing EFA and an additional 195 ones for the assessment of CFA. We first assessed the EFA and then the CFA. A quota sampling method was used to calculate and recruit the needed samples in proportion to the total eligible subjects in each major. The students who participated in the EFA were removed from the sampling frame when we recruited the subjects for the CFA.

Data collection

Data were collected using H-PEPSS from August to October 2020. This scale was developed by Ginsburg *et al*., and the original version is in English. The H-PEPSS consists of two sections. The first section consists of 5 items related to demographic variables such as age, sex, semester, the field of study, and passing a course on PS. The second section includes 23 items about the competencies needed for maintaining the PS namely teamwork with other health professionals (6 items), effective communication (3 items), managing safety risks (3 items), understanding human and environmental factors (3 items), recognize, respond to, and disclose adverse events and close calls (4 items), and safety culture (4 items).[10]

After coordinating with the faculties, the students' contact numbers were received from the class representatives in each faculty, and the selected students were added to the groups we already have created in WhatsApp and Telegram messengers. Then, text messages including information about the study aims, tips for completing the questionnaire, and the link to the questionnaire was sent to students as Google Forms. Three reactions were observed after sending these text messages to the students: (1) quick response to the text message and completing the questionnaire, (2) immediate rejecting (i.e. denial to participate), (3) nonresponse. Students who were not generally responsive were excluded from the study, and since a convenient sampling was carried out in each quota, people with immediate rejection and nonresponse were replaced with another one from the same quota. This was continued until the needed sample size was reached in each quota. In general, the scale was sent to a total of 724 eligible students to receive the required sample size in EFA and CFA phases, respectively. The students were requested to respond to each item separately based on the PS knowledge they possessed in the classroom and the clinical setting.

EFA and CFA

The Kaiser-Meyer-Olkin (KMO) measure and Bartlett test were used to evaluate the suitability of the data for factor analysis. The correlation between the main variable (PS) and factors and the correlation between factors and items (1–23)—calculated using the factor loading through CFA—are presented in Figures 1 and 2. If the factor loading value in any of the above cases is less than 0.4, the item should be eliminated. To determine the goodness of fit in this model, the Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI) were used. RMSEA values less than 0.06–0.07 are usually considered acceptable.[16,20] For CFI and TLI, values greater than 0.9 indicate acceptable goodness of fit.[22,23]

Reliability assessment

The reliability of H-PEPSS was assessed using the internal consistency and the test-retest stability assessment methods. The internal consistency assessment was performed with the participation of 40 eligible students. A Cronbach's alpha ≥0.7 was considered acceptable. For test-retest stability assessment, the questionnaire was completed by 40 students twice at a two-week interval, and interclass correlation coefficient (ICC) was calculated.

Ethical consideration

This study was approved by the Ethics Committee of the Isfahan University of Medical Sciences (IR.MUI.RESEARCH.REC.1399.357). Verbal and written consent was obtained from the participants. To maintain

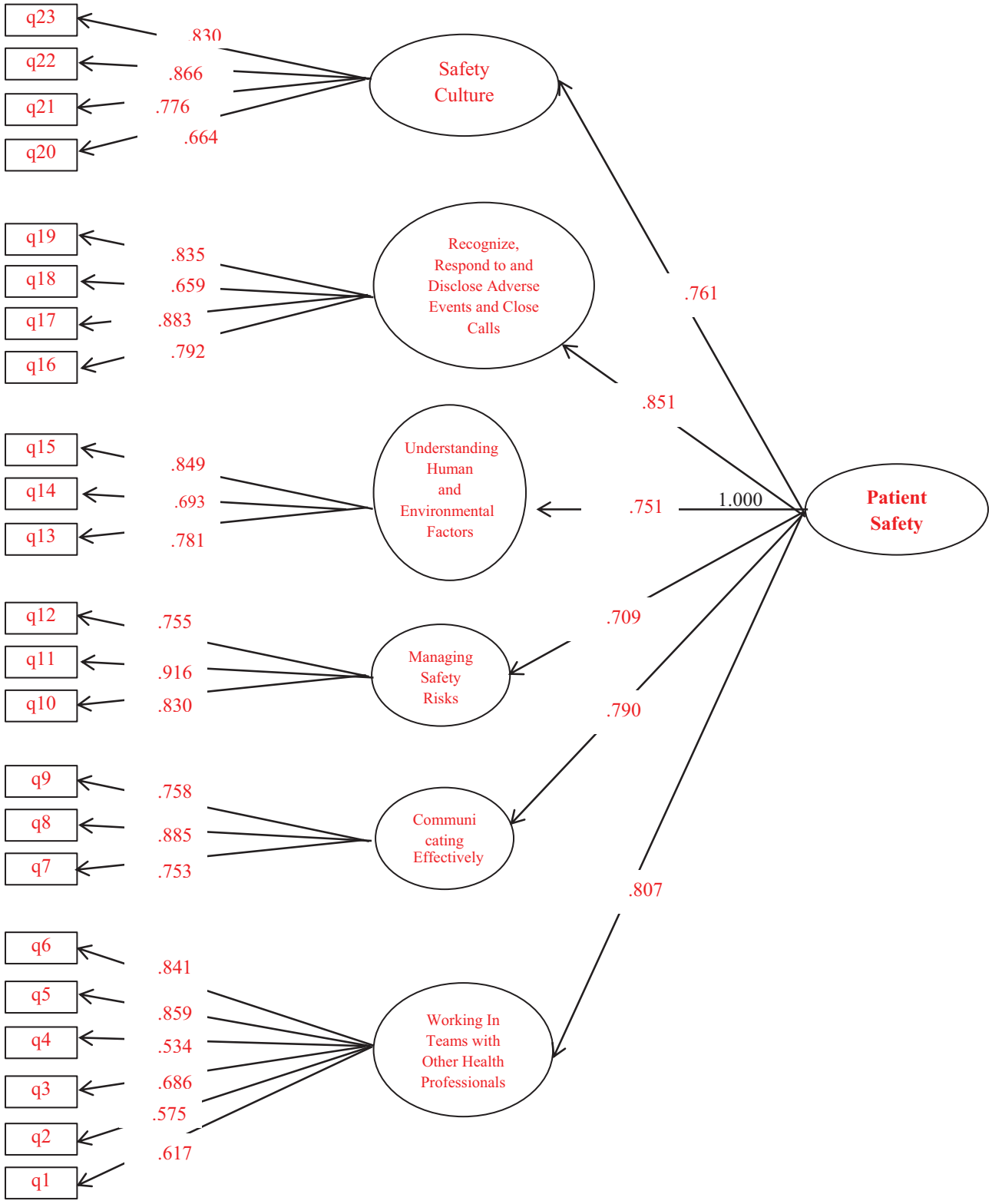

Figure 1: Confirmatory factor analysis (classroom version)

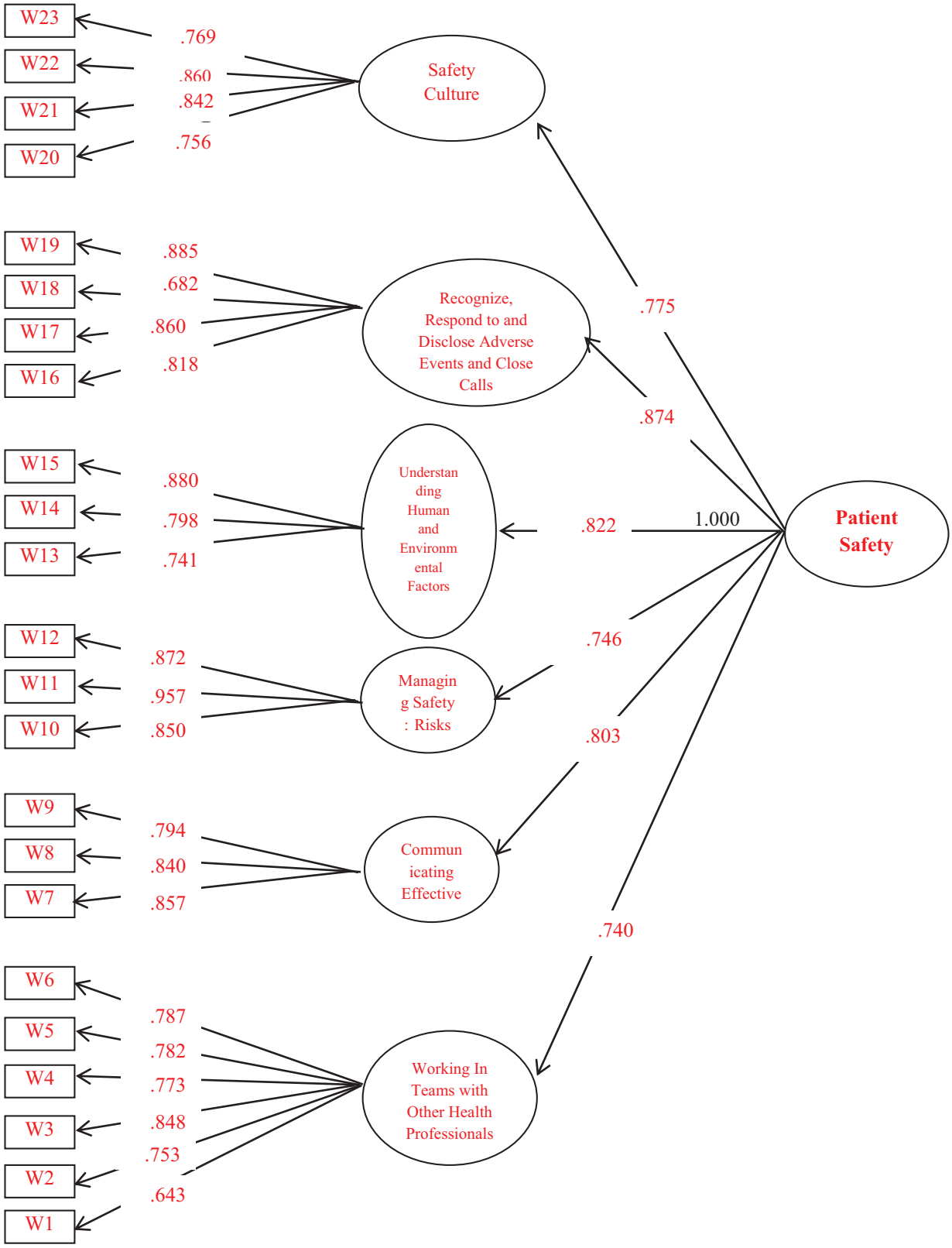

Figure 2: Confirmatory factor analysis (clinical setting version)

confidentiality, a numeric code was used instead of participants' names. Permission for psychometric assessment was obtained from the original developer of the scale, Dr. Liane Ginsburg.

Data analysis

In addition to the aforementioned analysis methods, descriptive and inferential statistics including mean, standard deviation, frequency and percentage, ICC, Cronbach's alpha, test-retest, EFA, and CFA were used to analyze the data. The Kolmogorov-Smirnov test was used to determine the normality of the data. In the test-retest method, a paired t-test was used to compare the mean scores of six domains in the classroom and clinical setting between the primary and secondary completion. CFA was performed using the M plus software, and other statistical calculations were performed using the SPSS software (version 16; SPSS Inc., Chicago, IL, USA). The statistical significance was set at <0.05.

Results

The results of face validity assessment

In the face validity assessment, the necessary changes were applied to the items through discussion among experts, and two items (items 3 and 14) were modified accordingly. The items' impact scores varied between 3.5 and 3.62. Therefore, no items were removed from the scale.

The results of content validity assessment

In determining qualitative content validity, necessary changes were applied through discussion among experts. Then, three items (items 1, 5, and 20) were modified. In the quantitative methods, the items' CVI scores varied between 0.72 and 1.00. Items with a CVI score of 0.7–0.79 were revised. No items were removed. The S-CVI was 0.91. Besides, the items' CVR ranged from 0.64 to 1.00.

The results of construct validity assessment

Characteristics of participants

The mean age of the students was 24.25 ± 2.54 years, ranging between 21 and 45 years. Among the 390 students, 45.1% were males, 42.1% and 22.7% were medical and nursing students, respectively [Table 1], and no one had passed a PS course.

Exploratory factor analysis

The descriptive statistic, correlation coefficient, and Cronbach's alpha of the Persian version of H-PEPSS have been presented in Table 2. The KMO value was 0.90 in the classroom and 0.92 in the clinical setting. Also, the significance level in the Bartlett test was <0.001 indicating the adequacy of the data for factor analysis. In the EFA, six similar factors were extracted for both the classroom and the clinical setting [Tables 3 and 4], which were the same as the domains in the original scale. The total variance explained was 75.01% and 79.06% for the competencies possessed in the classroom and the clinical setting, respectively. The highest factor loading values were related to the "recognize, respond to and disclose adverse events and close calls" domain both for the competencies possessed in the classroom and the clinical setting. The lowest factor loading values were related to "managing safety risk" and "teamwork with other health professionals" in the classroom and the clinical setting, respectively.

Confirmatory factor analysis

In CFA, the factor loading values of all items and factors were >0.4 [Figures 1 and 2]. Therefore, all 23 items were confirmed. Moreover, the highest factor loading value was related to factor 5 (i.e. 0.851 for the classroom and 0.874 for the clinical setting). The RMSEA value of the adjusted models was 0.064 for the classroom and 0.076 for the clinical setting. Also, CFI values for classroom and clinical settings were 0.931

Table 1: Characteristics of the participants in EFA and CFA stages[a]

Characteristics		EFA n = 195	CFA n = 195	Total
Age (year)		24.27 ± 2.78	24.24 ± 2.27	24.25 ± 2.54
Gender	Female	106 (27.2)	108 (27.6)	214 (54.9)
	Male	89 (22.8)	87 (22.4)	176 (45.1)
Health professional				
	Medicine	82 (21.1)	81 (21)	163 (42.1)
	Nursing	44 (11.3)	45 (11.4)	89 (22.7)
	Pharmacy	40 (10.3)	40 (10.3)	80 (20.6)
	Midwifery	10 (2.5)	10 (2.5)	20 (5)
	Surgical technology	12 (3)	11 (2.9)	23 (5.9)
	Anesthesia	7 (1.8)	8 (1.9)	15 (3.7)

CFA = confirmatory factor analysis, EFA = exploratory factor analysis, SD = standard deviation

[a]Data are presented as mean ± SD or n (%)

Table 2: The descriptive statistics, correlation coefficient, and Cronbach's alpha of the Persian version of the Health Professionals Education in Patient Safety Survey

	In the classroom			In the clinical setting		
	r	α	Mean ± SD	r	α	Mean ± SD
Working in teams with other health professionals						
1. Team dynamics and authority/power differences	0.618	0.933	3.68 ± 0.826	0.562	0.948	3.28 ± 1.102
2. Managing interprofessional conflicts	0.585	0.934	3.30 ± 1.043	0.614	0.947	3.78 ± 1.025
3. Debriefing and supporting team members after an adverse event or close call	0.589	0.934	3.60 ± 0.900	0.702	0.946	3.20 ± 1.067
4. Engaging patients as a central participant in the health care team	0.458	0.936	3.98 ± 0.920	0.649	0.947	3.12 ± 1.202
5. Sharing authority, leadership, and decision-making	0.643	0.933	3.65 ± 0.975	0.609	0.947	3.33 ± 1.248
6. Encouraging team members to speak up, question, challenge, advocate, and be accountable as appropriate to address safety issues	0.701	0.932	3.85 ± 0.893	0.632	0.947	3.25 ± 1.104
Communicating effectively						
7. Enhancing patient safety through clear and consistent communication with patients	0.560	0.934	4.13 ± 0.822	0.674	0.946	3.57 ± 1.107
8. Enhancing patient safety through effective communication with other health care providers	0.601	0.933	3.87 ± 0.853	0.665	0.947	3.30 ± 1.018
9. Effective verbal and nonverbal communication abilities to prevent adverse events	0.657	0.933	4.05 ± 0.867	0.664	0.947	3.75 ± 1.080
Managing safety risks						
10. Recognizing routine situations in which safety problems may arise	0.559	0.934	3.80 ± 0.791	0.660	0.947	3.73 ± 0.847
11. Identifying and implementing safety solutions	0.558	0.934	4.23 ± 0.698	0.686	0.946	3.70 ± 0.791
12. Anticipating and managing high-risk situations	0.604	0.933	3.85 ± 1.051	0.668	0.946	3.70 ± 0.926
Understanding human and environmental factors						
13. The role of human factors, such as fatigue, that affect patient safety	0.562	0.934	4.00 ± 0.877	0.619	0.947	4.05 ± 0.876
14. Safe application of health technology	0.524	0.935	3.70 ± 0.966	0.630	0.947	3.85 ± 0.893
15. The role of environmental factors such as workflow, ergonomics, and resources, which affect patient safety	0.616	0.933	3.92 ± 0.971	0.691	0.946	3.83 ± 1.107
Recognize, respond to, and disclose adverse events and close calls						
16. Recognizing an adverse event or close call	0.687	0.932	3.88 ± 0.883	0.714	0.946	3.70 ± 1.018
17. Reducing harm by addressing immediate risks for patients and others involved	0.655	0.933	3.98 ± 0.832	0.733	0.946	3.83 ± 0.903
18. Disclosing an adverse event to the patient	0.564	0.934	3.63 ± 1.148	0.574	0.948	3.03 ± 1.050
19. Participating in timely event analysis, reflective practice, and planning to prevent recurrence of events	0.722	0.932	3.83 ± 0.931	0.734	0.946	3.83 ± 0.931
Culture of safety						
20. The ways in which health care is complex and has many vulnerabilities (e.g. workplace design, staffing, technology, human limitations)	0.517	0.935	3.95 ± 0.876	0.611	0.947	3.68 ± 0.997
21. The importance of having a questioning attitude and speaking up when you observe things that may be unsafe	0.664	0.933	3.93 ± 0.797	0.660	0.947	3.57 ± 1.217
22. The importance of a supportive environment that encourages patients and providers to speak up when they have safety concerns	0.582	0.934	3.80 ± 0.966	0.649	0.947	3.03 ± 1.271
23. The nature of systems (e.g. aspects of the organization, management, or the work environment including policies, resources, communication, and other processes) and system failures and their role in adverse events	0.674	0.932	3.57 ± 0.958	0.605	0.947	3.48 ± 0.847

α = Cronbach's alpha if item deleted, r = correlated item total correlation, SD = standard deviation

Table 3: Exploratory factor analysis of Persian version of the Health Professionals Education in Patient Safety Survey (in the classroom)

	1	2	3	4	5	6
Q1. Team dynamics and authority/power differences	**0.533**	0.339	0.110	0.197	0.323	0.061
Q2. Managing interprofessional conflicts	**0.699**	0.167	0.206	0.119	0.266	−0.022
Q3. Debriefing and supporting team members after an adverse event or close call	**0.763**	0.059	0.241	0.090	0.169	0.114
Q4. Engaging patients as a central participant in the health care team	**0.769**	0.080	0.027	0.163	−0.067	0.144
Q5. Sharing authority, leadership, and decision-making	**0.624**	0.226	0.230	0.122	0.181	0.213
Q6. Encouraging team members to speak up, question, challenge, advocate, and be accountable as appropriate to address safety issues	**0.600**	0.429	0.141	0.148	0.207	0.194
Q20. The ways in which health care is complex and has many vulnerabilities (e.g. workplace design, staffing, technology, human limitations)	0.096	**0.716**	0.184	0.293	−0.025	0.061
Q21. The importance of having a questioning attitude and speaking up when you observe things that may be unsafe	0.190	**0.794**	0.219	0.068	0.179	0.203
Q22. The importance of a supportive environment that encourages patients and providers to speak up when they have safety concerns	0.158	**0.740**	0.171	0.032	0.106	0.268
Q23. The nature of systems (e.g. aspects of the organization, management, or the work environment including policies, resources, communication and other processes) and system failures and their role in adverse events	0.278	**0.715**	0.244	0.154	0.172	0.109
Q16. Recognizing an adverse event or close call	0.274	0.225	**0.734**	0.159	0.178	0.162
Q17. Reducing harm by addressing immediate risks for patients and others involved	0.155	0.110	**0.721**	0.246	0.198	0.288
Q18. Disclosing an adverse event to the patient	0.137	0.265	**0.769**	0.070	0.105	0.091
Q19. Participating in timely event analysis, reflective practice, and planning in order to prevent recurrence	0.230	0.298	**0.721**	0.162	0.151	0.262
Q10. Recognizing routine situations in which safety problems may arise	0.163	0.160	0.189	**0.830**	0.138	0.065
Q11. Identifying and implementing safety solutions	0.158	0.138	0.123	**0.856**	0.169	0.128
Q12. Anticipating and managing high-risk situations	0.216	0.147	0.143	**0.779**	0.131	0.241
Q7. Enhancing patient safety through clear and consistent communication with patients	0.190	0.106	0.134	0.133	**0.852**	0.156
Q8. Enhancing patient safety through effective communication with other health care providers	0.156	0.123	0.187	0.170	**0.855**	0.188
Q9. Effective verbal and nonverbal communication abilities to prevent adverse events	0.314	0.177	0.255	0.197	**0.565**	0.237
Q13. The role of human factors, such as fatigue, that affect patient safety	0.180	0.193	0.213	0.070	0.120	**0.751**
Q14. Safe application of health technology	0.082	0.143	0.129	0.167	0.199	**0.768**
Q15. The role of environmental factors such as work flow, ergonomics, and resources, which effect patient safety	0.160	0.198	0.229	0.174	0.145	**0.769**

and 0.923, respectively. Furthermore, the TLI value was 0.922 for the classroom and 0.912 for the clinical setting. All these values indicate the model's acceptable goodness of fit [Table 5].

The results of reliability assessment

The Cronbach's alpha of the scale was 0.936 for the classroom and 0.949 for the clinical setting. The ICC coefficients were 0.966 and 0.937 for the classroom and for the clinical setting, respectively, indicating a very good correlation between the values of the pre- and post-test, for both learning settings. The paired t-test showed that the students' mean scores for the classroom (t = 1.833, $P = 0.074$) and for the clinical setting (t = 0.841, $P = 0.405$) were not significantly different [Table 6].

Discussion

The H-PEPSS has been designed by Ginsburg *et al.* and has been translated into several languages.[10-14] In the present study, the Persian translation of the H-PEPSS showed a good face validity. The original English language scale consists of 23 items in six subscales. None of the Persian translated items were removed in face validity assessment; however, the word sharing in the item "sharing authority, leadership and decision-making" was replaced by the word "participation." Therefore, this item was modified as "participation

Table 4: Exploratory factor analysis of the Persian version of the Health Professionals Education in Patient Safety Survey (in the clinical setting)

	1	2	3	4	5	6
W1	**0.631**	0.165	−0.030	0.233	0.165	0.206
W2	**0.761**	0.268	0.149	0.022	0.016	0.224
W3	**0.778**	0.234	0.238	0.127	0.072	0.199
W4	**0.681**	0.060	0.241	0.132	0.391	0.081
W5	**0.783**	0.190	0.047	0.188	0.197	0.026
W6	**0.737**	0.028	0.274	0.211	0.256	0.006
W20	0.155	**0.685**	0.177	0.286	0.047	0.224
W21	0.244	**0.791**	0.175	0.260	0.112	0.066
W22	0.178	**0.827**	0.097	0.162	0.218	0.176
W23	0.187	**0.735**	0.139	0.106	0.063	0.329
W10	0.251	0.141	**0.806**	0.129	0.164	0.221
W11	0.168	0.196	**0.838**	0.184	0.282	0.136
W12	0.160	0.191	**0.802**	0.215	0.221	0.174
W16	0.175	0.305	0.367	**0.644**	0.159	0.209
W17	0.157	0.265	0.345	**0.624**	0.200	0.339
W18	0.261	0.171	0.068	**0.779**	0.077	0.134
W19	0.218	0.307	0.167	**0.743**	0.256	0.215
W7	0.239	0.149	0.342	0.086	**0.744**	0.256
W8	0.297	0.253	0.155	0.184	**0.786**	0.084
W9	0.291	0.030	0.324	0.272	**0.667**	0.187
W13	0.183	0.261	0.237	0.247	0.031	**0.704**
W14	0.133	0.168	0.199	0.197	0.301	**0.751**
W15	0.223	0.362	0.144	0.203	0.160	**0.744**

Table 5: Goodness-of-fit index for classroom and clinical setting

H-PEPSS$_{IR}$	TLI	RMSEA	CFI
Fit value		**≤0.05**	≥0.95
		≤0.07	≥0.90
Original models			
Classroom		0.078	**0.94**
Clinical settings		0.067	**0.94**
Adjusted models			
Classroom	0.922	0.064	**0.931**
Clinical settings	0.912	0.076	**0.923**

CFI = Comparative Fit Index, H-PEPSS = Health Professionals Education in Patient Safety Survey, RMSEA = Root Mean Square Error of Approximation, TLI = Tucker-Lewis Index

of health team members in authority, leadership, and decision-making." Also, for the item "safe use of health technology," a well-known example was added for a better understanding, and the item was modified to "safe use of health technologies such as medical equipment and computer systems, etc."

In content validity assessment, the criterion for an acceptable CVR was 0.59 according to Lawshe's table.[20] The CVR of items in the Persian version of the scale ranged between 0.64 and 1.00, and, therefore, no items were deleted, but the items "Team dynamics and authority/power differences" and "the ways in which health care is complex and has many vulnerabilities" were edited due to a CVI score of less than 0.79. Taskiran *et al.* and Huang *et al.* have also translated the H-PEPSS into Turkish and Chinese languages and reported acceptable CVI for the items in the Turkish and Chinese versions of the scale.[11,12]

After confirming the content validity, the Persian scale was administered to 390 students for factor analysis. Six factors were extracted in EFA, which were the same as the original scale and also the same as the studies conducted in Turkey, China, and Italy.[10-13] Due to the acceptable factor loading values of all items, no item was deleted in CFA. This finding is congruent with what was reported in a study conducted in Turkey.[11] However, seven items were removed during the CFA in the studies conducted in China, Italy, and Duch.[12,15,16]

Table 6: Test-retest reliability and Cronbach's alpha

		Classroom			Clinical Setting		
		Cronbach's alpha	Mean ± SD	t/*P* value; r/*P* value	Cronbach's alpha	Mean ± SD	t/*P* value; r/*P* value
Working in teams with other health professionals	First	0.873	3.16 ± 0.14	t = 1.077, *P* = 0.288	0.906	3.03 ± 0.13	t = 0.489, *P* = 0.627
	Second		3.02 ± 0.16	r = 0.633, *P* < 0.001		2.98 ± 0.16	r = 0.770, *P* < 0.001
Communicating effectively	First	0.845	3.62 ± 0.13	t = −0.071, *P* = 0.943	0.872	3.67 ± 0.13	t = 0.752, *P* = 0.457
	Second		3.62 ± 0.13	r = 0.592, *P* < 0.001		3.60 ± 0.14	r = 0.787, *P* < 0.001
Managing safety	First	0.875	3.70 ± 0.13	t = 0.623, *P* = 0.537	0.923	3.64 ± 0.12	t = 0.124, *P* = 0.902
	Second		3.60 ± 0.16	r = 0.516, *P* < 0.001		3.62 ± 0.13	r = 0.463, *P* = 0.003
Understanding human and environmental factors	First	0.816	3.12 ± 0.14	t = −2.068, *P* = 0.045	0.840	3.17 ± 0.13	t = −1.340, *P* = 0.188
	Second		3.42 ± 0.14	r = 469, *P* = 0.002		3.33 ± 0.14	r = 0.635, *P* < 0.001
Recognize, respond to and disclose adverse events and close call	First	0.875	3.53 ± 0.12	t = 1.112, *P* = 0.273	0.875	3.43 ± 0.12	t = 0.257, *P* = 0.798
	Second		3.40 ± 0.16	r = 0.674, *P* < 0.001		3.40 ± 0.16	r = 0.785, *P* < 0.001
Culture of safety	First	0.857	3.35 ± 0.16	t = 2.810, *P* = 0.008	0.900	3.11 ± 0.15	t = 1.454, *P* = 0.154
	Second		3.02 ± 0.17	r = 0.751, *P* < 0.001		2.96 ± 0.17	r = 0.801, *P* < 0.001
Total	First	0.936	3.41 ± 0.10	t = 1.833, *P* = 0.074	0.949	3.35 ± 0.12	t = 0.841, *P* = 0.405
	Second		3.34 ± 0.10	r = 0.935, *P* < 0.001		3.31 ± 0.11	r = 0.965, *P* < 0.001

First = test results, r = Pearson correlation, SD = standard deviation, Second = retest results, t = paired sample t-test

In the present study, the highest factor loadings in the classroom and clinical environment were related to the subscale of "recognize, respond to and disclosure of adverse events and close calls," while the lowest factor loadings in the classroom and clinical environment were in the "managing safety risks" and "teamwork with other health professionals" subscales. However, in the Turkish version of H-PEPSS, the highest and the lowest factor loading values in both the classroom and clinical setting were related to "understanding human and environmental factors" and "teamwork with other health professionals" subscales, respectively.[11] Also, the goodness-of-fit indices such as CFI, TLI, and RMSEA were calculated and confirmed the fitness of the model examined in the current study. However, more acceptable values of goodness-of-fit indices were reported in a study that examined the Dutch version of H-PEPSS.[16]

The Cronbach's alpha of the Persian H-PEPSS was greater than 0.93, illustrating the excellent internal consistency of the Persian scale.[22] This finding is congruent with what was reported in studies conducted in Turkey and Italy.[11,15] However, the Cronbach's alpha values reported by Huang *et al.* and Bergs *et al.* were lower than the values in the present study.[12,16] Furthermore, the ICC values confirmed the high stability of the Persian H-PEPSS. However, none of the similar studies reported the ICC of H-PEPSS.[12,15] Similar to our results, Taskiran *et al.* found no significant difference between the mean scores of H-PEPSS when they administered it two times in one group.[11] Our results, along with some earlier studies that examined PS competence[23-26] evaluated the effectiveness of training programs on improving this competency,[27,28] show that the H-PEPSS is a valid and reliable instrument for assessing PS competence.

The present study has strengths and limitations. For the first time, we translated and assessed the psychometric properties of H-PEPSS. This study was conducted in a university to homogenize students' learning environment. Due to the cancellation of formal training methods during the coronavirus disease 2019 (COVID-19) pandemic, it was not possible to communicate face to face with the participants in clinical or classroom settings, and it was a limitation of this study.

Conclusion

In this study, a Persian version of H-PEPSS was prepared. This scale has 23 items in six domains. The Persian H-PEPSS is a valid and reliable instrument for assessing health professionals' perceptions of PS competence at entry into practice. It can help the education system to assess how health care teachers (i.e. nurse educators, medical educators, etc.) teach PS to their students in the classroom and clinical setting. This scale can be used as a PS training guide and as an instrument to assess the students before, during, and immediately after the internship to ensure that graduates have the necessary qualifications to provide PS.

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Conflicts of interest

There are no conflicts of interest.

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