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# The validity and reliability properties of a Persian version of the evidence-based practice profile (EBP<sup>2</sup>) questionnaire among Iranian students of health-related fields

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## Abstract

**Background** Evidence-based medicine is defined as searching for medical information, reviewing and comparing it to each patient's situation, and then judging the optimal decision. We aimed to measure the psychometric properties of the Evidence-Based Performance Profile (EBP<sup>2</sup>) Questionnaire among the students of health-related fields at Shiraz University of Medical Sciences.

**Methods** This cross-sectional study was conducted in 2021. The EBP2 questionnaire, which includes 74 five-Likert-scale items, was translated into the Persian language using the forward-backward translation method. A panel of five experts approved the face, content, and structural validity of the questionnaire. The Cronbach's alpha and McDonald's Omega coefficients were utilized to assess the questionnaire's internal consistency. Furthermore, both confirmatory and exploratory factor analyses were used to assess the questionnaire's construct validity. SPSS software version 25 and LISREL software version 8.8 were used for statistical analysis.

**Results** Overall, 339 students participated in this study. The cultural adaptability, linguistic equivalence, and content validity of the Persian version of the EBP<sup>2</sup> questionnaire were approved by a five-member team of medical experts. In addition, the results showed excellent internal consistency of the Persian version of the EBP<sup>2</sup> questionnaire (Cronbach's alpha = 0.962, McDonald's Omega (ML) = 0.963). Moreover, all domains had acceptable reliability (> 0.7), except the Practice domain which had a marginally acceptable Cronbach's alpha coefficient equal to 0.686. Exploratory factor analysis discovered six domains for the questionnaire. Moreover, the confirmatory factor analysis

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demonstrated that all indices except the comparative fit index (CFI) and adjusted goodness of fit (AGFI) confirmed the validity of the EBP<sup>2</sup> questionnaire.

**Conclusion** The study's findings indicate that the Persian translated of the EBP2 questionnaire exhibited satisfactory validity and reliability for assessing students' evidence-based performance in health-related fields.

**Keywords** Validation study, Surveys and questionnaires, Evidence-based practice, Health occupations Students

## Background

The term evidence-based medicine was first used by several researchers at McMaster University in Canada [1, 2]. Evidence-based medicine has been defined as the correct and wise use of the best available evidence for clinical decision-making in patient care. This information is intended to adapt them to the specific disease conditions and ultimately to judge and use the best available evidence [3, 4].

Evidence found that a large proportion of physicians' errors were due to their lack of knowledge about best practices. But with careful, systematic, and transparent use of research systems in evidence-based medicine, these errors can be greatly reduced [5, 6]. To further improve the quality of patients' clinical care, in recent years, clinical experience has been combined with research evidence. Evidence-based medicine is the use of the best research evidence in clinical decision-making. Evidence-based medicine is now accepted as a new and reliable approach, and new discussions are underway on the axis of judgment to find the best evidence or qualitative evidence [7, 8]. Evidence-based practice contributes to improving patient outcomes and reducing healthcare costs. Therefore, various disciplines such as medicine, nursing, midwifery, psychotherapy, and psychology benefit from evidence-based practice [9–13].

The necessity of employing evidence-based practice in the context of pandemics, epidemics, crises, and the utilization of non-conventional therapies and medications becomes increasingly apparent [14–17]. Therefore, many healthcare staff face the challenge of implementing evidence-based methods as a one-size-fits-all solution in healthcare [18, 19]. The evidence-based Performance (EBP<sup>2</sup>) questionnaire, developed by McEvoy MP et al., is an instrument to measure the evidence-based performance of medical and paramedical students and healthcare-related staff. This questionnaire could be useful to use across health professions and reveal the performance of healthcare staff as a result of education and training covering the range of EBP<sup>2</sup> domains [20]. The EBP<sup>2</sup> questionnaire, which was tested on a large sample of people comprising students, academics, and healthcare practitioners from various professions, has demonstrated satisfactory levels of validity and reliability [21].

In this regard, several translated versions of this instrument, including Polish, Chinese, and Norwegian, were

developed. The studies provided evidence that the EBP<sup>2</sup> questionnaire is a valid and reliable tool for evaluating many elements of evidence-based knowledge, attitude, and practice among medical and health-related students and professionals in those societies [22–24]. On the other hand, there were several Persian versions of self-report questionnaires available for evidence-based practice (EBP) in allied health fields, and several studies were conducted on this issue. These questionnaires cover several aspects such as awareness, knowledge, saliency, attitudes, self-efficacy, intention, behaviors, organization, and personality. Nevertheless, a significant number of existing instruments have some limitations regarding the range of areas covered, the level of specificity in targeting the intended audience, and the rigor of their development process [25–28].

To the best of our knowledge, there was no study to evaluate the Persian version of the EBP<sup>2</sup> questionnaire, which was applicable in several fields of medical and paramedical professions. Therefore, this study aimed to examine the validity and reliability of the EBP2 questionnaire among the students of health-related fields in the Iranian population at Shiraz University of Medical Sciences, Shiraz, Iran.

## Methods

### Study design, participation, and sample size calculation

This cross-sectional study was conducted on the students affiliated with the Shiraz University of Medical Sciences in 2021 to evaluate the validity and reliability of the Persian-translated version of the EBP<sup>2</sup> questionnaire. The population of this study was medical and paramedical students at Shiraz University of Medical Sciences. According to the rule of thumb [29, 30], four to five individuals were considered for each item of the questionnaire. Therefore, approximately 320 participants were estimated as the minimum sample size for the study.

### Development of the Persian version of the questionnaire

To the development of the Persian version of the questionnaire, the forward-backward method was applied. In this regard, two independent bilingual experts first translated the questionnaire into Persian. Then the translated versions of the questionnaire were reviewed and re-translated into English by another independent expert and compared to the original version of the questionnaire. To

approve the face validity of the final version of the questionnaire, we got help from five members of the expert committee, who included methodologists, forward and backward translators, medical doctors with knowledge of medical education and professionalism, and language specialists who evaluated the final Persian translation. The committee of experts evaluated the translation to ensure that it conveyed the same meaning as the source text.

### **Instrument and scoring**

The questionnaire consists of 74 items categorized into six dimensions including Relevance (1–14 items), Sympathy (15–21 items), Terminology (22–38 items), Practice (39–47 items), Confidence (48–58 items), as well as Non-domain items (59–74 items). Each item is assigned a score of 1 for each point on the 5-point Likert scale, resulting in a minimum score of 1 and a maximum score of 5 per item. Moreover, items 75–87 were related to the demographic characteristics of the participants [21].

### **Data collection**

Because of the COVID-19 pandemic that resulted in students participating in virtual classes, the questionnaire was designed as an electronic form and distributed among the students to complete using social media. Each questionnaire took about 15 min to complete. Having revived the minimum sample size, we inactivated the electronic link to the questionnaire.

### **Ethical statement**

Permission to use and translate this questionnaire was obtained from Maureen Patricia McEvoy, one of the makers of the questionnaire, through email. In addition, the protocol of the study was approved by the Research Ethics Committee of Shiraz University of Medical Sciences (Ethics Code: IR.SUMS.REC.1399.1176). Furthermore, we inserted one question in the electronic questionnaire to obtain informed consent from the participants.

### **Reliability and validity assessment and statistical analysis**

We used LISREL software version 8.8 and SPSS software version 25 for statistical analysis. In this regard, Furthermore, the reliability of the EBP<sup>2</sup> domains was assessed by employing Cronbach's alpha coefficient and McDonald's Omega (ML) coefficient. A coefficient of at least 0.7 was deemed satisfactory for internal consistency. In addition, a comprehensive set of statistical analyses was conducted to determine the features of the items. These analyses included calculating the minimum and maximum scores, the mean value and the standard deviation (SD), the corrected item-total correlation, the scores of each items, and the Cronbach's alpha coefficient with and without specific items.

The Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and Bartlett's test of sphericity were employed to determine the suitability of factor analysis for our data, based on the proportion of variance in the variables. Then, the validity of the questionnaire was obtained using exploratory factor analysis, using SPSS software and principal component analysis method, and confirmatory factor analysis, using LISREL software. According to the objectives of the design, frequency, standard deviation, and mean were used to describe the descriptive data.

### **Results**

Overall, 324 students participated in our study and completed the questionnaire. The average age of participants was 28.83 years, with a minimum age of 21 years and a maximum of 41 years.

### **Cultural adaptation, linguistic equivalency, and content validity**

All five faculty members confirmed the cultural adaptation, language equivalence, and content validity of the Persian version of the EBP<sup>2</sup> questionnaire. All items on the scale had content validity index more than 0.90, and no questions were excluded.

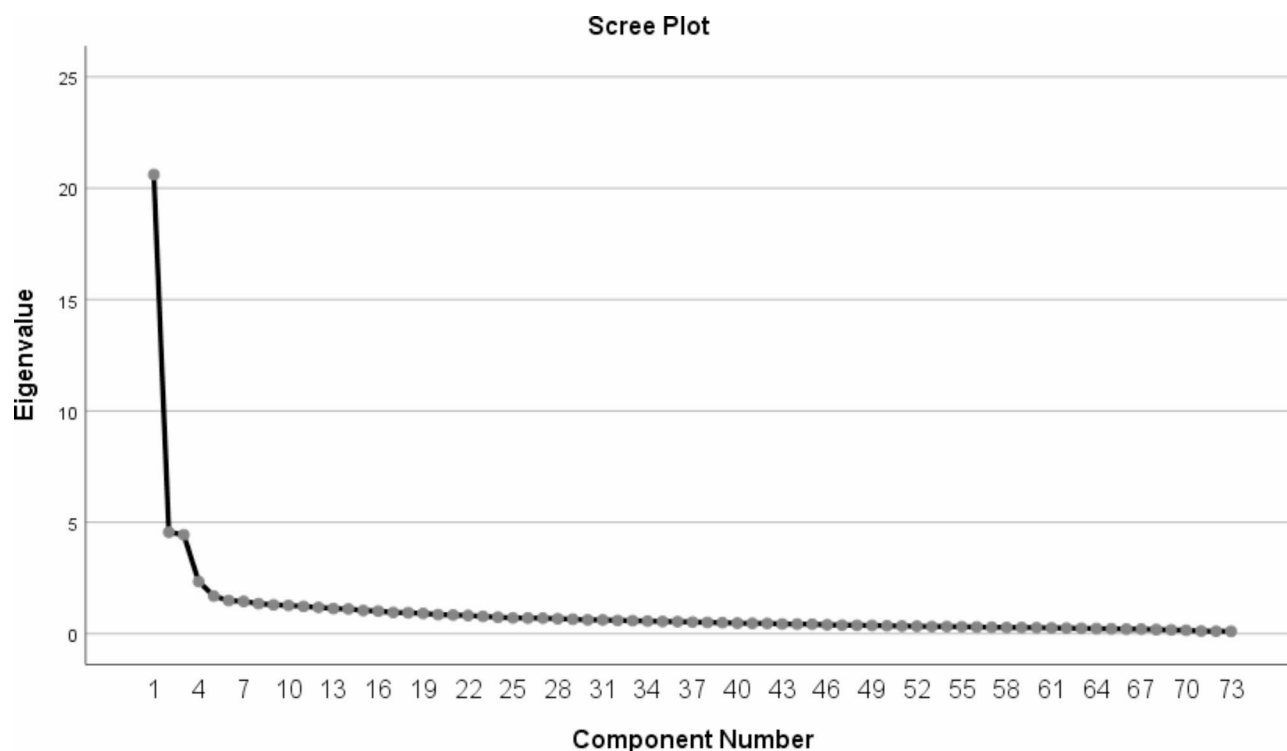
### **Assessing the reliability of the questionnaire**

The reliability of the EBP<sup>2</sup> questionnaire was confirmed with Cronbach's alpha coefficient of 0.962 and McDonald's Omega (ML) coefficient of 0.963. As it is clear in Table 1, all dimensions of the questionnaire had high and very good reliability. It should be noted that the practice dimension had relatively good reliability. Furthermore, all of the initial communalities had a value of 1, and all of the extracted communalities for the items were more than or equal to 0.4. In this regard, only three questions (39, 49, and 74) had extracted communalities below 0.3. Moreover, Table 2 presents the item analysis of the questionnaire including the frequency of minimum and maximum obtained scores, mean and standard deviation scores of each items, scale mean if item deleted, scale variance if item deleted, corrected item-total correlation, and Cronbach's Alpha if Item Deleted.

### **Construct validity and Exploratory factor analysis**

KMO index was found to be 0.932 and Bartlett's test yielded the following results:  $X^2=13625.400$ ,  $df=2628$ , and  $P\leq 0.001$ . These results showed that the KMO statistic was confirmed. These results indicated that the data were sufficient for providing a suitable model of exploratory factor analysis.

As was shown in Table 3, we used the principal component analysis method to calculate the percentage of variance changes expressed by the factor analysis model was calculated for the 16 extracted factors for before and



**Fig. 1** The scree plot displays the extracted components from the data. The number of components retained is five, as evidenced by the changes in the plot's shape with the inclusion of the fifth component

**Table 1** The Cronbach's alpha coefficient and McDonald's omega (ML) coefficient of each dimension of the questionnaire

Scale	Number of items	N	Minimum score	Maximum score	Mean (SD)	Cronbach's alpha	Omega
Total EBP2 tool	74	339	106/370	325/370	243.41 (43.43)	0.962	0.963
Relevance (1–14 items)	14	339	14/70	70/70	46.56 (10.58)	0.902	0.903
Sympathy (15–21 items)	7	339	8/35	35/35	22.66 (5.47)	0.838	0.841
Terminology (22–38 items)	17	339	19/85	80/85	53.54 (12.82)	0.91	0.913
Practice (39–47 items)	9	339	14/45	43/45	31.28 (5.14)	0.686	0.692
Confidence (48–58 items)	11	339	11/55	54/55	35.97 (7.95)	0.845	0.853
Non-domain (59–74 items)	16	339	19/80	75/80	53.35 (10.5)	0.869	0.872

McDonald's Omega (ML)

after the rotation. The value of this analysis was 64.607%, which is almost good (it was excellent if this percentage be greater than 75.).

To determine the number of factors that make up the questionnaire, we used the eigenvalue and Scree plot methods. In this regard, Fig. 1 shows that 5 factors were sufficient to explain the validity construct of the questionnaire. The rotated matrix of the factors after Varimax rotation shows the factors in a clearer form of the variables. The rotation was able to more reliably separate the structures and make the interpretation much easier. In Table 4, each row represents a question, for example, the first row is related to the first question that it is related to

the first factor (first dimension). According to this analysis, six factors were identified for questions related to different dimensions of the questionnaire.

#### Confirmatory factor analysis

Table 5 shows some of the most important fit indices of confirmatory factor analysis are presented. The results showed that all the indicators except GFI and AGFI were reported at an excellent level and the model had a good fit with the data. According to Lisrel's output, the calculated chi-square value was less than 3 and equal to 2.39 compared to the degree of freedom. The low level of this index indicated a small difference between the model and

**Table 2** The item analysis of the evidence-based Practice Profile (EBP<sup>2</sup>) questionnaire

Item	N	Minimum score (score = 1), n (%)	Maximum score (score = 5), n (%)	Mean	Std. Deviation	Scale Mean if Item Deleted	Scale Vari- ance if Item Deleted	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
q1	339	34 (10.0)	33 (9.7)	3.1681	1.14279	240.2389	1832.147	0.539	0.962
q2	339	30 (8.8)	40 (11.8)	3.2153	1.14778	240.1917	1834.445	0.513	0.962
q3	339	34 (10.0)	34 (10)	3.1504	1.13227	240.2566	1836.682	0.497	0.962
q4	339	28 (8.3)	35 (10.3)	3.1298	1.12040	240.2773	1837.118	0.498	0.962
q5	339	25 (7.4)	39 (11.5)	3.3923	1.06145	240.0147	1838.003	0.517	0.962
q6	339	30 (8.8)	54 (15.9)	3.3569	1.20134	240.0501	1830.279	0.530	0.962
q7	339	22 (6.5)	57 (16.8)	3.3982	1.12165	240.0088	1837.098	0.498	0.962
q8	339	23 (6.8)	59 (17.4)	3.4779	1.13130	239.9292	1837.332	0.491	0.962
q9	339	25 (7.4)	55 (16.2)	3.3953	1.14488	240.0118	1831.219	0.548	0.962
q10	339	30 (8.8)	56 (16.5)	3.3009	1.19579	240.1062	1835.308	0.483	0.962
q11	339	18 (5.3)	56 (16.5)	3.4454	1.10905	239.9617	1835.055	0.526	0.962
q12	339	28 (8.3)	54 (15.9)	3.3392	1.17416	240.0678	1831.164	0.534	0.962
q13	339	18 (5.3)	55 (15.2)	3.4395	1.09802	239.9676	1839.966	0.478	0.962
q14	339	28 (8.3)	49 (14.5)	3.3776	1.15342	240.0295	1834.165	0.513	0.962
q15	339	18 (5.3)	105 (31)	3.8879	1.06552	239.5192	1837.949	0.516	0.962
q16	339	24 (7.1)	20 (5.9)	3.2596	1.00760	240.1475	1833.339	0.601	0.962
q17	339	30 (8.8)	27 (8.0)	2.9705	1.10366	240.4366	1830.732	0.575	0.962
q18	339	28 (8.3)	34 (10)	3.0619	1.12226	240.3451	1830.392	0.568	0.962
q19	339	37 (10.9)	29 (8.6)	3.0560	1.14087	240.3510	1825.791	0.606	0.961
q20	339	15 (4.4)	50 (14.7)	3.3245	1.07734	240.0826	1841.330	0.473	0.962
q21	339	34 (10.0)	41 (12.1)	3.1032	1.16835	240.3038	1835.922	0.489	0.962
q22	339	32 (9.4)	38 (11.2)	3.0737	1.15276	240.3333	1836.051	0.494	0.962
q23	339	18 (5.3)	104 (30.7)	3.8171	1.14440	239.5900	1853.746	0.316	0.962
q24	339	16 (4.7)	36 (10.6)	3.2625	0.99946	240.1445	1841.532	0.509	0.962
q25	339	26 (7.7)	42 (12.4)	3.1681	1.09789	240.2389	1833.958	0.543	0.962
q26	339	33 (9.7)	41 (12.1)	3.1858	1.12961	240.2212	1836.333	0.502	0.962
q27	339	48 (14.2)	34 (10.0)	3.0059	1.18420	240.4012	1831.330	0.528	0.962
q28	339	57 (16.8)	19 (5.6)	2.7581	1.13597	240.6490	1840.489	0.456	0.962
q29	339	29 (8.6)	69 (20.4)	3.4543	1.18177	239.9528	1832.950	0.513	0.962
q30	339	72 (21.2)	25 (7.4)	2.7847	1.23231	240.6224	1833.721	0.483	0.962
q31	339	84 (24.8)	36 (10.6)	2.8053	1.34687	240.6018	1831.944	0.455	0.962
q32	339	58 (17.1)	39 (11.5)	2.9587	1.23966	240.4484	1825.662	0.557	0.962
q33	339	44 (13.0)	51 (15)	3.1917	1.22177	240.2153	1830.797	0.516	0.962
q34	339	46 (13.6)	44 (13.0)	3.1563	1.22440	240.2507	1820.934	0.610	0.961
q35	339	45 (13.2)	49 (14.5)	3.2094	1.22852	240.1976	1826.875	0.551	0.962
q36	339	80 (23.6)	55 (16.2)	3.3953	1.01910	240.0118	1841.183	0.503	0.962
q37	339	49 (14.5)	41 (12.1)	3.0914	1.23337	240.3156	1828.797	0.530	0.962
q38	339	40 (11.8)	54 (15.9)	3.2271	1.22536	240.1799	1839.024	0.435	0.962
q39	339	17 (5.0)	37 (10.9)	3.4631	0.99450	239.9440	1865.994	0.224	0.962
q40	339	15 (4.4)	48 (14.2)	3.3776	1.07096	240.0295	1860.597	0.265	0.962
q41	339	20 (5.9)	45 (13.3)	3.3304	1.05611	240.0767	1865.479	0.215	0.962
q42	339	11 (3.2)	78 (23.0)	3.5664	1.13218	239.8407	1836.655	0.498	0.962
q43	339	5 (1.5)	97 (28.6)	3.8083	1.03280	239.5988	1837.152	0.542	0.962
q44	339	11 (3.2)	54 (15.9)	3.5398	1.02370	239.8673	1847.192	0.432	0.962
q45	339	30 (8.8)	59 (17.4)	3.3068	1.20906	240.1003	1847.759	0.356	0.962
q46	339	17 (5.0)	51 (15.0)	3.3923	1.06701	240.0147	1839.245	0.501	0.962
q47	339	12 (3.5)	56 (16.5)	3.4985	1.04450	239.9086	1846.699	0.428	0.962
q48	339	38 (11.2)	28 (8.3)	3.0442	1.12835	240.3628	1849.149	0.369	0.962
q49	339	7 (2.1)	67 (19.8)	3.6932	0.95163	239.7139	1868.081	0.209	0.962
q50	339	31 (9.1)	60 (17.7)	3.3245	1.20441	240.0826	1833.650	0.496	0.962
q51	339	17 (5.0)	60 (17.7)	3.4513	1.10398	239.9558	1830.042	0.582	0.962

**Table 2** (continued)

Item	N	Minimum score (score = 1), n (%)	Maximum score (score = 5), n (%)	Mean	Std. Deviation	Scale Mean if Item Deleted	Scale Vari- ance if Item Deleted	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
q52	339	29 (8.6)	49 (14.5)	3.2832	1.16255	240.1239	1832.884	0.522	0.962
q53	339	21 (6.2)	69 (20.4)	3.4690	1.15439	239.9381	1831.686	0.538	0.962
q54	339	36 (10.6)	45 (13.3)	3.0295	1.21347	240.3776	1830.863	0.519	0.962
q55	339	26 (7.7)	65 (19.2)	3.3982	1.19570	240.0088	1830.453	0.531	0.962
q56	339	34 (10.0)	38 (11.2)	3.1268	1.17108	240.2802	1830.037	0.547	0.962
q57	339	34 (10.0)	49 (14.5)	3.1003	1.19984	240.3068	1827.172	0.562	0.962
q58	339	42 (12.4)	38 (11.2)	3.0531	1.19793	240.3540	1831.460	0.520	0.962
q59	339	29 (8.6)	46 (13.6)	3.3097	1.14932	240.0973	1832.171	0.536	0.962
q60	339	31 (9.1)	55 (16.2)	3.3038	1.19132	240.1032	1827.477	0.563	0.962
q61	339	37 (10.9)	41 (12.1)	3.1062	1.18194	240.3009	1831.702	0.525	0.962
q62	339	36 (10.6)	36 (10.6)	3.1357	1.17388	240.2714	1834.299	0.503	0.962
q63	339	42 (12.4)	53 (15.6)	3.1091	1.26276	240.2979	1826.742	0.536	0.962
q64	339	33 (9.7)	68 (20.1)	3.3953	1.24158	240.0118	1822.444	0.587	0.962
q65	339	9 (2.7)	36 (10.6)	3.4395	0.95693	239.9676	1832.824	0.640	0.961
q66	339	9 (2.7)	57 (16.8)	3.4218	1.06126	239.9853	1832.742	0.576	0.962
q67	339	18 (5.3)	45 (13.3)	3.2802	1.08018	240.1268	1833.626	0.556	0.962
q68	339	13 (3.8)	60 (17.7)	3.4897	1.09154	239.9174	1824.638	0.648	0.961
q69	339	7 (2.1)	76 (22.4)	3.6608	1.03201	239.7463	1831.764	0.604	0.962
q70	339	12 (3.5)	53 (15.6)	3.5280	1.02120	239.8791	1834.124	0.584	0.962
q71	339	23 (6.8)	43 (12.8)	3.3392	1.11205	240.0678	1832.773	0.548	0.962
q72	339	17 (5.0)	43 (12.7)	3.2950	1.06657	240.1121	1827.863	0.627	0.961
q73	339	9 (2.7)	60 (17.7)	3.5752	1.00418	239.8319	1831.377	0.626	0.961
q74	339	61 (18.0)	52 (15.3)	2.9646	1.37128	240.4425	1893.839	-0.080	0.964

**Table 3** Total Variance explained the Persian version of evidence-based Practice Profile (EBP<sup>2</sup>) questionnaire

Total Variance Explained									
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	1.180	1.617	58.738	1.180	1.617	58.738	1.674	2.293	57.255
2	1.129	1.547	60.285	1.129	1.547	60.285	1.518	2.080	59.335
3	1.107	1.516	61.801	1.107	1.516	61.801	1.356	1.858	61.192
4	1.037	1.420	63.221	1.037	1.420	63.221	1.299	1.780	62.972
5	1.012	1.386	64.607	1.012	1.386	64.607	1.194	1.635	64.607
6	0.951	1.303	65.911						

Extraction Method: Principal Component Analysis.

the observed data and the expected data of the research. Also, the value of RSMEA was within the permissible limit, which indicates a good fit. In this regard, the lower this value, the better the model fits. The comparative fit indices, including CFI, NFI, RFI, and IFI, all revealed good to excellent fit of the model. Also, the absolute fit indices of GFI and AGFI models are a measure of the relative value of variances and correlations that are justified by the model in a common way. The closer this value is to one, the better the fit of the data will be, which here was approximately appropriate. Other fit indices of the model show excellent and appropriate fit (Table 5).

## Discussion

The results of this study showed that the Persian version of the EBP2 is a valid and reliable tool to evaluate evidence-based practice among medical and paramedical students. In this regard, a panel of five medical specialists confirmed the cultural adaptation, linguistic equivalency, and content validity of the Persian version of the EBP2 questionnaire. Furthermore, all domains of the Persian version of the EBP2 had an excellent Cronbach's alpha coefficient and McDonald's Omega (ML) coefficient, except the domain of Practice (39–47 items) which has moderate to good Cronbach's alpha coefficient and McDonald's Omega (ML) coefficient in assessing the reliability of the questionnaire. This questionnaire is the

**Table 4** Rotated component matrix of the six-factor model for the Persian version of evidence-based Practice Profile (EBP2) questionnaire using exploratory factor analysis with Varimax rotation model

Item	N	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
q1	339	0.711					
q2	339	0.683					
q3	339	0.678					
q4	339	0.670					
q5	339	0.670					
q6	339	0.647					
q7	339	0.643					
q8	339	0.633					
q9	339	0.627					
q10	339	0.595					
q11	339	0.593					
q12	339	0.590					
q13	339	0.582					
q14	339	0.576					
q15	339		0.553				
q16	339		0.545				
q17	339		0.538				
q18	339		0.684				
q19	339		0.643				
q20	339		0.629				
q21	339		0.740				
q22	339			0.707			
q23	339			0.664			
q24	339			0.658			
q25	339			0.655			
q26	339			0.645			
q27	339			0.620			
q28	339			0.553			
q29	339			0.584			
q30	339			0.526			
q31	339			0.617			
q32	339			0.597			
q33	339			0.557			
q34	339			0.529			
q35	339			0.709			
q36	339			0.675			
q37	339			0.669			
q38	339			0.671			
q39	339				0.667		
q40	339				0.663		
q41	339				0.631		
q42	339				0.626		
q43	339				0.584		
q44	339				0.578		
q45	339				0.575		
q46	339				0.537		
q47	339				0.847		
q48	339					0.777	
q49	339					0.795	
q50	339					0.687	
q51	339					0.651	
q52	339					0.637	

**Table 4** (continued)

Item	N	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
q53	339					0.526	
q54	339					0.755	
q55	339					0.612	
q56	339					0.738	
q57	339					0.679	
q58	339					0.573	
q59	339						0.830
q60	339						0.633
q61	339						0.778
q62	339						0.589
q63	339						0.784
q64	339						0.631
q65	339						0.655
q66	339						0.553
q67	339						0.595
q68	339						0.523
q69	339						0.654
q70	339						0.59
q71	339						0.551
q72	339						0.621
q73	339						0.613
q74	339						0.545

**Table 5** Goodness of fit statistics of the evidence-based practice profile questionnaire (EBP<sup>2</sup>Q)

Indicates	$\chi^2_{df}$	df	RMSEA	NFI	IFI	CFI	GFI	AGFI	RFI
Six-dimensions	6277.77	2620	0.076	0.92	0.95	0.95	0.68	0.6	0.91

Root Mean Square Error of Approximation(RMSEA); Chi-degree freedom (CMIN/DF); incremental fit index (IFI); Relative fit index (RFI); incremental fit index (IFI); Normed Fit Index (NFI); Goodness of fit (GFI); Adjusted Goodness of Fit (AGFI); Comparative Fit Index (CFI)

first standardized tool in Persian that enables us to thoroughly evaluate the knowledge, attitude, and behavior of students and healthcare professionals from various fields in relation to evidence-based practice (EBP). Therefore, it seems that this questionnaire could be considered a suitable instrument among Iranian medical and paramedical students and healthcare professionals.

Evidence-based activism illuminates the continual co-production of factual and pressing issues in modern technology democracies [31]. In addition, today, evidence-based performance has been considered one of the most important parts of clinical activity, skill, and knowledge for all medical and paramedical practitioners [31, 32]. In this regard, pay-per-performance has been emerging to improve the quality of care in healthcare settings [33, 34].

There are several tools to evaluate evidence-based practice among health care practitioners, including evidence-based practice questionnaires for nurses [35], evidence-based practice questionnaire (S-EBPQ) [36], Evidence-Based Practice Evaluation Competence Questionnaire (EBP-COQ) [37], the Evidence-Based Practice Questionnaire (EBPQ) applicable in healthcare

professionals [38], etc. In this regard, a systematic review conducted by Silva AMd et al. found that most of the instruments were developed to assess the evidence-based practice among nurses and physical therapists, specifically [39]. On the other hand, many of these questionnaires were limited in domains to evaluate the several aspects of evidence-based practice among health care practitioners, comprehensively. In this regard, EBP<sup>2</sup> was developed to measure the evidence base practice to use in health care educational settings among the health care providers in different health disciplines [20], which was developed, translated, and cross-cultural and linguistic adaptation in some languages.

The Polish version of the EBP<sup>2</sup> questionnaire demonstrated high reliability and validity, and the results of psychometric properties and structures were similar to the original version of the EBP<sup>2</sup> questionnaire (which was developed in Australia in English). In the Polish version of this questionnaire, the domain of sympathy had the lowest reliability by Cronbach's alpha of 0.798. In addition, the validation study of Polish version of EBP<sup>2</sup> was conducted by including only nurses and midwives, which could be considered a limitation of this study and



decrease the Generalizability [22]. The Norwegian version of EBP<sup>2</sup> showed that all domains of this questionnaire, except the “sympathy”, had excellent reliability. In detail, the Norwegian version of EBP<sup>2</sup> showed excellent validity and reliability for the domains of Relevance, Terminology, and Confidence, but the Practice and Sympathy domains had not enough validity and reliability to use [24]. In 2024, Landsverk NG et al. conducted a newer study on Norwegian primary healthcare professionals, which confirmed the content validity of the Norwegian-translated version of EBP<sup>2</sup>, albeit with some linguistic modifications required. However, many of the participants believed that some items on the questionnaire were not necessarily relevant to their clinical practice. More specifically, the other psychometric properties of the questionnaire, such as CFI, RMSEA, and SRMR, validated the instrument’s model fit. Furthermore, the Norwegian version of this tool received approval for its internal consistency in all domains, except sympathy [40].

On the other hand, the psychometric properties of the Chinese version of the EBP<sup>2</sup> questionnaire revealed that the Chinese version of the questionnaire had good content validity. In addition, this version of EBP<sup>2</sup> showed good validity and reliability in all domains, except the Sympathy domain [23]. The other study that conducted by Jia et al. on the Chinese version of EBP<sup>2</sup> confirmed that this questionnaire was a highly valid and reliable instruments to assess the evidence-based practice in Chinese postgraduate students. However, some questions were deleted in this study due to low level of validation coefficients during the preparation of Chinese version of the questionnaire [41]. However, some parts of the results of Jia *et al.*’s study, such as internal consistency value of Chinese version of the questionnaire, were in line with the results of our study.

The results of our study were near the results of other studies. On this subject, our study demonstrated that the majority of domains of EBP<sup>2</sup>, including relevance, sympathy, terminology, and confidence, had excellent reliability. However, the reliability of the Practice domain was located at a moderate to a good level. This result might be due to an insufficient level of education to apply evidence-based documents or a lack of knowledge to intercept the results of scientific documents [42], which could affect the obtained scores of the items in the practice domain of the questionnaire.

Moreover, several studies showed that for many healthcare staff and professionals, the meaning of evidence-based practice was not clear, and their knowledge, attitude, performance, educational status, and occupational experience on this issue were insufficient [43–45]. In this regard, a review study conducted by Larsen et al. demonstrated that “Research courses and workshops”, “Collaboration with clinical practice”, “Journal clubs”, and

“Embedded librarians” were the common and effective methods for teaching evidence-based practice [36]. Additionally, Karlsholm G et al.’s study showed that writing a bachelor’s thesis was an effective way to learn evidence-based practice and that it could significantly raise the overall score of the evidence-based practice performance scale, particularly in the subscales of practice, retrieving/reviewing, and sharing/applying [46]. Further, the study by Nalweyiso DI et al. highlighted the challenges and facilitators of evidence-based practice among educators at a health science university in Uganda, a developing country. This study identified major hurdles as resistance to change, limited resources, inadequate organizational support, and insufficient locally produced research. Conversely, facilitators comprised robust organizational support, incorporation of evidence-based practice training into curricula, and the implementation of a ‘train the trainers’ model [47]. Therefore, focusing on these issues to promote evidence-based practice is strongly suggested for teaching undergraduate and postgraduate medical and healthcare-related students in our university other universities of medical sciences.

Exploratory factor analyses of the data revealed that the structure of the Persian version of the EBP<sup>2</sup> questionnaire was similar to the original version of the questionnaire. This result was in line with the structure of the Polish version of the EBP<sup>2</sup> questionnaire, which was similar to its original version [22]. On the other hand, Jia et al. and Hu et al. confirmed that the two Chinese versions of the EBP<sup>2</sup> questionnaire had a structure with four and eight components, respectively [23, 41], which was different from the structure of the original version of this instrument.

According to the results of our study, the confirmatory factor analysis indices confirmed the validity properties of the Persian version of the EBP<sup>2</sup> questionnaire for use among Iranian healthcare-related students, except in the GFI and AGFI indices. In this regard, the Jia et al. study revealed that all the fit indices of confirmatory analyses of the Chinese-translated version of EBP<sup>2</sup> confirmed the initial model, except GFI and NFI [41]. The confirmatory factor analyses of the other Chinese version of EBP<sup>2</sup> conducted by Hu et al. showed the acceptable validity of the questionnaire [23].

Although this project was the first study to assess the validity and reliability of the Persian-translated version of EBP<sup>2</sup>, there were some limitations in this study. First, the questionnaire was distributed among the student through an online questionnaire due to virtual education and the closeness of the universities due to the COVID-19 pandemic, so the results of the study might be affected by some biases. Next, the small sample size of the study made us the limitation in analyzing the data by adjusting to the participants’ characteristics such as fields of

study. Furthermore, this study was a single-center study, so the results of this study might not have enough generalizability. Accordingly, we recommend conducting further similar studies in multi-center design to increase the generalizability of the results. Moreover, an evaluation of the responsiveness of the EBP2 questionnaire was not conducted in this study, because each study participant fulfilled the questionnaire only one time. Therefore, we recommend evaluating this index of the EBP2 questionnaire in future studies. Finally, because of the large number of questions in the EBP<sup>2</sup> questionnaire, another standard instrument was not examined in addition to this questionnaire, so we could not evaluate the criterion validity of the questionnaire.

## Conclusion

The results of our study showed that the Persian-translated version of the EBP2 questionnaire had acceptable validity and reliability to evaluate evidence-based performance among Iranian healthcare-related students. Further studies are suggested to examine the evidence-based performance among healthcare-related students, especially by considering the study fields, to promote the related educational programs for the students.

## Abbreviations

EBP <sup>2</sup> Q	evidence-based practice profile questionnaire
COVID-19	Coronavirus disease 2019
RMSEA	Root Mean Square Error of Approximation
CMIN/DF	Chi-degree freedom
IFI	Incremental fit index
RFI	Relative fit index
NFI	Normed Fit Index
GFI	Goodness of fit
AGFI	Adjusted Goodness of Fit
CFI	Comparative Fit Index

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## Author contributions

M.M.P, M.A, M.M, and R.E designed the research. R.E, M.M.P, M.A, H.F gathered the data. M.M.P, M.M, and M.A analyzed the data. M.M.P, R.E, M.M, H.F, M.A wrote the first draft of the paper. All authors critically read, revised, and approved the final version of the paper.

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## Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

### Ethics approval and consent to participate

The permission to use and translate of this questionnaire was taken from Maureen Patricia McEvoy, one of the makers of the questionnaire, through

e-mail. In addition, the protocol of the study was approved by the Research Ethics Committee of Shiraz University of Medical Sciences (Ethics code: IR.SUMS.REC.1399.1176; Link: <https://ethics.research.ac.ir/ProposalCertificateEn.php?id=178224>). Furthermore, we inserted one question in the electronic questionnaire to obtain informed consent from the participants. Students who did not consent to complete the questionnaire were not enrolled. In addition, the participants' information was recorded anonymously. Moreover, the study complied with the guidelines of the Helsinki Declaration.

### Consent for publication

The authors declare that this manuscript contains no data or images on individuals, so consent for publication is not applicable.

### Competing interests

The authors declare no competing interests.

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