# RESEARCH

# **Open Access**

# Check for updates

# Investigating the psychometric properties of the Persian version of Psychological Emptiness Scale (PES) among nursing students

Mohammad Esmaeelzadeh<sup>1</sup>, Seyyed Abolfazl Vagharseyyedin<sup>2\*</sup>, Zahra Zamaninasab<sup>3</sup>, and Sajede Soleimani<sup>1</sup>

# Abstract

**Background** Psychological emptiness plays a significant role in the mental health of nursing students. However, there is currently no valid Persian instrument for measuring psychological emptiness in Iranian nursing students.

**Aim** This study aimed to translate and investigate the psychometric properties of the Persian version of the Psychological Emptiness Scale among Iranian nursing students.

**Methods** In this methodological study, after translating and assessing the face and content validity of the Persian version of the Psychological Emptiness Scale, 400 nursing students were selected through proportional quota sampling from four nursing and midwifery colleges affiliated with Birjand University of Medical Sciences in 2024. The factorial structure of the measure was assessed using exploratory factor analysis. Confirmatory factor analysis was then undertaken. Finally, the reliability, including internal consistency and test-retest reliability, and the convergent and divergent validity of the measure were evaluated.

**Results** The results of exploratory factor analysis revealed that a three-factor structure accounted for 60.20% of the total variance. The results of the CFA revealed that the three-factor model of the Persian version of the Psychological Emptiness Scale had good or acceptable fit indices. The reliability of the total scale was calculated with a Cronbach's a coefficient of 0.949, McDonald's omega of 0.949, and ICC of 0.840, suggesting acceptable reliability. Results also showed that the convergent and divergent validity of the measure were satisfactory.

**Conclusion** The findings of this study suggest that the Persian version of the 19-item PES is a reliable and valid instrument for assessing psychological emptiness in Iranian nursing students.

Keywords Psychometrics, Nursing student, Psychological distress

\*Correspondence: Seyyed Abolfazl Vagharseyyedin Waghars@bums.ac.ir <sup>1</sup>Student Research Committee, Birjand University of Medical Sciences, Birjand, Iran

Department of Epidemiology and Biostatistics, school of Health, social Determinants of Health Research Center, Birjand University of Medical Sciences, Birjand, Iran



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creative.commons.org/licenses/by-nc-nd/4.0/.

<sup>&</sup>lt;sup>2</sup>Department of Nursing, Faculty of Nursing and Midwifery, Birjand University of Medical Sciences, Southern Khorasan, Birjand 97175-379, Iran <sup>3</sup>Department of Epidemiology and Biostatistics, School of Health, Social

# Introduction

Mental health refers to a condition of wellness where individuals recognize their abilities, manage typical life stresses, work effectively and profitably, and are capable of contributing to their community [1]. Mental health is a topic that has been extensively researched among students in recent years; because the number of health issues is significant and continues to rise among this group [2]. In other words, mental health issues are quite prevalent among college students [3].

Poor mental health is a complex and common psychological problem among university students in developed and developing countries [4]. The widespread incidence of depression, anxiety, and suicidal ideation within the student population has positioned student mental health as a critical global concern. These mental health challenges significantly detrimentally affect both the overall quality of life and academic performance of students [5–7]. One study conducted in Asia showed that about 66.86% of students had a diagnosis of depression and 57.39% had anxiety [8]. Regarding suicidal ideation, a systematic review was also conducted in 2021 and showed that the prevalence of suicidal ideation among students is high [9].

There are many stressors for students in healthcare fields such as nursing; these stressors include academic stressors (difficulties in understanding and learning a new curriculum, high workload, and repeated tests), psychosocial stressors (high family expectations and financial pressure), and sociodemographic stressors (such as being female, being single, and having parents with higher educational level) [10–12]. One of the things that often appears along with poor mental health is a feeling of psychological emptiness (PE) [13]. The feeling of PE is related to other emotional states, such as boredom and loneliness [14]. Previous research has suggested that experiencing boredom and loneliness can be linked to poor educational outcomes, decreased engagement, and lower academic achievement [15, 16].

PE is ambiguous [17], resembling emotional states such as boredom, numbness, loneliness, and hopelessness. However, PE does not overlap with these concepts [18]. PE is a state in which an individual lives a life devoid of emotion and purpose, such that the individual feels disconnected from others and unable to connect with them [19]. Identifying PE is very important; because it is associated with impulsivity, self-harm, suicidal behavior, and impaired psychosocial functioning [20]. The importance of this issue increases when we know that psychological emptiness is even associated with drug and alcohol abuse [21]. Given the high prevalence of psychological disorders in students, especially nursing students [22], and the impact that PE has on the development of these disorders, it is necessary to identify and manage this problem. Understanding the essence of emptiness can be challenging and hard to articulate in precise terminology. Consequently, researchers have sought to delineate the characteristics and pinpoint specific elements of this concept [23]. Hazell (1984) was the first to develop the Experienced Level of Emptiness Scale for college students [24]. Also, Buggs (1996) made another attempt by developing the Emptiness Scale in clinical samples [25]. Lastly, Ermis-Demirtas et al. (2022) developed and validated a measure, named the Multidimensional Sense of Emptiness Scale (MSES) in the general population [23]. Finally, the Psychological Emptiness Scale (PES) was developed by Heron et al. (2024) [9] and then evaluated among patients with personality disorders [19].

Psychological emptiness plays a significant role in the mental health of nursing students. In order to measure psychological emptiness among nursing students, a valid and reliable instrument is necessary. However, there is currently no valid Persian instrument for measuring psychological emptiness in Iranian nursing students. Considering the changing and dynamic nature of concepts [26], it seems that a more recent scale, such as the PES, will be more suitable than the Experienced Level of Emptiness Scale and the Emptiness Scale for measuring emptiness among Iranian nursing students. Furthermore, the MSES had has a narrow conceptualisations of emptiness and ignored the inherent phenomenological complexity of this experience. While the items of PES have been derived from the findings of a phenomenological study [19]. Therefore, in this study we decided to translate and investigate the psychometric properties of the Persian version of the PES among Iranian nursing students.

# Methods

# Study design

This methodological study, conducted in 2024, was to translate and investigate the psychometric properties of the Persian version of PES in Iranian nursing students.

#### Participants and setting

The research population comprised nursing students from Birjand University of Medical Sciences (BUMS). The minimum sample size for conducting factor analysis is equal to 5–10 times the number of items intended in the Scale [27]. Therefore, the minimum sample size required for factor analysis in the present study is 380 participants. In this study, a total of 400 participants were chosen for exploratory factor analysis (EFA) and participants for confirmatory factor analysis (CFA). Then, this sample was randomly splitted into two halves; one half for EFA and the other half for CFA. It is notable that the simplest method for splitting a sample into two halves is to split it at random [28]. The sampling was done from October 2024 to December 2024 using proportional quota sampling method based on the population nursing students in four Nursing and Midwifery Colleges affiliated to BUMS. The inclusion criteria included: willingness to participate in the study, being enrolled in the second semester or beyond of a nursing program, not having obvious mental, physical, or cognitive disorders according to the participant's statement or no using of psychoactive drugs and not experiencing an emotional crisis in the past 6 months (e.g., death of a loved one).

Upon obtaining the ethical approval code from the ethics committee at BUMS, one of the researchers (SS) attended students' classrooms with permission from university authorities and approached the potential participants. The research purpose was thoroughly communicated to them. All participants were informed about the purpose of the study, and informed consent was obtained from all participants. Data collection was done using a paper-based survey.

# **Study instruments**

#### Demographic information questionnaire

The demographic information in this study included age, gender, marital status, and place of residence.

#### Psychological Emptiness Scale (PES)

The items in the original version of the PES were generated based on a thematic analysis in which 178 individuals with lived experience of emptiness participated [13]. This scale comprises 19 items, which are rated on a fourpoint Likert scale with the following options: "Never = 0", "Sometimes = 1", "Often = 2", and "All the time = 3". PES includes two substantially correlated yet psychometrically independent subscales. The first subscale is Nothingness, which refers to the feeling of having no direction in life and lacking inner fulfillment (items 3, 4, 5, 9, 14, 15, and 18). The second subscale is Detachment, which reflects a sense of numbness, disconnection, indifference, and inefficacy (items 1, 2, 6, 7, 8, 10, 11, 12, 13, 16, 17, and 19). To calculate the total score for each subscale, the scores of all items within that subscale are summed. The total score of this scale ranges from 0 to 57. The validity and reliability of PES were confirmed in the study by Herron et al. [19].

#### De Jong Gierveld loneliness scale

In this study, the convergent validity of the Persian version of PES was examined using the Persian version of the De Jong Gierveld Loneliness Scale. This scale consists of eight items: five positive [1, 4, 7, 8, 11] and three negative [2, 5, 9] with three answer options: "yes", "more or less", and "no". A response of "more or less" or "yes" to a positively framed item results in a score of zero, while for negatively framed items, such responses yield a score of one. The psychometric properties of the Persian version of this scale have been confirmed in Iran [29].

#### **Oxford Happiness Questionnaire (OHQ)**

To examine the divergent validity of the Persian version of the (PES), the Oxford Happiness Questionnaire (OHQ), developed and refined by Hills and Argyle (2002) was used. This questionnaire comprises 29 items across six dimensions: life satisfaction, joy, self-esteem, calmness, control, and efficacy. Respondents answer each item using a 4-point Likert scale, where 0 corresponds to strong disagreement and 3 indicates strong agreement. The total scores of the items in this questionnaire range from 0 to 87, with a higher score with higher scores reflecting greater happiness [30]. The validity and reliability of the Persian version of the OHQ have been confirmed in Iranian students [31].

#### **Translation procedure**

Initially, the first author (ME) received written permission from the developer of the PES. The World Health Organization protocol was used to translate and adapt the PES into the Persian language. Two bilingual translators independently translated the PES into Persian. An expert panel, including the researchers involved in this study and the two translators, assessed and compared the two translated scales. Any discrepancies were rectified, resulting to a consensus on a unified Persian version. In the next step, two additional bilingual translators, who were not familiar to the original scale, translated the Persian version back into English. The translated scales were then compared with the original, and any minor discrepancies were addressed. For example, in item 6, one of the translators used "apathy" instead of "numbness". Additionally, in item 19, one of the translators applied "withdrawn" instead of "disengaged". After the research team and two translators reviewed the items, they concluded that "numbness" and "disengaged" were more appropriate translations from the Persian version that were consistent with the original version of the instrument. Ultimately, this process resulted in the establishment of an initial Persian version of the PES.

# Face validity and content validity

Face validity was evaluated both qualitatively and quantitatively. An expert panel, consisting of 12 faculty members from the Nursing and Midwifery College of BUMS, along with ten undergraduate nursing students, participated in the qualitative evaluation of face validity. They were asked to provide feedback on the difficulty, relevance, and clarity of each item on the scale. For the quantitative evaluation of face validity, a group of ten nursing students rated the importance of each item on a 5-point Likert scale. The scale ranged from "very important=5" to "not important = 1". The formula used to calculate the impact score of each item was "Impact score = frequency (%) × importance". Frequency, represented as a percentage, indicates the proportion of students who rated the item a 4 or 5. Importance is determined by averaging all responses. Items with an impact score greater than 1.5 were considered suitable for further analysis [32, 33].

For content vality evaluation, the content validity ratio (CVR) and content validity index (CVI) for the items were calculated by 12 faculty members in nursing. The CVR examined the items' necessity (not necessary=1, useful but not essential = 2, essential = 3). The formula for CVR is (Ne - N/2)/(N/2), in which the Ne is the number of experts indicating "essential" and N is the total number of experts [34]. When the number of experts is 12, the minimum acceptable CVR is equal to 0.56 [35]. To calculate CVI, 12 experts (same as for CVR) evaluated the relevancy of items by dichotomous response: relevant = 4 and irrelevant = 1. The CVI was calculated by dividing the number of items experts rated as relevant (rating of 4) by the total number of experts (i.e., 12) [36].

#### **Construct validity**

To assess the construct validity of this scale, EFA and CFA were conducted.

# EFA

Bartlett's test with a significance level below 0.05 is also acceptable. The favorable results of both tests indicate a suitable correlation matrix for factor analysis.

Exploratory Factor Analysis (EFA) is employed to discover the underlying structure of a relatively large set of items. In this study, 200 students were included to examine the EFA. Bartlett's test of sphericity was used to examine the significance of the correlation matrix between items [37]. A KMO was conducted to assess the adequacy of sampling. A KMO score closer to one is ideal for factor analysis, with scores above 0.5 generally acceptable and scores above 0.7 preferred [38]. Factor load value represents the relationship between each factor and each item on the scale. A minimum factor load value of 0.3 was considered in this study; anything lower suggests a weak relationship [39]. Principal Component Analysis (PCA) was used for factor extraction, considering skewness  $(\pm 2)$  and kurtosis  $(\pm 7)$  indices [40]. Then, according to the correlation results of more than 0.3 between factors, Promax rotation, the most common rotation used in humanities studies, was run [41]. The presence of an item in a latent factor is determined by a factor loading of around 0.3 Items with commonalities below 0.2, as suggested by Child (2006), were excluded from the EFA [42].

# CFA

A CFA was performed to evaluate the structure of the factor results hypothesized by the EFA. To evaluate model fit in CFA, researchers compare goodness-of-fit indices against fixed cutoff values. Generally, the goodness of fit of a model is confirmed by the following indices: root mean square error of approximation (RMSEA) < 0.08, comparative fit index (CFI) > 0.90, incremental fit index (IFI) > 0.9, and normed chi-square ( $\chi 2/df$ ) < 5.00. Additionally Parsimonious Normed Fit Index (PNFI) > 0.5 and Parsimonious Comparative Fit Index (PCFI) > 0.5 were evaluated. Moreover, the lower Akaike information criterion (AIC) was calculated to compare the models [43–45].

#### Convergent and discriminant validity

The convergent and discriminant validity of the Persian version of the PES were evaluated using Fornell and Larcker's criteria and Anderson and Gerbing's method. Composite reliability (CR) and Average Variance Extracted (AVE) for each factor should be greater than 0.7 and 0.5, respectively, for convergent validity. Also, when the 95% confidence interval for the all possible correlation between factors does not include 1.0, it indicates that there is evidence supporting the discriminant validity of the factors [46, 47].

## Convergent and divergent validity of total scale

We assessed convergent validity by examining the correlation between the Persian version of the PES and its factor scores with the scores from participants on the De Jong Gierveld Loneliness Scale. Additionally, to evaluate divergent validity, we explored the relationship between the Persian version of the PES and its factor scores with the scores obtained by participants on the OHQ.

#### Reliability

We assessed internal consistency reliability by calculating Cronbach's alpha ( $\alpha$ ) and McDonald's omega ( $\Omega$ ). We also evaluated stability using inter-class correlations (ICCs). To assess stability, 15 nursing students filled out the scale on two occasions, with a three-week gap. When the values of the coefficients  $\alpha$  and  $\Omega$  were greater than 0.7, they are considered acceptable [48]. Lastly, the ICCs value  $\geq$  0.8 was considered acceptable [49].

## Results

# **Demographic characteristics**

A total of 400 undergraduate nursing students participated in the current study. The average age of the nursing students was 21.31 (standard deviation = 2.57) years. 255 participants (63.7%) were categorized as women, 374 participants (93.5%) were identified as single, and 365 participants (66.2%) were noted as living in student

**Table 1** The characteristics of study participants (N = 400)

Variables		Number (%)
Gender	Male	145 (36.3)
	Female	255 (63.7)
Marital status	Married	26 (6.5)
	Single	374 (93.5)
Place of residence	Dormitory	265 (66.2)
	Private House	72 (18)
	With Family	63 (15.8)

Table 2 I-CVR and I-CVI for the PES items
---

Item	n No.	I-CVI	I-CVR
1	Felt unable to feel emotions (e.g., joy, happi- ness, anger, sadness)	1	0.66
2	Felt indifferent to anything that goes on around you	1	0.83
3	Felt that anything that you might do is pointless	1	1
4	Felt that you are nothing	1	0.66
5	Felt empty inside (e.g., feeling like an "empty shell")	0.92	0.66
6	Felt emotionally numb	0.92	0.66
7	Felt that positive things such as love or joy do not stick to you, that they just pass through you	1	0.66
8	Felt that you are just going through the motions	1	0.83
9	Had a sense of an inner void that cannot be filled	1	0.83
10	Had neither desires nor motivations	1	0.66
11	Felt incapable of doing anything right	0.92	0.66
12	Felt that you had no impact on others	1	0.83
13	Felt that you are just a burden to other people	0.92	0.66
14	Feeling somehow detached from reality, that you are not fully part of the world	1	0.66
15	Felt that you just 'exist', but are not really 'alive'	0.92	1
16	Felt that between you and the outside world there is some sort of barrier (e.g., a fog, a veil, a chasm or gulf)	1	0.83
17	Felt that you had nothing to offer the world, that you are worthless	1	0.83
18	Lacked a sense of direction in life	0.92	0.83
19	Were disengaged, and not really caring about anything	1	0.66

dormitories. The demographic details of the participants are displayed in Table 1.

#### Face and content validity

The findings from the face validity evaluation revealed that every aspect of the tool was considered appropriate, clear, and important. Furthermore, the quantitative face validity outcomes demonstrated that all scores surpassed the minimum requirement of 1.5.

Based on the insights provided by 12 experts, several items were revised to enhance their qualitative content

validity. For the quantitative content validity, the content validity ratio (CVR) and content validity index (CVI) were computed for each item. None of the items were discarded when applying the suitable cutoff value of 0.56. The item-level content validity ratio (I-CVR) and scalelevel content validity index (S-CVI) were determined to be 0.76 and 0.97, respectively (Table 2).

# **Construct validity**

In the principal component exploratory factor analysis, a Kaiser–Meyer–Olkin (KMO) value of 0.930 was obtained, suggesting a strong level of sampling adequacy. Furthermore, Bartlett's test of sphericity produced a significant result of 2051.849 (P<0.001), indicating that the correlations among variables were adequate for conducting factor analysis.

According to Table 3, the principal component EFA model identified three factors, which were established using eigenvalues exceeding one. The findings showed that these three factors collectively represented 60.20% of the overall variance. Given the 0.3 threshold, no items were excluded since the factor loadings for all scale items exceeded 0.3.

Also, the scree plot created from the EFA is displayed in Fig. 1.

# CFA

Three models were designed to conduct CFA. Ultimately, the third model provided the best indicators compared to the other models. CFA findings in Model 3 confirmed all goodness of fit indices of the final model ( $\chi$ 2 = 351.052;  $\chi^2$  /DF = 2.356, *P* < 0.001, RMSEA = 0.068, CFI = 0.934, NFI = 0.892, PCFI = 0.732, PNFI = 0.700, IFI = 0.935, TLI = 0.916 and AIC = 471.052); (Table 4).

Figure 2 displays the factor loading for each item.

#### Convergent and discriminant validity

In this study, CR for Factor 1, Factor 2, and Factor 3 were 0.899, 0.864, and 0.842 respectively. Also, AVE was 0.526, 0.480, and 0.0.571 for factors 1, 2, and 3, respectively. These values suggest an acceptable convergent validity. Also the 95% confidence interval for the correlation between factors did not include 1.0, suggesting there is evidence supporting the discriminant validity of the factors (Table S1).

# Convergent and divergent validity of total scale

The results of the Spearman correlation test confirmed the convergent and divergent validity of the PES (P < 0.001; Table 5).

# Reliability

The reliability coefficients, including Cronbach's alpha,  $\Omega$ , and the Intra-class correlation (ICC) coefficients

**Table 3** Exploratory factors extracted from 19 items of the Persian version of the psychological emptiness scale (n = 200)

No. of Ite	m	Mean	SD	Skewness	Kurtosis	Factor loading	$h^2$
Factor 1: (	Factor 1: (%Variance=48.20, Eigenvalue=9.15)						
4	Felt that you are nothing	0.50	0.72	1.10	0.7	0.841	0.647
10	Had neither desires nor motivations	0.63	0.82	1.10	0.29	0.808	0.654
17	Felt that you had noth- ing to offer the world, that you are worthless	0.46	0.67	1.38	1.40	0.771	0.697
12	Felt that you had no impact on others	0.70	0.75	0.91	0.46	0.652	0.554
18	Lacked a sense of direction in life	0.78	0.75	0.67	-0.02	0.648	0.562
13	Felt that you are just a burden to other people	0.48	0.68	1.21	0.57	0.642	0.537
11	Felt incapable of doing anything right	0.66	0.74	0.94	0.48	0.634	0.587
8	Felt that you are just going through the motions	0.93	0.70	0.45	0.16	0.572	0.512
Factor 2: (	%Variance=6.32, Eigenvalue=1.20)						
2	Felt indifferent to anything that goes on around you	0.88	0.76	0.49	-0.33	0.823	0.585
1	Felt unable to feel emotions (e.g., joy, happi- ness, anger, sadness)	0.55	0.69	1.23	1.57	0.752	0.511
6 Felt emotionally numb		0.68	0.71	0.72	-0.05	0.621	0.618
7	Felt that positive things such as love or joy do not stick to you, that they just pass through you	0.65	0.79	1.07	0.53	0.614	0.470
3	Felt that anything that you might do is pointless	0.70	0.67	0.65	0.19	0.561	0.593
5	Felt empty inside (e.g., feeling like an "empty shell")	0.64	0.73	0.99	0.66	0.530	0.635
9	Had a sense of an inner void that cannot be filled	0.77	0.83	0.97	0.42	0.520	0.576
Factor 3: (	(%Variance=5.68, Eigenvalue=1.08)						
16	Felt that between you and the outside world there is some sort of barrier (e.g., a fog, a veil, a chasm or gulf)	0.45	0.65	1.36	1.53	0.833	0.683
14	Feeling somehow detached from reality, that you are not fully part of the world	0.46	0.70	1.57	2.24	0.801	0.712
15	Felt that you just 'exist', but are not really 'alive'	0.54	0.75	1.27	0.92	0.750	0.673
19	Were disengaged, and not really caring about anything	0.67	0.77	0.99	0.37	0.568	0.634

 $oldsymbol{h}^2$ : Communalities

SD: Standard Deviation

pertaining to the three factors derived from the PES, were determined to be adequate. The Cronbach's alpha,  $\Omega$  and Intra-class correlation coefficient for total scale was 0.949, 0.949 and 0.840, respectively (Table 6).

# Discussion

This study was conducted to translate and investigate the psychometric properties of the Persian version of the PES among nursing students.

In the qualitative face validity assessment phase, all items of the initial Persian version of the PES were considered as clear and appropriate. Moreover, in the quantitative face validity assessment, the impact score for all



Fig. 1 Scree plot showing three factors

**Table 4**Goodness of fit indexes results from CFA of the Persianversion of PES

Index	Calculated	Accept-			
	Model 1 (PES with 1 Factor)	Model 2 (PES with 2 Factors)	Model 3 (PES with 3 Factors)	able Range	
$\chi^2$ (P-value)	409.985 ( <i>P</i> < 0.001)	360.692 ( <i>P</i> < 0.001)	351.052 (P<0.001)	P<0.05	
$\chi^2$ /DF	2.697	2.389	2.356 (P<0.001)		
RMSEA	0.092	0.084	0.068 (P<0.001)	Good: < 0.08 Average: 0.08-0.1 Weak: > 0.1	
CFI	0.889	0.910	0.934 (P<0.001)	>0.9	
NFI	0.837	0.859	0.892 (P<0.001)	>0.9	
PNFI	0.669	0.680	0.700 (P<0.001)	> 0.05	
PCFI	0.711	0.723	0.732 (P<0.001)	> 0.05	
IFI	0.891	0.911	0.935 (P<0.001)	>0.9	
TLI	0.861	0.886	0.916 (P<0.001)	>0.9	
AIC	523.985	476.692	471.052 (P<0.001)	The model with the lowest AIC offers the best fit	

items was above 1.5 [48] As such, all items were maintained for further analysis.

In terms of content validity of the initial Persian version of the PES, the CVR for all items was above 0.66, which was considered acceptable since the minimum CVR value for the twelve panel experts involved is 0.56 [50]. Additionally, an I-CVI above 0.78 and a S-CVI 0.9 or higher is desirable [48]. In our study, the I-CVI for all items ranged from 0.92 to 1, and the S-CVI was 0.97, which was deemed satisfactory. To assess the factorial structure of the PES an EFA was conducted. The factor loadings in the EFA results ranged from 0.470 to 0.712, all greater than the value of 0.3 suggested by Kartal M & Bardakçı (2018) [51]. The results of the EFA revealed the existence of three factors with eigenvalues more than 1. It was found that items loaded on the first to third factor explained 48.20% (8 items), 6.32% (7 items), and 5.68% (4 items) of the total variance, respectively.

The combined variance explained by these three factors was 60.20%. This scale which encompasses an extensive spectrum of statements related to psychological emptiness was translated and validated in Iran for the first time. To the best of our knowledge, the EFA is not translated and validated to be used in countries other than England.

It is notable that Herron et al. (2024), as developers of 19-item PES, began their psychometric evaluation with 31 items. The results of EFA in Herron et al. study indicated the existence of two factors explaining 54% of the total variance of the scale [19]. This suggests that the Persian version of the PES among Iranian nursing students may offer a more robust three-factor model with a higher proportion of explained variance.

Although the original PES is reported to have a twofactor solution [19], results of an EFA in this study indicated a three-factor solution was more appropriate. A review of the literature on existing instruments designed to measure emptiness revealed that their factor structure is not necessarily the same. In this regard, Hazell (1984) developed the Experienced Level of Emptiness Scale, which consisted of two factors, namely, Experienced Level of Emptiness and Experienced Level of Existential Concern advantages and disadvantages [19]. Also,



Fig. 2 The final model of the Persian version PES based on CFA (N = 200)

another attempt was made by Buggs (1996) to develop the Emptiness Scale which included two factors Inner sense of emotional hunger and yearning and [2] Generalized sense of emotional numbness [25]. Lastly, the MSES developed and validated by Ermis-Demirtas et al. (2022) had three factors: A sense of Inner Emptiness, a Sense of Absence of Relatedness, and a Sense of Meaninglessness [52].

Indeed, when assessing the factor structure of a scale, different studies can yield varying results. These discrepancies in findings may be attributed to the particular study population, the cultural context, and the distinct

Table 5         The results for spearman's correlation coefficients
regarding the correlations between total Persian version of PES
scores, factor 1, factor 2, factor 3, OHO and loneliness scores

Variable	Factor 1	Factor 2	Factor 3	Total Score
OHQ Total	-0.632***	-0.617***	-0.463***	-0.642***
Loneliness Total	0.428***	0.449***	0.332***	0.453***
***P<0.001				

**Table 6** Reliability analysis result of the Persian version of PES

Factors	Cronbach's alpha	McDonald's omega	ICC
Factor 1	0.906	0.905	0.764
Factor 2	0.867	0.870	0.784
Factor 3	0.865	0.869	0.741
Total	0.949	0.949	0.840

methodologies employed in each study. This underscores the necessity of taking these elements into account when interpreting and comparing research outcomes [53]. The sample recruited in the current study were nursing students, while in the study by Herron et al. (2024) individuals were recruited that felt empty. Furthermore, all participants in the Herron et al.'s study had high or low personality disorders [19]. This may account for discrepancies in the factor structure of the PES and the combined variance explained by extracted factors in the present study compared with the Herron et al. study.

In the next step, we used CFA to assess whether the data set fit the structural factor model constructed by the EFA. The results of the CFA revealed that the three-factor model of the PES had good or acceptable fit indices. Additionally, we tested two other models: (a) a one-factor model where all 19 items of the scale indicated one factor and (b) a two-factor model where 9 items were loaded on the one factor and 10 items indicated another factor. Notably, based on the model fit indices, these two models also had acceptable fits. The three models were compared using AIC. Since a model with smaller AIC values is considered more appropriate than others [54], we concluded that the three-factor model of the Persian version of PES is superior to the one-factor and two-factor models.

The results indicated good convergent validity of the Persian version of PES, as evidenced by moderate and positive correlations (0.7 > r > 0.3) of this scale and its factors with loneliness were assessed by the De Jong Gierveld Loneliness Scale. It is in line with previous research that suggests that the feeling of emptiness is related to a sense of loneliness [14, 55]. The Persian version of PES and its three factors showed moderately significant negative correlations with OHQ scores. This finding provides evidence for the divergent validity of the Persian version of PES. The self-determination theory supports the negative association between emptiness and happiness, positing that relatedness is fundamental for attaining happiness [56]. According to the previous research, disconnectedness is identified as one of the important attributes of emptiness [19]. Therefore, a negative correlation between emptiness and happiness is expected.

In this study, the internal consistency of the Persian version of PES was excellent, with a Cronbach's alpha of 0.949 and an  $\Omega$  of 0.949. This internal consistency is comparable to the original scale, the alpha of which had a value of 0.95 [19]. Also, Cronbach's alphas and  $\Omega$ s for the three factors of the scale were between 0.865 and 0.906 and 0.869 to 0.905, respectively. These criteria indicate good to excellent reliabilities for the factors of the Persian version of the PES. The stability reliability of the Persian version of PES was calculated using ICCs. ICCs between 0.5 and 0.75 and between 0.75 and 0.9 are indicative of moderate to good reliability, respectively [57]. In our study, the ICC for the total scale was 0.840 and for the two factors ranged from 0.741 to 0.784. Thus, the stability reliability of the total scale and its two factors was moderate to good.

From a practical viewpoint, this scale can be used to identify factors influencing feelings of emptiness among nursing students, particularly in academic settings. Additionally, it can serve as a valuable tool in assessing interventions aimed at reducing feelings of emptiness and in detecting changes in emptiness levels among nursing students over time.

This study has some limitations that should be considered when interpreting the results. Firstly, the data collected from all instruments relied on self-reported data of participants, which introduces the potential for self-reporting bias such as social desirability. The social desirability bias refers to the inclination of a research participant to portray themselves in a manner that aligns with societal norms, even if it does not accurately reflect the truth. Social desirability may have influenced the responses of nursing students to the PES. We attempted to mitigate this potential effect by ensuring the anonymity of the survey. Finally, this study exclusively involved nursing students from a single university. Generally speaking, single-center studies are conducted in a more homogeneous population than multi-center studies. This homogeneous population can limit the generalizability of research findings. It is notable that BUMS has diverse nursing students enrolled from various cities. Future studies should focus on more diverse samples from Iranian nursing students.

# Conclusion

The findings of this study suggest that the Persian version of the 19-item PES is a reliable and valid instrument for assessing psychological emptiness in Iranian nursing students. The Persian version of the PES now is ready to be used in larger surveys in Iran to monitor psychological emptiness and guide health promotion. The PES sets a foundation for future research in the area of psychological emptiness area. Lastly, the provided data in this study serves as a basis for further exploration of the potential and limitations of the instrument.

#### Abbreviations

AIC	Akaike information criterion
AVE	Average Variance Extracted
CFA	Confirmatory factor analysis
CFI	Comparative fit index
CR	Composite reliablity
CVI	Content validity index
CVR	Content validity ratio
EFA	Exploratory factor analysis
I-CVR	Item-content validity ratio
IFI	Incremental fit index
KMO	Keiser-Meyer-Olkin
ML	Maximum likelihood
MSES	Multidimensional sense of emptiness scale
NFI	Normed fit index
OHQ	Oxford Happiness Questionnaire
PAF	Principal axis factoring
PCA	Principal component analysis
PCFI	Parsimonious comparative fit index
PCEFA	Principal component exploratory factor analysis
PE	Psychological emptiness
PES	Psychological emptiness scale
PNFI	Parsimonious normed fit index
RMSEA	Root means square error of approximation
S-CVI	Scale-content validity index
TLI	Tucker–Lewis's index

# **Supplementary Information**

The online version contains supplementary material available at https://doi.or g/10.1186/s12912-025-03024-w.

Supplementary Material 1

#### Acknowledgements

Our special thanks goes to the Deputy for Research and Technology Birjand University of Medical Sciences, Birjand, Iran, for its assistance during the current study.

#### Author contributions

Study design: ME and SAV; data collection: SS and ME; analysis and statistics: ZZ, ME, and SAV, manuscript preparation: ME and SAV. All authors approved the final version for submission.

#### Funding

This study was unfunded.

#### 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

Our study adhered to the Declaration of Helsinki regarding research carried out on humans and/or human data. The Ethics Committee of Birjand University of Medical Sciences approved the study proposal (BUMS. REC.1403.274). Potential participants were informed about the purpose of the study, and informed consent was obtained from all participants. The authors followed the principles of the Committee on Publication Ethics (COPE) when publishing their findings.

#### Consent for publication

Not applicable.

#### **Competing interests**

The authors declare no competing interests.

Received: 26 January 2025 / Accepted: 21 March 2025 Published online: 07 April 2025

#### References

- Mohebbi Z, Setoodeh G, Torabizadeh C, Rambod M. State of mental health and associated factors in nursing students from southeastern Iran. Invest Educ Enferm. 2019;37(3). https://doi.org/10.17533/udea.iee.v37n3e04. PubMed PMID: 31830402; PubMed Central PMCID: PMCPMC7871495.
- Malla A, Joober R, Garcia A. Mental illness is like any other medical illness: a critical examination of the statement and its impact on patient care and society. J Psychiatry Neurosci. 2015;40(3):147–50. https://doi.org/10.1503/jpn.150 099. PubMed PMID: 25903034; PubMed Central PMCID: PMCPMC4409431.
- Pedrelli P, Nyer M, Yeung A, Zulauf C, Wilens T. College students: mental health problems and treatment considerations. Acad Psychiatry. 2015;39(5):503–11. https://doi.org/10.1007/s40596-014-0205-9. Epub 20140821.
- Mofatteh M. Risk factors associated with stress, anxiety, and depression among university undergraduate students. AIMS Public Health. 2021;8(1):36– 65. Epub 20201225. https://doi.org/10.3934/publichealth.2021004. PubMed PMID: 33575406; PubMed Central PMCID: PMCPMC7870388.
- Sonmez Y, Akdemir M, Meydanlioglu A, Aktekin MR. Psychological Distress, Depression, and Anxiety in Nursing Students: A Longitudinal Study. Healthcare (Basel). 2023;11(5). Epub 20230221. https://doi.org/10.3390/ healthcare11050636. PubMed PMID: 36900639; PubMed Central PMCID: PMCPMC10001336.
- Nguyen HTH, Hoang AP, Vu LM, Tran DQ, Bui LK, Pham TT, et al. Prevalence of and risk factors associated with depression among nursing students acting on the frontline of COVID-19 pandemic: A cross-sectional study. Front Public Health. 2022;10:1020419. https://doi.org/10.3389/fpubh.2022.1020419. Epub 20230109.
- Moraes S, Barbosa VFB, Alexandre ACS, Santos SCD, Guimarães FJ, Veras JLA. Risk of suicide among nursing students. Rev Bras Enferm. 2021;74(6):e20200867. https://doi.org/10.1590/0034-7167-2020-0867. Epub 20210820.
- Ahad A, Chahar P, Haque E, Bey A, Jain M, Raja W. Factors affecting the prevalence of stress, anxiety, and depression in undergraduate Indian dental students. J Educ Health Promot. 2021;10:266. https://doi.org/10.4103/jehp.jeh p\_1475\_20. Epub 20210730.
- Crispim MO, Santos C, Frazão IDS, Frazão C, Albuquerque RCR, Perrelli JGA. Prevalence of suicidal behavior in young university students: A systematic review with meta-analysis. Rev Lat Am Enfermagem. 2021;29. https://doi.org/ 10.1590/1518-8345.5320.3495. Epub 20211108.e3495.
- Fauzi MF, Anuar TS, Teh LK, Lim WF, James RJ, Ahmad R, et al. Stress, anxiety and depression among a cohort of health sciences undergraduate students: the prevalence and risk factors. Int J Environ Res Public Health. 2021;18(6). htt ps://doi.org/10.3390/ijerph18063269. Epub 20210322.
- de Sá ECML, Torres RV, Cotta KCG, Ezequiel ODS, Lucchetti G, Lucchetti ALG. Mental health throughout the medical career: A comparison of depression, anxiety, and stress levels among medical students, residents, and physicians. Int J Soc Psychiatry. 2023;69(5):1260–7. Epub 20230224. https://doi.org/10.11 77/00207640231157258. PubMed PMID: 36825658.
- Asani MO, Farouk Z, Gambo S. Prevalence of perceived stress among clinical students of Bayero university medical school. Nigerian J Basic Clin Sci. 2016;13(1):55–8. https://doi.org/10.4103/0331-8540.176209. PubMed PMID: 01369989-201613010-00010.
- Herron SJ, Sani F. Understanding the typical presentation of emptiness: a study of lived-experience. J Ment Health. 2022;31(2):188–95. https://doi.org/1 0.1080/09638237.2021.1922645. Epub 20210519.
- 14. D'Agostino A, Pepi R, Monti MR, Starcevic V. The feeling of emptiness: a review of a complex subjective experience. Harv Rev Psychiatry. 2020;28(5):287–95.
- Mizani H, Cahyadi A, Hendryadi H, Salamah S, Retno Sari S. Loneliness, student engagement, and academic achievement during emergency remote teaching during COVID-19: the role of the god locus of control. Humanit Social Sci Commun. 2022;9(1):1–9.

- Elsner D, Broadbear JH, Rao S. What is the clinical significance of chronic emptiness in borderline personality disorder? Australas Psychiatry. 2018;26(1):88–91. Epub 20171016. https://doi.org/10.1177/103985621773467 4. PubMed PMID: 29034695.
- 18. Hazell C. The experience of emptiness: AuthorHouse. 2003.
- Herron SJ, Saunders R, Sani F, Feigenbaum J. The psychological emptiness scale: a psychometric evaluation. BJPsych Open. 2024;10(2):e42. Epub 20240201. https://doi.org/10.1192/bjo.2023.649. PubMed PMID: 38299317; PubMed Central PMCID: PMCPMC10897692.
- Miller CE, Townsend ML, Grenyer BFS. Understanding chronic feelings of emptiness in borderline personality disorder: a qualitative study. Borderline Personality Disorder Emot Dysregulation. 2021;8(1):24. https://doi.org/10.118 6/s40479-021-00164-8.
- Roos CR, Kirouac M, Pearson MR, Fink BC, Witkiewitz K. Examining temptation to drink from an existential perspective: associations among temptation, purpose in life, and drinking outcomes. Psychol Addict Behav. 2015;29(3):716–24. https://doi.org/10.1037/adb0000063. Epub 20150302.
- Tung YJ, Lo KKH, Ho RCM, Tam WSW. Prevalence of depression among nursing students: A systematic review and meta-analysis. Nurse Educ Today. 2018;63:119–29. Epub 20180209. https://doi.org/10.1016/j.nedt.2018.01.009. PubMed PMID: 29432998.
- Ermiş H, Smith R, Watson J. Development and initial validation of the multidimensional sense of emptiness scale. Cours Psychol. 2022;50:001100002211108. https://doi.org/10.1177/00110000221110847.
- Hazell CG. A scale for measuring experienced levels of emptiness and existential concern. J Psychology: Interdisciplinary Appl. 1984;117(2):177–82. https://doi.org/10.1080/00223980.1984.9923674.
- 25. Buggs GR. Emptiness: assessment, origins, sequelae, and relationship to abuse. California Institute of Integral Studies; 1996.
- 26. Rodgers BL, Knafl KA. Concept development in nursing: Foundations, techniques, and applications. 1993.
- 27. Kellar S, Kelvin E. Exploratory factor analysis. Munro's statistical methods for health care research. Philadelphia, PA: Wolters Kluwer; 2012.
- 28. Lorenzo-Seva U. SOLOMON: A method for splitting a sample into equivalent subsamples in factor analysis. Behav Res Methods. 2022;54(6):2665–77.
- Hosseini L, Froelicher ES, Sharif Nia H, Ashghali Farahani M. Psychometrics of Persian version of the 11 items de Jong Gierveld Ioneliness scale among an Iranian older adults population. BMC Public Health. 2021;21(1):2056. https://d oi.org/10.1186/s12889-021-12068-x. Epub 20211110.
- Hills P, Argyle M. The Oxford happiness questionnaire: a compact scale for the measurement of psychological well-being. Pers Indiv Differ. 2002;33(7):1073– 82. https://doi.org/10.1016/S0191-8869(01)00213-6.
- Liaghatdar MJ, Jafari E, Abedi MR, Samiee F. Reliability and validity of the Oxford happiness inventory among university students in Iran. Span J Psychol. 2008;11(1):310–3. https://doi.org/10.1017/s1138741600004340. PubMed PMID: 18630671.
- Polit DF. Assessing measurement in health: beyond reliability and validity. Int J Nurs Stud. 2015;52(11):1746–53. https://doi.org/10.1016/j.ijnurstu.2015.07.0 02. Epub 20150717.
- Rust J, Golombok S. Modern psychometrics: the science of psychological assessment. Routledge; 2014.
- 34. Frey B. The SAGE Encyclopedia of Educational Research, Measurement, and Evaluation. 2018.
- Lawshe CH. A quantitative approach to content validity. Pers Psychol. 2006;28:563–75. https://doi.org/10.1111/j.1744-6570.1975.tb01393.x.
- Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. Res Nurs Health. 2006;29(5):489–97. 20147. PubMed PMID: 16977646.

- Mohammadbeigi A, Mohammadsalehi N, Aligol M. Validity and reliability of the instruments and types of measurments in health applied researches. J Rafsanjan Univ Med Sci. 2015;13(12):1153–70.
- Mvududu N, Sink C. Factor analysis in counseling research and practice. Couns Outcome Res Evaluation. 2013;4:75–98. https://doi.org/10.1177/21501 37813494766.
- Tavakol M, Wetzel A. Factor analysis: a means for theory and instrument development in support of construct validity. Int J Med Educ. 2020;11:245–7. https://doi.org/10.5116/ijme.5f96.0f4a. Epub 20201106.
- 40. Tabachnick BG, Fidell LS, Ullman JB. Using multivariate statistics: pearson Boston. MA; 2013.
- Sharif Nia H, Pahlevan Sharif S, Goudarzian AH, Haghdoost AA, Ebadi A, Soleimani MA. An evaluation of psychometric properties of the Templer's death anxiety Scale-Extended among a sample of Iranian chemical warfare veterans. J Hayat. 2016;22(3):229–44.
- 42. Child D. The essentials of factor analysis. Continuum. 2006.
- Kline RB. Principles and practice of structural equation modeling. Guilford; 2023.
- Nikkhah M, Heravi-Karimooi M, Montazeri A, Rejeh N, Sharif Nia H. Psychometric properties the Iranian version of older People's quality of life questionnaire (OPQOL). Health Qual Life Outcomes. 2018;16:1–10.
- Sathyanarayana S, Mohanasundaram T. Fit indices in structural equation modeling and confirmatory factor analysis: reporting guidelines. Asian J Econ Bus Acc. 2024;24(7):561–77.
- Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. J Mark Res. 1981;18(1):39–50.
- 47. Anderson JC, Gerbing DW. Structural equation modeling in practice: A review and recommended two-step approach. Psychol Bull. 1988;103(3):411.
- 48. Polit D, Beck C. Essentials of nursing research: appraising evidence for nursing practice. Lippincott Williams & Wilkins; 2020.
- Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. J Chiropr Med. 2016;15(2):155–63. https:// doi.org/10.1016/j.jcm.2016.02.012. Epub 20160331.
- Lawshe C. A quantitative approach to content validity. Per-sonnel Psychology. 1975;28(4):563–575.
- 51. Kartal M, Bardakçı S. Reliability and validity analysis with SPSS and AMOS applied examples. Ankara, Turkey: Akademisyen Publishing; 2018.
- Ermis-Demirtas H, Smith RL, Watson JC. Development and initial validation of the multidimensional sense of emptiness scale. Couns Psychol. 2022;50(7):918–41.
- Sharif-Nia H, Sobhanian P, Froelicher ES, Farhadi B, Hejazi S, Goudarzian AH, et al. A validity and reliability evaluation of fear of progression questionnaire in Iranian breast cancer patients: A methodological study. Health Sci Rep. 2024;7(7):e2260.
- 54. Weston R, Gore PA Jr. A brief guide to structural equation modeling. Couns Psychol. 2006;34(5):719–51.
- Herron SJ, Sani F. Understanding the typical presentation of emptiness: a study of lived-experience. J Mental Health. 2022;31(2):188–95.
- Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol. 2000;55(1):68.
- 57. Koo T, Li M. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. J Chiropr Med. 2016;15:155–63.

# Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.