



# Psychometric Properties of Iranian Version of Emotional Processing Scale

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## Abstract

**Edited by:** Branislav Filipović  
**Citation:** Kharamin S, Shokraeezadeh AA, Shirazi YG, Malekzadeh M. Psychometric Properties of Iranian Version of Emotional Processing Scale. Open Access Maced J Med Sci. 2021 Apr 18; 9(B):217-224. <https://doi.org/10.3889/oamjms.2021.5902>  
**Keywords:** Emotional processing; Psychometric properties; Validity; Iranian version  
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**Received:** 18-Feb-2021  
**Revised:** 03-Apr-2021  
**Accepted:** 07-Apr-2021  
**Copyright:** © 2021 Shirali Kharamin, Ali Asghar Shokraeezadeh, Yasaman Ghafaryan Shirazi, Mohammad Malekzadeh  
**Funding:** The research was funded by Yasuj University of Medical Sciences.  
**Competing Interests:** The authors have declared that no competing interests exists.  
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**BACKGROUND:** Emotional processing scale (EPS) is a fundamental test for measurement of the abnormal processing of emotion and psychosomatic disorders in psychotherapy sessions. Despite its importance, EPS has not been yet translated and validated in the Iranian population.

**AIM:** To fill this gap, this study aims to adapt and examined the psychometric properties of five EPS in the Iranian population. Using cluster sampling, we selected 1283 university students.

**METHODS:** The structural equation modeling and confirmatory factor analysis used to analyze the assessment of validity.

**RESULTS:** The result showed the Cronbach's alpha, split half, and test re-test reliability in acceptable ranges; 0.91, 0.90, and 0.91, respectively, for total scores scale. Root Mean Square Error of Approximation, Standardized Root Mean Square Residual, goodness of fit, and comparative fit index were at an acceptable range, 0.07, 0.05, 0.90, 0.90, 0.89, and 0.85, respectively. The total scores of EPS also showed a positive correlation (0.63,  $p < 0.001$ ) with GHQ 28.

**CONCLUSION:** The result suggested that five factors model of EPS which includes: The suppression, sign of unprocessed emotion, unregulated emotion, avoidance, and impoverished emotional experience model fit the data well be most appropriated for Iranian population.

## Introduction

Emotional processing (EP) was defined at first by Rachman [1] as "a process whereby emotional disturbances are absorbed and decline to the extent that other experiences and behavior can proceed without disruption." More recently and finally, it has been defined as a psychological, psychophysiological, and psychoneurological mechanism by which emotional disturbance reactions in individuals are substituted to non-distressed reactions [2].

Rachman [3] believed that the abnormal processing of emotion could result in direct and indirect signs. The role of emotional mechanism in the emersion or maintenance of several psychological disorders such as PTSD [4], panic disorder [5], and depression [6], [7] has been investigated in many studies. In addition, many studies proposed its contribution to psychosomatic disorders including fibromyalgia [8], chronic fatigue [9], [10], chronic pain [11], [12], inflammatory bowel disease [13], [14], and functional gastrointestinal disorders [15], [16]. Literature

also showed a relationship between abnormal emotional regulation and several physical illnesses such as cancer [17], [18], cardiovascular diseases [19], and multiple sclerosis [20]. Therefore, many scholars have considered EP an important factor in psychotherapy [21], [22], [23], [24], [25].

Despite this critical role, the lack of psychometrically valid instrument to enclose all dimensions of this concept was a fundamental problem in this area until 2007. Baker *et al.* developed the first version of EP scale (EPS) in 2007 [26]. They established this scale according to Rachman's original conceptualization, and their new model of EP. Baker *et al.*, first aims was to prepare a tool to add a range of dimensions to EPS such as separation of different EP types, categorization of patients for therapy and research, and evaluation of treatment interventions [26].

In the prior 38-item version of this scale, explanatory factor analysis showed an eight-factor solution relating to the style of emotional experiences (three factors), the mechanism controlling the experience and expression of emotions (four factors), and signs of inadequate processing (one factor). Internal consistency, test-retest

reliabilities reported 0.89 and 0.86, respectively. In a later study, Baker *et al.* [27] tried to refine and shorten this scale and yielded a five-factor solution with a 25-item scale and a moderate to high reliability for all new factors. In the new version of scale four factors remained in similar form, two of the original factors removed, and one new factor emerged. The coefficient  $\alpha$  value for the scale was 0.92. Internal consistency was high ( $\alpha \geq 0.80$ ) for three factors and moderated for two ( $\alpha \geq 0.70$ ). The Pearson's test-retest correlation coefficient obtained for the entire scale was 0.74. The psychometric data on final 25-item version also showed internal consistency 0.92, 88, and 0.90 for UK, Italian and Italian, and UK data, respectively [26], [28].

This scale has been translated into nine languages and validated in Italian and Japanese samples [20], [29]. However, there has not been an Iranian version of EPS. Due to the cultural and language differences between the original EPS test's source language and culture, the adaptation or ESP test for use in the Iranian population with disparate culture and language is necessary to reach equivalence between the EPS test and the Iranian versions of the test [4], [30], [31], [32]. Therefore, this research aimed to assess psychometric properties of this scale in Iranians population.

## Methods

### Participants

After confirming the research proposal by the Research Ethics Committee of Yasuj University of medical sciences, 1283 university students were selected using a cluster sampling method. Most of the participants were female (61%). The mean age was  $22/0.24 \pm 3.5$  for female,  $23.33 \pm 4.06$  for male, and  $22.66 \pm 0.3.75$  (ranged from 17 to 40) for the total. Besides, 28% of the participants were married. Of the initials sample, 155 participants also selected randomly from the entire sample to fill GHQ-28. For criterion-related validity, three different samples were selected from Internal Medicine Clinic patients; Diabetes (60), Migraine (50), and Ischemic Heart Diseases IHD (50). Using neighborhood controls selection [2], we selected the same numbers of people without any mentioned disorders as the control group for each patient group.

Table 1 shows the demographic data related to these three groups.

### Measures

#### EPS

As mentioned above the EPS is a 25-item, five-factor self-report questionnaire designed to measure EP styles and deficits [26], [28]. The scale is rated on a ten-point scale (0 for completely disagree to 9 for completely agree). It measures five dimensions, namely: Suppression (SUP), signs of unprocessed emotion (SUE), unregulated emotion (UE), avoidance (AVO), and impoverished emotional experience (IEE). Each subscale consists of five items.

#### General health questionnaire (GHQ - 28)

The GHQ-28 was included to test the convergent validity of the translated version of EPS. The GHQ-28 is a self-administered screening instrument to detect those with diagnosable psychiatric disorders [33]. The GHQ-28 provides four scores on somatic symptoms (GHQ1), anxiety and insomnia (GHQ2), social dysfunction (GHQ3), and severe depression (GHQ4); seven items for each dimension. Items may be scored using 0-1-2-3 Likert scores (at present study), or they may be scored 0-0-1-1, which indicates whether a symptom is absent or present [33].

#### Procedures and participants

The original version of the EPS scale was translated and adapted to the Persian language following the rules of Borsa *et al.* [34] and WHO rules [35]. At first, the scale was translated to Persian by an expert team (two persons) and evaluated by an expert panel. Then, it was translated back to English by an independent translator, who did not know the questionnaire. To ensure that the new version of the test is equivalent to the original version, the translators and researchers compared the Persian and back-translated versions of the questionnaire with the original version. Finally, the expert panel reached a consensus about the meaning of words and concepts. Then, the Persian version of the scale was prepared for administration using pre-test and interviewing with 30 participants.

**Table 1: Demographic data related to three patient's groups**

Variables	IHD		Diabetes		Migraine	
	PT	NPT	PT	NPT	PT	NPT
Age	59.84 (14.63)	58.2 (14.78)	47.38 (10.97)	49.86 (6.41)	29.63 (6.69)	29.88 (7.41)
Sex (%)						
Male	23 (46)	27 (54)	24	28	27	26
Female	25 (50)	25 (50)	36	32	23	24
Education (%)						
Primary to high school	46 (92)	43 (86)	36	33	26	25
Academic education	4 (8)	7 (14)	24	27	24	25
Marriage status						
Married	47 (94)	48 (96)	29	27	20	22
Single	3 (6)	2 (4)	21	33	30	28

PT: Patients group, NPT: None patient group

ESP was completed by 1238 male and female university students in south of Iran (Yasuj). Participants were selected using cluster sampling (class as cluster). One hundred and fifty-five participants completed EPS and GHQ-28 and the remained (1083) participants only filled ESP. For assessment of test re-test, reliability 80 participants refilled EPS 2 times with 4 weeks' interval. The GHQ-28 and test re-test groups were selected randomly from each class (approximately 12 and 6%, respectively). The demographic data for these two groups were, to some extent were similar to the original sample.

A convenience sampling was applied for recruiting three patients (Diabetes, Migraine, and IHD). All of the patients were diagnosed by an internal specialist (Table 1). Subsequently, in line with Kharamin *et al.* [2], we used neighborhood controls selection [36] for selecting the control group. Data were analyzed using SPSS version 22 (for descriptive, reliability, T-test, and correlation data analysis) and a confirmatory factor analysis (CFA) was carried out to determine the EPS factor structure. The LISREL program (version 8.8) [37] was used for this analysis. This study used the Root Mean Squared Error of Approximation (RMSEA), as well as the standardized root mean square residual (SRMR), the comparative fit index (CFI), incremental fit index (IFI), goodness of fit index (GFI), and normed fit index (NFI).

## Results

### Descriptive data

The result indicated that the mean of total EPS scores was  $107.89 \pm 41.98$  ( $108.87 \pm 1.62$  for female and  $109.06 \pm 42.88$  for male). The mean scores of subscales ranged from  $24.86 \pm 9.77$  for AVO to  $19.31 \pm 10.25$  for IEE (Table 1). The Skewness ( $-0.46$ – $0.53$ ) and Kurtosis ( $-1.2846$ – $0.99$ ) were within acceptable limits range of  $\pm 2$  [38], [39], [40]. There was a significant difference between male and female in AVO (Table 2), but this was not the case in other subscales and total mean scores.

**Table 2: Means and standard deviations of sample scores in EPS**

Items	Means (SD)			T	P-value
	Female	Male	Total		
SUP	21.67 (11.22)	22.45 (10.80)	21.73 (11.03)	1.12	0.261
SUE	22.51 (10.13)	22.12 (10)	22.17 (10.07)	0.62	0.54
UE	19.84 (10.08)	20.41 (10.57)	19.81 (10.24)	0.88	0.38
AVO	25.45 (9.74)	23.84 (9.67)	24.86 (9.77)	2.65	0.008
IEE	19.39 (10.28)	20.19 (10.21)	19.31 (10.26)	1.24	0.21
Total	108.87 (41.45)	109.01 (42.88)	107.89 (41.98)	0.054	0.96

SUP: Suppression, SUE: Signs of unprocessed emotion, UE: Unregulated emotion, AVO: Avoidance, IEE: Impoverished emotional experience, EPS: Emotional processing scale

### Reliability

Data analysis with 25 items showed acceptable alpha values. The results of reliability are presented in Table 3. Means of corrected inter-items correlation for total scores was 0.49 and ranged from 0.44 (for

IEE and AVO) to 0.56 (for SUP) for subscales which are considered acceptable according to Nunnally [41]. Cronbach's alpha, split-half, and test re-test reliability for total scores of EPS were 0.91, 0.90, 0.91 respectively (Table 2) which are in acceptable ranges [41]. In addition, Cronbach's alpha was 0.80, 0.71, 0.70, and 0.73 for SUP, SUE, UE, AVO, and IEE, respectively (Table 2). The highest and lowest values in the three reliability methods were related to SUP and AVO, respectively. Table 4 shows the inter-subscale and total scores correlations (inter consistency between subscales). The highest and lowest between subscales correlations are 0.71 (between IEE and UE) and 0.45 (between SUP and AVO). These two scores for correlation between subscales and total scores are 0.85 (total scores and IEE) and 0.74 (total scores and AVO).

**Table 3: Different types of reliability for scale and subscales**

Factors	Cronbach alpha	Mean inter-item correlation	Split half	Test re-test
SUP	0.80	0.56	0.79	0.88
SUE	0.71	0.47	0.79	0.82
UE	0.71	0.46	0.70	0.85
AVO	0.70	0.44	0.74	0.80
IEE	0.73	0.44	0.78	0.83
Total	0.91	0.49	0.90	0.91

SUP: Suppression, SUE: Signs of unprocessed emotion, UE: Unregulated emotion, AVO: Avoidance, IEE: Impoverished emotional experience, EPS: Emotional processing scale

## Validity

### Convergent validity

If the EPS is a valid measure of emotion reactivity, scores on the ERS should be correlated with measures of like constructs (i.e., convergent validity). Spearman correlations, used to evaluate convergent validity, are presented in Table 3. All of the subscales and total scores had a positive correlation with GHQ-28 subscales and total scores. The highest and lowest correlations with GHQ total scores belonged to the UE with 0.61 ( $p < 0.001$ ) and SUP with 0.44 ( $p < 0.001$ ), respectively. In addition, the total EPS scores showed a positive correlation (0.63,  $p < 0.001$ ) with convergent scale.

### Criterion-related validity

As proposed by previous original papers [5], [19], [26], [27], [28], this mechanism plays a significant role in the emergence or maintenance of many health-related problems, especially in psychosomatic disorders. As presented in Table 5, participants with a Diabetes, Migraine, and IHD reported significantly higher emotion processing abnormalities than those without each of these disorders. The T scores for three groups were 3.45 (df118,  $p.01$ ); 3.45 (df98,  $p.001$ ); and 3.27 (df98,  $p.001$ ), respectively.

### CFA

The five factors model showed satisfactory goodness-of-fit indices, despite a significant  $\chi^2$  ( $p < 0.01$ ). However, RMSEA, SRMR, CFI, IFI, GFI,

**Table 4: Intersubcales and convergent validity correlations**

Subscales	SUP	SUE	UE	AVO	IEE	Total EPS	GHQ1	GHQ2	GHQ3	GHQ4	Total GHQ
SUP	1										
SUE	0.57	1									
UE	0.52	0.70	1								
AVI	0.45	0.56	0.57	1							
IEE	0.62	0.71	0.66	0.47	1						
Total	0.77	0.86	0.84	0.74	0.85	1					
GHQ1	0.22	0.39	0.48	0.22	0.44	0.43	1				
GHQ2	0.45	0.50	0.57	0.36	0.54	0.59	0.62	1			
GHQ3	0.29	0.36	0.34	0.26	0.37	0.40	0.21	0.42	1		
GHQ4	0.38	0.43	0.47	0.32	0.48	0.51	0.49	0.50	0.44	1	
Total GHQ	0.45	0.55	0.61	0.38	0.60	0.63	0.74	0.82	0.63	0.84	1

All of correlation are significant at the P values 0.01 level (number=155). GHQ1 (somatic symptoms), GHQ2 (anxiety and insomnia), GHQ3 (social dysfunction), and GHQ4 (depression). SUP: Suppression, SUE: Signs of unprocessed emotion, UE: Unregulated emotion, AVO: Avoidance, IEE: Impoverished emotional experience, EPS: Emotional processing scale

**Table 5: Scores on the emotion reactivity scale by absence versus presence of diabetic, migraine, and IHD (as diagnosed by specialist)**

Groups	Diabetic			Migraine			IHD		
	PT	NPT	Result	PT	NPT	Result	PT	NPT	Result
SUP	22.65 (12.38)	18.8 (10.38)	T=1.85, df118, p. 07	25.90 (7.09)	21.42 (9.59)	T=2.65, df98, p. 009	25.8 (9.38)	24.62 (8.21)	T=0.34, df98, p. 7
SUE	25.07 (9.45)	19.23 (8.96)	T=3.47, df118, p. 001	25.88 (7.12)	24.54 (8.68)	T=0.84, df98, p. 4	29.68 (6.84)	26.46 (6.66)	T=2.38, df98, p. 02
UE	22.87 (10.92)	17.45 (11.02)	T=2.70, df118, p. 008	25.40 (8.15)	20.52 (10.54)	T=2.60, df98, p. 01	30.30 (9.31)	26.06 (7.72)	T=2.48, df98, p. 01
AVO	24.25 (7.31)	24.57 (7.47)	T=0.23, df118, p. 8	28.4 (7.20)	24.04 (7.76)	T=2.91, df98, p. 004	29.24 (4.48)	25.82 (4.71)	T=3.72, df98, p. 0001
IEE	20.68 (5.99)	14.18 (9.88)	T=4.36, df118, p. 0001	24.1 (9.04)	17.34 (10.36)	T=3.47, df98, p. 001	25.76 (9.59)	20.6 (7.89)	T=2.94, df98, p. 004
Total	115.52 (26.03)	94.23 (39.48)	T=3.45, df118, p. 01	129.68 (26.54)	107.86 (36.01)	T=3.45, df98, p. 001	140.26 (27.71)	123.56 (22.94)	T=3.27, df98, p. 001

SUP: Suppression, SUE: Signs of unprocessed emotion, UE: Unregulated emotion, AVO: Avoidance, IEE: Impoverished emotional experience, EPS: Emotional processing scale, PT: Patients, NPT: None patients group, IHD: Ischemic heart disease

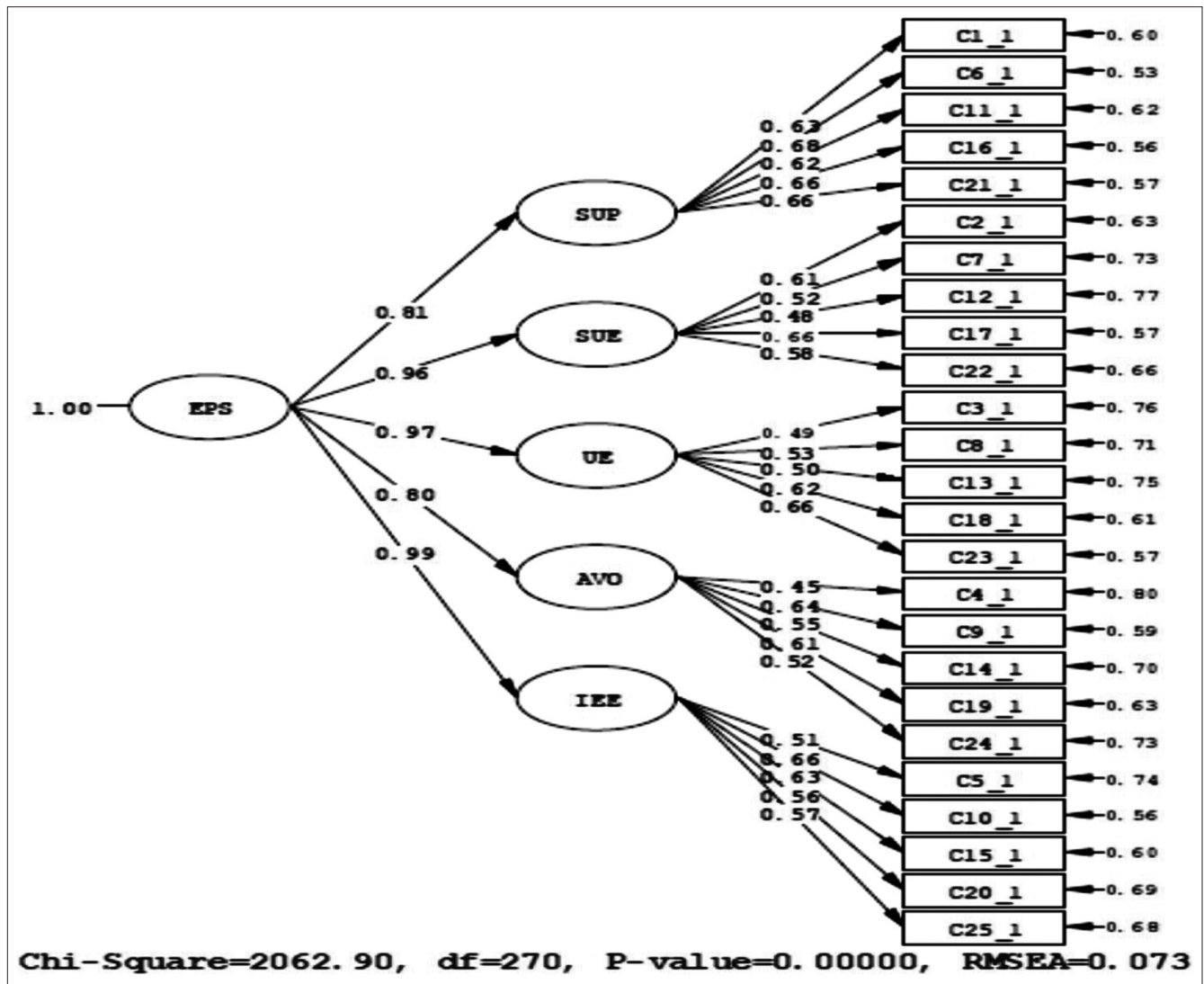


Figure 1: Loading values for 25 items on their factors (standardized values). SUP: Suppression, SUE: Signs of unprocessed emotion, UE: Unregulated emotion, AVO: Avoidance, IEE: Impoverished emotional experience, EPS: Emotional processing scale

and CFI were at an acceptable range, 0.07, 0.05, 0.90, 0.90, 0.89, and 0.85, respectively. Standardized factors loadings and T values are presented in Figures 1 and 2. All items loaded significantly on their original factors, with the highest loading score of item 6 on SUP (0.68) and the lowest loading score of item 4 on AVO (0.45). Means of loading scores for SUP, SUE, UE, AVO, IEE, and total EPS were 0.65, 0.57, 0.56, 0.55, 0.59, and 0.91, respectively. All T values, as shown in Figure 2, were at significant ranges.

### Discussion

The present study examined the psychometric properties of five subscales EPS in the Iranian population, using structural equation modeling and the more typical CFA. The result demonstrated that the overall model fit was appropriated for five factors. We found that, as was the case in previous studies [26], the suppression, sign

of unprocessed emotion, UE, AVO, and IEE model fit the data well. This study is the first effort to validate and adapt the ESP validation in Iranian population.

Our findings were consistent with the original studies. The Cronbach's alpha was at an excellent level [42], [43], [44] which was consistent with UK data (0.92), Italian data (0.88), and Italian and UK data (0.90) as reported by Baker *et al.* [28]. The subscale alphas were, to some extent, inconsistent with originals. The alpha values for SUP were high ( $\alpha > 0.80$ ) and for SUE, UE, AVO, and IEE were moderate ( $\alpha \geq 0.70$ ). In both studies, the lowest value for  $\alpha$  was for AVO. Although, in Italian and UK data, the SUE subscale was at the top (0.83), in present study the SUP subscale was at the first step (0.80) that could be related to cultural diversities. In the present study, the mean inter-item correlation was 0.49 that seems more robust than original data (0.31 in UK data, 0.22 in Italian, and 0.26 in both) [26], [27], [28]. Besides, the split-half and test-retest reliability were in an acceptable range, as same as the original paper.

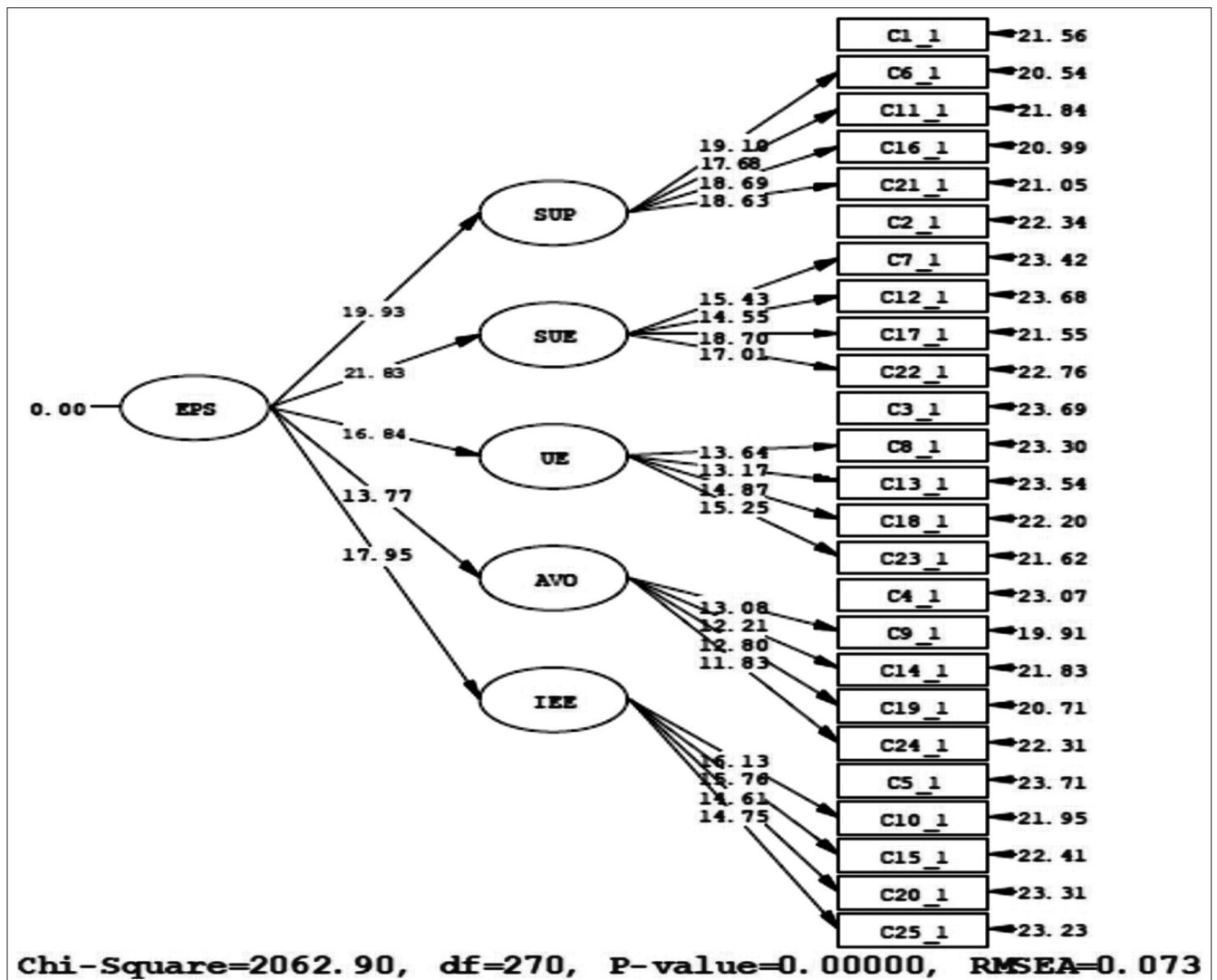


Figure 2: T values for all 25 items on their factors and EPS. SUP: Suppression, SUE: Signs of unprocessed emotion, UE: Unregulated emotion, AVO: Avoidance, IEE: Impoverished emotional experience, EPS: Emotional processing scale

The correlation between the five subscales and total EPS scores (as same as original paper) was all on a satisfactory level. Whereas original paper [27] that the IEE had the highest correlation with total scores, in the present study, this place was related to SUE (0.86) that could be related to different cultures. The lowest place for this correlation in the present and original papers was related to AVO subscale. In addition, inconsistent with original paper IEE factor correlated most highly with the other subscale and AVE was in the opposite direction of this continuum with the lowest correlations (in concordance to original paper).

If the EPS is a valid measure of emotion reactivity, scores on the scale should be correlated with measures of like constructs (i.e., convergent validity). Evidence for convergent validity of EPS was supported by significant positive correlations between five subscales and total scores of EPS and total scores of GHQs. The strongest correlation was found between UE subscale and GHQ, and the most weakness correlation was related to GHQ and AVO. As would be expected, high scores in EPS were accompanied by high scores in GHQ. As proposed by previous original papers [27] this mechanism plays a significant role in the emergence or maintenance of many health-related problems, especially in psychosomatic disorders. The construct validity of the EPS would be supported further by demonstrating that scores on this scale differ in the presence versus absence of these conditions (i.e., criterion validity). As presented in Table 5, all three groups of patients showed a significantly higher means of abnormal EP than control groups. These results supported the criterion validity of this scale.

According to RMSEA, SRMR, CFI, IFI, GFI, and CFI scores, the model showed the goodness of fit for five factors. The acceptable scores in RMSEA according to MacCallum *et al.* [45], RMR [46], [47], [48], CFI, IFI [49], GFI [50], and acceptable loaded scores for all items on their factors according to Kline [51], significant T values for all items and theoretical supported an appropriate fit for the model. All 25 items had an acceptable loading value on their factors. The result is nearly inconsistent with the original study [27]. In both studies, the lowest mean loaded scores were related to the AVO factor. In the present study, the highest mean loaded scores were related to UE with 0.01 discrepancy to SUE while in the original study is related to SUE. The mean loaded scores in other factors in both studies are, to some extent, similar.

## Conclusion

To conclude, according to excellent reliability data, well goodness of fit, strong loadings of all items on their factors, significant T values, significant correlation

with convergent validity tool, and strong consistency with original papers, it seems that five factors model of EPS be most appropriated for the Iranian population. This study contains some limitations that are important to acknowledge. The sample consisted of no psychiatric population; therefore, it is recommended to use this scale for other population (especially psychiatric disorders population) and assess by other types of validity methods (e.g., discriminate validity).

## Acknowledgment

We thank all the participants in this study who made this study possible by their participation.

## Authors' Contributions

AS was the principal investigator, who designed the study, analyzed the data and wrote the paper. SH Kh contributed to the study design and writing of the paper. M.M contributed to the analysis of the data and writing the result of manuscript. AS contributed to analysis of data, helped in writing, and contributed to interpretation of the data. All authors read and approved the final manuscript.

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