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# Psychometric properties of emotional processing questionnaire in irritable bowel syndrome patients and non-clinical population

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***Abstract***

**Introduction:** Difficulties in emotional processing are common in Irritable Bowel Syndrome (IBS) and are associated with the symptoms of this syndrome. This research aimed to examine the psychometric properties of a researcher-developed instrument to better identify impairments in emotion processing in these patients.

**Materials and Methods:** This descriptive-correlational study was conducted in two phases among healthy individuals and IBS patients in Iran (2024). First, a Persian translation of the Emotional Processing Questionnaire was performed on a non-clinical population (n= 278). Subsequently, this questionnaire, along with the Brief Symptom Inventory (BSI-18), was administered to IBS patients (n= 305). Confirmatory factor analysis, construct reliability, criterion validity, and assessment of reliability were analyzed.

**Results:** Findings indicated strong content validity (CVR= 78-92% and CVI= 82-94%). Exploratory factor analysis revealed four factors: emotional experience and expression, emotional awareness and differentiation, emotional tolerance, and emotional communication and regulation. These factors were confirmed by confirmatory factor analysis in the patient sample (GFI= 0.9). Criterion validity showed that disrupted emotional processing was a significant positive predictor of somatization ($P< 0.001$), depression ($P< 0.001$), and anxiety ($P< 0.001$). Among the subscales, emotional tolerance was a significant predictor of somatization, depression and anxiety, while emotional experience and expression was only a significant predictor of depression. The overall scale demonstrated high reliability (α= 0.921, CR= 0.943, Guttman split-half coefficient= 0.871).

**Conclusion:** With its satisfactory psychometric properties, the Emotional Processing Questionnaire can be used as a reliable and valid tool for measuring emotional processing in Irritable Bowel Syndrome patients.

**Keywords:** Emotion, Irritable Bowel Syndrome, Somatization

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## Introduction

Emotional processing refers to a set of interrelated cognitive, physiological, and behavioral mechanisms through which individuals perceive, interpret, regulate, and express emotions (1). This multifaceted process involves the absorption and resolution of emotional disturbances, allowing individuals to experience and behave without ongoing disruption from those emotions (2). Efficient emotional processing enhances resilience and prevents psychological distress, while impairments in this process heighten vulnerability to mental and physical issues (3). Low emotional awareness and poor differentiation of negative emotions are linked to depression (4,5). Whereas healthy expression may reduce depressive symptoms (6). Deficits in tolerating negative emotions are central to anxiety (7) and somatization, where unresolved emotional distress manifests physically due to difficulties in emotional processing (8). Impaired emotional processing is central in psychosomatic medicine, (9) especially in Irritable Bowel Syndrome (IBS), which is accompanied by emotional disturbances (10). Around half of IBS patients experience alexithymia, associated with lower quality of life and higher symptom severity (11,12). Emotional awareness deficits are also common, linking to psychological distress and symptom burden (13,14). IBS patients often struggle with emotional regulation difficulties, including excessive suppression and limited adaptive strategies, which correlate with higher anxiety, depression, and symptom severity (15). Suppressing negative emotions, particularly anger, exacerbates psychological distress and symptoms (16). Identifying specific emotional processing deficits in Irritable Bowel Syndrome (IBS) is essential for implementing targeted therapeutic interventions, as each approach demonstrates greater efficacy in addressing particular components of emotional processing. CBT and mindfulness approaches are helpful for regulation difficulties (17,18). DBT for emotion tolerance (19) and emotional schema therapy for improving emotional communication (20). Thus, a comprehensive tool assessing multiple dimensions of emotional processing is needed to inform tailored treatments for IBS patients. To date, several well-known and widely used scales have been developed to assess emotion and related areas, such as the Toronto Alexithymia Scale (TAS-20) which examines difficulties in identifying and describing feelings, the Emotion Regulation Questionnaire (ERQ) which examines expressive suppression and cognitive reappraisal, Emotional Expressivity Scale (EES) which examines different qualities of emotional expression and etc. However, each of these instruments focuses on a specific aspect of emotional processing. The only scale that attempts to measure multiple dimensions of emotional processing is the Emotional Processing Scale (EPS) (21) which assesses suppression, avoidance, emotional experience, controllability of emotions, and signs of unprocessed emotions. Nevertheless, this scale does not specifically evaluate emotional awareness, emotional differentiation, or emotional tolerance. Furthermore, despite the particular importance of emotional expression in disorders such as IBS, the EPS lacks a distinct subscale for this component and includes only a limited number of items addressing emotional expressivity. Considering that Irritable Bowel Syndrome (IBS) is one of the most prevalent psychosomatic gastrointestinal disorders, and that emotional processing difficulties are frequently observed in these patients, the present study aims to examine the psychometric properties of a comprehensive emotional processing questionnaire, which, unlike existing tools, assesses various dimensions of this construct in the Iranian IBS patient population and can provide valuable information for designing targeted therapeutic interventions.

## Materials and Methods

The design of this study is descriptive-correlational. The main material of this study, the Emotional Processing Questionnaire, is a researcher-developed instrument designed by Berens and colleagues (13) to assess emotional processing in patients with Irritable Bowel Syndrome (IBS). Given that the psychometric properties of this questionnaire had not yet been examined, in this research a comprehensive psychometric evaluation was conducted through two independent studies involving samples of healthy individuals and patients with IBS. Statistical analyses including Content Validity Ratio (CVR), Content Validity Index (CVI), Exploratory Factor Analysis (EFA), reliability assessment using Cronbach's alpha, Confirmatory Factor Analysis (CFA), Construct Reliability (CR), and Guttman's split-

half coefficient were conducted, utilizing SPSS version 27 and AMOS version 24.

Study 1: In the first study, the sample consisted of healthy individuals, with an initial total of 310 participants. After attrition, the final sample size was reduced to 260. The sampling method used was one-stage cluster sampling. The target population included students and staff from Isfahan University of Medical Sciences and Isfahan University, during the period from April to June 2024. For sampling, 8 faculties from these two universities were randomly selected as clusters, and participants were then sampled from the members of these faculties. The researcher visited each of the selected faculties and invited their members to complete the questionnaires. The questionnaires were administered individually, using paper-and-pencil forms (rather than electronic). In addition to the main questionnaire (Emotional Processing Questionnaire), participants also completed a separate form regarding their demographic characteristics. Inclusion criteria: 1) Age 18 years and older, 2) at least junior high school education, 3) no diagnosed mental disorder, and 4) no physical illness. Exclusion criteria: 1) any cognitive impairment or intellectual disability that affects understanding the questions, 2) inability to read the questions due to visual deficits, 3) and leaving the questionnaires unfinished. Before data collection, all participants were informed about the objectives and were provided informed consent.

Study 2: The sample in this study consisted of IBS patients, with an initial total of 340 participants. After attrition, the final sample size was reduced to 305. Due to the specific target group (IBS patients), purposive sampling was used. The target population included all patients diagnosed with IBS in the city of Isfahan, during the period from August to October 2024. Sampling was conducted in 4 private gastroenterology clinics at Isfahan. Research team members were stationed in the clinics. The gastroenterologist referred patients to the research team after the visit if they met the diagnostic criteria for IBS according to the ROME-IV criteria. If the patients met the inclusion criteria of the study, they were asked to complete the emotional processing questionnaire plus the demographic characteristics form. The questionnaires were administered individually, using paper-and-pencil forms. Subsequently, a link containing the electronic form of Brief Symptom Inventory (BSI-18) was sent to them one month later. Inclusion criteria: 1) Age 18 years and older, 2) at least junior high school education, 3) no diagnosed mental disorder, and 4) diagnosis of IBS and no other physical illness. Exclusion criteria: 1) any cognitive impairment or intellectual disability that affects understanding the questions, 2) inability to read the questions due to visual deficits, and 3) and leaving the questionnaires unfinished. Before data collection, participants were informed about the study's objectives and provided informed consent. Preparation of the Emotional Processing Questionnaire (Persian Version): The items of emotional processing questionnaire are derived from the integrated four subscales of the Operationalized Psychodynamic Diagnosis–Structured Questionnaire (OPD-SQ) and two subscales of the Mentalization Questionnaire (MZQ). The items for the four dimensions of emotion processing were selected from the OPD-SQ subscales as follows: To measure "emotional tolerance," items from the "control ability (self-regulation)" subscale were used (5 items). To measure "emotional differentiation," items from the "self-perception" subscale were used (4 items). To measure "emotional communication," items from the "emotional communication with others" subscale were used (6 items) and to measure "emotional experience," items from the "emotional communication with self" subscale were used (4 items). To measure the other two dimensions of emotion processing, namely "emotional awareness" and "emotion regulation," items from the two subscales with the same names in the MZQ questionnaire were used (4 and 3 items) respectively. Consequently, this scale consists of 26 items and 6 subscales, with responses rated on a 5-point Likert scale ranging from 1 to 5. (1= fully disagree, 2= partly disagree, 3= neither agree nor disagree, 4= partly agree, 5= fully agree). The arrangement of the questions to form the Emotional Processing Questionnaire was as follows: first, all the selected questions from the four subscales of the OPD-SQ were included, following the original numbering order of the OPD-SQ. Then, the questions from the two subscales of the MZQ were placed at the end of the questionnaire. In this way, while the organization of the questions adhered to the logical and sequential order of the original

OPD-SQ version, the questions were simultaneously shuffled within the Emotional Processing Questionnaire, resulting in a randomized placement of items alongside each other. Finally, the questionnaire was translated into Persian using the forward-backward translation method, followed by a review by an English speaker. A pilot test with 40 participants identified an ambiguous item (item 26), which was revised. The final Persian version was deemed appropriate for use.

Research instruments

*A) Operationalized Psychodynamic Diagnosis Structure Questionnaire (OPD-SQ):* The OPD-SQ is a 95-item self-report tool designed to assess personality structure and functioning within a psychodynamic framework. It includes eight main scales and 21 subscales, covering dimensions such as self- and other-regulation, communication, and attachment. The measure shows strong convergent validity, with high latent ($r \geq 0.677$) and observed ($r \geq 0.503$) inter-subscale correlations, a significant correlation with the PHQ-4, and a correlation of $r = 0.62$ with expert ratings. It also demonstrates high internal consistency (hierarchical $\omega = 0.834$) and good inter-rater reliability. Confirmatory factor analysis supports a satisfactory to good model fit, confirming the OPD-SQ's reliability and validity (22).

*B) Mentalization Questionnaire (MZQ):* The 15-item self-report Mentalization Questionnaire (MZQ) assesses aspects of mentalization such as self-reflection, emotional awareness, psychic equivalence, and affect regulation, with higher scores reflecting lower mentalization. It shows strong convergent validity through a significant correlation with the OPD-SQS total score ($r = 0.94$, $P < 0.001$) and good overall internal consistency (McDonald's $\omega = 0.88$). Although subscale internal consistencies were moderate ($\omega = 0.65$-$0.79$), corrected item-total correlations ranged from 0.34 to 0.64, supporting the measure's satisfactory reliability and validity (23).

*C) Brief Symptom Inventory-18 (BSI-18):* Depressive, anxious, and somatic symptoms were assessed using the 18-item Brief Symptom Inventory (BSI-18), a valid and reliable tool with items rated on a 5-point Likert scale. The BSI-18 includes subscales for depression, anxiety, and somatization, showing good internal consistency ($\alpha = 0.87$, .84, and 0.82 respectively) and high overall reliability (GSI $\alpha = 0.93$) (24). Convergent validity is supported by strong correlations with other instruments (e.g., $r = 0.72$ with PHQ for depression). In an Iranian sample, concurrent validity with SCL-90 subscales was high (depression $r = 0.94$, anxiety $r = 0.96$, somatization $r = 0.96$), and Cronbach's alpha coefficients were 0.75, 0.82, 0.69, and 0.83 for the respective subscales and total score (25).

## Results

In the first study, after removing flawed questionnaires from the sample, the sample size reached 278. A total of 278 individuals, 60.1% of the sample members were between 18 to 25 years, 14% were between 26 to 35 years, 11.5% were between 36 to 45 years, 9.9% were between 46 to 55 years, 2.9% were between 56 to 65 years, and 1.6% were over 66 years old. Also, 50.8% of the sample were women, while 49.2% of the sample were men. Additionally, among the sample 24.7% had a high school diploma, 56% had a bachelor's degree, 11.5% had a master's degree, and 4.9% had a doctoral degree. Content validity was assessed by a panel of 10 psychology experts with expertise in psychometrics. The Content Validity Ratio (CVR) for all 26 items ranged from 78% to 92%, exceeding the minimum required value of 0.62 based on Lawshe's table for 10 experts. The Content Validity Index (CVI) also ranged from 82% to 94%, surpassing the minimum acceptable value of 0.7. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity were calculated to determine the adequacy of sample size and whether or not data are suitable for factor analysis. The KMO value was 0.897, which is above 0.60, indicating the adequacy of the sample size and the Bartlett's test statistic was significant (Chi-square= 2316.709, df= 253, $P < 0.001$), indicating that the conditions for (EFA) are satisfied. Therefore, factor analysis was conducted using Principal Component Analysis (PCA) and Varimax rotation to extract the main factors. Based on eigenvalues greater than 1, four final subscales were extracted that explaining 53.038% of the total variance. It is worth noting except for items 18, 20, and 25, which had very low factor loadings and were removed from the questionnaire, all other items had factor loadings greater than 0.4 and were acceptable. Table 1 shows the descriptive statistics, the correlations of each item with the total score, Cronbach's alpha when each item deleted, and the factor loadings for each item.

**Table 1.** Descriptive statistics, internal consistency, exploratory factor analysis of the Emotional Processing Questionnaire

| Items | Descriptive statistics | | | | Correlations with the total score | Cronbach's alpha with each item deleted | Components | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | Skewness | Kurtosis | | | Subscale 1 | Subscale 2 | Subscale 3 | Subscale 4 |
| Item 1 | 2.51 | 1.28 | 0.26 | -1.26 | 0.61** | 0.893 | 0.568 | | | |
| Item 8 | 2.64 | 1.30 | 0.25 | -1.19 | 0.66** | 0.891 | 0.703 | | | |
| Item 9 | 2.36 | 1.31 | 0.45 | -1.14 | 0.58** | 0.894 | 0.803 | | | |
| Item 10 | 2.58 | 1.27 | 0.22 | -1.23 | 0.68** | 0.891 | 0.707 | | | |
| Item 14 | 1.99 | 1.12 | 0.89 | -0.19 | 0.57** | 0.894 | 0.495 | | | |
| Item 15 | 2.29 | 1.20 | 0.56 | -0.87 | 0.56** | 0.894 | 0.643 | | | |
| Item 19 | 2.62 | 1.22 | 0.32 | -0.92 | 0.64** | 0.892 | 0.410 | | | |
| Item 2 | 2.69 | 1.22 | 0.19 | -1.17 | 0.66** | 0.891 | | 0.612 | | |
| Item 3 | 2.14 | 1.03 | 0.74 | -0.07 | 0.59** | 0.893 | | 0.761 | | |
| Item 4 | 2.12 | 1.03 | 0.66 | -0.53 | 0.61** | 0.893 | | 0.840 | | |
| Item 7 | 2.11 | 1.02 | 0.79 | 0.05 | 0.60** | 0.893 | | 0.746 | | |
| Item 22 | 2.29 | 1.09 | 0.85 | -0.52 | 0.70** | 0.891 | | 0.479 | | |
| Item 5 | 2.62 | 1.14 | 0.17 | -1.00 | 0.50** | 0.895 | | | 0.598 | |
| Item 13 | 1.84 | 0.89 | 0.82 | -0.02 | 0.49** | 0.895 | | | 0.660 | |
| Item 16 | 2.24 | 1.11 | 0.51 | -0.84 | 0.51** | 0.895 | | | 0.751 | |
| Item 17 | 2.4 | 1.18 | 0.51 | -0.79 | 0.55** | 0.894 | | | 0.565 | |
| Item 23 | 2.38 | 1.15 | 0.47 | -0.79 | 0.56** | 0.894 | | | 0.545 | |
| Item 26 | 2.54 | 1.23 | 0.24 | -1.12 | 0.40** | 0.898 | | | 0.545 | |
| Item 6 | 2.92 | 1.39 | -0.08 | -1.35 | 0.44** | 0.898 | | | | 0.775 |
| Item 11 | 2.27 | 1.26 | 0.55 | -0.96 | 0.54** | 0.898 | | | | 0.689 |
| Item 12 | 2.24 | 1.20 | 0.70 | -0.57 | 0.33** | 0.900 | | | | 0.585 |
| Item 21 | 2.71 | 1.22 | 0.19 | -1.01 | 0.54** | 0.895 | | | | 0.610 |
| Item 24 | 2.48 | 1.18 | 0.37 | -0.87 | 0.53** | 0.895 | | | | 0.408 |

** Significance at the 0.05 level

According to the results of Table 1, the correlation of each item with the total score of the Emotional Processing Questionnaire is at least 0.3 and are significant ($P<$ 0.001). Additionally, the Cronbach's alpha for the Emotional Processing Questionnaire was calculated 0.898 and the Cronbach's alpha for the first subscale was 0.834, for the second subscale was 0.839, for the third subscale was 0.774, and for the fourth subscale was 0.701, which were indicating a desirable internal consistency. Furthermore, removing item 12 increases the total Cronbach's alpha to 0.900. However, if item 12 is removed, the Cronbach's alpha for the fourth subscale decreases to 0.694. Therefore, this item was not removed from the questionnaire.

In the second study, after removing flawed questionnaires from the sample, the sample size reached 305. Out of 305, 16.1% were between

18 to 25 years, 24.7% were between 26 to 35 years, 32.8% were between 36 to 45 years, 17.1% were between 46 to 55 years, 7.4% were between 56-65 and 2% were over than 66 years. Also, 77.4% of the sample were women, while 22.6% of the sample were men. Additionally, among the sample, 17.7% had junior high school education, 30.8% had a high school diploma, 9.5% had an associate degree, 33.1% had a bachelor's degree, 7.9% had a master's degree, and 1% had a PhD degree. The assumptions of CFA in AMOS are including linearity, multivariate normality, no multicollinearity, adequate sample size and no outliers. The first four assumptions are satisfied and the outliers were removed based on the Mahalanobis distance criterion. In addition, for improving the model fit, adjustments were added to the model, and then the final model is depicted in Figure 1.

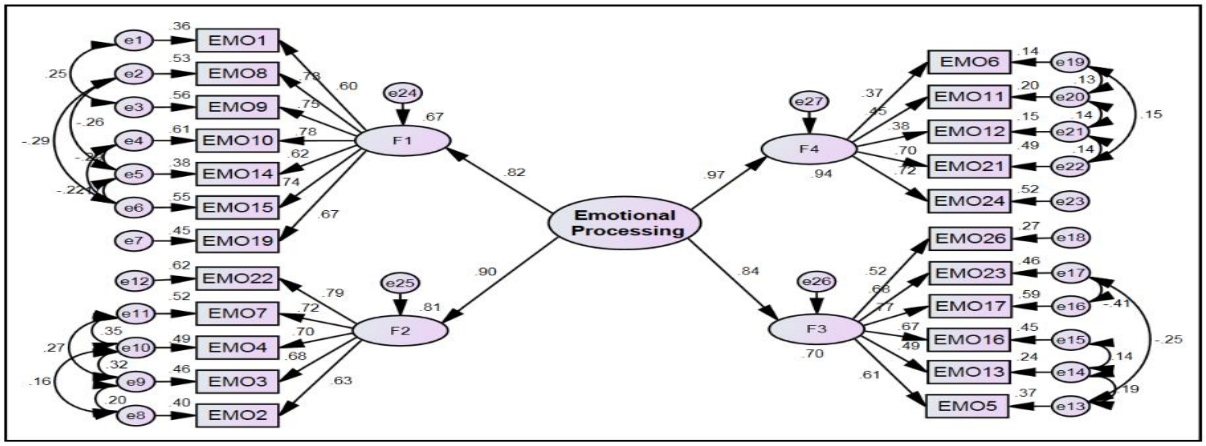


**Figure 1.** Standardized coefficients model for CFA data

All factor loadings of the model in Figure 1 are greater than 0.4 and significant ($P< 0.001$). Also, the factor loading of item 12 is 0.38. Since, this item is significant ($P< 0.001$) and removing from the model causes decreasing in Cronbach's alpha; therefore, there is no need to eliminate this item. Results in Table 2 shows that the model in Figure 1 is acceptable and has desirable fit according to empirical data. Table 3 presents internal consistency, construct reliability and Guttman split-half reliability coefficient.

**Table 2.** Fit indices for of the emotional processing questionnaire

| | CMIN/DF | GFI | AGFI | NFI | CFI | IFI | TLI | PNFI | PCFI | RMSEA |
|---|---|---|---|---|---|---|---|---|---|---|
| Results | 2.04 | 0.90 | 0.86 | 0.87 | 0.93 | 0.93 | 0.91 | 0.71 | 0.76 | 0.059 |
| Acceptable fit | 3 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.50 | 0.050 | 0.10 |

**Table 3.** Internal consistency, construct reliability and Guttman split-half reliability coefficient

| | Cronbach's alpha | CR | Guttman |
|---|---|---|---|
| Subscale 1 | 0.863 | 0.870 | 0.803 |
| Subscale 2 | 0.818 | 0.831 | 0.865 |
| Subscale 3 | 0.784 | 0.794 | 0.759 |
| Subscale 4 | 0.700 | 0.700 | 0.700 |
| Scale | 0.921 | 0.943 | 0.871 |

Assessing internal consistency by Cronbach's alpha, Construct Reliability (CR) and Guttman split-half reliability coefficient is also conducted in Table 3.

Results shows that the Emotional Processing Questionnaire and its subscales have adequate reliability. Subsequently, criterion validity was assessed of the Emotional Processing Questionnaire. For this purpose, simple and multiple linear regression analyses were performed which the residuals of the model follow a normal distribution. In fact, the Kolmogorov-Smirnov test was not significant ($P> 0.05$). Moreover, the Variance Inflation Factor (VIF) values are less than 3, suggesting that there is no multicollinearity among the

predictor variables. Additionally, the Durbin-Watson statistic falls between 1.5 and 2.5, indicating the independence of the model's residuals. Therefore, the assumptions of the regression model were satisfied.

**Table 4.** Results of the regression analysis for somatization, depression and anxiety

| Criterion variable | Predictor | Unstandardized Coefficients | | t | P | VIF | R | R squared | Adjusted R squared | Durbin Watson |
|---|---|---|---|---|---|---|---|---|---|---|
| | | B | Std Error | | | | | | | |
| Somatization | Constant | 1.403 | 0.725 | 1.936 | 0.054 | - | 0.463 | 0.215 | 0.204 | 2.183 |
| | Subscale 1 | 0.199 | 0.042 | 4.751 | <0.001** | 1.998 | | | | |
| | Subscale 2 | 0.093 | 0.055 | 1.694 | 0.091 | 1.991 | | | | |
| | Subscale 3 | -0.027 | 0.050 | -0.545 | 0.586 | 1.860 | | | | |
| | Subscale 4 | 0.059 | 0.061 | 0.976 | 0.330 | 1.823 | | | | |
| Somatization | Constant | 1.362 | 0.717 | 1.898 | 0.059 | - | 0.432 | 0.186 | 0.184 | 2.181 |
| | Emotional processing | 0.091 | 0.011 | 8.124 | <0.001** | - | | | | |
| Depression | Constant | -2.088 | 0.750 | -2.784 | 0.006** | - | 0.563 | 0.317 | 0.307 | 2.198 |
| | Subscale 1 | 0.167 | 0.043 | 3.848 | <0.001** | 1.998 | | | | |
| | Subscale 2 | 0.067 | 0.057 | 1.183 | 0.238 | 1.998 | | | | |
| | Subscale 3 | 0.020 | 0.052 | 0.384 | 0.701 | 1.860 | | | | |
| | Subscale 4 | 0.272 | 0.063 | 4.328 | <0.001** | 1.823 | | | | |
| Depression | Constant | -1.798 | 0.740 | -2.432 | 0.016** | - | 0.545 | 0.297 | 0.295 | 2.196 |
| | Emotional processing | 0.128 | 0.012 | 11.042 | <0.001** | - | | | | |
| Anxiety | Constant | -2.545 | 0.684 | -3.720 | <0.001** | - | 0.684 | 0.468 | 0.461 | 2.119 |
| | Subscale 1 | 0.377 | 0.040 | 9.520 | <0.001** | 1.998 | | | | |
| | Subscale 2 | 0.073 | 0.052 | 1.403 | 0.162 | 1.991 | | | | |
| | Subscale 3 | 0.019 | 0.048 | 0.400 | 0.689 | 1.860 | | | | |
| | Subscale 4 | 0.050 | 0.057 | 0.863 | 0.389 | 1.823 | | | | |
| Anxiety | Constant | -2.483 | 0.706 | -3.516 | <0.001** | - | 0.633 | 0.401 | 0.399 | 2.090 |
| | Emotional processing | 0.153 | 0.011 | 13.873 | <0.001** | - | | | | |

The findings in Table 4 show positive and significant effect of the emotional processing on somatization, depression and anxiety ($P<$ 0.001). Also, subscale 1 has positive and significant effect on somatization, depression and anxiety ($P<$ 0.001). Furthermore, t-value of subscale 4 (t= 4.328) indicates positive and significant effect on depression ($P<$ 0.001). These results indicate that the emotional processing Questionnaire and its subscales have criterion validity.

## Discussion

The discussion begins with the number of factors underlying the questionnaire. In the present study, exploratory factor analysis revealed a four-factor structure, whereas the primary version of the questionnaire developed by Berens and colleagues comprised six subscales. These six subscales were formed by combining subscales from the MZQ and OPD-SQ, without conducting exploratory factor analysis. However, performing EFA is essential, as the structure of items may shift or new factors may emerge when developing a new construct—a finding that was confirmed in our research. In this study, items 1, 8, 9, 10, 14, 15, and 19 were found to load on a single factor, referred to as "subscale 1" in the results section. This subscale was labeled emotional tolerance, as its items reflect difficulties in enduring unpleasant emotions. Five of these seven items are the same items as the emotional tolerance subscale in the primary questionnaire. However, the varimax rotation in the current analysis included two additional items—Item 8 ("There is often such a chaos of feelings inside me that I couldn't even describe it.") and Item 10 ("I often suffer from an unbearable inner tension without knowing the reason for it."). Although originally categorized under emotional differentiation, these items were found to align conceptually with emotional tolerance, as both reflect the overwhelming and distressing nature of emotional experiences that are difficult to endure. In this study, items 2, 3, 4, 7, and 22 were found to load on a single factor, labeled emotional awareness and differentiation. While emotional awareness and emotional differentiation were treated as

separate subscales in the original questionnaire, the present analysis indicated that these aspects formed a unified construct. The factor included items reflecting both difficulties in identifying emotions (e.g., item 22: "Often I don't even know what is happening inside of me") and distinguishing between them (e.g., item 2: "I often have feelings that I can't understand"). Additionally, two items originally associated with emotional experiencing—items 3 and 4—were also loaded on this factor, as they reflect a lack of emotional clarity rather than the mere presence of emotions. These findings suggest that, although conceptually distinct, emotional awareness and differentiation may occur simultaneously in practice, with no clear separation between the two processes. Items 5, 13, 16, 17, 23, and 26 were found to load on a single factor, labeled emotional communication and regulation. This factor included all items from the original emotional communication subscale, along with two items from the emotion regulation subscale. The merging of these dimensions suggests that difficulties in interpersonal understanding may lead to intense emotional responses, which in turn hinder effective regulation. For example, item 26 ("Sometimes feelings are dangerous for me")—originally part of the regulation subscale—was grouped within this factor, reflecting the emotional cost of poor communication and dysregulation. These findings support the integration of communication and regulation into a single construct. Items 6, 11, 12, 21, and 24 were found to load on a single factor, labeled emotional experience and expression.

This factor combined items from multiple subscales of the original questionnaire, including emotional communication, emotional experiencing, emotional awareness, and emotion regulation. For instance, item 21 ("Frequently it's difficult for me to perceive my feelings at their full intensity") reflects emotional experience despite being originally categorized under awareness. Similarly, item 24 suggests difficulty in understanding one's emotions, and item 12 reflects emotional blunting. Items 6 and 11, originally from the communication subscale, refer to emotional expression, particularly in non-verbal forms. These observations indicate that emotional experience and expression tend to co-occur and are conceptually intertwined. Thus, their combination into a unified factor appears theoretically justified. The overall findings of the exploratory factor analysis demonstrated how the original six subscales were reduced to four, with several constructs merging into broader dimension.

The results obtained from the confirmatory factor analysis in IBS patients confirmed the existence of 4 factors. The merging of certain subscales—such as emotional awareness and differentiation, or emotional experience and expression—may reflect the inherently intertwined nature of emotional processing in individuals with psychosomatic symptoms. In populations such as IBS patients, emotional experiences are often diffuse, difficult to identify, and hard to regulate, suggesting that the boundaries between different aspects of emotional functioning may be less distinct (15). This convergence of emotional processes may point to a more integrated yet disorganized pattern of emotional experience, which could contribute to the somatization of psychological distress. These findings underscore the need to view emotional processing in psychosomatic populations as a dynamic and overlapping construct rather than a set of discrete, sequential components (15).

Based on the predictive validity findings, the emotional processing questionnaire as a whole significantly predicted depression, anxiety, and somatization among IBS patients. Notably, the emotional tolerance subscale was a significant predictor for all three outcomes, whereas the emotional experience and expression subscale was specifically associated with depression. These results suggest that difficulties in tolerating negative emotions may contribute broadly to psychological and somatic symptoms in IBS, while reduced emotional experience and expression may be more closely linked to depressive symptoms. This pattern aligns with previous research indicating that emotional processing deficits, particularly in affect tolerance, are prominent in IBS patients and are associated with increased symptom severity (13). Furthermore, studies have shown that interventions targeting emotional awareness and expression can lead to improvements in IBS symptoms, highlighting the clinical relevance of these emotional processing dimensions (3). Among the studies that have conducted similar research to ours—namely, those that examined the psychometric properties of instruments measuring emotional processing—is the study by Gay et al. conducted in France (26). In their research, Gay

and colleagues validated the French version of the Emotional Processing Scale (EPS), which we previously referred to in the introduction. Similar to our approach, they employed the forward-backward translation method and administered the questionnaire to both the general population and individuals with physical disorders. The Cronbach's alpha for the total scale in their study was 0.91, indicating excellent reliability, which is very close to the alpha obtained in our study (0.92). Their factor analysis replicated the five-factor structure of the original English version, while our analysis supported a four-factor structure, compared to the six-factor model of the original scale. In terms of convergent validity, their results were satisfactory: the total score of their EPS showed significant correlations with the Toronto Alexithymia Scale (TAS-20) and the Hospital Anxiety and Depression Scale (HADS), with coefficients of 0.50 and 0.55, respectively. Similarly, in our study, the Emotional Processing Scale demonstrated strong predictive power for both anxiety and depression. These findings suggest that our results align well with similar research, thereby supporting the validity and reliability of our methodology and outcomes. However, like any other study, this research has limitations, including being conducted in a specific cultural and social context, focusing on a single psychosomatic disorder (IBS), and having a limited sample size, and convergent and divergent validity, as well as test-retest reliability, were not assessed. These limitations restrict the generalizability of the findings to other populations and sociocultural contexts. Future research should examine the psychometric properties of this questionnaire with larger sample sizes, including individuals with other somatic symptom disorders or psychosomatic diseases, in addition to the general population. Owing to budgetary and temporal constraints, this research was not able to fully evaluate all reliability and validity measures. Nevertheless, it is recommended that future studies undertake a more comprehensive assessment.

## Conclusion

The present study found that the 23-item, four-factor Emotional Processing Questionnaire (EPQ-23) demonstrated satisfactory psychometric properties. The EPQ-23 exhibited strong construct, criterion, and predictive validity. Its high internal consistency ensured reliable and stable results over time. The EPQ-23 can be used to assess various dimensions of emotional processing in both patients with irritable bowel syndrome and in the general population.

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**Conflict of Interest**

The authors declare no conflict of interest.

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**Ethical Considerations**

This research was approved by research ethics committee of University of Isfahan. All ethical principles, including providing participants with informed consent, obtaining written consent forms, maintaining the confidentiality of individuals' information, and allowing participants to withdraw from the study at any stage, were strictly adhered to.

**Code of Ethics**

IR.UI.REC.1402.086

**Authors` Contributions**

Shirin Irani and Nahid Akrami wrote the manuscript, Shirin Irani and Iraj Kazemi did statistical analysis and validation process, Shirin Irani and Zohre Moosavi revised and edited the whole article and Zahra Izadikhah checked and approved the final draft.

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