



Assessment of the Emotional Reactivity Through the Positive and Negative Emotions: The Psychometric Properties of the Persian Version of the Perth Emotional Reactivity Scale

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Abstract

Background: Emotional reactivity is a key construct for understanding psychopathology. Examining the psychometric properties of the instruments in societies with different cultures can help with their external validity.

Objectives: The current study aimed at standardization and validation of the Perth emotional reactivity scale (PERS) in Iranian university students.

Methods: The Persian version of the PERS was produced through forward translation, reconciliation, and back-translation. A total of 302 (169 males and 133 females) nonclinical students were selected by convenience sampling method, and completed a set of questionnaires, including the PERS, weight efficacy lifestyle questionnaire-short form (WEL-SF), eating attitude test-16 (EAT-16), self-esteem scale (SES), difficulties in emotion regulation scale-16 (DERS-16), and self-compassion scale (SCS) short-form. The construct validity of the PERS was assessed using confirmatory factor analysis and divergent and convergent validity. Internal consistency and test-retest reliability (a 2-weeks interval) were used to evaluate the reliability. Data analysis was performed using LISREL (version 8.8) and SSPS (version 22) software.

Results: All PERS scales and subscales were found with good internal consistency and test-retest reliability in a nonclinical population. The convergent validity and divergent validity were also found good. The results of this study provides the support for the applicability of the six-factor (RMSEA = 0.06, NFI = 0.94, NNFI = 0.96, and CFI = 0.97) and two-factor (RMSEA = 0.07, NFI = 0.94, NNFI = 0.96, and CFI = 0.96) models of the PERS.

Conclusions: The PERS showed good validity and reliability and can be useful in assessing emotional reactivity in the Iranian population. The PERS can be promising as a measure to use in emotional-based studies and clinical settings.

Keywords: Emotional Reactivity, Psychometric Properties, Scale, Confirmatory Factor Analysis

1. Background

Emotional regulation is considered as a core process in psychopathological research and treatment (1). Several studies have confirmed the fact that week emotional regulation causes psychopathological symptoms (2). As shown in various studies, deficits in emotion regulation are related to psychopathological and several mental health problems (3, 4).

Emotions are either positive (like happiness) or negative (like sadness), and surface acting as a response through three emotional channels, namely experiential

(feelings of anger), physiological (increased heartbeat), and behavioral (trying to escape) (5). Some researchers believe that people vary according to their emotional response span (6-8), which is based on (1) how simple it is to activate emotional responses in them, (2) the intensity of emotional responses or the peak amplitude of arousal, and (3) the duration of emotional response or how long it takes the arousal levels to be back to baseline. These three dimensions of emotional responses (activation, intensity, and duration) are normally conceptualized together as the construct of emotional reactivity (7, 9). Emotional reactiv-

ity is the intensity, duration, and expansion of emotional experience (10). Emotional reactivity is an important construct, and some pathological models consider abnormal levels of reactivity as the trigger for the transdiagnostic risk factor (3-11).

People with high levels of emotional reactivity find it more difficult to regulate emotions, and the psychopathological risk in those with insufficient emotional regulation skills is higher (12, 13). Consequently, psychotherapy approaches are mostly in line with trying to normalize the emotional reactivity levels through the instruction of emotional regulation skills (11, 14). Although a major part of the research literature has focused on the key role of emotional regulation in psychopathology (15), very few have investigated the emotional reactivity and its characteristics. However, emotional reactivity is the main proportion of emotional experience (16) and similar to emotional regulation; it is the key construct in understanding pathology (17). The troublesome levels of emotional reactivity are proved to play a significant role in causing and maintaining certain scopes of psychological disorders (8, 18, 19).

Thus, evaluating emotional reactivity is of utmost importance. In experimental environments, emotional reactivity is evaluated through psychophysiological instruments (20), but such methods are quite impractical for clinical or research goals (6). Several self-report instruments have been developed (10, 21-23). Although such instruments mostly have limitations in evaluating the emotional reactivity (9), the Perth emotional reactivity scale (PERS) is the most comprehensive instrument to assess emotional reactivity (9). To the best of the researchers' knowledge, psychometric characteristics of the PERS have only been investigated once in a study by Becerra et al. (6).

The psychometric properties, as well as its six-factor and two-factor structure, have been investigated and approved previously (6). To expand the studies and evaluate the effective treatments on emotional reactivity, having valid and reliable instruments of great importance. In societies with individualistic cultures, emotional reactivity has been normed, and also its relationship with the susceptibility to psychological problems has been investigated. Considering the psychometric characteristics of this scale in societies with different cultural patterns can surely improve the scale's external validity (24).

2. Objectives

Due to the psychological consequences of emotional reactivity, the absence of a valid and reliable Persian scale, and the importance of such scale in clinical research and therapeutic purposes, the present study aimed at investi-

gating the psychometric characteristics of the Persian version of the PERS.

3. Methods

3.1. Participants and Sampling

The present psychometric study was conducted on the undergraduate students of Tehran University studying in the academic year 2018 - 2019. The sample size needed for confirmatory factor analysis is about 200 samples (25). Applying the convenience sampling method, 340 nonclinical students were recruited. We excluded 38 students who did not completely answer the scales. The subjects aged between 19 and 46 years, having enough knowledge about the Persian language and were willing to complete the self-report measures. The participants were assured of the possibility of withdrawal from the study at any time and voluntary participation. The participants' demographic information was collected, and they completed a package of questionnaires. The inclusion criteria were being university students and the minimum age of 18 years, whereas those with malignant disease were excluded. This study was approved by the Ethics Committee of Iran University of Medical Sciences (approval code: IR.IUMS.REC 1396.9421521003).

3.2. Measures

The Persian version of the PERS: The PERS is a 30-item questionnaire that measures three aspects of emotional reactivity (duration, activation, and intensity), and assesses them separately for positive and negative emotional reactivity. The PERS consists of six subscales of five items each: positive-activation, positive-duration, positive-intensity, negative-activation, negative-duration, and negative-intensity. It is scored on a five-point Likert scale ranging from 1 (very unlike me) to 5 (very like me). The total score of six distinct subscales is acquired by summing the five items that match to that subscale. Therefore, the minimum and maximum scores for each subscale are 5 and 25. Three subscales of each dimension can be combined into a general negative reactivity scale or general positive reactivity scale score. Positive and negative reactivity scale scores are ranged from 15 to 75. Higher scores in each dimension indicate higher levels of emotional reactivity (6). It is meaningless to calculate an overall reactivity score by combining the general positive and negative reactivity scale scores. The internal consistency of the general positive and negative reactivity scales was good (6).

The comparability of the Persian version of the PERS and the original PERS has been validated by exact translation and back-translation methods. The PERS was first

translated into Persian independently by four clinical psychologists with a Ph.D. degree. Next, the Persian PERS was back-translated by a Persian-English bilingual individual to validate the translation, and the back-translated version was reviewed by another bilingual one. The ultimate version of the Persian PERS was also compared to the original version by two bilingual clinical psychologists.

Self-Compassion Scale (SCS) Short-Form: This scale includes 12 items. Participants need to rate their agreement on a five-point Likert scale from 1 (nearly never) to 5 (nearly always). The short-form SCS was correlated with its long-form ($r = 0.97$), and its test-retest reliability was reported as 0.92 (26). The results of the psychometric properties of this scale in the Iranian population support the three-factor structure of self-compassion in a nonclinical sample, with Cronbach's alpha of 0.78 (27).

Self-Esteem scale (SES): The SES contains 10 items that assess global self-worth by measuring both negative and positive feelings about the self. It is scored on a four-point scale, from "strongly agree" to "strongly disagree." SES is scored by direct and reverse scoring. It has shown optimal psychometric properties (28).

Weight Efficacy Lifestyle Questionnaire-Short Form (WEL-SF): The WEL-SF is an 8-item questionnaire that measures an individual's perceived ability to control weight by resisting eating when confronted with negative emotions, availability of food, social pressure to eat, physical discomfort, and/or positive activities. The items are rated from 0 (not confident) to 10 (very confident). Therefore, the total score is ranged from zero to 80. Higher scores indicate higher self-efficacy (29). It has shown good psychometric properties in the Iranian population (30).

Difficulties in Emotion Regulation Scale-16 (DERS-16): The DERS-16 is a 16-item questionnaire that measures global difficulties in emotion regulation. It is scored on a five-point Likert scale from 1 (almost never) to 5 (almost always). Respondents rate the extent to which each item applies to them. Its total score can range from 16 to 80, with higher scores reflecting greater levels of emotion dysregulation. The DERS-16 has shown good internal consistency (Cronbach's $\alpha = 0.74$) (31). It also had good psychometric properties in the Iranian population (32).

Eating Attitude Test-16 (EAT-16): The EAT-16 is a short-form version of the EAT-26. The EAT-16 is a 16-item questionnaire that assesses eating thoughts and behaviors with simple statements and is scored on a six-point Likert scale from "Never" (1) to "Always" (6) (33). The EAT-16 has shown with good psychometric properties (33).

3.3. Statistical Analysis

Data analysis was performed using the Statistical Package for the Social Sciences Statistics V. 22.0 (34). Test-retest

reliability, internal consistency, convergent validity, and divergent validity of the Persian version of the PERS were analyzed. Internal consistency was calculated using Cronbach's alpha. A Cronbach's alpha value between .70 and .95 demonstrates good internal consistency (35). Test-retest reliability was measured with the intraclass correlations coefficient (ICC). An $ICC \geq 0.70$ indicates the acceptable reproducibility of a measure (35). Divergent validity and convergent validity were assessed with Pearson correlations. All reported significance values were two-tailed, and P values less than 0.05 were considered significant.

The construct validity of the PERS was evaluated using structural equation modeling (SEM). The six-factor and two-factor structure of the PERS, as suggested in the original version, was tested using the LISREL software (version 8.8). The model parameters were calculated using maximum likelihood. Confirmatory factor analysis indicators are more accurate when the sample is larger than 250 (36). The evaluation of a model is based on several fit indices. The normal chi-square should be less than three for an appropriate model (36). The root mean square error of approximation (RMSEA) should be less than 0.08 for an appropriate fit (36). The comparative fit index (CFI) ranges from 0 - 1, with the values of 0.90 or greater indicating a good fit (25, 36).

Normed fit index (NFI) ≥ 0.90 is indicative of a good model fit (25). Also, the non-normed fit index (NNFI) or TLI ≥ 0.90 represents good model fit (36). The standardized root mean square residual (SRMR) ranges from 0 - 1, and the values of 0.08 or less are desired (25, 36). Incremental fit index (IFI) also should be equal to or greater than 0.90 to accept the model (25). The goodness of fit index (GFI) and adjusted goodness of fit index (AGFI) that adjust for several parameters were also estimated, ranging from 0 - 1, with the values of 0.90 or greater indicating the good model fit (37).

4. Results

4.1. Description of the Sample

This study was performed on 302 university students, including 169 male (56%) and 133 female (44%) students with the age range of 19 - 46 years. The mean and standard deviation of the PERS subscales are shown in Table 1.

4.2. Internal Consistency

Cronbach's alpha of the PERS subscales was calculated (Table 2). The PERS subscales were found to have good internal consistency with Cronbach's alpha values of 0.87, 0.92, 0.77, 0.84, 0.73, 0.83, 0.81, and 0.83 for general positive reactivity, general negative reactivity, positive-activation,

Table 1. Mean and Standard Deviation of the Perth Emotional Reactivity Scale (PERS) Subscales in Female and Male Students

| Gender | No. | Mean | SD |
|----------------------------|-----|-------|-------|
| Positive reactivity | | | |
| Female | 133 | 50.44 | 11.06 |
| Male | 169 | 49.74 | 10.36 |
| Negative reactivity | | | |
| Female | 133 | 47.95 | 12.91 |
| Male | 169 | 49.04 | 14.08 |
| Positive-activation | | | |
| Female | 133 | 16.46 | 4.05 |
| Male | 169 | 16.43 | 3.90 |
| Negative-activation | | | |
| Female | 133 | 15.82 | 4.97 |
| Male | 169 | 15.81 | 5.04 |
| Positive-intensity | | | |
| Female | 133 | 16.45 | 4.20 |
| Male | 169 | 16.36 | 4.18 |
| Negative-intensity | | | |
| Female | 133 | 16.17 | 4.58 |
| Male | 169 | 16.94 | 4.75 |
| Positive-duration | | | |
| Female | 133 | 17.52 | 3.81 |
| Male | 169 | 16.95 | 3.64 |
| Negative-duration | | | |
| Female | 133 | 15.95 | 4.43 |
| Male | 169 | 16.28 | 5.11 |

negative-activation, positive-duration, negative-duration, positive-intensity, and negative-intensity subscales, respectively.

Table 2. Internal Consistency (Cronbach's Alpha Coefficients) for the Perth Emotional Reactivity Scale (PERS) Subscales Test-Retest Reliability

| | Number of Items | Cronbach's Alpha |
|---------------------|-----------------|------------------|
| Positive-reactivity | 15 | 0.87 |
| Negative-reactivity | 15 | 0.92 |
| Positive-activation | 5 | 0.77 |
| Negative-activation | 5 | 0.84 |
| Positive-duration | 5 | 0.73 |
| Negative-duration | 5 | 0.83 |
| Positive-intensity | 5 | 0.81 |
| Negative-intensity | 5 | 0.83 |

Test-retest reliability was calculated for general posi-

tive reactivity, general negative reactivity, and the six subscales of PERS on a sample of 31 university participants who completed the PERS for the second time after two weeks. The results showed good test-retest reliability across PERS subscales with significant ICC between time points 1 and 2 scores ($ICC > 0.8, P < 0.001$) (Table 3).

4.3. Convergent and Divergent Validity of the PERS

The convergent validity of the PERS was investigated by examining the relationship between PERS subscales and the scores on self-report measures of the EAT-16 and DERS-16. The results demonstrated an expected relationship between the PERS subscales and EAT-16 and DERS-16. To evaluate the divergent validity of the PERS subscales, we examined the association between the PERS subscales and three theoretically less related constructs, including self-compassion, self-esteem, and self-efficacy. As expected, we found the expected relationship between PERS subscales and these three constructs (Table 4).

4.4. Confirmatory Factor Analysis (CFA)

To assess the construct validity of the PERS and determine the fit of the factor and subscales structure, CFA, as described by Becerra et al. was performed (6). Based on the results of the PERS, the six-factor and two-factor models were tested. According to the results of fit indices for six-factor and two-factor models, the six-factor and two-factor models fitted the data well. The results indicated a good fit (Table 5).

5. Discussion

The present study aimed at assessing the psychometric properties of the Persian version of the PERS in a nonclinical population of students. The findings showed that six subscales of positive-activation, positive-duration, positive-intensity, negative-activation, negative-duration, and negative-intensity had an acceptable GFI.

The six-factor model provided a good fit to the data according to all fit indices. These results are also consistent with the examination of the factor structure of the PERS in a nonclinical sample (6). Also, they are consistent with the current theoretical conceptualizations of the emotional reactivity construct (7). Also, the results showed that the two factors of general positive reactivity and general negative reactivity had an acceptable GFI. In line with Becerra et al. (6) research, our study distinguished between positive and negative reactivity. General positive reactivity and general negative reactivity were also negatively correlated (6). This shows that the levels of emotional reactivity can

Table 3. Mean (Standard Deviation) and Test-Retest Reliability for the PERS Subscales

| | Time-Point 1 | Time-Point 2 | ICC | P Value |
|---------------------|---------------|---------------|------|---------|
| Positive reactivity | 53.87 (8.23) | 53.22 (9.61) | 0.86 | < 0.001 |
| Negative reactivity | 44.12 (11.06) | 45.06 (11.44) | 0.93 | < 0.001 |
| Positive-activation | 17.83 (3.13) | 17.77 (3.41) | 0.87 | < 0.001 |
| Negative-activation | 14.06 (3.89) | 15.06 (4.47) | 0.92 | < 0.001 |
| Positive-duration | 18.09 (2.98) | 17.58 (3.38) | 0.84 | < 0.001 |
| Negative -duration | 14.61 (4.12) | 14.70 (3.98) | 0.93 | < 0.001 |
| Positive-intensity | 17.93 (3.26) | 17.87 (3.69) | 0.87 | < 0.001 |
| Negative-intensity | 15.45 (4.04) | 8.06 (2.92) | 0.83 | < 0.001 |

Abbreviations: ICC, intraclass correlation coefficient; PERS, Perth emotional reactivity scale.

Table 4. Convergent and Divergent Validity of the PERS

| Scale | P-R | N-R | P-act | N-act | P-dur | N-dur | P-int | N-int |
|-----------------|--------------------|--------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| EAT-16 | -0.08 | 0.45 ^b | -0.03 | 0.46 ^b | -0.08 | 0.43 ^b | -0.09 | 0.36 ^b |
| DERS-16 | -0.12 ^a | 0.44 ^b | -0.05 | 0.45 ^b | -0.12 ^a | 0.40 ^b | -0.15 ^b | 0.40 ^b |
| Self-compassion | 0.39 ^b | -0.70 ^b | 0.35 ^b | -0.68 ^b | 0.31 ^b | -0.67 ^b | 0.41 ^b | -0.62 ^b |
| Self-esteem | 0.36 ^b | -0.68 ^b | 0.29 ^b | -0.69 ^b | 0.30 ^b | -0.62 ^b | 0.40 ^b | -0.58 ^b |
| WEL-SF | 0.12 ^a | -0.50 ^b | 0.09 | -0.51 ^b | 0.09 | -0.47 ^b | 0.16 ^b | -0.43 ^b |

Abbreviations: DERS-16, difficulties in emotion regulation scale; EAT-16, eating attitudes test; N-act, negative-activation; N-dur, negative -duration; N-int, negative-intensity; N-R, negative reactivity; P-act, positive-activation; p-dur, positive-duration; PERS, Perth emotional reactivity scale; P-int, positive-intensity; P-R, positive reactivity; SCS, self-compassion scale (short-form); Self-esteem scale; WEL-SF, weight efficacy and lifestyle questionnaire (short-form).

^aCorrelation is significant at 0.05 level.

^bCorrelation is significant at 0.01 level.

Table 5. The Goodness of Fit Indices for Six-Factor and Two-Factor Models of the Perth Emotional Reactivity Scale (PERS)

| Model | χ^2 | df | P value | χ^2/df | RMSEA | IFI | CFI | SRMR | NNFI (TLI) | NFI | Gfi | RFI | AGFI |
|------------|----------|-----|---------|-------------|-------|------|------|------|------------|------|------|------|------|
| Six-factor | 947.78 | 390 | 0.001 | 2.43 | 0.06 | 0.97 | 0.97 | 0.07 | 0.96 | 0.94 | 0.83 | 0.93 | 0.79 |
| Two-factor | 1058.04 | 404 | 0.001 | 2.61 | 0.07 | 0.96 | 0.96 | 0.07 | 0.96 | 0.94 | 0.81 | 0.93 | 0.78 |

be differed dramatically based on the valence of the emotion. The results of our research were consistent with those reported by Becerra et al. (6). However, our results are in contrast to the studies, in which emotional reactivity was considered as a more general nonvalenced term (10, 38). To explain the results, emotional responses are several related, but separable stages. Individuals can differ in duration, intensity, and activation. Besides, considering the importance of a separate evaluation of activation, duration, and intensity, it has shown that two individuals can show similar patterns regarding reactivity in one facet (e.g., intensity); however, they can differ significantly in another (39). The assessment of emotional reactivity must specify the valence of the emotion, as the last research proposed that people's typical experience of emotions can vary substantially based on whether the stimuli are negatively or positively valenced (40). Our research recognized the ne-

cessity of assessing negative and positive reactivity separately. Based on our findings, the general negative reactivity scale and general positive reactivity scale demonstrated separate latent structures.

The PERS demonstrated high internal consistency, which is comparable with the results of Becerra et al. research (6). The six subscales and the two broader scales all demonstrated good to excellent levels of internal consistency, which is consistent with Becerra et al. reports (6). Test-retest reliability over two weeks with a sample of 31 university students yielded a significant ICC for the PERS subscales. The EAT-16 and DERS-16 were used to evaluate convergent validities of the PERS. The results demonstrated that general positive reactivity, positive-activation, positive-duration, and positive-intensity had a negative correlation with EAT-16 (41, 42), and also general negative reactivity, negative-activation, negative-duration,

and negative-intensity had a positive and significant correlation with EAT-16 (10, 43, 44). The findings showed a negative correlation between general positive reactivity, positive-duration, positive-activation, and positive-intensity, and DERS-16. Also, general negative reactivity, negative-activation, negative-duration, and negative-intensity had a positive and significant correlation with DERS-16 (6, 12, 13). The results showed that general positive reactivity, positive-duration, positive-activation, and positive-intensity had a positive and significant correlation with self-compassion, self-esteem, and eating self-efficacy. Based on the results, general negative reactivity, negative-duration, negative-activation, and negative-intensity showed a negative and significant correlation with self-compassion (45, 46), self-esteem (47, 48) and eating self-efficacy (49, 50). High negative reactivity and low positive reactivity are associated with psychopathology (6).

The results of the CFA supported the applicability of the six-factor and two-factor models in an Iranian sample.

It should be noted that this research had also some limitations. First, all evaluated instruments in this study were self-report questionnaires. Therefore, correlations could have been inflated by common method variance. Second, emotional reactivity was just measured by self-report and was not approved by other tools. It is recommended to examine whether the PERS also correlates coherently with laboratory measures of emotional reactivity in future studies. Third, the sample of this study was limited to the subjects with specific demographic characteristics. They were all university students and were mostly single, young, well-educated, and male. This may lead to an obstacle for generalizing the results to the general population. The sample was not diverse enough to be considered as a normative reference in clinical decision making.

Further studies are needed to confirm the validity of the PERS across different populations. Also, in the present study, a short period of time and a small sample size were used for test-retest reliability. Therefore, a longer period of time and greater sample sizes should be regarded in the next studies to assess test-retest reliability. The psychometric properties of emotional reactivity should be assessed in other communities and related samples.

5.1. Conclusions

The Persian version of the PERS showed good and reliable validity to measure emotional reactivity in a nonclinical sample. Also, this study confirmed the results of studies conducted on the cross-cultural validity of this measure, providing more support for the generalizability of the relationship between emotional reactivity and some previously studied psychopathologies. The results of this ap-

proved the results of studies on the relevance of the emotional reactivity measured by the PERS. The PERS seems promising as a measure to be used in emotional studies and clinical practice. It is recommended to use of the PERS in other relevant future studies.

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Footnotes

Authors' Contribution: Esmail Mousavi Asl, Youkhabe Mohammadian, Banafsheh Gharraee, and Sajad Khanjani contributed to the research conception, conducted the study, revised the draft, and agreed for all aspects of the study. Abdolreza Pazouki contributed to the revising of the draft, approval of the final version of the manuscript, and agreed for all aspects of the research.

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Ethical Approval: The subjects were assured of the possibility of withdrawal from the study at any time and voluntary participation. The participants' demographic information was collected and they completed a package of questionnaires. This study was approved by the Ethics Committee of Iran University of Medical Sciences (approval code: IR.IUMS.Rec 1396.9421521003).

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Patient Consent: The participants' were assured of voluntary participation in this study. The participants' demographic information was collected and they completed a package of questionnaires.

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