

# Research Paper:

## Evaluating the Psychometric Properties of Emotion Reactivity Scale in Iranian Adolescents: Relation to Nonsuicidal Self-Injury



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## ABSTRACT

**Background:** Emotional reactivity is important in the development and maintenance of psychopathology, including Nonsuicidal Self-Injury (NSSI), Emotion Reactivity Scale (ERS) is a self-report measure to assess this concept.

**Objectives:** The present study aimed to evaluate the psychometric properties of ERS in Iranian adolescents. We also compared the emotional reactivity in adolescents with and without NSSI.

**Materials and Methods:** The study samples consisted of 646 high school students with the Mean±SD age of 16.55±0.71 years. The data were gathered using ERS, Depression Anxiety Stress Scales (DASS), and Functional Assessment of Self-Mutilation (FASM). The collected data were analyzed using factor analysis, Pearson's correlation coefficient, and analysis of variance. Cronbach's alpha coefficient was also calculated as a measure of internal consistency.

**Results:** The 21-item ERS demonstrated strong internal consistency ( $\alpha=0.92$ ), and factor analysis supported the single factor structure of ERS. With regard to convergent validity, the ERS indicated positive correlations of medium to large magnitudes with the measures of depression, anxiety, and stress, ranging from 0.45 to 0.62. The study participants with a history of NSSI reported significantly higher emotion reactivity, compared to those without such condition.

**Conclusion:** This investigation suggested that the Persian version of ERS is a reliable and valid tool for measuring emotional reactivity in nonclinical Iranian adolescents.

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## 1. Introduction

**E**motion reactivity refers to the extent that emotion may be intensely experienced (i.e. emotion intensity), the period of time before arousal level returns to baseline (i.e. emotion persistence), and the stimulus range that trigger response (i.e. emotion sensitivity) [1]. There is a close connection between emotional reactivity and emotion regulation; more intense emotions are likely to be harder to regulate and poorer regulation skills and failure in emotional regulation are likely to result in more intense and persistent emotional responses [2-4].

A large body of literature has considered the role of emotion regulation in the development and maintenance of psychopathology [5]; however, limited studies have specifically focused on emotional reactivity. Some research has studied emotion reactivity as a component of temperament and personality [6-9]; however, temperament is a distinct and much broader component which encompasses the emotional reactivity [1]. This trend is unfortunate, as emotional reactivity may help explain why or how psychopathology is developed and maintained [1]. For instance, studies have revealed a relationship between emotional reactivity and engaging in Nonsuicidal Self-Injury (NSSI) [1, 10-13].

NSSI indicates intentional self-injuries, such as cutting, burning, biting oneself, etc. for motivations other than to die; it is socially unacceptable [14]. Adolescents are the most vulnerable group for NSSI; in a meta-analysis NSSI prevalence rate was reported equal to 17.2% among nonclinical adolescent samples [15]. Gholamrezaei et al. reported a lifetime prevalence rate of 21.3% in Iranian university students; the majority of them were engaged in NSSI from adolescence [16]. This prevalent behavior can result in serious physical consequences, such as physical injury, infectious diseases, medical complications, and sudden death [17-19]. Moreover, it leads to emotional distress [18, 19] and impairments in academic performance [17, 20], and is a potent predictor of suicidal attempts [21, 22].

Because of some problems underlying the assessment of emotional reactivity, this important construct has received little attention [23]. Nock et al. developed the Emotional Reactivity Scale (ERS) in response to the lack of specificity of previous measures (e.g. EATQ, BIS/BAS) or the narrow focus of some of them (e.g. AIM, EIS; focusing exclusively on the intensity of emotions). ERS-a self-report instrument-was designed to assess

three aspects of emotion reactivity, including intensity, persistence, and sensitivity [1].

Nock et al., and Claes et al. reported emotion reactivity was best conceptualized as a single factor construct; moreover, it demonstrated a strong internal consistency. These studies supported the construct validity of ERS [1, 13]. The present study evaluated the psychometric properties of the Persian version of ERS. Additionally, we compared the emotional reactivity in Iranian adolescents with and without a history of NSSI.

## 2. Materials and Methods

A total of 646 students from 12 high schools in different regions of Tehran City, Iran (north, south, west, and east), participated in the present study. Inclusion criteria included the provision of informed consent. Each subject was requested to complete FASM, ERS, and DASS-12. Incomplete questionnaires were excluded from the study analysis. All the obtained personal information was kept confidential.

The sample size was calculated based on 3 to 15 subjects for each item [24] of ERS. We separately calculated the required sample size for Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The following instruments were applied in the current study:

### Emotion Reactivity Scale (ERS)

The ERS is a self-report measure designed by Nock et al. to assess emotion reactivity. It consists of 21 items that assesses emotion sensitivity (items 3, 4, 6, 17, 19, 20, 21), intensity (items 2, 5, 7, 9, 12, 13, 14, 15, 16, 18), and persistence (items 1, 8, 10, 11). Each item is rated on a 5-point Likert-Type Scale ranging from 0 (=does not describe me at all) to 4 (=describes me completely) [1]. In the study by Nock et al. the internal consistency of the 21-item ERS was reported as 0.94. Although Exploratory Factor Analysis (EFA) and reliability analysis supported a single factor structure for the ERS, the authors reported acceptable internal consistency coefficients for the three hypothesized factors of emotion, ranging from 0.81 (persistence) to 0.88 (sensitivity) [1].

### Depression Anxiety Stress Scale-12 (DASS-12)

The DASS is a 12-item measure that assesses anxiety, depression, and stress. Items are rated on a 4-point Likert-type scale (0-3) [25]. Responses to the DASS-12 have demonstrated good reliability and validity in high school students [26].

### Functional Assessment of Self-Mutilation (FASM)

This instrument was designed by Lloyd et al. to assess frequency, functions, and the other characteristics of Self-Mutilation Behavior (SMB), including the degree of physical pain, the duration of time being preoccupied before engaging in SMB, and the abuse of alcohol or drugs during self-injury [27]. The FASM consists of two sections; the first section is a checklist of 11 self-injury behaviors (cutting the skin, burning the skin, self-biting, scratching the skin, inserting objects to the nail or skin, self-punching, picking at the wound, pulling hair, erasing the skin, and self-tattooing). We deleted self-tattooing as a NSSI behavior because many Iranian adolescents are getting fashionable tattoos. Moreover, the item ‘picked at a wound’ may be a clinically insignificant behavior among adolescent participants [28]; therefore, we conservatively eliminated those who only endorsed this item, from further analyses.

In the second section, 22 items inquire about the reasons that one engaged in self-injury. The items are rated on a 4-point Likert-Type Scale, ranging from 0 “never”, 1 “rarely”, 2 “some”, to 3 “often” [27]. In the present study, we only used the first section of FASM. To investigate the internal consistency, Cronbach’s alpha coefficient and split-half reliability for the total scale were calculated. To determine the convergent validity of ERS, Pearson’s correlation coefficient was calculated between the ERS total score and DASS-12. EFA and CFA were then conducted to examine the factorial structure of ERS. Before conducting EFA, the sample was randomly split into two halves. The EFA and CFA were performed with the first and second halves of the samples, respectively.

Model fit was evaluated using multiple indices of fit, including Chi-Squared Test ( $\chi^2$ ), Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), Incremental Fit Index (IFI), and the Non-Normed

Fit Index (NNFI). Acceptance of models was based on the following criteria: NNFI>0.90, CFI>0.90, RMSEA<0.06, and IFI>0.90 [29, 30].

Increased emotional reactivity has been proposed as the main component in some psychological disorders, including NSSI [1]; thus, the ERS scores should differ in the presence versus absence of NSSI (i.e. criterion validity). A univariate Analysis of Variance (ANOVA) was conducted to compare individuals with a history of NSSI and those without such history in the ERS total score. Statistical analyses were performed using SPSS.

### 3. Results

The Mean±SD age of study participants was 16.55±0.71 (range: 15-18) years. The participants’ gender and academic major are presented in Table 1. The internal consistency reliability of the 21-item ERS was obtained as 0.92. Cronbach’s  $\alpha$  coefficients for part 1 and part 2 of the test were 0.84 and 0.88, respectively. The correlation between the two parts of the test was equal to 0.80.

To explore the factor structure of ERS, an EFA (with the principal component method of extraction and Varimax rotation) was performed on the first half of the samples. The results of KMO (=0.91) and Bartlett’s Test of Sphericity ( $\chi^2=2.71$ ;  $df=210$ ;  $P<0.001$ ) revealed the factorability of the collected data (Table 2). Twenty-one items loaded significantly on a single factor. The obtained factor loadings are presented in Table 3.

The single factor model emerged from EFA, and the 3-factor model suggested by Nock et al. [1] were compared on goodness-of-fit to check whether we could replicate the one-and three-factor solution of Nock et al. [1]. The single factor and 3-factor models explained 37% and 51.94% of the total variance, respectively. A

Table 1. The participants’ gender and academic major

| Variable       | No. (%)               |                          |                             |
|----------------|-----------------------|--------------------------|-----------------------------|
|                | Total (N=646)         | With Self-Injury (n=178) | Without Self-Injury (n=468) |
| Gender         | Male                  | 294(45.51)               | 218(46.58)                  |
|                | Female                | 352(54.48)               | 250(53.41)                  |
| Academic major | Mathematics           | 198(30.1)                | 161(34.4)                   |
|                | Human sciences        | 253(40.0)                | 161(34.4)                   |
|                | Experimental sciences | 181(28.6)                | 140(29.91)                  |

**Table 2.** KMO and Bartlett's Test results

| Tests   | Results  |
|---|--|
| Kaiser-Meyer-Olkin Measure of sampling adequacy | 0.91   |
| Bartlett's test of Sphericity                   | Chi-Squared ( $\chi^2$ )=2.71<br>df=210<br>P<0.001 |

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summary of the CFA results for the two models is presented in Table 4. The obtained data revealed that both models had relatively acceptable model fit; however, some criteria suggested that a single factor of emotion reactivity best represented the data, as follows: the first factor accounted for 37% of the total variance in scores,

the correlation between factors was high, and all items had loadings of  $\geq 0.47$  in the single factor model.

We tested the convergent validity of ERS by examining the correlation between this measure and DASS-12. The ERS suggested the positive correlation of large magni-

**Table 3.** Standardized factor loadings of ERS items

| Number | Item  | Factor Loading |
|--------|---|----------------|
| 14     | I am easily agitated.   | 0.74           |
| 21     | Other people tell me I'm overreacting.  | 0.68           |
| 16     | When something bad occurs, my mood changes very quickly. People tell me I have a very short fuse. | 0.67           |
| 13     | I am often bothered by things that other people don't react to.                                   | 0.66           |
| 12     | I get angry at people very easily.  | 0.66           |
| 17     | People tell me that my emotions are often too intense for the situation.                          | 0.66           |
| 15     | My emotions go from neutral to extreme in an instant.   | 0.66           |
| 5      | I tend to get very emotional very easily.   | 0.65           |
| 20     | I often get so upset it's hard for me to think straight.  | 0.63           |
| 3      | When I experience emotions, I feel them very strongly/intensely.                                  | 0.62           |
| 4      | When I'm emotionally upset, my whole body gets physically upset, as well.                         | 0.62           |
| 19     | My moods are very strong and powerful.  | 0.61           |
| 11     | When I am angry/upset, it takes me much longer than most people to calm down.                     | 0.61           |
| 9      | Even the littlest things make me emotional.   | 0.58           |
| 1      | When something occurs that upsets me, it's all I can think about for a long time.                 | 0.53           |
| 2      | My feelings get hurt, easily.   | 0.53           |
| 8      | When I feel emotional, it's hard for me to imagine feeling any other way.                         | 0.53           |
| 6      | I experience emotions very strongly.  | 0.53           |
| 18     | I am a very sensitive person.   | 0.53           |
| 7      | I often feel extremely anxious.   | 0.51           |
| 10     | If I have a disagreement with someone, it takes me so long to get over it.                        | 0.47           |

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**Table 4.** Summary of the CFA results of the two models of ERS

| Model    | $\chi^2$ | CFI  | NFI  | NNFI | GFI  | IFI  | RMSEA (90% CI*) |
|----------|----------|------|------|------|------|------|-----------------|
| 1-Factor | 911.31   | 0.95 | 0.93 | 0.94 | 0.80 | 0.95 | 0.01            |
| 3-Factor | 888.83   | 0.95 | 0.93 | 0.94 | 0.80 | 0.95 | 0.01            |

\* Confidence interval

**Table 5.** Comparison of the emotional reactivity in individuals with and without NSSI

| Variable             | Mean±SD     |              | F <sub>1,644</sub> | P      |
|----------------------|-------------|--------------|--------------------|--------|
|                      | With NSSI   | Without NSSI |                    |        |
| Emotional reactivity | 62.63±16.64 | 49.98±15.8   | 80.17              | <0.001 |

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tude with the total score of DASS-12 ( $r=0.62$ ;  $P<0.001$ ). Correlations between the ERS and DASS-depression, DASS-anxiety, and DASS-stress were of medium to large magnitudes (0.45, 0.47, and 0.62 respectively;  $P<0.001$ ). A univariate ANOVA was conducted to compare emotional reactivity between individuals with and without NSSI. As per Table 5, the study participants with a history of engaging in NSSI reported significantly higher emotion reactivity than those without such history. ( $F_{1, 644}=80.17$ ,  $P<0.001$ ).

#### 4. Discussion

The present study evaluated the psychometric properties of the Persian version of ERS in Iranians high school students. With regard to the internal consistency, this measure indicated excellent internal consistency. This finding is consistent with the studies by Nock et al., Secer et al. and Claes et al. who reported strong internal consistency for ERS [1, 13, 31].

We also observed that ERS possess a unidimensional factor structure. In two previous investigations [1, 13], also, a single factor of emotion reactivity provided the best fit to data. However, Secer et al. argued that a three-factor model best characterized the data [31]. The current study supported the convergent validity of ERS; emotional reactivity positively correlated with the measures of depression, anxiety, and stress. In line with our results, Nock et al. found significantly higher emotion reactivity in adolescents with mood or anxiety disorders, compared to those without such disorders [1].

This finding highlights the relation between emotion reactivity and emotional regulation and replicates the

results of previous studies that elevations in emotion can increase the likelihood of psychopathology [32, 33].

Along with Nock et al. and Claes et al. the construct validity of ERS supported by demonstrating that scores on the ERS differ in the presence of NSSI versus absence of this condition (i.e. criterion validity). The study participants with a history of NSSI reported significantly higher emotion reactivity, compared to those without a history of NSSI [1, 13].

One explanation for this finding is that avoidance mediates the relationship between NSSI and emotional reactivity or closely related constructs (e.g. negative emotionality & negative affective intensity) [10, 34, 35]. Individuals with higher levels of emotional reactivity experience more aversive cognitive and emotional states. They may use avoidance as a coping strategy to reduce emotional arousal [10]. Engaging in NSSI is a successful, albeit temporary way to reduce aversive cognitions and avoid aversive emotions [10, 36-38]. The emotion regulation function of NSSI is central in some NSSI theories [36, 39-41].

Nock et al. reported that emotional reactivity mediated the association between psychopathology and self-injurious thoughts and behaviors [1]. However, the reason for this relationship has remained unrecognized for future studies [1]. The findings should be viewed in the context of some limitations. The study samples consisted of high school students; this means the findings should be generalized to other groups with caution. Our reliance on self-report questionnaires has the limitation of biases, including social desirability and retrospective recall. Moreover, the cross-sectional design of the study restricts our ability to conclude the direction of relations

among the study variables. These limitations should receive more attention in future investigations.

## 5. Conclusion

The attained findings suggest ERS as a psychometrically valid and reliable instrument for the measurement of emotional reactivity in adolescents. These results would facilitate research on this important construct and may also be used by clinicians.

## Ethical Considerations

### Compliance with ethical guidelines

The study was approved by the Ethics Committee of Shahed University (No: IR.SHAHED.REC.1397.001).

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### Authors' contributions

Conceptualization, author names: Maryam Izadi, Parvaneh Mohammadkhani, Hamid Yaghubi; Methodology: All authors; Project administration,: Maryam Izadi; Formal analysis: Maryam Izadi and Hammidreza Hasanabadi; Data curation: Maryam Izadi and Hammidreza Hasanabadi; Writing-original draft: Maryam Izadi; Writing-review & editing: Parvaneh Mohammadkhani.

### Conflict of interest

The authors declared no conflicts of interests.

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