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RESEARCH

Psychometric Properties of Perth Emotional Reactivity Scale - Short Form in Turkish Community Sample

Perth Duygusal Tepkisellik Ölçeği - Kısa Formunun Türk Toplum Örneklemindeki Psikometrik Özellikleri

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Abstract

The aim of this study was to examine the psychometric properties of the short form of the Perth Emotional Reactivity Scale in Turkish community sample. The sample consisted of 236 participants aged between 18-60. The structure of the scale was examined by confirmatory factor analysis. Difficulties in Emotion Regulation Scale - Short Form, Emotional Reactivity Scale and Brief Symptom Inventory (depression, somatization, anxiety and obsessive symptoms subscales) were used for the validity study. As a result of confirmatory factor analysis it was seen that the structure model which has 6 subscale and 2 composite scale was in consistent with the structure of the original scale. Multiple linear regression analysis results indicated that the most predictive variable for somatization, obsessive symptoms and anxiety was general negative reactivity and for depression it was general positive reactivity. No differentiation was found between the subscales and composite scales of Perth Emotional Reactivity Scale – Short Form according to the gender. As a result of reliability analysis the Cronbach's Alpha values were found as 0.91 for general negative reactivity, 0.92 for general positive reactivity, 0.76 for negative-activation, 0.81 for negative-intensity, 0.85 for negative-duration, 0.79 for positive-activation, 0.82 for positive-intensity, 0.83 for positive-duration. As a result it was determined that Perth Emotional Reactivity Scale – Short Form is a valid and reliable scale for Turkish community.

Keywords: Perth Emotional Reactivity Scale, emotional reactivity, validity, reliability

Öz

Bu çalışmada Perth Duygusal Tepkisellik Ölçeği'nin kısa formunun Türk toplum örnekleminde psikometrik özelliklerinin araştırılması amaçlanmıştır. Örneklem 18-60 yaş aralığında 236 kişiden oluşmaktadır. Ölçek yapısı doğrulayıcı faktör analizi ile incelenmiştir. Geçerlik çalışması kapsamında Duygu Düzenleme Güçlüğü Ölçeği – Kısa Form, Duygusal Tepkisellik Ölçeği ve Kısa Semptom Envanteri (depresyon, somatizasyon, anksiyete ve obsesif belirtiler alt ölçekleri) kullanılmıştır. Doğrulayıcı faktör analizi sonucunda 6 alt bileşen ve 2 üst bileşenden oluşan yapı modelinin ölçeğin yapısına uygun olduğu görülmüştür. Çoklu doğrusal regresyon analizi sonuçlarına göre ise somatizasyonu, obsesif belirtileri ve anksiyeteyi en fazla yordayan değişkenin genel negatif tepkisellik, depresyonu en fazla yordayan değişkenin ise genel pozitif tepkisellik olduğu belirlenmiştir. Perth Duygusal Tepkisellik Ölçeği – Kısa Form alt ve bileşik ölçeklerinin cinsiyete göre farklılaşmadığı saptanmıştır. Güvenirlik analizleri sonucunda Cronbach Alfa değerleri genel negatif tepkisellik için 0.91, genel pozitif tepkisellik için 0.92, negatif–aktivasyon için 0.76, negatif–yoğunluk için 0.81, negatif–süre için 0.85, pozitif–aktivasyon için 0.79, pozitif–yoğunluk için 0.82, pozitif–süre için 0.83 olarak bulunmuştur. Sonuç olarak Perth Duygusal Tepkisellik Ölçeği – Kısa Formu'nun Türk toplumu için geçerli ve güvenilir bir ölçüm aracı olduğu tespit edilmiştir.

Anahtar sözcükler: Perth Duygusal Tepkisellik Ölçeği, duygusal tepkisellik, geçerlik, güvenirlik

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IN CLINICAL psychology and psychiatry, individuals generally need help because of high level of negative emotions, low level of positive emotions or insufficient coping skills with emotions (Lane and Schwartz, 1987, Kring and Bachorowski, 1999). It is seen that emotion regulation is one of the core processes in the psychopathologic studies and therapeutic approaches (Gross and John 2003, Srivastava et al. 2009). Therefore, the relationship between psychopathology and emotion regulation has become an important research field (Polivy and Herman 2002, Joormann and Gotlib 2010, Miklósi et al. 2014, Johnson et al. 2016, Nesayan et al. 2017) and it is seen that in these studies, generally, the strategies of emotion regulation or control of impulsivity were investigated. In the literature, there are limited studies about the characteristics of emotional reactivity which could be considered as the starting point of emotion regulation (Davidson 1998, Becerra and Campitelli 2013).

It is seen that in the studies where emotional responses were examined, mostly the neurobiological structures related to motivational and emotional processes that have an influence on the existing of these reactions were investigated (Davidson 1998). In these studies, it was determined that prefrontal cortex had an effect on the inhibition of amygdala through the neural pathways and GABAergic system (Quirck et al. 2003). Additionally, it was determined that lesions in medial prefrontal cortex cause the fear-related responses to continue for a long time (Morgan and LeDoux 1995). Furthermore, it was found that prefrontal asymmetric activation had an effect on negative and positive emotional responses (Wheeler et al. 1993). In accordance with these studies, Davidson (1998) claimed that there are three factors effective in determining the characteristics of emotional responses: (a) the existence of sufficient stimulus for the activation of emotional response, in other words, the intensity of the stimulus that causes emotional response; (b) intensity of emotional response; (c) the duration of emotional response. These three factors (activation, intensity, and duration) are accepted as the components of the structure of emotional reactivity. In other words, the level of emotional reactivity of an individual could be evaluated via these components (Davidson 1998, Becerra and Campitelli 2013).

The abnormal levels for emotional reactivity, which is defined as a component of emotion regulation, could be a risk factor for psychopathology (Linehan 1993, Rottenberg and Johnson 2007, Gross and Jazaieri 2014). In psychotherapy, it is usually aimed to reach the normal levels for emotional reactivity via teaching emotion regulation skills (Britton et al. 2012, Feliu-Soler et al. 2014). In the literature, there are so many studies looking at the relationship between emotional reactivity and depression (Bylsma 2008, Bylsma et al. 2011), anxiety disorders (Goldin et al. 2009), borderline personality disorder (Kuo and Linelan 2009), eating disorders (Barnhart et al. 2020), bipolar disorder (Gruber et al. 2011), obsessive compulsive disorder (OCD) (Cougle et al. 2013), somatization (McHugh et al. 2020), posttraumatic stress disorder (Fonzo et al. 2017), non-suicidal self-injury behavior (Boyes et al. 2020), substance use disorder (Kornreich et al. 2003). Additionally, in the study conducted by Seçer and Ulaş (2020), in which the effects of COVID-19 on OCD patients were investigated, it was found that emotional reactivity had a mediation role on the relationship between OCD symptoms and fear of COVID-19. The findings in these studies indicate that evaluating emotional reactivity is an important factor in clinical evaluation and therapeutic interventions.

Psychophysiological techniques such as pulse wave velocity or skin conductance have been used for evaluating emotional reactivity (Mauss et al. 2005). However, these methods may not be functional with regards to time and application. Because of this, self-report scales which help evaluating emotional reactivity, have been developed by the researchers. The Early Adolescent Temperament Questionnaire (EATQ-R) (Capaldi and Rothbart 1992); Affect Intensity Measure (AIM) (Larsen and Diener 1987); Emotion Intensity Scale (EIS) (Bachorowski and Braaten 1994); Emotion Reactivity Scale (ERS) (Nock et al. 2008); Emotional Reactivity, Intensity and Perseveration Scale (ERIPS) (Ripper et al. 2018); Perth Emotional Reactivity Scale (PERS) (Becerra et al. 2019) are some of these scales. Additionally, it can be said that the items of Behavioral Inhibition and Behavioral Activation Scales (BIS/BAS) (Carver and White 1994) which was developed to investigate the behaviors and attitudes related to basic personality traits, are associated with emotional reactivity. In our country, it is seen that the Turkish validity and reliability studies of BIS/BAS (Şişman 2012, Bilge 2020), EATQ-R (Demirpençe and Putnam 2019) and ERS (Seçer et al. 2013) were done.

The conceptual model of BIS/BAS (Carver and White 1994) is found to be related to personality traits rather than emotional reactivity. In EATQ-R (Capaldi and Rothbart 1992) which evaluates temperament and social emotional functionality in early adolescence period, negative and positive emotions as well as the control of an individual on her/his behaviors are examined. It is seen that in EATQ-R, the emotional reactivity is evaluated via only intensity, however, duration and activation which are the other components of emotional reactivity, are excluded from evaluation. In AIM (Larsen and Diener 1987) only intensity of emotion is assessed. However, duration and activation are not included in evaluation. In the scale of EIS (Bachorowski and Braaten 1994) just intensity of emotion is measured like AIM. In ERS (Nock et al. 2008) it is seen that the negative emotional reactivity is evaluated in general. In the items of the scale, the positive emotions are not specified. In ERIPS (Ripper et al. 2018), it is aimed to determine the levels of perseveration, activation, and intensity. However, the duration which is one of the components of emotional reactivity is excluded from evaluation. Different from these scales mentioned above, in PERS (Becerra et al. 2019) the three components of emotional reactivity (activation, intensity and duration) are evaluated with regards to both negative and positive emotions separately.

It is seen that PERS was developed based on Gross's (2015) extended process model of emotion regulation (Becerra et al. 2019). According to Gross (2002), activation, intensity and duration of emotion are the factors that affect emotion regulation. In the extended process model of emotion regulation, Gross (2015) defined evaluation mechanisms which are intertwined and interacted with each other, to explain the factors that starts the emotion regulation. An emotion regulation which is existed after an evaluation, starts a new evaluation and the coming stimulus is evaluated as negative or positive. Preece (2019) considered activation, intensity, and duration of emotion as the components of emotional reactivity, based on Gross's extended process model of emotion regulation. The Perth Emotional Reactivity scale, which was developed in this direction, is an alternative scale to the other scales, in which only negative emotions are evaluated (Nock et al. 2008) or which are insufficient to evaluate all subcomponents of emotional reactivity (Larsen and Diener 1987, Capaldi and Rothbart 1992, Bachorowski and Braaten 1994, Nock et al. 2008, Ripper et al. 2018).

In line with the literature, our study aimed to do Turkish validity and reliability study for the short form of PERS (PERS-S) (Preece et al. 2019) and determine the psychometrics of the scale which is thought to be useful for clinical researches and therapeutic interventions as PERS-S evaluates all components of emotional reactivity and also the negative and positive emotions separately.

Method

Sample

The study was carried out by the online method between September 2020 – November 2020, and the sample consisted of 236 people including 150 (63.6%) female and 86 (36.4%) male participants, aged between 18-60 (31.04±9.21). They were selected by convenience sampling method. 12 (5.1%) participants were primary school graduates, 90 (38.2%) were high school graduates and 134 (56.8%) were university graduates. In the sample, 134 (56.8%) participants were single, 92 (39.0%) were married and 5 (2.1%) were divorced and 5 (2.1%) participants' partners were decedent.

Within the scope of validity, Difficulties in Emotion Regulation Scale - Short Form (DERS-S) and Emotional Reactivity Scale and Brief Symptom Inventory (the subscales of depression, somatization, anxiety and obsessive symptoms) were applied to 104 participants including 47 (45.2%) female and 57 (54.8%) males, aged between 18-57 (33.23±8.89), from the main sample.

Procedure

For doing Turkish adaptation of PERS-S, the original scale was translated into Turkish by two academicians who had a good comprehension of English after obtaining the required permission and information related to the scale from Dr. David Preece. After examination of translations, the expressions which were thought to best represent the items of original scale, were selected. The back translation of the scale was made by a translator who graduated from English Language and Literature, and the final version of scale was determined by comparing the translation with the original scale.

Within the scope of convergent validity, discriminant validity and predictive validity studies, depression, somatization, anxiety, and obsessive symptoms subscales in BSI were used. In this study, the BSI subscales which were thought to be directly related to the diagnostic criteria in DSM-5, were included, and the other subscales of BSI which were thought to have transdiagnostic features were excluded.

For the ethical approval of the study, the ethics committee approval was obtained from the Ethics Committee of Istanbul Sabahattin Zaim University, dated 30/09/2020 and numbered 2020/09.

Data was collected by online scale forms via the links created through Google forms, which were prepared by the researchers. The participants were reached by convenience sampling method according to the principle of voluntariness. In the online form, the participants were informed that they could withdraw the study at any time and the consent was obtained by stating that the data would be used for scientific study. In the study, the scales which had 104 items totally, were given through a single screen, and the application lasted 15 minutes on average. No fee or gift was given to the participants. In the study, filling in each question was required, also opportunity was given to the

participants to go back and change their answers. More than one entry from the same IP was not accepted and filling the scales again from the same IP address, was not allowed. The scales were sent to the circle of the researchers via messages. No publicity or advertisement were made in other media tools. The participants were invited to attend the study with the following message:

"This study aims to collect data for scientific research in psychology. Participation in the study is completely voluntary. No identifying information is requested from you in the study. Your answers will be kept completely confidential in accordance with the Law on the Protection of Personal Data No.6698 and the relevant legislation, and the data will be evaluated only by the researchers, and it will be used within the scope of scientific publications. The scales do not include the questions which will cause personal discomfort. However, if you feel uncomfortable because of any question or any other reason, you are free to withdraw the study. We would like to thank you in advance for your participating to this study."

In the literature, for determining the sample size, it is generally accepted that five times the number of items in the scale is sufficient. However, it is stated that, a ratio of one in ten is useful in obtaining reliable results in factor analysis (Tinsley and Tinsley 1987). In line with the literature, in the study it was aimed to include 180 participants at least, due to the 18 items in the scale. The inclusion criteria was determined as the participants being over 18 years old. A total of 244 people participated in our study. As a result of excluding 8 people who were determined to be under the age of 18, totally 236 people were included in the study. For determining the statistical power of the study, Gpower program (Erdfelder et al. 1996) was used and the statistical power of the study was found as 0.92 with a significance level of 0.05 and an effect size of 0.3 (Cohen 1992).

Measures

Demographic information form

This form was prepared by the researchers, and it included the sociodemographic information related to the participants' age, gender, and education. For the age, no age range options were defined. Instead of this, the information related to age was taken through the self-report of the participants. In the form, two options for gender as male and female; and three options for education as primary, high school and university, were offered.

Perth Emotional Reactivity Scale Short Form (PERS-S)

The scale is developed by Preece and his colleagues (2019), by shortening the Perth Emotional Reactivity Scale which includes 30 items. The scale has 18 items, and it is five-point Likert scale (1=completely disagree, 5=completely agree). In the scale, the emotional reactions are evaluated with three subscales as activation, intensity and duration. Additionally, the emotions are evaluated as negative and positive separately. In the scale there are six subscales as positive-activation, positive-intensity, positive-duration, negative-activation, negative-intensity, negative-duration. Also, positive and negative emotional reactions are evaluated as composite subscales named general positive reactivity and general negative reactivity. As a result of analysis, the Cronbach's Alpha was found 0.91 for general negative reactivity, 0.92 for general positive reactivity, 0.76

for negative-activation, 0.81 for negative-intensity, 0.85 for negative-duration, 0.79 for positive-activation, 0.82 for positive-intensity, 0.83 for positive-duration. The high scores in all composite and subscales, show that the level of reactivity is high in regarding subscale; in other words, it means that the emotions activate more easily/quickly, more intensive and last longer.

Difficulties in Emotion Regulation Scale – Short Form (DERS-S)

The scale was developed by Bjureberg and his colleagues (2016) and it consisted of 16 items. The Turkish adaptation of the scale was done by Yiğit and Guzey Yiğit (2019). It is a 5-point Likert scale (0=almost never, 4=almost always) and it has five subscales as: Clarity, Goals, Impulse, Strategies and Non-acceptance. Also, total score could be used for the evaluation of scale. The high scores are accepted as the high level of difficulties in emotion regulation. In the Turkish reliability and validity study of the scale, Cronbach's Alpha reliability coefficient was found as 0.92. In our study, for DERS-S the Cronbach's Alpha coefficient was determined as 0.96 (Table 1).

Table 1. Means, standard deviations, reliability coefficients, skewness and kurtosis values for the subscales and composite scales of PERS-S (s=236) and BSI, DERS-S and ERS (s=104)

PERS-S subscales	Mean±SD	α	Skewness	SE	Kurtosis	SE
Negative-activation	10.25±3.01	0.67	-0.364	0.158	-0.588	0.316
Negative-intensity	10.90±3.24	0.82	-0.688	0.158	-0.212	0.316
Negative-duration	9.28±3.36	0.77	-0.251	0.158	-0.924	0.316
Positive-activation	12.22±2.25	0.60	-0.947	0.158	0.941	0.316
Positive-intensity	12.12±2.41	0.69	-1.192	0.158	1.618	0.316
Positive-duration	11.07±2.58	0.71	-0.555	0.158	-0.127	0.316
PERS-S composite scales	Mean.±SD	α	Skewness	SE	Kurtosis	SE
General Negative Reactivity	30.43±8.55	0.89	-0.402	0.158	-0.630	0.316
General Positive Reactivity	35.42±6.20	0.84	-0.855	0.158	0.893	0.316
Brief Symptom Inventory	Mean.±SD	α	Skewness	SE	Kurtosis	SE
Somatization	2.70±3.36	0.78	1.437	0.237	1.658	0.469
Obsessive Symptoms	5.75±4.33	0.80	0.792	0.237	0.276	0.469
Depression	5.72±5.09	0.87	1.337	0.237	1.405	0.469
Anxiety	4.64±3.91	0.80	1.159	0.237	1.214	0.469
Difficulties in Emotion Regulation Scale	17.38±13.35	0.96	1.045	0.237	0.679	0.469
Emotional Reactivity Scale	Mean.±SD	α	Skewness	SE	Kurtosis	SE
ERS-sensitivity	14.04±2.77	0.81	0.373	0.237	-0.710	0.469
ERS-persistence	12.54±2.30	0.56	0.275	0.237	-0.008	0.469
ERS-arousal/intensity	14.95±4.27	0.85	0.040	0.237	-0.401	0.469
ERS-total	41.53±8.13	0.89	0.411	0.237	-0.662	0.469

BSI: Brief Symptom Inventory; DERS: Difficulties in Emotion Regulation Scale; ERS: Emotional Reactivity Scale; General Negative Reactivity=N-activation+N-intensity+N-duration; General Positive Reactivity=P-activation+P-intensity+P-duration; PERS-S: Perth Emotional Reactivity Scale-Short Form; Sd: Standard deviation; SE: Standard error

Emotional Reactivity Scale

Developed by Nock and his colleagues (2008), the scale aimed to assess the emotional reactivity. It includes 17 items and it is a 4-point Likert scale (1=completely disagree, 4=completely agree). There are three subscales as sensitivity, arousal/intensity and persistence. The Turkish adaptation was done by Seçer and his colleagues (2013). The

internal consistency reliability coefficient was found as 0.94 in the original study which was conducted by Nock and his colleagues (2008). In the Turkish adaptation study, the internal consistency reliability coefficients were determined as 0.82 for the overall scale, 0.82 for sensitivity, 0.76 for arousal/intensity, 0.71 for persistence. In our study, the Cronbach's Alpha values were determined as 0.89 for the overall scale, 0.81 for sensitivity, 0.56 for persistency and 0.85 for arousal/intensity (Table 1).

Brief Symptom Inventory

The Brief Symptom Inventory (BSI) was developed by Derogatis (1992) and it is the short version of SCL-90 Symptom Checklist. The scale includes 53 items, and it is a 5-point Likert scale (0=Not at all, 4=Extremely often). It has 9 subscales (obsessive symptoms, paranoid ideation, hostility, anxiety, psychoticism, somatization, interpersonal sensitivity, depression, phobic anxiety) and three global indices. The assessment could be done also through the total score of the scale. The Turkish adaptation of the scale was done by Şahin and Durak (1994). The internal consistency reliability coefficients are ranging from 0.64 to 0.81. In our study, the subscales of somatization, obsessive symptoms, depression, and anxiety were evaluated. In our study, the Cronbach's Alpha values were found as 0.78 for somatization, 0.80 for obsessive symptoms, 0.87 for depression and 0.80 for anxiety (Table 1).

Statistical analysis

For the statistical analysis, SPSS v25.0 and AMOS v25.0 programs were used. In adaptation studies, it is accepted as appropriate to perform confirmatory factor analysis (CFA) instead of exploratory factor analysis (EFA) to determine the compatibility of the model of the original study with the target culture (Çokluk et al. 2010, Seçer, 2015). Therefore, in our study, the compatibility of the factor structure of the PERS-S to Turkish culture was investigated by confirmatory factor analysis. In the analysis, the good fit indices which are accepted as the most basic indicator of the compatibility of the scale model and the proposed theory to the data (Hooper et al. 2008) were calculated. In order to determine the compatibility of the factors in the scale with the data, the good fit indices were evaluated by confirmatory factor analysis whether $\chi 2/df$ (the ratio of the chi-square value to the degrees of freedom) was less than 3; RMSEA (Root Mean Square Error of Approximation) was less than 0.08; CFI (Comparative Fit Index) and TLI (Tucker Lewis Index) were higher than 0.90, which are acceptable fit values (Şimşek 2007).

For the convergent validity analysis, to determine the correlation between the subscales and composite scales of PERS-S and also ERS and DERS-S, Pearson Product-Moment Correlation coefficient analysis was performed. For discriminant validity, the subscales of PERS-S and BSI were evaluated by factor analysis. Within the scope of predictive validity, multiple linear regression analysis was performed to determine the prediction level of subscales of PERS-S for somatization, obsessive symptoms, depression and anxiety. For the internal consistency reliability analysis, Cronbach's Alpha values of PERS-S subscales and composite scales; for the two-half test reliability analysis Gutmann Split Half coefficient values were calculated. Additionally, the Cronbach's Alpha values of ERS, DERS-S and subscales of BSI, which were used for validity analysis, were calculated. Independent samples t-test

analysis was used to determine whether there is a differentiation between the subscales and composite scales of PERS-S according to the gender.

Results

Independent samples t-test was used to compare the subscales and composite scales of PERS-S according to the gender. No significant difference was found between the groups. The reliability coefficients, skewness and kurtosis values of PERS-S subscales and composite scales, DERS-S, ERS and subscales of BSI are shown at Table 1. For the skewness and kurtosis values, being in the range of ±2, was accepted as evidence for the data to have a normal distribution (Tabachnick and Fidell 2013).

Validity

Confirmatory factor analysis

In confirmatory factor analysis, the four model, which were proposed in the original study, were tested (Figure 1, Figure 2, Figure 3, Figure 4). Accordingly, in model 1, all items in the scale were evaluated as general emotional reactivity with a single-factor model. In Model 2, the items of the scale were tested with a 2-factor correlated model as general positive reactivity and general negative reactivity. In model 3, the subscales (positive-activation, positive-intensity, positive-duration, negative-activation, negative-intensity, negative-duration) were evaluated with a 6-factor correlated model. In model 4, a 6-factor higher-order model was tested with six subscales (positive-activation, positive-intensity, positive-duration, negative-activation, negative-intensity, negative-duration) and two higher order general composite subscales (general positive reactivity, general negative reactivity).

Table 2. Results of goodness-of-fit values for the tested confirmatory factor analysis of proposed models for PERS-S

	Acceptable values*	Model-1	Model-2	Model-3	Model-4	Model-4 (modification)
X^2	-	895.98**	328.43**	251.67**	299.73**	248.74**
sd	-	135	134	120	128	125
X^2/sd	≤5	6.64	2.45	2.10	2.34	1.99
CFI	>0.90	0.54	0.88	0.92	0.90	0.93
TLI	>0.90	0.48	0.87	0.90	0.88	0.91
RMSEA	≤0.08	0.16	0.08	0.07	0.08	0.07
CI (%90)	-	(0.145-0.165)	(0.068-0.089)	(0.056-0.080)	(0.064-0.087)	(0.053-0.077)
sRMR	≤0.08	0.19	0.09	0.07	0.09	0.08
AIC	-	967.98	402.43	353.67	385.73	340.74

*Şimşek 2007; **p<0.001; AIC: Akaike information criterion; CFI: Comparative Fit Index; df: degree of freedom; PERS-S: Perth Emotional Reactivity Scale-Short Form; RMSEA: Root Mean Square Error of Approximation; sRMR: Standardized Root Mean Square Residual; TLI: Tucker Lewis Index; X^2=chi square

As a result of analysis, it was found that model 3 in which the 6-factor correlated model was offered, is the best fitting model to the data according to fit indexes (χ2/ sd, CFI, TLI, RMSEA, sRMR ve AIC). Additionally, it was determined that for model 4 in which 6-factor higher-order model was offered, except TLI and sRMR, other fit indexes were acceptable. The modifications were performed through model 4 due to theoretical basis and the structural model of the original scale. After the modifications that were

done between item1-item13, item5-item17 and item8-item4, it was seen that the model reached the acceptable values. It was determined that single-factor model (Model 1) and 2-factor correlated model (Model 2) did not have the acceptable values of fit indexes (Şimşek 2007) (Table 2).

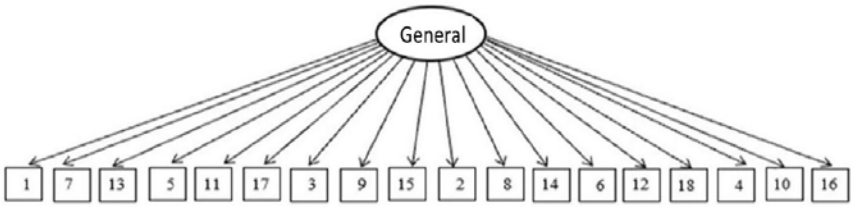

Figure 1. Single-factor model (Model 1) in which all items are evaluated together as "General Emotional Reactivity

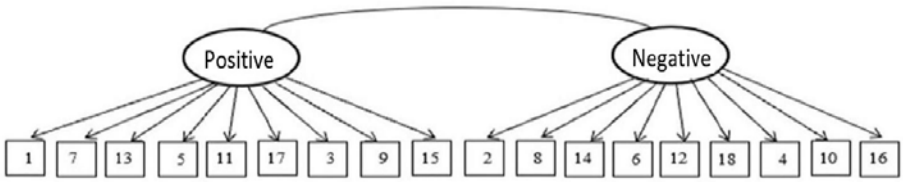

Figure 2. 2-factor correlated model (Model 2) in which the items are evaluated as "General Positive Reactivity" and "General Negative Reactivity"

Negative: general negative reactivity; Positive: general positive reactivity

Table 3. Guttman Split-Half reliability coefficients of PERS-S subscales and composite scales, correlation coefficients between PERS-S subscales and composite scales and Difficulties in Emotion Regulation Scale, Emotional Reactivity Scale, Brief Symptom Inventory (s=104)

	Gutt-man	DERS	ERSs	ERSp	ERSa	ERS	Som	Obs	Dep	Anx
N-activa-tion	0.64	0.37**	0.72**	0.63**	0.62**	0.75**	0.32**	0.27**	0.29**	0.37**
N-intensity	0.75	0.40**	0.55**	0.54**	0.58**	0.64**	0.27**	0.23*	0.27**	0.35**
N-duration	0.71	0.55**	0.55**	0.58**	0.64**	0.69**	0.31**	0.32**	0.34**	0.46**
P-activa-tion	0.62	-0.29**	0.05	0.07	-0.20*	-0.07	-0.23*	-0.23*	-0.35**	-0.26**
P-intensity	0.73	-0.45**	-0.01	-0.07	-0.25*	-0.15	-0.28**	-0.22*	-0.44**	-0.25**
P-duration	0.66	-0.38**	-0.03	-0.05	-0.23*	-0.15	-0.33**	-0.27**	-0.52**	-0.26**
GNT	0.84	0.51**	0.68**	0.68**	0.70**	0.78**	0.34**	0.31**	0.34**	0.45**
	0.87	-0.44**	0.00	-0.02	-0.27**	-0.15	-0.33**	-0.29**	-0.51**	-0.30**

*p<0.05; **p<0.01; Anx: Anxiety; Dep: Depression; DERS: Difficulties in Emotion Regulation Scale; ERS:Emotional Reactivity Scale; ERSp: Emotional Reactivity Scale-persistence; ERSs: Emotional Reactivity Scale-sensitivity; ERSa: Emotional Reactivity Scale-arousal; Gutmann: Guttman split half realiability coefficients; GNR: General Negative Reactivity; GPR: General Positive Reactivity; N: negative; Obs: Obsessive symptoms; P: Positive; Som: Somatization; PERS-S: Perth Emotional Reactivity Scale-Short Form

Convergent validity

As a result of correlation analysis which was performed within the scope of convergent validity study, a negative correlation was found between the subscales and composite subscales of PERS-S which evaluates positive emotional reactivity and DERS-S (between -0.29 and -0.54, p<0.01), ERS-arousal subscale (between -0.20 and -0.25, p<0.05), BSI-Somatization (between -0.23 and -0.33, p<0.01), BSI-Obsessive symptoms (between -0.22 and -0.29, p<0.05), BSI-Depression (between -0.35 and -0.52, p<0.01), BSI-Anxiety (between -0.25 ad -0.30, p<0.01). Positive correlations were determined between the negative subscales and composite subscales of PERS-S and DERS-S (between 0.37 and 0.55, p<0.01), ERS subscales and total score (between 0.54 and 0.78, p<0.01), BSI-Somatization (between 0.27 and 0.33, p<0.01), BSI-Obsessive symptoms (between 0.23 and 0.32, p<0.01), BSI-Depression (between 0.27 and 0.34, p<0.01), BSI-Anxiety (between 0.35 and 0.46, p<0.01) (Table 3).

Table 4. Common variance values and factor loadings of subscales of PERS-S and BSI

	Common variance values	Factor 1	Factor 2	Factor 3
Anxiety	0.787	0.913		
Obsessive symptoms	0.808	0.885		
Somatization	0.761	0.844		
Depression	0.765	0.796		
Negative intensity	0.739		0.882	
Negative activation	0.676		0.868	
Negative duration	0.768		0.836	
Positive activation	0.809			0.868
Positive intensity	0.810			0.843
Positive duration	0.920			0.790

BSI: Brief Symptom Inventory; PERS-S: Perth Emotional Reactivity Scale-Short Form

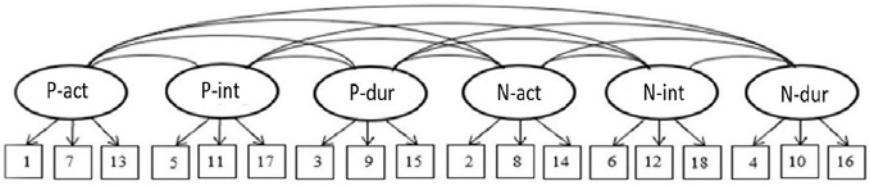

Figure 3. 6-factor correlated model (Model 3) in which the items are evaluated as "Positive-activation, Positive-intensity, Positive-duration, Negative-activation, Negative-intensity, Negative-duration"

N-act: negative-activation; N-int: negative-intensity; N-dur: negative-duration; P-act: positive-activation; P-int: positive-intensity; P-dur: positive-duration

Discriminant validity

For discriminant validity, the subscales of PERS-S and BSI were investigated by factor analysis. As a result of the analysis which was performed to determine the compatibility of the PERS-S and BSI subscales to the factor analysis, Kaiser-Meyer-Olkin (KMO) coefficient was found as 0.77 (good) and Bartlett result was found as $X^2(45)= 664.84$, p<0.001. These results indicated the compatibility of the subscales of PERS-S and BSI to factor analysis. In the analysis, it was determined that subscales of BSI, PERS-S

negative emotional reactivity subscales and PERS-S positive emotional reactivity subscales were loaded to three different factors. As a result, three-factor structure with an eigenvalue above 1 which explains the 78.42% of the total variance (BSI subscales 44.18%, PERS-S negative emotional reactivity 21.42%, PERS-S positive emotional reactivity 12.82%) was found (Table 4).

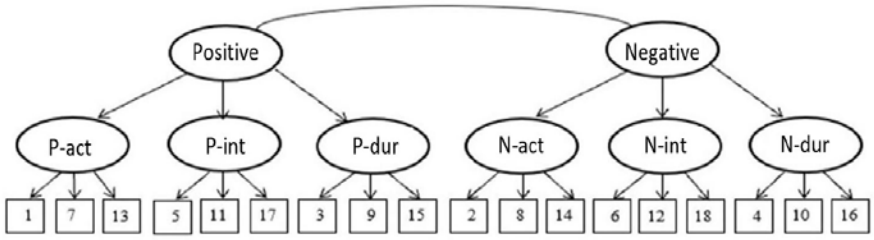

Figure 4. 6-factor higher-order model (Model 4) in which the items are evaluated as "Positive-activation, Positive-intensity, Positive-duration, Negative-activation, Negative-intensity, Negative-duration" and also "General positive reactivity, General negative reactivity"

N-act: negative-activation; N-int: negative-intensity; N-dur: negative-duration; P-act: positive-activation; P-int: positive-intensity; P-dur: positive-duration

Predictive validity

Regression analysis was performed to determine the predictive levels of subscales and composite subscales of PERS-S of somatization, obsessive symptoms, depression and anxiety. As a result, it was found that the positive and negative duration which are included in Model-3, predict the somatization 19% (F(2,101) = 12.120), obsessive symptoms 16.5% (F(2,101) = 9.893), depression 36% (F(2,101) = 28.721), anxiety 26% (F(2,101) = 17.678). The variables of GNR and GPR predicted the somatization 21% (F(2,101) = 13.643), obsessive symptoms 21% (F(2,101) = 9.953), depression 36% (F(2,101) = 28.084) and anxiety 27% (F(2,101) = 18.927) (Table 5).

Table 5. Results of regression analysis of predictor variables for psychological symptoms according to Model 4

Dependent Variables	Predictor variables	*B*	SE	Beta	t	R^2	F	ΔR^2
Somatization	Constant (a)	-5.640	2.203		2.560*		13.643**	0.21
	GNT	0.127	0.035	0.319	3.604**	0.12		
	GPT	-0.181	0.052	-0.310	-3.503**	0.09		
Obsessive symptoms	Constant (a)	8.702	2.924		2.976*		9.953**	0.21
	GNT	0.148	0.047	0.289	3.174**	0.10		
	GPT	-0.199	0.069	-0.264	-2.891**	0.07		
Depression	Constant (a)	16.210	3.016		5.374**		28.084**	0.36
	GPT	-0.436	0.071	-0.492	-6.147**	0.27		
	GNT	0.184	0.048	0.305	3.819**	0.09		
Anxiety	Constant (a)	5.634	2.467		2.284*		18.927**	0.27
	GNT	0.198	0.039	0.428	5.026**	0.20		
	GPT	-0.183	0.058	-0.269	-3.165**	0.07		

*p<0.05, **p<0.001 GNR:General Negative Reactivity; GPR:General Positive Reactivity; SE: Standard error

Reliability

As a result of reliability analysis of PERS-S subscales and composite scales, no item was excluded from the scale due to having no negative or under 0.20 item-total score correlation. In the results of internal consistency analysis, Cronbach's Alpha coefficients were found as 0.82 for the whole scale of PERS-S; in the subscales of PERS-S, 0.67 for Negative-activation, 0.82 for Negative-intensity, 0.77 for Negative-duration, 0.60 for Positive-activation, 0.69 for Positive-intensity, 0.71 for Positive-duration; in the composite subscales, 0.89 for General Negative Reactivity, 0.84 for General Positive Reactivity (Table 1).

In split-half reliability analysis, the Guttman Split-Half reliability coefficients were determined as 0.83 for the whole scale, 0.64 as the lowest value for Negative-activation, 0.75 as the highest value for Negative-intensity, 0.84 for General Negative Reactivity and 0.87 for General Positive Reactivity (Table 3).

Discussion

The aim of this study was to do the Turkish validity and reliability study of PERS-S in which emotional reactivity and its components are evaluated according to negative and positive emotions separately. For this purpose, 4 models were tested through confirmatory factor analysis to determine the factor structure of the scale. As a result of analysis, the 6-factor models [model 3 – 6-factor correlated model (positive-activation, positive-intensity, positive-duration, negative-activation, negative-intensity, negative-duration) and model 4 - 6-factor higher-order model (6 subscales (positive-activation, positive-intensity, positive-duration, negative-activation, negative-intensity, negative-duration) and two higher order general composite subscales (general positive reactivity, general negative reactivity)] were excellent fit to the data for the structure model of the scale. It was found that the goodness of fit values for Model 1 (single factor model – general emotional reactivity) and Model 2 (2-factor correlated model – general positive reactivity, general negative reactivity) were not acceptable. It can be said that the 6 factor models in which the components of emotions (activation, intensity and duration) are evaluated according to negative and positive, are in accordance with Gross's extended process model of emotion regulation and also this conceptual basis is supported statistically. It is seen that in the original study of the scale, similar results were obtained. In the Persian adaptation study of the scale conducted by Mousavi Asl and his colleagues (2020), the six-factor higher-order model (Model 4) and six factor correlated model (Model 3) were tested, and the results obtained in this study are consistent with our study.

As a result of internal consistency analysis, the Cronbach's Alpha coefficients of PERS-S subscales and composite scales were found between 0.60 and 0.89. Additionally, the item-total score correlations of the items in the scale were determined positive and higher than 0.20 and no item elimination was done. In the split-half reliability analysis, the Guttman Split-Half reliability coefficients were determined between 0.64 and 0.87 for subscales and composite scales. It was determined that the values obtained via reliability analysis were within acceptable limits.

In the discriminant validity analysis study, which was carried out to test the structural validity of PERS-S, BSI subscales and PERS-S subscales were analyzed by factor analysis. As a result of analysis, it was seen that psychological symptoms, negative

emotional reactivity and positive emotional reactivity were loaded to different factors. In discriminant validity, the fact that loading of the related subscales on the same factors, indicates a high correlation between these subscales. The subscales which are loaded to different factors, are evaluated as having different structure (Farrell and Rudd 2009). Accordingly, these results indicated that the items of negative and positive reactivity subscales of PERS-S, differentiated from psychological symptoms and also the subscales separated from each other structurally.

As a result of the analysis which was performed within the scope of convergent validity, positive correlations were found between DERS-S and the subscales and composite scales of PERS-S in which negative emotional reactivity was evaluated; and negative correlations were determined between DERS-S and the subscales and composite scales of PERS-S in which positive emotional reactivity was evaluated. These findings indicate that difficulties in emotion regulation and poor emotion regulation skills are related to increased negative emotional reactivity and decreased positive emotional reactivity. Furthermore, it was determined that ERS had a correlation with only the subscales and composite scales of PERS-S in which negative emotional reactivity was evaluated. According to this result, it is seen that the items in ERS are related to negative dimension of emotional reactivity, on the other hand ERS has no items which distinguish positive emotional reactivity and as a result ERS generally evaluates the negative emotional reactivity. According to the correlations between the BSI subscales and the subscales and composite scales of PERS-S, it is seen that the increase in negative emotional reactivity and decrease in positive emotional reactivity are associated with the increase in somatization, depression, anxiety and obsessive symptoms. It can be said that these findings support the relationship between emotional reactivity and psychopathology in line with the studies in the literature (Rottenberg and Johnson 2007, Bylsma et al. 2008, Goldin et al. 2009, Bylsma et al. 2011, Barnhart et al. 2020, Boyes et al. 2020).

As a result of regression analysis which was performed to determine the predictive levels of emotional reactivity components for psychological symptoms, it was found that the variable which predicted somatization, obsessive symptoms, and anxiety the most, was general negative reactivity. It was determined that the most predictive variable for depression was general positive reactivity.

When the literature is investigated, in a study conducted by Benning and Ait Oumeziane (2017), it was determined that low level of positive reactivity increased the tendency to depression, in accordance with the findings obtained in our study. In a study, negative emotional reactivity was investigated in obsessive-compulsive disorder patients, and it was found that the level of emotional reactivity and increased compulsions had a positive correlation (Cougle et al. 2013). In another study conducted by Goldin and his colleagues (2009), it was determined that the level of negative emotional reactivity in people with social anxiety disorder, was higher than the control group. It is seen that the findings of our study are compatible with these studies mentioned above (Goldin et al. 2009, Cougle et al., 2013, Benning and Ait Oumeziane 2017).

In literature, generally the relationship between negative emotional reactivity and psychological symptoms have been investigated and intervention methods have been offered in line with these results. However, it is seen that the relationship between psychopathology and positive emotional reactivity was excluded from the evaluation and

therefore the interventions that likely to affect the treatment process related to positive emotional reactivity were probably unnoticed. In this respect, the evaluation of emotional reactivity and its components through positive and negative in PERS-S, makes a significant contribution to the literature and studies.

The importance of evaluating emotions as positive and negative separately in measurement tools in which emotional reactivity is assessed, has been also demonstrated by the studies in psychopathology (Davidson 1998, Barrett et al. 2001). For instance, in the individuals with borderline personality disorder, an increase in negative emotional reactivity was determined whereas no increase was detected in positive emotional reactivity (Levine et al. 1997). In bipolar disorder's mania period, an increase in positive emotional reactivity was determined and the level of negative emotional reactivity was found in normal limits (Gruber et al. 2011). Additionally, there are some studies which indicated that positive emotional reactivity was at low levels in depression patients (Bylsma et al. 2008, Bylsma et al. 2011, Benning ve Ait Oumeziane 2017). These studies (Gruber et al. 2011, Benning ve Ait Oumeziane 2017, Scott et al. 2017) can be evidence not only for the negative emotional reactivity but also for the importance of evaluating the positive emotional reactivity. Additionally, it is thought that evaluating the emotional reactivity as positive and negative separately would be useful for determining the possible therapeutic interventions which would affect the treatment process positively.

In this study, excluding the clinical sample could be the most important limitation. It is thought that further studies could include the clinical samples which have the disorders such as borderline personality disorder (Kuo and Linehan, 2009), bipolar disorder (Gruber et al. 2011) and depression (Bylsma et al. 2008) that are thought to be related to emotional reactivity. Also, using PERS-S in these studies could provide investigating the disorder-specific emotional reactivity profiles and developing intervention methods.

Conclusion

It was determined that Perth Emotional Reactivity Scale – Short Form is a valid and reliable scale for Turkish community.

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