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Measuring Emotional Reactivity: Reliability and Validity of the Turkish Versions of the Perth Emotional Reactivity Scale (PERS) and its Short Form (PERS-S)

Duygusal Tepkiselliğin Ölçülmesi: Perth Duygusal Tepkisellik Ölçeği (PDTÖ) ve Kısa Formunun (PDTÖ-KF) Türkçe Versiyonlarının Güvenilirlik ve Geçerliliği

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ABSTRACT

Objective: Individual differences in emotional reactivity are generally investigated using psychophysiological measures and self-report scales. This study aimed to adapt the Perth Emotional Reactivity Scale (PERS) and its short form (PERS-S), which assess individual differences in emotional reactivity to positive and negative emotions with three subscales (activation, intensity, and duration), into Turkish.

Method: Participants (N=393, 73% female; for usable data) completed the PERS and other related measures including positive and negative affect, emotion dysregulation, and psychological distress symptoms.

Results: Confirmatory factor analyses supported the 6-factor structure of both the PERS and PERS-S. Results also showed that the Turkish versions of the scales can be used as 6- or 2-factor scales, depending on the research interest (PERS: $\chi 2/df = 4.15$, CFI=0.9, NFI= 0.9, RMSEA= 0.09 [0.085 - 0.094]; PERS-S= $\chi 2/df = 3.19$, CFI=0.96, NFI=0.94, RMSEA= 0.075 [0.067 - 0.083]). The positive and negative emotional reactivity subscales showed satisfactory internal consistencies (all ’s > .68) and two-week test-retest reliability levels (all r’s > .62) and were correlated with emotion dysregulation, psychopathology, and positive/negative affect.

Conclusion: The Turkish versions of PERS and PERS-S are reliable and valid tools for measuring individual differences in emotional reactivity.

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

ÖZ

Amaç: Duygusal tepkisellikteki bireysel farklılıklar genellikle psikofizyolojik ölçümler ve öz bildirim ölçekleri kullanılarak incelenmektedir.Bu çalışmanın amacı, pozitif ve negatif duygular için duygusal tepkiselliğin bireysel farklılıklarını üç alt ölçekle (aktivasyon, yoğunluk ve süre) değerlendiren Perth Duygusal Tepkisellik Ölçeği (PDTÖ) ve kısa formunu (PDTÖ-KF) Türkçeye uyarlamaktır.

Yöntem: Katılımcılar (N=393, %73 kadın; kullanılabilir veri için) PDTÖ’yü ve pozitif ve negatif duygulanım, duygu düzenlemede güçlükler ve psikolojik sıkıntı belirtileri gibi diğer ilgili ölçümleri yanıtlamıştır.

Bulgular: Doğrulayıcı faktör analizleri hem PDTÖ hem de PDTÖ-KF'nin 6 faktörlü yapısını doğrulamıştır. Ayrıca, sonuçlar ölçeklerin Türkçe versiyonlarının, araştırmanın odağına bağlı olacak şekilde 6 ya da 2 faktörlü olarak kullanılabileceğini göstermiştir (PERS: $\chi 2/df = 4,15$, CFI=0,9, NFI= 0,9, RMSEA= 0,09 [0,085 – 0,094; PERS-S= $\chi 2/df = 3,19$, CFI=0,96, NFI=0,94, RMSEA= 0,075 [0,067 – 0,083]). Pozitif ve negatif duygusal tepkisellik alt ölçeklerinden alınan puanların iç tutarlık katsayılarının tatmin edici olduğu görülmüş (all ’s > 0,63), iki haftalık test tekrar test güvenilirlik düzeyleri orta ve yüksek seviyede çıkmış (all r’s > 0,62) ve bu puanlar duygu düzenleme güçlüğü, psikopatoloji ve pozitif/negatif duygulanım ile korelasyon göstermiştir.

Sonuç: PDTÖ ve PDTÖ-KF’nin Türkçe versiyonlarının duygusal tepkisellikteki bireysel farklılıkları ölçmek için güvenilir ve geçerli araçlar olduğu gösterilmiştir.

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

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Introduction

Emotions are often triggered by salient internal or external stimuli and initiate a series of cognitive, behavioral, physiological, and motor reactions with a relatively automatic appraisal of such stimuli (Moors 2009). In fact, individuals show significant differences in how and to what extent they respond to these emotional stimuli, known as emotional reactivity (ER), which includes three related facets (Davidson 1998). The first facet, the activation facet, refers to the lowest arousal threshold required for initiating an emotional response and how quickly this arousal reaches its peak amplitude. The second facet is the intensity of one's emotional response to the relevant stimulus, i.e., how intensely the emotion is experienced. The third facet refers to the duration of the emotional experience, which is defined as the time required for the emotional arousal triggered by the stimulus to return to its baseline level.

Three facets of ER can be differentially elicited by negative and positive emotions (Becerra et al. 2019). A substantial number of studies have previously suggested that negative and positive emotional experiences are highly associated with different levels and qualities of cognitive, behavioral, and physiological reactions (for a comprehensive review, see Fox 2008). In particular, studies using physiological measures (e.g., brain activity and startle response) support this conceptualization of ER by distinguishing individual differences in ER (e.g., Wheeler et al. 1993). For example, differences noticed in prefrontal cortex activation are among the determinants of emotion intensity, or individual differences in left and right prefrontal cortex activation are associated with negative and positive emotion intensity, respectively (Hamann & Canli 2004).

Individual differences in ER are considered risk factors for the development of psychopathology in children and adolescents (Dahl & Gunnar 2009), and adults (Gross & Jazaieri 2014). More specifically, ER research indicates that low positive and high negative ER may be a risk factor for depression (Bylsma et al. 2008), that elevation in ER is associated with an increase in compulsive behaviors (Cougle et al. 2013), and that individuals with social anxiety demonstrate greater negative ER to threatening situations (Goldin et al. 2009). Larionow et al. (2023) reported that increased positive ER was negatively and increased negative ER was positively correlated with levels of general depressive and anxious symptoms, with similar findings for perceived stress. Barnhart et al. (2020) found that ER plays a moderating role in the relationship between negative and positive emotional eating and binge eating, emphasizing that ER may have a unique influence on these relationships. In addition, individuals with borderline personality disorder show higher ER to negative stimuli compared to individuals without any personality disorder (Gratz et al. 2010). All of these findings point to the unique relationship between ER and psychopathology and the need to address individual differences in ER.

ER is also closely related to emotion regulation. According to Gross (2014), intense emotions are more challenging to regulate and likely lead to behavioral problems. Strategies used for emotion regulation may also affect ER (particularly emotional activation). Moreover, ER is associated with some personality traits, another source of individual differences. For example, individuals with high neuroticism, defined as a predisposition to feel negative emotions, experience more intense and long-lasting negative emotions than those with low neuroticism (Widiger 2009). In particular, an increase in negative ER is associated with high neuroticism (Hisler et al. 2020). Highly extroverted individuals (Watson & Clark 1997) tend to show higher ER to positive stimuli (Larsen & Katelaar 1989). These findings support the idea that ER may occur at different levels in individuals with different personality traits.

Overall, there are individual differences in ER to emotional stimuli, which are often assessed with psychophysiological measures (Carlson et al. 1989). Yet, according to Davidson (1998), individual differences in ER do not necessarily occur at the same level in all components that create an emotional episode, such as subjective (e.g., the feeling of emotion), physiological (e.g., skin conductance response, heart rate, etc.), and behavioral (e.g., escape) components. Instead, ER might emerge differentially in these components (Davidson 1998). For example, one's high skin conductance response -a measure used to assess ER in the physiological component- to a stimulus signaling danger/threat may not result in the same level of intensity in the subjective component every time. Therefore, the assessment focusing only on one component of emotion might provide limited insight into individual differences in ER. Still, psychometrically robust self-report instruments assessing ER in the subjective component of emotion are relatively scarce. Considering the importance of ER in psychopathology, the development of self-report instruments to assess ER would contribute to a better understanding of these individual differences. To address this gap, Becerra and Campitelli (2013) introduced a novel scale, the Perth Emotional Reactivity Scale (PERS), which was initially designed in English in Perth, Australia. The research team subsequently tested its psychometric properties in a follow-up study (Becerra et al. 2019).

The PERS has some advantages over other self-report instruments that measure ER and related constructs such as the Behavioral Inhibition/Behavioral Activation Scale (Carver & White 1994) and the Emotion Reactivity Scale (Nock et al. 2008), which have also been adapted into Turkish (Şişman 2012, Seçer et al. 2013, respectively). More specifically, those measures focus solely on certain aspects of ER, such as intensity or activation, and fail to measure ER to both positive and negative events. Therefore, we particularly chose the PERS for adaptation in assessing ER as it covers all three different facets of ER (i.e., activation, intensity, and duration) for negative and positive emotions based on Davidson's (1998) model.

The research team (Preece et al. 2019) recently developed a short, 18-item form of the PERS (PERS-S). The PERS and PERS-S were both proven to have a second-order two-factor structure that includes positive and negative ER, each with three subscales (i.e., activation, duration, and intensity). Excellent internal consistencies (Cronbach's alphas) above .91 for second-order factors of positive and negative ER and good internal consistencies (Cronbach's alphas) ranging from .76 to .89 for their subscales were reported for the PERS and the PERS-S. The scales' concurrent validities were validated through their associations with the scores of other ER measurements, difficulties in emotion regulation, and psychological symptoms (Becerra et al. 2019, Preece et al. 2019). Thus, the robust psychometric properties of both original and short forms of the scale have enabled researchers to reliably and validly use the scales, and thereby various researchers adapted the PERS into different languages (e.g., Persian- Asl et al. 2020, Russian- Larionov et al. 2021 for PERS-S). Significantly, Balaban and Bilge (2021) adapted only the short form of the scale into Turkish, but not the original version. Moreover, as they did not examine the incremental validity of the short form, did not focus on regulating positive emotions for concurrent validity, and did not measure test-retest reliability, the psychometric properties of the PERS and PERS-S in Turkish have yet to be comprehensively examined.

The present study aimed to examine the psychometric properties of the PERS and PERS-S in a Turkish community sample. To this end, we adapted the PERS and PERS-S into Turkish, novel self-report measurement tools to assess both positive and negative ER in its three facets. We tested their factor structures, examined their concurrent and incremental validity, and also assessed their internal consistency and test-retest reliability.

Methods

Sample

Kline (2016) stated that 5 or 10 cases per parameter would be sufficient for conducting structural equation modeling. This criterion was used to determine the sample size. A total of 404 adults participated in this study with a convenient sample method, using an online survey platform. They participated in this study on a voluntary basis without any remuneration for their participation. We excluded data from 11 participants who failed to pass attention checks (e.g., if you are reading this question, tick "almost always") inserted through the questionnaires. We had no specific exclusion criteria except for the requirement to provide proper answers to attention-check questions and the requirement to be over 18 years old. Therefore, the dataset from 393 adults aged 18-68 was used in all analyses. The majority of the participants (73%) were females, and 0.5% did not prefer to declare their sex. The participants' mean age was 28.28 years (SD = 8.71, Median = 25). Forty-three percent of the sample had a high school degree or less, 36% had a bachelor's degree, and 21% had a master's degree. Moreover, half of the sample was active college students. The majority of the participants (78%) were single. Seventy percent of the sample lived in a metropolis. Most of the participants (87%) reported no psychiatric diagnosis.

Procedure

We have obtained permission from the corresponding authors of the PERS and PERS-S to adapt the scales into Turkish. Following ethical approval (Manisa Celal Bayar University, No: E-050.01.04.69564), the first and second authors and a clinical psychologist fluent in Turkish and English first translated the items into Turkish separately. Then, the clarity and equivalence of the translated items were evaluated by three experts with at least master's degree in psychology. Later, the authors reviewed these evaluations and prepared the Turkish versions of the scales. Finally, another experienced psychologist fluent in both languages performed the back-translation of the items. We reviewed the compatibility of the back-translated items with the original items and finalized the scales.

We collected the data via Microsoft Forms, an online survey platform. Before starting the data collection, we tested the functionality of all forms on this platform. We selected the participants through announcements on

social media and email groups using a convenient sampling method. The announcements were public and informed potential participants about the content of the study and its approximate duration and provided a link to participate. Those who provided their digital consent to participate in the study were administered the measurement tools. Data with duplicate IPs were excluded to prevent duplicate responses. Participants were required to complete all items on all forms and were able to navigate between form pages. We did not administer the PERS-S to the participants as a separate form. At this stage, we followed the same methodology used by Preece et al. (2019), who first developed the PERS-S and examined the psychometric properties of the PERS and PERS-S. As in that study, we investigated the properties of the PERS-S based on the responses extracted from the PERS. That is, we derived participants' PERS-S scores by using the relevant short-form items from the responses to the PERS. It took approximately 25 minutes to complete all of the instruments with a total of 131 items. This study was not preregistered. The data supporting the results are publicly available at the following OSF link (https://osf.io/kgfrw/).

After data collection, to assess the test-retest reliability of the instruments, we informed the participants about the second phase of the study and obtained the e-mail addresses of those accepting to participate in the second phase. Two weeks after the initial data collection, we sent an electronic invitation to those giving their consent to participate in the second phase of the research. A total of 215 people (81% females, 18% males, 1% others; Mage = 27.49, SD = 9.25, Median = 24) were ask to fill out only the PERS again. Similar to the first stage, we did not administer PERS-S as a separate instrument and used responses from the relevant items in the PERS to derive PERS-S scores. It took about 5 minutes on average for the participants to complete the scale.

Measures

Perth Emotional Reactivity Scale

This scale was developed by Becerra et al. (2019) to measure individual differences in positive and negative emotional reactivity. It contains 30 items of 5-point Likert-type (1 = very unlike me and 5 = very like me). The scale is composed of six lower-order scores (positive activation [e.g., I tend to get happy very easily], positive intensity [e.g., I think I experience happiness more intensely than my friends], positive duration [e.g., When I'm happy, the feeling stays with me for quite a while], negative activation [e.g., I tend to get upset very easily], negative intensity [e.g., If I'm upset, I feel it more intensely than everyone else.], and negative duration [e.g., When I'm upset, it takes me quite a while to snap out of it.]) and two higher-order scores (general positive reactivity and general negative reactivity).

Higher scores indicate a higher level of ER. In the original study, the researchers calculated Cronbach's alpha coefficients to be .93 for the general positive reactivity and .94 for the general negative reactivity. The coefficients ranged between .81 and .89 for its six subscales. PERS-S (Preece et al. 2019) demonstrated good psychometric properties, confirming its original factor structure. Internal consistency coefficients for the subscales were between .72 and .92 for the PERS-S. Becerra et al. (2019) and Preece et al. (2019) showed that the PERS-Positive scores were negatively and the PERS-Negative scores were positively correlated with psychopathology symptoms, supporting the concurrent validation of the scales. See the Appendix for Turkish items of the PERS and PERS-S.

Emotional Reactivity Scale (ERS)

The ERS was developed by Nock et al. (2008) to primarily assess negative ER. It contains 21 items of 5-point Likert-type (0 = not at all like me and 4 = completely like me). The ERS is composed of three subscales (sensitivity [e.g., My feelings get hurt easily], intensity [e.g., When I experience emotions, I feel them very strongly/intensely], and persistence [e.g., When something happens that upsets me, it's all I can think about it for a long time]), along with its total score. Higher scores indicate an increase in ER. In the original study, Cronbach's alphas of the subscales varied between .81 and .94. Seçer et al. (2013) adapted the ERS into Turkish by removing four items from the scale as those items distorted the factor structure of the ERS. Thus, they reported that the internal consistency coefficients of the 17-item Turkish version of the ERS ranged from .76 to .91. They also demonstrated the concurrent validity of the scale, with the total score correlating positively with fear of negative evaluation and social anxiety.

Difficulties in Emotion Regulation Scale-Short Form (DERS-16)

This scale was developed by Bjureberg et al. (2016) to measure difficulties in the emotion regulation process. It contains 16 items (e.g., I have difficulty making sense out of my feelings) of 5-point Likert-type (1 = almost never and 5 = almost always). The DERS-16 is composed of five subscales and a total score. Higher scores indicate an

increase in emotion dysregulation. The internal consistency and test-retest reliability coefficients of the total score of the DERS-16 were .92 and .85, respectively. Yiğit and Güzey Yiğit (2019) adapted the scale into Turkish and calculated Cronbach's alpha coefficients of the subscales to be between .78 and .92. Positive associations between the DERS-16 scores and psychopathology symptoms confirmed the validity of the scale (Bjureberg et al. 2016, Yiğit & Güzey Yiğit 2019).

Difficulties in Emotion Regulation Scale-Positive (DERS-Positive)

This scale was developed by Weiss et al. (2015) to assess the difficulties in regulating positive emotions. It contains 13 items of the 5-point Likert type (1 = almost never and 5 = almost always). It gives three subscale scores (nonacceptance [e.g., When I'm happy, I feel guilty for feeling that way], goals [e.g., When I'm happy, I have difficulty concentrating], and impulse [e.g., When I'm happy, I have difficulty controlling my behaviors]) along with a total score. Higher scores indicate an increase in difficulty regulating positive emotions. The researchers reported the internal consistency coefficients for these scores to be between .83 to .90. Asıcı et al. (2018) investigated the psychometric properties of the Turkish version of the scale. They showed its construct validity confirming the 3-factor structure and the internal consistency coefficients ranging from .69 and .90.

Ten-Item Personality Inventory (TIPI)

This inventory was developed by Gosling et al. (2003) to introduce a new inventory for personality assessment based on the Big Five Personality Model. It contains ten items (e.g., extraverted and enthusiastic, dependable and self-disciplined, and critical and quarrelsome) of 7-point Likert-type (1 = disagree strongly and 7 = agree strongly). The TIPI gives five scores, with higher scores indicating increased relevant personality traits. Researchers investigated its psychometric properties on a large sample and reported them as acceptable. Atak (2013) adapted the TIPI into Turkish and found the internal consistency coefficients ranging from .81 to .86 and the test-retest reliability coefficient being above .77. Moderate correlations between the TIPI scores and the scores of another five-factor personality scale confirmed the validity of the scale at an acceptable level (Atak 2013).

Depression Anxiety Stress Scales–21 (DASS-21)

This scale was developed by Henry and Crawford (2005) to measure individuals' depression, anxiety, and stress levels. It contains 21 items (e.g., I couldn't seem to experience any positive feeling at all, I was aware of dryness of my mouth, and I found it hard to wind down, respectively) of 4-point Likert-type (0 = did not apply to me at all and 3 = applied to me very much, or most of the time). It gives depression, anxiety, and stress subscores and a total score reflecting the overall levels of psychological distress. A higher score indicates increased symptoms. The original study reported internal consistency coefficients between .82 and .93. Sarıçam (2018) adapted the scale into Turkish and found Cronbach's alpha coefficients for the subscales to be above .77. The Turkish version had the same factor structure as the original one and showed strong correlations with its long form, indicating a good structural and concurrent validity.

Positive and Negative Affect Schedule (PANAS)

This scale was developed by Watson et al. (1988) to assess positive and negative affect. It contains 20 items in total [e.g., interested, excited, distressed, and upset] of a 5-point Likert-type (1 = very slightly or not at all and 5 = extremely). It gives two scores named positive affectivity and negative affectivity. Higher scores on a subscale indicated an increased affect on that subscale. In the original study, Cronbach's alphas were reported as .88 for positive affect and .85 for negative affect. Gençöz (2000) adapted the scale into Turkish and reported alpha values to be .86 and .83, respectively. The predictive validity of the Turkish version of the scale was at a good level as it successfully predicted the levels of depressive and anxious symptoms after three weeks.

Statistical Analysis

All statistical analyses were performed using SPSS 25.0 and LISREL 8.80. Prior to the statistical analyses, the dataset was examined for univariate (skewness-kurtosis) and multivariate (Mahalanobis distances) normality, and no values were found that distorted the normal distribution. For the sample size in factor analysis, Kline (2016) stated that 20 individuals per item is ideal and 10 individuals is acceptable. Accordingly, our sample size (N = 393, for usable data) was acceptable for the 30-item PERS, while it was ideal for the 18-item PERS-S.

First, we presented means and standard deviations of the scores as descriptive statistics and performed a multivariate analysis of variance (MANOVA) for sex comparisons.

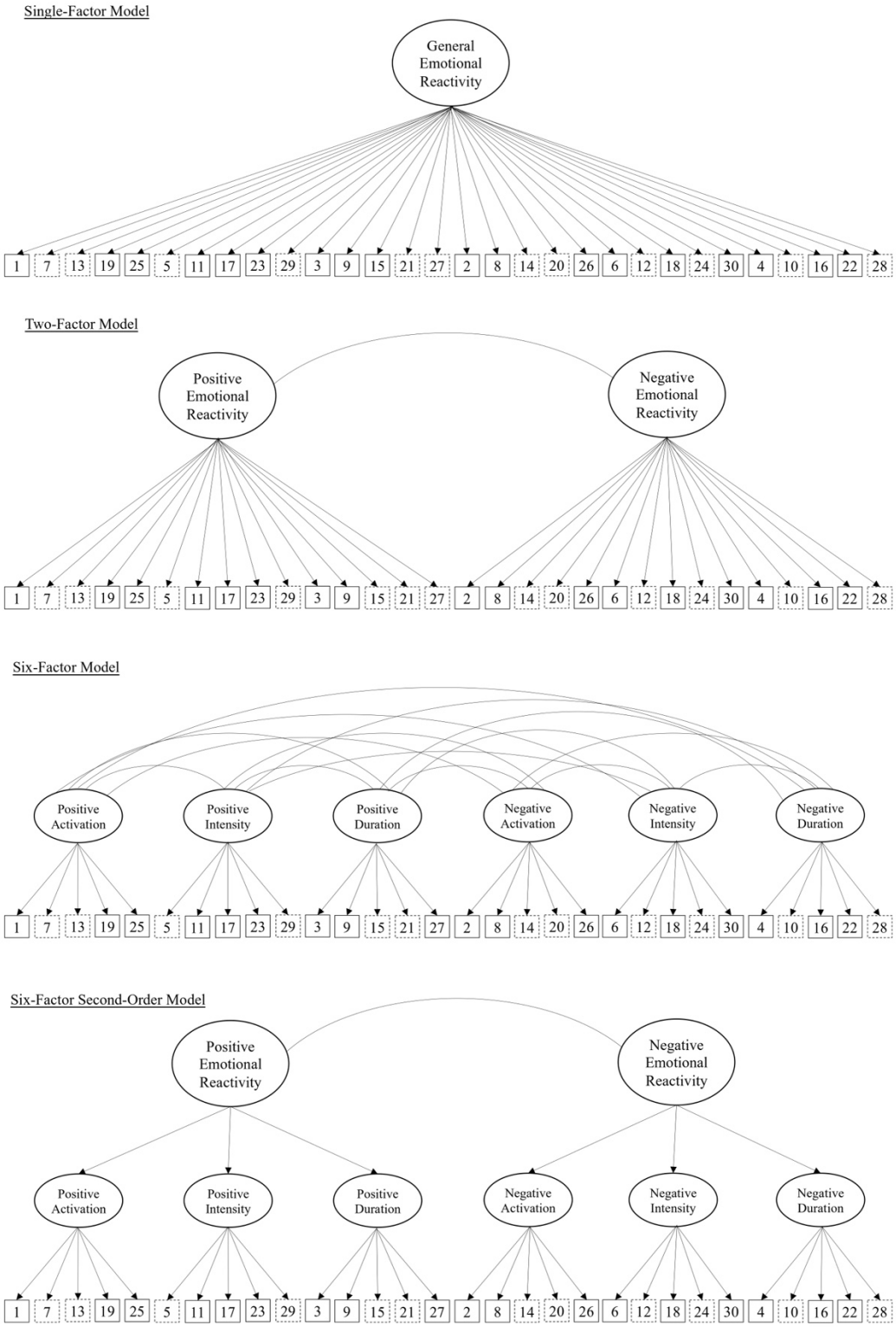

Fig. 1. The models tested for factor structures of the PERS and the PERS-S

Note. Items shown with dotted lines are those not included in the PERS-S

Second, we conducted a series of confirmatory factor analyses (CFAs). Since many researchers emphasized the importance of the use of exploratory factor analysis (EFA) in the test development process and the use of CFA

in the adaptation process and that the use of EFA and CFA in the same sample is not recommended (Kline 2016), we only used CFA in the present study. We employed the same analysis strategy as Preece et al. (2019). Thus, we tested both first-order and second-order structures. We separately tested four different models for both versions of the scale (see Figure 1). The first model was the one in which all items were assumed to cluster under only one factor, while the second model was the one in which items loaded dichotomously valence (positive and negative) factors. The third model was the six-factor model with no second-order components. The final model had six factors, with loadings on two separate second-order factors. In addition, we used maximum likelihood estimation and robust maximum likelihood estimation in the analyses and, thus reported how the results of the CFAs converged with both estimation methods without being affected by the distributions. We used the following goodness of fit indices (Thompson 2004): chi-square (X2) and Satorra-Bentler chi-square (S-B X2) values, the ratio of chi-square to degrees of freedom (X2/df; < 2.5 good, < 5 acceptable), the comparative fit index (CFI; > .95 good, > .90 acceptable), the normed fit index (NFI; > .95 good, > .90 acceptable), the root mean square error of approximation (RMSEA; < .05 good, < .10 acceptable), and the Akaike information criterion (AIC; lower is better).

Third, for the concurrent validity of the PERS, we computed correlations between the scores on the PERS/PERS-S and scores on the ERS, DERS-16, DERS-Positive, DASS-21, TIPI, and PANAS. Fourth, for incremental validity, we performed hierarchical regression analyses to investigate whether PERS contributes to the variance of psychological distress beyond ERS. Fifth, we calculated Cronbach's alpha coefficients for the internal consistency reliability of the scales. We interpreted the coefficients above .90 as excellent, above .80 as good, and above .60 as acceptable (Taber 2018). Finally, we examined the retest reliability of the scales by using the Pearson and intraclass correlation (ICC) coefficients, taken two weeks apart from 215 participants.

Results

Table 1 presents the descriptive statistics of the participants' scores on the measurements. We also investigated the sex differences in the mean scores of subscales of the PERS and PERS-S using MANOVA. The findings revealed that the effect of sex was statistically significant, Pillai's Trace = .07, $F(6, 384) = 4.86$, $p < .001$, $\eta 2 = .07$. Since the analysis was performed on six dependent variables, the significance criterion of p-value was set to 0.008 (0.05/6) in the follow-up tests. On the PERS, we found that the participants significantly differed by sex only on the activation subscale, where female participants showed faster activation to both positive ($F(1, 389) = 9.32$, $p < .008$, $\eta 2 = .02$) and negative emotions ($F(1, 389) = 11.37$, $p < .008$, $\eta 2 = .03$) than the male participants. On the PERS-S, MANOVA results also showed that the effect of sex was significant, Pillai's Trace = .09, $F(6, 384) = 6.52$, $p < .001$, $\eta 2 = .09$. Then, we performed a one-way analysis of variance (ANOVA) to uncover the source of differentiation and concluded that, as on the PERS, the participants significantly differed by sex only on the activation subscale, where female participants had significantly higher positive ($F(1, 389) = 17.88$, $p < .008$, $\eta 2 = .04$) and negative activation ($F(1, 389) = 11.11$, $p < .008$, $\eta 2 = .03$) scores compared to the males.

Structural Validity

We tested four alternative factor structures for both the PERS and PERS-S with a series of CFAs. As stated in the data analysis section, we examined these different models through two different estimation methods. Both methods converged on similar results (see Table 2). Accordingly, the model showing the best fit to the data was the six-factor model. The fit indices of the second-order model, in which the six factors give loadings on two higher-order factors, were also within the acceptable ranges. Yet, the one- and two-factor models for both the PERS and PERS-S produced fit indices below the acceptable threshold. Comparing six-factor and six-factor second-order models by X2, S-B X2 difference test, and AIC values, the 6-factor model showed a statistically better fit to the data (all p's < .001). Table 3 presents the item-factor loadings of the model, separately for the PERS and PERS-S. All factor loadings were statistically significant (all p's < .001). Except for items 13 and 27 (only on the PERS), all factor loadings were .40 and above. However, these items were not removed from the data set, considering the satisfactory factor loadings of the other items and the good internal consistency of these factors, and in order to preserve the original structure of the PERS.

Although the 6-factor model showed a better fit to the data, the second-order model, in which six factors are loaded on two higher-order factors, also showed acceptable fit indices and higher factor loadings of the items (.85 and above). Therefore, we concluded that the second-order model could also be conveniently used based on the recommendations of Preece et al. (2019) and Davidson's (1988) theoretical framework for ER. In summary, the original factor structures of both the PERS and the PERS-S were also confirmed for the Turkish versions.

Table 1. Cronbach's alphas, means, and standard deviations of used measurements							
	All sample (N = 393)			**Female (n = 287)**		**Male (n = 104)**	
	Ort.	SS	Cronbach α	Ort.	SS	Ort.	SS
PERS							
General Positive Reactivity	3.60	0.53	0.86	3.64	0.52	3.48	0.55
Positive activation	3.67	0.57	0.63	3.73	0.54	3.53	0.64
Positive intensity	3.49	0.69	0.78	3.54	0.68	3.34	0.69
Positive duration	3.63	0.60	0.70	3.65	0.61	3.56	0.58
General Negative Reactivity	3.25	0.75	0.92	3.31	0.74	3.07	0.73
Negative activation	3.26	0.86	0.84	3.35	0.85	3.03	0.84
Negative intensity	3.43	0.81	0.82	3.50	0.81	3.24	0.80
Negative duration	3.05	0.77	0.78	3.09	0.76	2.95	0.77
PERS-S							
General Positive Reactivity	3.66	0.59	0.83	3.71	0.57	3.51	0.61
Positive activation	3.80	0.66	0.68	3.89	0.60	3.57	0.76
Positive intensity	3.69	0.66	0.62	3.74	0.65	3.56	0.68
Positive duration	3.48	0.76	0.69	3.51	0.77	3.38	0.72
General Negative Reactivity	3.25	0.80	0.90	3.32	0.78	3.06	0.82
Negative activation	3.39	0.92	0.78	3.48	0.90	3.13	0.92
Negative intensity	3.34	0.94	0.85	3.41	0.92	3.15	0.97
Negative duration	3.03	0.82	0.72	3.08	0.81	2.90	0.84
ERS							
Total	43.50	7.30	0.85	44.21	7.21	41.57	7.25
Sensitivity	14.64	2.96	0.85	14.97	2.91	13.76	2.95
Intensity	15.98	2.97	0.53	16.16	3.02	15.47	2.81
Persistence	12.89	2.53	0.65	13.08	2.46	12.34	2.66
DERS-16							
Total	37.00	13.10	0.93	37.69	13.47	35.23	11.99
Clarity	4.27	1.92	0.86	4.36	1.96	4.04	1.82
Goals	9.28	2.97	0.85	9.40	2.96	8.96	3.03
Impulse	5.68	2.81	0.85	5.74	2.89	5.57	2.62
Strategy	11.53	5.27	0.90	11.82	5.43	10.78	4.76
Nonacceptance	6.23	3.14	0.83	6.37	3.25	5.88	2.82
DERS-Positive							
Total	17.51	4.78	0.85	17.74	4.98	16.88	4.19
Nonacceptance	4.62	1.45	0.73	4.63	1.47	4.56	1.42
Goals	6.70	2.75	0.85	6.87	2.91	6.23	2.20
Impulse	6.19	1.98	0.82	6.23	2.03	6.09	1.86
TIPI							
Extraversion	9.56	3.44	0.77	9.70	3.37	9.11	3.59
Agreeableness	9.94	2.55	0.26	10.16	2.46	9.37	2.71
Conscientiousness	11.40	2.41	0.48	11.41	2.43	11.32	2.36
Neuroticism	7.53	2.96	0.44	7.85	2.97	6.65	2.77
Openness to experience	10.52	2.56	0.42	10.41	2.66	10.87	2.27
DASS-21							
General psychological distress	16.41	10.70	0.92	17.35	10.92	13.72	9.56
Depression	6.66	4.94	0.88	6.97	5.01	5.79	4.63
Anxiety	4.08	3.90	0.83	4.42	4.08	3.11	3.14
Stress	5.72	3.56	0.80	6.04	3.59	4.83	3.33
PANAS							
Negative affect	22.41	7.12	0.85	22.87	7.42	21.11	6.08
Positive affect	34.46	6.24	0.81	34.18	6.30	35.18	6.07

PERS: Perth Emotional Reactivity Scale, PERS-S: Perth Emotional Reactivity Scale-Short Form, ERS: Emotional Reactivity Scale, DERS-16: Difficulties in Emotion Regulation Scale-Short Form, DERS-Positive: Difficulties in Emotion Regulation Scale-Positive, TIPI: Ten-Item Personality Inventory, DASS-21: Depression Anxiety Stress Scale-Short Form, PANAS: Positive and Negative Affect Schedule.

Table 2. The fit indices of the factor structures of the PERS and the PERS-S (findings of both maximum likelihood [ML] and robust maximum likelihood [RML] estimations)

		X2 or S-B X2 (df)	p	X2/df	CFI	NFI	RMSEA [90% CI]	AIC
PERS								
ML	1-factor model	5320.85 (405)	<0.001	13.14	0.85	0.83	0.18 [0.17 - 0.18]	5440.85
	2-factor model	1861.42 (404)	<0.001	4.61	0.92	0.90	0.096 [0.092 - 0.10]	1983.42
	6-factor model	1537.34 (390)	<0.001	3.94	0.93	0.91	0.087 [0.082 - 0.091]	1687.34
	6-factor second-order model	1660.20 (400)	<0.001	4.15	0.93	0.91	0.09 [0.085 - 0.094]	1790.20
RML	1-factor model	5520.19 (405)	<0.001	13.63	0.67	0.65	0.18 [0.18 - 0.18]	5640.19
	2-factor model	1890.24 (404)	<0.001	4.68	0.90	0.88	0.097 [0.092 - 0.10]	2012.24
	6-factor model	1556.39 (390)	<0.001	3.99	0.92	0.90	0.087 [0.083 - 0.092]	1706.39
	6-factor second-order model	1685.74 (400)	<0.001	4.21	0.92	0.89	0.09 [0.086 - 0.095]	1815.74
PERS-S								
ML	1-factor model	2245.91 (135)	<0.001	16.64	0.84	0.83	0.20 [0.19 - 0.21]	2317.91
	2-factor model	509.28 (134)	<0.001	3.80	0.95	0.93	0.085 [0.077 - 0.092]	583.28
	6-factor model	317.29 (120)	<0.001	2.64	0.97	0.96	0.065 [0.056 - 0.065]	419.29
	6-factor second-order model	415.10 (130)	<0.001	3.19	0.96	0.94	0.075 [0.067 - 0.083]	497.10
RML	1-factor model	2356.18 (135)	<0.001	17.45	0.67	0.66	0.20 [0.20 - 0.21]	2428.18
	2-factor model	516.48 (134)	<0.001	3.85	0.94	0.93	0.085 [0.078 - 0.093]	590.48
	6-factor model	320.27 (120)	<0.001	2.67	0.97	0.95	0.065 [0.057 - 0.074]	422.27
	6-factor second-order model	417.82 (130)	<0.001	3.21	0.96	0.94	0.075 [0.067 - 0.083]	499.82

PERS: Perth Emotional Reactivity Scale, PERS-S: Perth Emotional Reactivity Scale-Short Form, X2: Chi-square, S-B X2: Satorra-Bentler Chi-square, df: Degrees of freedom, CFI: Comparative fit index, NFI: Normed fit index, RMSEA: Root mean square of approximate errors, AIC: Akaike information criterion.
We determined an additional equality constraint among the loadings for each second-order factor to get additional degrees of freedom since the second-order models included only three first-order factors for each second-order factor.

Concurrent Validity

We performed a series of Pearson correlation analyses to investigate the concurrent validity of the PERS. Table 4 shows the associations between the scores on both the PERS and the PERS-S and the other instruments used in the present study. We presented the results of the analyses using the total scores of the specified measurement tools to keep the results manageable. In general, the PERS and the PERS-S yielded similar associations with the other instruments. While all PERS negative reactivity scores showed a high positive correlation with the ERS total score, only the positive duration scores were negatively correlated with the ERS total score. Nonsignificant correlations between the remaining PERS positive reactivity scores and the ERS total score were observed. In addition, the total score of DERS-16 was positively correlated with all negative reactivity scores of the PERS and negatively correlated with all positive reactivity scores. Difficulties in regulating positive emotions (DERS-Positive) had significant correlations, mainly with the negative reactivity component of the PERS.

Regarding the relationship between ER and personality traits (TIPI), the positive reactivity component of the PERS was positively correlated with extraversion, agreeableness, conscientiousness, and openness to experience,

while it was negatively correlated with neuroticism. There were strong positive correlations between neuroticism and negative ER scores.

As expected, ER was significantly related to one's overall psychological distress and to both positive and negative affect. The sum of depression, anxiety, and stress scores, the psychological distress score (DASS-21), showed a moderate negative correlation with the positive ER while demonstrating a high positive correlation with the negative ER. Moreover, we found a similar pattern between negative and positive affect (PANAS) and the negative and positive reactivity components of the PERS, respectively.

Table 3. Standardized factor loadings of the PERS and the PERS-S items (findings of both maximum likelihood [ML] and robust maximum likelihood [RML] estimations)

	PERS		**PERS-S**	
Factors/Item Numbers	**ML**	**RML**	**ML**	**RML**
General Positive Reactivity (second-order)				
Positive activation (first-order)	0.94	0.93	0.89	0.91
1	0.71	0.84	0.72	0.72
7	0.44	0.61	-	-
13	0.26	0.17	-	-
19	0.68	0.78	0.70	0.70
25	0.57	0.62	0.55	0.55
Positive intensity (first-order)	0.85	0.85	0.98	0.96
5	0.69	0.75	-	-
11	0.74	0.84	0.70	0.70
17	0.64	0.84	0.67	0.67
23	0.44	0.49	0.41	0.41
29	0.75	0.87	-	-
Positive duration (first-order)	0.90	0.91	0.91	0.91
3	0.75	0.88	0.76	0.76
9	0.75	0.85	0.74	0.74
15	0.49	0.65	0.49	0.49
21	0.52	0.68	-	-
27	0.33	0.40	-	-
General Negative Reactivity (second-order)				
Negative activation (first-order)	0.97	0.97	0.96	0.96
2	0.70	0.82	0.75	-
8	0.65	0.77	0.67	0.75
14	0.67	0.92	-	0.67
20	0.79	0.93	-	-
26	0.78	0.87	0.77	0.77
Negative intensity (first-order)	0.94	0.94	0.92	0.92
6	0.77	0.86	0.78	0.78
12	0.58	0.89	-	-
18	0.78	0.89	0.80	0.80
24	0.50	0.63	-	-
30	0.85	0.94	0.86	0.86
Negative duration (first-order)	0.97	0.96	0.93	0.93
4	0.62	0.79	0.65	0.65
10	0.52	0.72	-	-
16	0.62	0.92	0.58	0.58
22	0.82	0.94	0.84	0.84
28	0.66	0.83	-	-

PERS: Perth Emotional Reactivity Scale, PERS-S: Perth Emotional Reactivity Scale-Short Form, All factor loadings had p-value of < 0.001.

Incremental Validity

We performed two separate hierarchical regression analyses to test the incremental validity of the PERS and the PERS-S. In these analyses, we employed the DASS-21 total score (psychological distress) as the outcome variable, the ERS total score as the predictor of the first step, and the PERS positive and negative reactivity scores as the predictors of the second step. Also, we performed additional hierarchical regression analyses to test the incremental validity of the PERS and the PERS-S on levels of depressive, anxious, and stress symptoms separately (see Addendum 2. Supplementary Material). According to the findings, the first step was statistically

significant, F(1, 390)= 144.20, p< .001, R2= .27. Thus, the ERS total score (β= .52, p< .001) was significantly associated with psychological distress. The second step of the analysis, in which the two general scores of the PERS were added, was also statistically significant, F(3, 388)= 86.84, p< .001, R2= .40. Accordingly, the second step made a statistically significant contribution to the variance explained in the first step by 13%, ΔF(2, 388)= 42.73, p< .001. The ERS total score (β= .24, p< .001), the contribution of the PERS general positive (β= -.21, p< .001), and negative reactivity scores (β= .36, p< .001) to the model were also significant in this step.

Considering the incremental validity of the PERS-S, we found similar results as reported above. The PERS-18 scores included in the model in the second step contributed significantly to the model, F(3, 388)= 86.11, p< .001, R2= .40. Moreover, the variance explained in the first step increased statistically by 13%, ΔF(2, 388)= 41.93, p< .001. Accordingly, the positive (β= -.22, p< .001) and negative reactivity scores (β= .33, p< .001) significantly predicted psychological distress over the ERS total score.

Table 4. Correlations among the PERS, the PERS-S, and the other measurements

	General Positive Reactivity	**Positive activation**	**Positive intensity**	**Positive duration**	**General Negative Reactivity**	**Negative activation**	**Negative intensity**	**Negative duration**
Age	0.12*/ 0.16**	0.06/ 0.14**	0.08/ 0.03	0.18***/ 0.22***	-0.23***/ -0.22***	-0.27***/ -0.26***	-0.19***/ -0.17***	-0.16**/ -0.17***
ERS-Total Score	-0.02/ -0.08	0.04/ -0.01	0.08/ 0.05	-0.18***/ -0.23***	0.78***/ 0.78***	0.73***/ 0.72***	0.75***/ 0.74***	0.66***/ 0.61***
DERS-16-Total Score	-0.25***/ -0.31***	-0.13*/ -0.20***	-0.16**/ -0.16**	-0.37***/ -0.40***	0.70***/ 0.70***	0.68***/ 0.64***	0.63***/ 0.61***	0.63***/ .63***
DERS-Positive-Total Score	-0.08/ -0.11*	-0.06/ -0.09	0.01/ 0.02	-0.17***/ -0.19***	0.23***/ 0.21***	0.23***/ 0.18***	0.22***/ 0.18***	0.19***/ .21***
TIPI-Extraversion	0.47***/ 0.47***	0.36***/ 0.43***	0.45**/ 0.41**	0.38***/ 0.37***	-0.32***/ -0.31***	-0.33***/ -0.31***	-0.22***/ -0.22***	-0.32***/ -0.32***
TIPI-Agreeableness	0.36***/ 0.38***	0.29***/ 0.38***	0.28**/ 0.25**	0.36***/ 0.34***	-0.36***/ -0.30***	-0.31***/ -0.26***	-0.35***/ -0.27***	-0.34***/ -0.27***
TIPI-Conscientiousness	0.32***/ 0.37***	0.18***/ 0.25***	0.22**/ 0.24**	0.42***/ 0.43***	-0.47***/ -0.45***	-0.47***/ -0.43***	-0.40***/ -0.38***	-0.42***/ -0.40***
TIPI-Neuroticism	-0.21***/ -0.26***	-0.13*/ -0.18**	-0.08/ -0.10*	-0.33***/ -0.36***	0.67***/ 0.69***	0.68***/ 0.69***	0.61***/ 0.61***	0.55***/ 0.55***
TIPI-Openness to experience	0.07/ 0.06	0.08/ 0.09	0.01/ 0.02	0.09/ 0.04	0.12*/ 0.06	0.08/ 0.04	0.12*/ 0.06	0.12*/ 0.06
DASS-21-Total Score	-0.31***/ -0.34***	-0.21***/ -0.25***	-0.17**/ -0.17**	-0.42***/ -0.43***	0.60***/ 0.59***	0.57***/ 0.54***	0.57***/ 0.53***	0.51***/ 0.51***
PANAS-Negative affect	-0.38***/ -0.41***	-0.27***/ -0.32***	-0.27**/ -0.24**	-0.44***/ -0.46***	0.63***/ 0.59***	0.62***/ 0.58***	0.59***/ 0.53***	0.53***/ 0.47***
PANAS-Positive affect	0.57***/ 0.57***	0.39***/ 0.39***	0.53***/ 0.51***	0.54***/ 0.53***	-0.33***/ -0.31***	-0.37***/ -0.29***	-0.21***/ -0.19***	-0.33***/ -0.37***

*p < .05 ** p < .01 *** p < .001; Note. The values to the left of the slash are the correlation coefficients belonging to the PERS, while the values to the right are the ones belonging to the PERS-S. ; PERS: Perth Emotional Reactivity Scale, PERS-S: Perth Emotional Reactivity Scale-Short Form, ERS: Emotional Reactivity Scale, DERS-16: Difficulties in Emotion Regulation Scale-Short Form, DERS-P: Difficulties in Emotion Regulation Scale-Positive, TIPI: Ten-Item Personality Inventory, DASS-21: Depression Anxiety Stress Scale-Short Form, PANAS: Positive and Negative Affect Schedule

Internal Consistency and Test-Retest Reliability

Table 1 shows Cronbach's alpha coefficients of both versions of the PERS and other measures obtained in the present study. The findings showed acceptable internal consistency of the positive and negative reactivity components on both forms of the PERS. Cronbach's alphas of the positive ER subscales (between .63 and .70) and negative subscales (between .78 and .84) of PERS were in the acceptable range. The Cronbach's alphas for overall positive and negative ER values were .86 and .92, respectively. The pattern was similar for PERS-S. Cronbach's alphas of the positive ER subscales (between .62 and .69) and negative subscales (between .72 and .85) of PERS-S were in the acceptable range. The alphas for overall positive and negative ER values were .83 and .90, respectively. While the negative reactivity subscales in both forms yielded excellent and good internal

consistencies, the positive reactivity subscales showed slightly lower alpha coefficients. Overall, we found Cronbach's alpha coefficients of all subscales in both forms to be within acceptable limits.

For the test-retest reliability, we performed Pearson correlation and ICC analyses on the PERS and the PERS-S scores obtained at a two-week interval. The following in parentheses give the ICC coefficients. Accordingly, we calculated the test-retest reliability coefficients to be .83 (.86) for the positive reactivity component and .84 (.87) for the negative reactivity component on the PERS. They were .73, .74, and .76 (.81, .81, and .84) for the positive activation, intensity, and duration, respectively, and .82, .79, and .77 (.88, .84, and .84) for negative activation, intensity, and duration, respectively. We also obtained similar results for the PERS-S. The test-retest reliability coefficients were .79 (.85) for the positive reactivity component and .85 (.89) for the negative reactivity component. In addition, we calculated them to be .68, .62, and .73 (.78, .73, and .82) for the positive activation, intensity, and duration, respectively, while they were .81, .77, and .77 (.87, .85, and .83) for the negative activation, intensity, and duration, respectively.

Discussion

We carried out the present study to adapt both the original and the short forms of the PERS into Turkish and to examine their psychometric properties. Our findings confirmed the original factor structures of the scales, reported the correlations of the PERS and PERS-S scores with other constructs associated with ER and yielded good reliability coefficients.

The PERS developed by Becerra et al. (2019), based on Davidson's (1998) theoretical model, measures positive and negative ER across its activation, intensity, and duration aspects. Our results indicated that both the 6-factor first-order structure and the second-order structure subsuming these factors can be conveniently used to measure the intended construct using the original and short forms of the PERS (Becerra et al. 2019, Preece et al. 2019). These results are in line with previous reports, for example, the Persian version of the PERS (Asl et al. 2020), and the Russian (Larionov et al. 2021) and the Turkish versions of the PERS-S (Balaban & Bilge 2021). We found that both the subscale scores for positive-negative activation, intensity, and duration, as well as the overall scores for general positive-negative reactivity, can be used. Although the fit statistics of the 6-factor structure showed better psychometric properties, the second-order factors also yielded acceptable fit statistics. To preserve Davidson's (1998) theoretical model and the original factor structure of the scale (Becerra et al. 2019, Preece et al. 2019), we recommend that both structures can be used to measure ER.

A closer examination of the items revealed that the factor loadings of positive reactivity items 13 (I tend to get enthusiastic about things very quickly) and 27 (If someone pays me a compliment, it improves my mood for a long time) on the PERS were below .40. In fact, these items gave relatively low loadings on their component in the original study (Preece et al. 2019) and were not included in the PERS-S. However, despite these lower loadings, the statistically significant factor loadings of these items did not appear to compromise the internal consistency of their respective factor. As such, we opted to keep and not remove these two items from the PERS based on good fit statistics observed in the present study and on our motivation to preserve the scale's original structure. Besides, these items were not included in the PERS-S, where all factor loadings were above .40.

Considering reliability, we found that Cronbach's alpha values of the 6-factor structure were above the acceptable threshold for both forms. The relevant coefficients were higher for the general positive and general negative reactivity scores compared to the sub-scale scores. These findings are consistent with previous studies on the internal consistency of the PERS/PERS-S (Becerra et al. 2019, Preece et al. 2019, Asl et al. 2020). The present study was the first to examine the test-retest reliability of the scale and reached highly positive results regarding it, which further supports the robust psychometric properties of the PERS/PERS-S. These results indicate that one's self-report ER remains relatively stable over time.

Further, we tested the concurrent validity of the PERS/PERS-S using the ERS, which is among the most frequently utilized instruments to measure ER in Turkish. The findings indicated high correlations between the subscales of the PERS, particularly regarding negative emotions, and the total ERS score. This expected result suggests that the Turkish version of the PERS successfully measures ER. Furthermore, only the duration subscale on the PERS positive reactivity component was negatively correlated with the total ERS score, which is highly consistent with the finding of Becerra et al. (2019). In addition, such a finding indicates that the ERS remains insufficient in measuring positive ER, while the PERS offers a more comprehensive assessment of both negative and positive ER.

The concurrent validity of the PERS/PERS-S was further assessed with difficulties in emotion regulation as assessed by the DERS-16. We demonstrated that difficulties in emotion regulation were negatively correlated with positive ER but positively correlated with negative ER. In line with previous research employing the PERS/PERS-S (Becerra et al. 2019, Preece et al. 2019, Asl et al. 2020, Balaban & Bilge 2021), our findings suggested that one may experience less difficulty in emotion regulation as positive ER increases, and, in contrast, more difficulties in regulating emotions as reactivity to negative emotions increases. Gross and Jazaieri (2014) highlighted that emotion regulation is a construct highly influenced by ER, and the present study supports this association. Moreover, we addressed how PERS/PERS-S was associated with difficulties in regulating positive emotions and found that difficulties in regulating positive emotions were linked with negative ER. Although it was expected to be negatively correlated with positive ER, the correlation coefficients were not statistically significant. Altogether, difficulties in regulating both positive and negative emotions were significantly related to the PERS/PERS-S negative ER scores.

Similar to personality traits, ER refers to a predisposition to emotional experience and reactions to emotional stimuli (Becerra et al. 2019). In other words, how quickly one feels positive and negative emotions, how intense such emotions are, and how long these emotions are experienced are the factors creating individual differences measured with the PERS. Thus, the expectation that such differences might also be linked with the five-factor personality traits led us to test the concurrent validity of the PERS through personality traits. Accordingly, we found that extraversion, agreeableness, conscientiousness, and openness to experience as personality traits were positively associated with positive ER, while neuroticism was positively associated with negative ER. To the best of our knowledge, the present study was the first to address the relationship between PERS scores and personality traits. Our findings seem highly reasonable considering that those with high neuroticism are more likely to feel negative emotions via emotion manipulation (Larsen & Ketelaar 1989), and have more difficulties in emotion regulation (Barańczuk 2019). Although our findings regarding personality traits contribute to the ER literature as measured by the PERS, future research should note the low internal consistency coefficients of the TIPI observed in the present study and attempt to replicate our findings using another relevant measure.

Furthermore, we explored the relationships between psychological distress (DASS-21 total score) and the PERS scores. The results suggested increased psychological distress in the face of reduced positive ER and elevated negative ER, which is consistent with previous findings obtained using the PERS (Becerra et al. 2019, Preece et al. 2019, Asl et al. 2020, Balaban & Bilge 2021). The previous research also highlighted the relationship between ER and psychopathology and addressed ER as a risk factor interacting with emotion regulation (Gross & Jazaieri 2014). However, ER has only been examined in response to negative emotions. Our findings revealed that positive ER was negatively related to psychopathology symptoms and negative affect, but positively related to positive affect. Considering that how people approach their positive emotions influences their moods (see Gruber 2019), introducing a tool that handles positive emotions is crucial. Indeed, our results on the incremental validity of the PERS yielded that the total scores on both forms of the PERS significantly predicted psychopathology symptoms over the total ERS score. In the second step, increased negative ER and decreased positive ER eliminated the effect of ERS in predicting depressive symptoms severities. Because the effects of both positive and negative ER were significant for all symptom severities, we believe that the PERS will present opportunities for research on reactivity to positive emotions in psychopathology.

We found that the PERS and PERS-S scores of females tended to be higher than males, and the difference in activation was statistically significant. Although Balaban and Bilge (2021) reported no sex difference, our results were in line with some previous findings (Becerra et al. 2019, Preece et al. 2019, Larionov et al. 2021). Indeed, this sex difference is expected, considering that females tend to show and verbalize their emotions more than males (Brody & Hall 2008) and also show higher arousal to negative stimuli (Bianchin & Angrilli 2012). Considering that most previous evidence comes from psychophysiological measures, examining the sex differences in ER using the PERS is a valuable contribution to the literature. We also note that readers should be cautious when interpreting sex differences in ER, as the results may have been biased by the unequal sex ratio in the present study, potentially limiting the generalizability of our findings.

Besides, considering that individuals' processing of emotional stimuli significantly biases their cognitive processes, such as perception, attention, and memory, researchers interested in biased emotion processing leading to psychopathology may also utilize the PERS. For example, individuals with high ER have demonstrated attentional biases toward danger/threat-related stimuli and devote more attentional resources to processing such stimuli (Matusz et al. 2015). The bias is not only limited to attention, but individuals with increased ER are selectively better at remembering stimuli signaling danger/threat (Matusz et al. 2015). However, this bias in cognitive processes sometimes leads to rapid but erroneous responses to the stimuli. Individuals with high neuroticism are more prone to false memories of negative emotional stimuli (Norris et al. 2019). Thus,

understanding the association between ER and attention and memory biases to emotional stimuli may also help researchers to understand psychopathology better.

The present study had some limitations that need to be addressed in further studies. Following the procedure used in the original study of PERS-S (Preece et al. 2019, see also other studies using a similar approach Merz et al. 2013, Kaçar-Başaran et al. 2022), we derived PERS-S scores from the participants' responses to the relevant items of the PERS, so we did not administer the PERS-S as a separate instrument. This procedure might have inflated the degree of similarity between the PERS and the PERS-S regarding their psychometric properties and has the potential to increase method bias. Yet, consistent findings with Balaban and Bilge's (2021) study indicate that the good psychometric properties of PERS-S could not solely be explained by the potential method bias and that the PERS-S is a valid and reliable tool to measure ER across different Turkish community samples.

Although our primary aim was to test the psychometric properties of the PERS and the PERS-S in a Turkish community sample, the representativeness of our sample may have been limited by several factors such as unequal sex distribution, online recruitment of participants, or lack of inclusion of clinical samples with different psychopathologies. We also note that we did not apply any specific exclusion or inclusion criteria based on individuals' current psychopathology status. Considering that both our findings and previous research suggest that psychopathology symptoms are closely related to the level of ER (e.g., Bylsma et al. 2008, Cougle et al. 2013, Gross & Jazaieri 2014), future studies should extend the present study to ensure the replicability of the findings in more representative or comparable clinical and nonclinical samples, using a more strict inclusion/exclusion criteria. Moreover, we aimed to adapt the PERS/PERS-S into Turkish to better understand how ER emerges in the subjective component of emotion by testing the concurrent validity utilizing other self-report measurements. Future studies may consider exploring ER using different physiological instruments or experimental methods in the laboratory setting to uncover the similarities and differences between the methodologies. Besides, measuring ER as a state factor in the laboratory setting would allow for gaining better insight into how ER can be influenced by context-specific factors.

Lastly, despite our rigorous translation procedure, due to practical reasons, we did not test the linguistic equivalence of the original and Turkish versions of the PERS by administering both versions to the same sample that is proficient in both languages. Indeed, linguistic equivalence is considered an optional step for translation studies (Sertel-Berk 2020) and we note that three experts with at least a master's degree in psychology confirmed the translation of the items from the source language to the target language conveyed the same meaning. Still, it is worth examining the linguistic equivalence of Turkish versions of the PERS and the PERS-S in future studies to increase the validity of the translated items.

Conclusion

Our study suggested that the PERS and the PERS-S are valid and reliable tools in a Turkish sample. Compared to the previous studies that investigated the psychometric properties of the PERS, the present study has particular strengths in that we translated both forms of the PERS into Turkish, conducted a rigorous translation process, and recruited a relatively large sample.

Further, this was the first study to examine the test-retest reliability and incremental validity of the scales and to provide the findings on the relationships between the PERS and personality traits. Confirming the scales' validity and reliability would enable researchers to use more up-to-date ER measures in Turkish, which is likely to pave the way for the multidimensional and cross-cultural assessment of ER. Overall, the PERS may be utilized to explore the associations of ER with psychopathology and some individual differences, as well as to contribute to cognitive psychology research investigating the effects of emotion on cognition. To conclude, using the scale may enhance our theoretical background on ER and enable the scientific community to better understand human emotions in practice.

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Addendum 1. Turkish versions of Perth Emotional Reactivity Scale (PERS) and its Short Form (PERS-S)

Perth Emotional Reactivity Scale (PERS) Turkish form

This questionnaire is designed to measure different aspects of how you typically react toexperiencing emotional events. Please score the following statements according to howmuch they apply or do not apply to you on a typical day. Circle one answer for each question

		Bana hiç benzemiyor.	Benden biraz daha farklı	Ne bana benziyor ne de benzemiyo	Ne bana benziyor ne de benzemiyo	Tıpkı benim gibi.
1	**Çok kolay mutlu olmaya yatkınımdır.**	1	2	3	4	5
2	**Çok kolay üzülmeye yatkınımdır.**	1	2	3	4	5
3	**Mutlu olduğumda, bu his benle uzunca bir süre kalır.**	1	2	3	4	5
4	**Üzgün olduğumda, kendimi toplamam epey zaman alır.**	1	2	3	4	5
5	Mutluluğu arkadaşlarımdan daha yoğun yaşadığımı düşünüyorum.	1	2	3	4	5
6	**Üzgünsem, bunu diğer herkesten daha yoğun hissederim.**	1	2	3	4	5
7	Duygularım nötrden olumluya kendiliğinden geçer.	1	2	3	4	5
8	**Çok kolay hayal kırıklığına uğramaya yatkınımdır.**	1	2	3	4	5
9	**Olumlu hissettiğimde, günün büyük bir bölümünde böyle kalabilirim.**	1	2	3	4	5
10	Sinirlendiğim bir durumu atlatmak diğer insanlara kıyasla daha fazla zamanımı alır.	1	2	3	4	5
11	**Neşeli olduğumda, bunu oldukça derinden hissetmeye yatkınımdır.**	1	2	3	4	5
12	Engellenmişlik hissini oldukça derinden yaşarım.	1	2	3	4	5
13	Bir şeylere çok çabuk heveslenmeye yatkınımdır.	1	2	3	4	5
14	Çok kolayca engellenmiş hissetmeye yatkınımdır.	1	2	3	4	5
15	(Belli bir konuyla ilgili) Hevesimi uzunca bir süre sürdürebilirim.	1	2	3	4	5
16	**Engellenmişlik hissinden kurtulmak benim için zordur.**	1	2	3	4	5
17	**Olumlu ruh halini oldukça güçlü yaşarım.**	1	2	3	4	5
18	**Normalde mutsuz olduğumda bunu çok şiddetli hissederim.**	1	2	3	4	5
19	**Olumlu şeylerle ilgili anında iyi hissederim.**	1	2	3	4	5
20	Duygularım nötrden olumsuza çok çabuk geçer.	1	2	3	4	5
21	Güzel haberler alırsam, belli bir süre mutlu kalırım.	1	2	3	4	5
22	**Olumsuz ruh haline bir kere girdiğimde bundan kurtulmak zor olur.**	1	2	3	4	5
23	**Bir şeye heveslendiğimde bunu çok güçlü şekilde hissederim.**	1	2	3	4	5
24	Sinirlendiğimde, bu duygumu çok güçlü şekilde hissederim.	1	2	3	4	5
25	**İyi haberlere çok çabuk tepki veririm.**	1	2	3	4	5
26	**Olumsuz şeyler hakkında çok çabuk karamsar olmaya yatkınımdır.**	1	2	3	4	5
27	**Biri bana iltifat ederse, bu durum ruh halime uzun bir süre iyi gelir.**	1	2	3	4	5
28	Bir şeye kızdığımda, bu bütün günümü mahveder.	1	2	3	4	5
29	Akraba ve arkadaşlarıma kıyasla olumlu hisleri daha derinden yaşarım.	1	2	3	4	5
30	**Olumsuz hislerimi çok yoğun yaşarım.**	1	2	3	4	5

Notes: Items in bold represent the items of the PERS-SF.

Scoring of the Scale

Six sub-scores and two total scores can be obtained from the scale. The scale does not have a single total score. There are no reverse coded items in the scale.

The sub-dimensions and related items are given below. The scoring of each sub-dimension is formed by summing the answers given to the related items.

Positive Emotional Reactivity: All items with an odd number

Positive activation: items 1, 7, 13, 19, 25

Positive intensity: items 5, 11, 17, 23, 29

Positive Duration: Articles 3, 9, 15, 21, 27

Negative Emotional Reactivity: Even number all items

Negative activation: items 2, 8, 14, 20, 26

Negative intensity: items 6, 12, 18, 24, 30

Negative duration: items 4, 10, 16, 22, 28

Addendum 2. Supplementary Material

Table Supplementary. Hierarchical regression analysis results for incremental validity of the PERS and PERS-S				
	Scores of the DASS -21 as predicted variables			
	Depression	Anxiety	Stress	General Psychological Distress
Step I	$AdjR^2$ = 0.14 $F(1, 391)$ = 64.56***	$AdjR^2$ = 0.26 $F(1, 391)$ = 136.57***	$AdjR^2$ = 0.26 $F(1, 391)$ = 139.36***	$AdjR^2$ = 0.27 $F(1, 391)$ = 144.20***
ERS	β = 0.38***	β = 0.51***	β = 0.51***	β = 0.52***
Step II	$AdjR^2$= 0.30 $F(3, 389)$= 56.79*** $\Delta AdjR^2$= 0.16 $\Delta F(2, 388)$= 45.55***	$AdjR^2$= 0.32 $F(3, 389)$= 62.36*** $\Delta AdjR^2$= 0.06 $\Delta F(2, 388)$= 18.97***	$AdjR^2$= 0.33 $F(3, 389)$= 64.29*** $\Delta AdjR^2$= 0.07 $\Delta F(2, 388)$= 19.98***	$AdjR^2$= 0.40 $F(3, 389)$= 86.84*** $\Delta AdjR^2$= 0.13 $\Delta F(2, 388)$= 42.73***
ERS	β = 0.12	β = 0.32***	β = 0.25***	β = 0.24***
PERS Positive	β = -0.27***	β = -0.15**	β = -0.09*	β = -0.21***
PERS Negative	β = 0.32***	β = 0.24**	β = 0.33***	β = 0.36***
Step I	$AdjR^2$ = .14 $F(1, 391)$ = 64.56***	$AdjR^2$ = .26 $F(1, 391)$ = 136.57***	$AdjR^2$ = .26 $F(1, 391)$ = 139.36***	$AdjR^2$ = .27 $F(1, 391)$ = 144.20***
ERS	β = 0.38***	β = 0.51***	β = 0.51***	β = 0.52***
Step II	$AdjR^2$= .30 $F(3, 389)$= 57.29*** $\Delta AdjR^2$= .16 $\Delta F(2, 388)$= 46.19***	$AdjR^2$= .33 $F(3, 389)$= 63.09*** $\Delta AdjR^2$= .07 $\Delta F(2, 388)$= 19.79***	$AdjR^2$ = .32 $F(3, 389)$= 61.16*** $\Delta AdjR^2$ = .06 $\Delta F(2, 388)$= 16.51***	$AdjR^2$= .40 $F(3, 389)$= 86.11*** $\Delta AdjR^2$ = .13 $\Delta F(2, 388)$= 41.93***
ERS	β = 0.11	β = 0.31***	β = 0.30***	β = 0.25***
PERS-S Positive	β = -0.28***	β = -0.16**	β = -0.12*	β = -0.22***
PERS-S Negative	β = 0.32***	β = 0.25**	β = 0.27***	β = 0.33***

*p < .05 **p < .01 ***p < .001; PERS: Perth Emotional Reactivity Scale, PERS-S: Perth Emotional Reactivity Scale-Short Form, ERS: Emotional Reactivity Scale, DASS-21: Depression Anxiety Stress Scale-Short Form..