THE ITALIAN VERSION OF THE STATE EMOTION REGULATION INVENTORY-SHORT FORM (IT-SERI-SF) AND THE ASSESSMENT OF ITS MEASUREMENT INVARIANCE ACROSS GROUPS AND SITUATIONS

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Emotion regulation (ER) plays a crucial role in mental and social well-being. This study aims to develop an Italian version of the State Emotion Regulation Inventory (SERI) and to assess its invariance across gender, age, and different testing situations, including students facing exams or dealing with someone suffering, and healthcare professionals interacting with distressed patients. Analyzing data from a sample of 737 respondents, a 12-item version of the scale was developed, demonstrating strong reliability and structural validity. Full metric and scalar invariance were established across genders and age groups, while partial scalar invariance was established across situational groups. The study contributes to the literature by providing a lacking Italian situational ER assessment tool and offering insights into its applicability in diverse contexts.

A substantial body of recent empirical evidence associates good mental and social functioning with effective emotion regulation (ER), that is, individuals' ability to shape one or more aspects of emotion to achieve their goals (Frijda, 2013; Gross, 2015). A functional ER entails a vast repertoire of strategies to choose from (Meneghini et al., 2024) as well as flexibility in the use of these strategies (Aldao et al., 2015). Along with dispositional factors, such as personal tendencies to rely on certain strategies (Lougheed & Hollenstein, 2012), the ability to select the appropriate strategy based on situational features appears crucial for one's health and well-being (Aldao & Nolen-Hoeksema, 2010). However, instruments that measure ER strategy choices in specific situations (state measures) are scarce, and this hinders research on the dynamic and complex mechanisms that contribute to ER.

A brief, standardized self-report questionnaire that assesses ER situationally is the State Emotion Regulation Inventory (SERI) developed by Katz et al. (2017). This 16-item scale is based on the Gross (2015) model of ER and measures the use of the four most extensively investigated cognitive strategies: distraction, brooding, reappraisal, and acceptance. Distraction is a regulatory process that entails an individual's attempt

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303-314
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& Meneghini, A. M.
State Emotion Regulation Inventory — Italian
Short Form

to deflect attention away from a disturbing stimulus/cognition to avoid processing it. Thus, employing distraction leads individuals to shift their attention to different aspects of the situation (Gross & Thompson, 2007). Brooding is a maladaptive form of rumination, involving an emphasis on the negative aspects of the situation and a tendency to be self-critical (Treynor et al., 2003). Reappraisal concerns reframing one's perspective on a disturbing stimulus/situation to change its emotional impact (McRae et al., 2012). Finally, acceptance implies letting one's emotional reactions occur without resisting or attempting to change them, that is, allowing internal sensations and reactions to emerge without trying to reduce or control them (Kohl et al., 2012; Werner & Gross, 2010). The SERI was specifically designed by Katz and colleagues (2017) as a brief instrument that can be used repeatedly, and that takes into account people's tendency to use more than one strategy simultaneously, combining them, especially in natural settings (Katz et al., 2017). Notably, Kolbeinsson et al. (2022) showed that the SERI subscales can be employed independently to assess the spontaneous, momentary use of each strategy of interest according to the specific needs of a study. For instance, Engelmann and Bannert (2019) utilized the reappraisal subscale to evaluate the effects of ER training in a learning environment.

Katz et al. (2017) developed the SERI, selecting 16 items from an initial pool of 36 items. These were drawn from a wide range of validated subscales of trait-based measures of emotion regulation (e.g., Emotion Regulation Questionnaire by Gross & John, 2003; Cognitive Emotion Regulation Questionnaire by Garnefski et al., 2001), which were adapted for use in the state assessment. These items were administered to a sample of 188 university students who had previously undergone a negative cognition extraction procedure. During the procedure, students were asked to recall an unpleasant, nontraumatic personal event to elicit negative feelings and thoughts. The procedure was designed to induce spontaneous emotion regulation strategies. Parallel analysis and principal axis factoring analysis (oblique rotation) were run, and, in line with the authors' expectations, a 4-factor solution emerged. The items with unique factor loading that loaded the most in each factor were selected to develop a 16-item scale with four subscales: distraction ($\alpha = .82$), reappraisal ($\alpha = .78$), brooding ($\alpha = .73$), and acceptance ($\alpha = .70$). The convergent and incremental validity of the 16-item scale were tested and the authors stated that the "results point to the added utility of the state-based assessment of the SERI as a tool to predict current change in distress levels, over and above the measurement provided by existing trait-based measure" (Katz et al., 2017, p. 6). To further validate the instrument, the authors administered the final version of the SERI (i.e., the 16-item scale) to a second independent sample of respondents (155 undergraduate students). They used confirmatory factor analysis (CFA) to test the suitability of the 4-factor model against two other models with three and five factors, respectively. The results indicated that the 4-factor model was the best fit (αs from .70 to .82; Katz et al., 2017).

The good psychometric properties of the SERI were also supported by Gökdağ et al. (2023), who recently adapted the SERI to the Turkish context using the same laboratory-based emotion induction procedure used by Katz et al. (2017). Their results, obtained from a sample of 167 undergraduate students, confirmed the good reliability (αs ranging from .82 to .87) and acceptable incremental validity of the scale. Additionally, the 4-factor structure was confirmed, although some items showed weaker factor loadings than expected.

Understanding the dynamics of ER in specific situations requires well-validated questionnaires specifically developed for such purposes. While reliable instruments exist in the Italian context to evaluate trait-based dimensions of ER (e.g., Meneghini et al., 2024; Rossi et al., 2023), none is currently available for state-based assessments. This work aims to fill the gap by validating an Italian version of the SERI. The scale, due to the experimental procedure used during its development and its robust psychometric properties, appears to be a valuable option.

Furthermore, this work aims to provide a novel contribution concerning the psychometric properties of the SERI by testing its invariance between genders, two age groups, and three different conditions of administration. The invariance of measurement instruments across groups of interest is a prerequisite to ensure fair comparisons between them (Anselmi et al., 2021; Colledani, 2018; Fagnani et al., 2021; Vandenberg & Lance, 2000). Last but not least, testing the invariance of the SERI across different administration conditions is helpful to further investigate the suitability of the scale as a situational assessment tool, which is the purpose for which it was designed.

METHOD

Participants

The data used in this study were obtained from three different research projects designed to explore how individuals respond to various situations that evoke unpleasant emotions. Specifically, the three studies investigated the emotional responses of students facing exams or dealing with someone suffering, and healthcare professionals interacting with distressed patients.

The total sample comprises 737 respondents aged from 18 to 68 years (17.7% males; $M_{age} = 26.63$, $SD = 9.81$). Among them, 281 (20.45% males; $M_{age} = 23.76$, $SD = 6.08$) were university students who completed the questionnaire regarding their experience of facing an exam. They were recruited via social networks and through collaboration with several Italian universities. Among them 15.92% were enrolled in science-related departmentes, while the remaining were from a variety of courses in humanities (e.g., psychology, social work, linguistic, law, economics, politics). Bachelor's students comprised 61.05% of the sample, while Master's students accounted for 34.08% (the remaining were enrolled in other post-graduate programs).

The nurses who completed the questionnaire referring to a situation where they had to deal with a distressed patient were 214 (15.96% males; $M_{age} = 36.88$, $SD = 11.23$). They were contacted by e-mail with the collaboration of the head nurses of some hospitals in Veneto (northern Italy). Most of them worked in medical or surgical wards (64.02%; the others worked in psychiatry, oncology, geriatrics, emergency, pediatrics, or intensive care) and had more than five years of experience (53.74%; only 13.08% had less than one year of experience).

The respondents from the second sample of university students, who answered the questionnaire concerning a situation in which they had to deal with another person suffering, were 242 (10.37% males; $M_{age} = 20.88$, $SD = 1.76$). They were contacted through social networks and emails in collaboration with students of psychology courses. Among respondents, students from the departments of "Culture and civilization" and "Foreign languages and literatures" accounted for 70.24%, while the remaining were from a variety of departments, including social work and other humanities. A small percentage of them were also workers (10.33%) employed in different sectors (e.g., teachers, freelancers).

All participants were Italian and took part in the study voluntarily and anonymously. Before accessing the questionnaire, they were required to provide electronic informed consent and were informed of the study aims, the duration of the task, and the option to withdraw at any time. The study adhered to ethical standards in line with the Helsinki Declaration.

TPM Vol. 31, No. 3, September 2024
303-314
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& Meneghini, A. M.
State Emotion Regulation Inventory — Italian
Short Form

Measures

The Italian version of the SERI was administered to all participants. The scale includes 16 items scored on a 7-point scale (1= *strongly disagree*, 7 = *strongly agree*) and assesses four cognitive strategies in the regulation of unpleasant emotions: distraction (e.g., "I tried to call to mind other topics that were unrelated to the thought"), reappraisal (e.g., "I tried to reevaluate the situation more positively"), brooding (e.g., "I critically analyzed the possible implications of my thought"), and acceptance (e.g., "I allowed the thought to come up without delving into it or avoiding it"). The Italian version of the instrument was created via forward and backward translations conducted by two native Italian researchers and a native English speaker. The scale was administered to all participants in the same format, but was preceded by an introductory sentence tailored to three specific situations. Students from the first sample were asked to indicate how they regulated unpleasant emotions elicited by facing an exam, healthcare workers how they regulated unpleasant emotions when dealing with distressed patients, and students from the second sample how they regulated unpleasant emotions when encountering someone suffering. The introductory sentence was: "Try to recall your feelings and emotional reactions when you are [*about to take a challenging exam; dealing with a distressed patient; encountering someone suffering*]. Then, please indicate the degree to which you agree with each of the following statements." This approach allowed for the exploration of ER strategies in various real-life contexts.

Analysis

A cross-validation approach was used to develop the Italian version of the SERI. To begin with, the data set was randomly divided into two subsamples of equal size. The first subsample ($n = 368$; 16.15% males; $M_{age} = 26.44$, $SD = 9.56$) was used to perform parallel analysis (PA) and exploratory factor analysis (EFA). The PA was conducted to determine the optimal number of factors to be considered to represent the 16 items of the SERI. The number of factors was determined by considering the eigenvalues estimated from the actual data that exceeded the average from 1,000 random correlation matrices. After determining the optimal number of factors, exploratory factor analysis (EFA) was conducted, asking for the number of factors suggested by PA. Both EFA and PA were performed using Geomin oblique rotation (Muthén & Muthén, 2012) and robust maximum likelihood estimator (MLR; Yuan & Bentler, 2000). The data from the second subsample ($n = 369$; 15.32% males; $M_{age} = 26.81$, $SD = 10.06$) were used to run CFA. The results of EFA and CFA were evaluated by considering several fit indexes: χ^2, CFI, SRMR, and RMSEA. A good fit is indicated by nonsignificant χ^2, CFI values $\geq$ .95 (.90-.95 for reasonable fit), and SRMR/RMSEA values $\leq$ .06 (.06-.08 for reasonable fit; see Marsh et al., 2004). EFA and CFA were also evaluated, considering the configuration and the size of the factor loadings. If an item exhibited misfit characteristics, such as substantial cross-loadings or weak loadings on the intended factor, it was eliminated, and the model underwent CFA reevaluation to assess the impact of the removed item.

For the final model, metric and scalar invariance and the equality of latent means were examined across genders, two age groups (young people aged between 18 and 29 years vs. adults aged 30 years or older), and three group conditions (students regulating emotions before an exam vs. nurses coping with distressed patients vs. students dealing with a suffering person). The alignment optimization method (Asparouhov & Muthén, 2014) was used to perform these tests. This approach was selected because it allows for automatic, robust, and simultaneous metric and scalar invariance tests across multiple groups. Moreover, it also allows for the reliable assessment of latent mean differences, even in the presence of some degree of noninvariance

(Byrne & Van de Vijver, 2017). In particular, the alignment optimization process automatically accounts for the noninvariance of all factor loadings and intercepts in the estimation of latent means, resulting in estimates that are more reliable compared to those obtained with other methods (Byrne & Van de Vijver, 2017; Luong & Flake, 2023). The model was identified by fixing the mean and variance of the reference group to 0 and 1, respectively (the FIXED alignment optimization option is needed when working with only two groups; Byrne & Van de Vijver, 2017). Before applying the alignment method, configural invariance was verified using a classical multiple group approach and considering traditional fit indices (i.e., CFI $\geq$ .95; SRMR/RMSEA values $\leq$ .06). All analyses were conducted using Mplus (Muthén & Muthén, 2012).

Cronbach's α and composite reliability coefficients (Bagozzi & Yi, 1988; Bentler, 2009) were computed to test reliability. For the SERI subscales that were shortened due to item removal, Cronbach's α values were compared to those of the original full-length versions. Additionally, they were also compared with the coefficients resulting by applying the Spearman-Brown prophecy formula (Brown, 1910; Spearman, 1910).

Validity for the shortened scales was confirmed by examining Pearson's correlations between the full-length and abbreviated scales, using the correction for common items suggested by Levy (1967). Analyses of measurement invariance, reliability, and validity were conducted on the entire sample.

RESULTS

The results of the PA conducted on the first subsample suggested the retention of four factors (Figure 1). Guided by the PA results, EFA was run requesting four factors. The model exhibited a good fit, $\chi^2(62)$ = 143.439, $p < .001$; RMSEA = .06 [.05, .07]; CFI = .95; SRMR = .03.
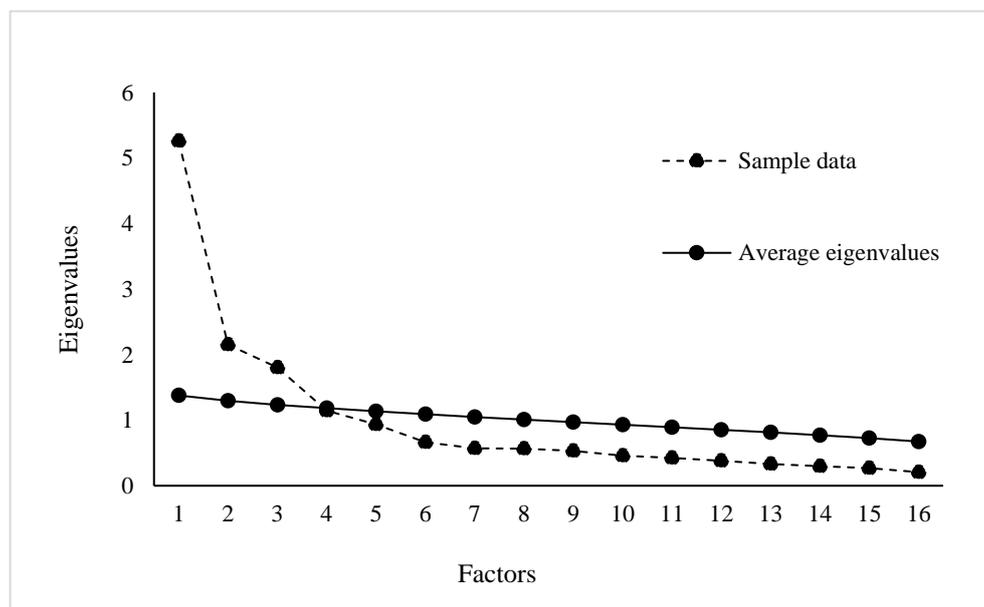

FIGURE 1
Parallel analysis

Note. Scree plot of real data eigenvalues and average random data eigenvalues.

However, the pattern of factor loadings (λ) revealed significant cross-loadings for five items (i.e., Items 1, 13, 10, 11, and 4; see Table 1), with three of them exhibiting larger loadings in the nontarget factors (i.e., Items 10, 11, and 4).

TABLE 1
Factor loadings and factor intercorrelations of the 4-factor EFA ($n = 368$)

	Distraction	Reappraisal	Brooding	Acceptance
Item	λ	λ	λ	λ
1	.76***	−.02	.08	−.14*
5	.74***	.07	.05	−.02
9	.80***	.03	−.14	.09
13	.72***	.02	−.21**	.04
2	.11	.62***	.15	−.02
6	.00	.84***	−.01	.02
10	.39***	.33***	.20*	−.04
14	−.03	.93***	−.01	.03
3	.06	.07	.62***	.07
7	.07	−.02	.80***	−.06
11	.48***	−.09	.22*	.15*
15	−.03	.11	.73***	.04
4	−.15*	.09	.34***	.22**
8	−.06	−.03	.04	.61***
12	.08	.00	.01	.62***
16	.05	.00	−.02	.78***
Factor intercorrelations				
Reappraisal	.35***			
Brooding	.38***	.52***		
Acceptance	.24***	.08	.12	

*$p < .05$; **$p < .01$; ***$p < .001$.

In line with these results, the CFA run on the second subsample showed a poor fit: $\chi^2(98) = 400.653$, $p < .001$; RMSEA = .09 [.08, .10]; CFI = .82; SRMR = .09. In this model, the modification indices suggested freeing the cross-loadings of Items 4, 10, and 11. Because these items also exhibited a nonsimple structure (and larger loadings in the nontarget factor) in the EFA, they were eliminated, and a subsequent CFA was performed. The model with 13 items achieved a reasonable fit: $\chi^2(59) = 187.923$, $p < .001$; RMSEA = .08 [.06, .09]; CFI = .90; SRMR = .06. However, despite the model demonstrating an acceptable fit, one additional item was removed from the distraction subscale. This adjustment aimed to create a final version of the Italian adaptation of the SERI with a well-defined structure and the same number of items (i.e., three) in each subscale. The item removed from the distraction subscale (i.e., Item 1) was excluded because it was similar in content to other items in the subscale and showed a (weak) cross-loading on the acceptance subscale. The final model with four factors and 12 items obtained a successful fit: $\chi^2(48) = 140.997$, $p < .001$; RMSEA = .07 [.06, .08]; CFI = .92; SRMR = .05. The χ^2 was significant, but the SRMR showed good values, and CFI

TPM Vol. 31, No. 3, September 2024
303-314
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Colledani, D., Mignolli, G.,
& Meneghini, A. M.
State Emotion Regulation Inventory — Italian
Short Form

and RMSEA were acceptable. In the model, all items exhibited substantial loadings (ranging from .65 to .86) on the intended factor, and interfactor correlations were small to moderate in size (ranging from .06 to .65; see Table 2).

TABLE 2
Factor loadings and factor intercorrelations of the 12-item CFA (n = 369)

Item	Reappraisal	Brooding	Distraction	Acceptance
2	.73***			
6	.86***			
14	.84***			
3		.70***		
7		.81***		
15		.75***		
5			.65***	
9			.85***	
13			.67***	
8				.74***
12				.65***
16				.65***
Factor intercorrelations				
Brooding	.65***			
Distraction	.22**	.06		
Acceptance	.15	.16*	.29***	

*p < .05; **p < .01; ***p < .001.

Given the favorable results of the 12-item model, it was deemed the optimal solution and subsequently used to assess measurement invariance. The results of multiple-group analyses supported the configural invariance across all the considered groups — gender: $\chi^2(96)$ = 224.631, p < .001; RMSEA = .06; CFI = .94; SRMR = .05; age: $\chi^2(96)$ = 260.220, p < .001; RMSEA = .07; CFI = .93; SRMR = .05; condition: $\chi^2(144)$ = 324.730, p < .001; RMSEA = .07; CFI = .92; SRMR = .06 — while the alignment method supported full metric and scalar invariance across gender and age groups. Full metric invariance was also supported across situational groups, while scalar invariance was only partially supported. In particular, Item 2 showed a larger intercept in the group of students facing an exam. Concerning latent means, significant differences were observed between age and situational groups. Specifically, younger respondents obtained significantly higher scores on the distraction subscale compared with older respondents (over 30 years old). Meanwhile, students facing an exam scored significantly higher across all latent factors than the other two groups, namely students interacting with a person's suffering and nurses dealing with a distressed patient.

The 12-item Italian State Emotion Regulation Inventory-Short Form (IT-SERI-SF) demonstrated strong reliability and validity (Table 3). In particular, the 3-item subscales showed CR and Cronbach's α coefficients ranging from .72 to .86. Notably, Cronbach's coefficients for the 3-item subscales, calculated using the Spearman-Brown prophecy formula, and those from the 4-item subscales were found to be lower than the coefficients empirically observed for the 3-item version. The only exception was the distraction subscale, where the 3-item version showed a smaller coefficient than that of the 4-item one, yet greater than

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that predicted by the Spearman-Brown prophecy formula. Additionally, the correlation coefficients (corrected for common items) between the 3-item and 4-item subscales were positive and ranged from moderate to large (r from .62 to .81), thus supporting the validity of the IT-SERI-SF.

TABLE 3
Descriptive statistics, internal consistency coefficients, and correlations for the 16- and 12-item scales

	Distraction	Reappraisal	Brooding	Acceptance
12-item scale				
CR	.77	.85	.80	.73
Cronbach's α	.78	.86	.80	.72
M	3.08	4.43	4.16	3.79
SD	1.52	1.60	1.53	1.45
Correlation corrected for common items	.74	.81	.73	.62
Predicted α	.77	.80	.70	.61
16-item scale				
Cronbach's α	.82	.84	.76	.68
M	3.11	4.29	4.05	3.85
SD	1.51	1.48	1.40	1.29

Note. Correlation corrected for common items = correlation between short and full-length scales corrected with the formula suggested by Levy (1967); Predicted α = Cronbach's α for 3-item subscales predicted using the Spearman-Brown prophecy formula.

DISCUSSION

Research on ER in distressing life situations has recently focused on the concept of individual levels of flexibility. This aspect has proven essential for recovery from such situations and for preventing the development of affective disorders (e.g., Aldao et al., 2015). Flexibility in ER entails employing diverse strategies based on the current situational demands (Bonanno et al., 2004) and the ability to change strategy as the situation evolves (Battaglini et al., 2022; Pruessner et al., 2020). To advance the knowledge on this important issue, a valid instrument that situationally assesses the use of different strategies simultaneously is crucial. For this purpose, a promising instrument is the SERI (Engelmann & Bannert, 2019; Gökdağ et al., 2023; Katz et al., 2017; Kolbeinsson et al., 2022). The scale is valuable because of the experimental procedures used in its development, as well as its robust psychometric properties.

Currently, to the best of our knowledge, no validated scale for the situational assessment of ER strategies exists in the Italian context. Therefore, the present study aimed to validate the SERI in Italian. Moreover, the invariance of the scale across genders, two age groups, and three different administration conditions was tested.

To adapt the SERI to the Italian context, the scale was translated from English to Italian and underwent a back-translation process. The final version was administered to a large sample of respondents under three different conditions that evoked unpleasant emotions: students facing a challenging exam, healthcare professionals (i.e., nurses) interacting with a distressed patient, and students dealing with a suffering person.

TPM Vol. 31, No. 3, September 2024
303-314
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& Meneghini, A. M.
State Emotion Regulation Inventory — Italian
Short Form

The collected data were analyzed using a cross-validation approach. First, parallel analysis was run to determine the optimal number of factors underlying the 16 items of the SERI. The results suggested a 4-factor structure. Subsequently, EFA and CFA were run on two different samples. These analyses allowed us to define a scale comprising 12 items (IT-SERI-SF) that measure the four dimensions of distraction, reappraisal, brooding, and acceptance. In particular, EFA and CFA suggested eliminating three items because they exhibited greater loadings on a nontarget factor, which negatively impacted the fit of the model. These items were from the acceptance, reappraisal, and brooding subscales. The removal of these items resulted in a model with an acceptable fit. However, a fourth item was dropped from the distraction subscale. This adjustment aimed to obtain a final version of the Italian adaptation of the SERI with a well-defined structure and with the same number of items (i.e., three) in each subscale. The final 12-item model achieved an acceptable fit, and all the 3-item subscales showed satisfactory reliability and validity coefficients. Interestingly, Cronbach's α coefficients for the 3-item subscales predicted by the Spearman-Brown prophecy formula and, in most cases, those for the 4-item subscales were lower than those observed for the 3-item subscales empirically developed in the study. These results indicate that the item selection process was carried out effectively, excluding items that were not parallel to the others and, therefore, poorly capable of contributing to the internal consistency of the subscales. Also, the elimination of these items did not compromise validity, as indicated by the correlation coefficients (corrected for common items) between the 3-item and 4-item subscales, which were positive and moderate to large (r from .62 to .81), thus supporting the validity of the IT-SERI-SF.

With regard to the invariance analyses, the results showed that the IT-SERI-SF has the same functioning across males and females and age groups. Conversely, one item was found to function differently across situational groups. Specifically, Item 2 (i.e., "I tried to reevaluate the situation more positively") showed a higher intercept on the group of students facing an exam. Having established (at least partially) approximate scalar invariance, we were able to meaningfully test the equality of the latent means on the IT-SERI-SF subscales across groups. The results supported the equality of latent means across genders, while differences were found concerning age and situational groups. Specifically, younger respondents obtained significantly higher scores on the distraction factor compared to older respondents (over 30 years). In contrast, the students facing an exam scored significantly higher on all latent factors than the other two groups (nurses and students dealing with a suffering person). Regarding the difference in the distraction subscale across age groups, the findings align with previous findings in the literature showing that younger people tend to attribute greater effectiveness to the strategy of distraction compared to their older counterparts (Livingstone et al., 2020). Regarding the conditions of administration, the results indicate that the latent means of the two groups presented with a situation of interpersonal stress (students interacting with a suffering person and nurses dealing with a distressed patient) did not differ from each other, but with the group presented with a different condition (students facing an exam). This supports the effectiveness of the scale in accurately capturing differences in emotion regulation between groups in different situations.

This study makes a valuable contribution to the field of ER by introducing, in the Italian context, a brief self-report instrument to assess the use of four cognitive strategies for unpleasant emotions. It also makes an important contribution by delving into the study of its psychometric properties. In this work, the 4-factor structure and the good validity and reliability of the scale have been confirmed using a much larger and more heterogeneous sample than those used in previous validation studies, which only included students (Gökdağ et al., 2023; Katz et al., 2017). In addition, for the first time, the invariance of the scale across groups of interest was verified. This investigation, crucial for the validation of a psychological assessment instrument, specifically determines whether meaningful comparisons can be made between groups (Colledani et al., 2022; Millsap, 2011; Vandenberg & Lance, 2000). Moreover, the invariance of the IT-

SERI-SF was also tested across situational contexts to provide further support for the effectiveness of the scale in different settings, in line with its intended purpose.

While the study results hold value, certain limitations must be acknowledged. For instance, the impact of social desirability, along with other response biases that might have influenced the results, was not tested. Furthermore, although our sample was substantial, it was recruited online and consisted of voluntary participants, potentially leading to a self-selection bias. Future studies should seek to replicate and extend our findings using representative samples. Future studies should also extend the application of the IT-SERI-SF to a broader range of ER contexts, including different clinical, nonclinical, and culturally diverse settings. These explorations would help determine the broader applicability and relevance of the scale. Further investigations may also explore the convergent validity of the IT-SERI-SF compared to other established ER measures, enhancing our understanding of its effectiveness and potential contribution. Additionally, exploring how the IT-SERI-SF correlates with scales of other psychological constructs could provide further validation and insights into its utility.

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TPM Vol. 31, No. 3, September 2024
303-314
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Colledani, D., Mignolli, G.,
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