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Original Article

Validity and reliability of the emotional intelligence scale in pre-service physical education teachers

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Abstract:
Purpose: The current study examined the factor structure and the internal consistency of the Schutte Self-Report Emotional Intelligence (SSREI) scale in two samples of Greek pre-service Physical Education (PE) teachers (Sample 1 n = 516; Sample 2 n = 335). **Method:** Data were collected through a pencil-paper survey. Multiple confirmatory factor analyses were conducted to test several proposed factor models from previous studies, as well as measurement invariance across gender. Reliability of the scale was measured with Cronbach a coefficients. **Results:** The analysis showed that the Ng et al. (2010) two-level factor model fit the current data best, while the exclusion of the scale's reverse coded items made the current model structure more stable and interpretable, ultimately resulting in a higher order model with four factors. **Conclusion:** The proposed emotional intelligence model was complex with a high order factor. We further suggested either to rephrase the three items including negations to a positive meaning, or to remove these from the scale, to increase the validity and reliability scores. Implications of the study and usefulness of SSREI scale among pre-service PE teachers are further discussed.
Key Words: **trait emotional intelligence, self-report, confirmatory factor analysis, validation, measurement invariance, psychometrics**.

Introduction

High quality teaching depends on teachers' ability to clarify, understand and reflect on emotions (McCaughtry, 2004; Owens & Ennis, 2005), and as such, the evaluation of teachers' perceptions of their emotional world are often put at the center of the educational process. Self-reported measures of emotional dispositions fall under the broader domain of trait Emotional Intelligence (EI) assessment, focus on traits or behaviors that are embedded in personality and can affect typical performance (Petrides, Mikolajczak, Mavroveli, Sanchez-Ruiz, Furnham, & Pérez-González, 2016). Within educational contexts, trait EI has been associated with greater job satisfaction and accomplishment (Brackett, Palomera, Mojsa, Reys, & Salovey, 2010), performance advantages in undergraduate learning (Perera & DiGiacomo, 2013), teaching effectiveness (Asrar-ul-Haq, Anwar, & Hassan, 2017), lower instances of burnout (Cohen & Abedallah, 2015) and personal well-being (Mérida-Lopez & Extremera, 2017).

Trait EI is particularly important in Physical Education (PE) and sport professionals, since it fosters their skills to deal effectively with everyday work pressures (Gaudreault, Richards, & Woods, 2016), and managerial issues (Carson, Hemphill, Richards, & Templin, 2016). Furthermore, in the context of sport performance, EI relates to emotions, physiological stress responses, successful psychological skill usage, and more successful athletic performance. In the context of physical activity, trait EI relates to physical activity levels and positive attitudes toward physical activity (Laborde, Dosseville, & Allen, 2016).

The current generation of young PE and sport professionals lack social skills (Carr & Volberding, 2012), while being self-absorbed and constrained in a 'go hard or go home' teaching mentality (Timken & McNamee, 2012). These attributes may lead to inabilities to regulate and appraise emotions while working with others, something that can have negative implications for their wellbeing and effectiveness (Taxer & Frenzel, 2015), as well as their job satisfaction (Zeidner, Matthews, & Roberts, 2012). When preparing future PE teachers, it is therefore important to evaluate their EI levels in order to promote successful opportunities for professional growth.

Thus far, the use of trait EI assessment instruments among undergraduate PE students remains limited (Bahadir, 2018; Laborde, Dosseville & Allen, 2016). Independently of how EI is measured, teachers who are able to regulate, properly identify and utilize emotions (theirs and others) while problem-solving and decision-making, might experience higher levels of satisfaction and wellbeing (Zeidner, Matthews, & Roberts, 2012). The latter may influence the quality of education that they offer, beyond benefits at a personal level.

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One of the most extensively used measurements to assess trait EI due to its brevity and availability in the public domain is the Schutte Self-Report Emotional Intelligence Scale (SSREI: Schutte et al., 1998). The SSREI is a 33-item self-report trait EI scale developed based on Salovey and Mayer's (1990) model of EI that includes three categories: (a) Appraisal and expression of emotions (self and other); (b) Regulation of emotions (self and other); and (c) Utilization of emotions in solving problems (flexible planning, creative thinking, redirected attention, and motivation). Several studies have examined SSREI's psychometric properties; however, its factor structure remains inconsistent and unclear, ranging from three to five factors (Perez, Petrides, & Furnham, 2005).

Apart from the SSREI validation studies in the general population (e.g., Gong & Paulson, 2018; Ng, Wang, Kim, & Bodenhorn, 2010; Petrides & Furnham, 2000; Saklofske, Austin, & Minski, 2003), a study conducted by Lane et al. (2009) indicated partial support for single factor model, and further support for a five-factor model (optimism was removed) for use with athletes. However, further validation work is needed in this field and more validation studies are encouraged in different cultural contexts, to further explore cultural differences in sport and physical activity (Laborde, Dosseville, & Allen, 2016; Lane et al., 2009).

Given the popularity of the SSREI scale and usefulness of including different trait EI measures in research (Di Fabio & Saklofske, 2014a, 2014b), the aim of the present study was to investigate the factorial structure of the SSREI on pre-service PE teachers from all Faculties of PE and Sport Science in Greece, reporting additional cross-cultural validity evidence. We conducted thorough fit tests of previously proposed models via Confirmatory Factor Analysis (CFA), and we also tested the final scale for measurement invariance across gender. A unique advantage of the selected sample was its dual nature, because most pre-service PE teachers are student-athletes, with extensive athletic experience (Adamakis, 2018).

Material & methods

Participants

A total of 851 pre-service PE teachers participated in the present study. The entire sample was split in two sub-samples. Sample 1 consisted of 516 participants from the National and Kapodistrian University of Athens (45.9% female; 21.47±2.43 years; 11.26±4.38 years of previous athletic experience). Sample 2 comprised of 335 participants from all Faculties of Physical Education and Sport Science in Greece (44.8% female; 21.79±2.19 years; 11.59±4.31 years of previous athletic experience). All participants represented a heterogeneous sample of student-athletes who competed at levels ranging from elite/professional competitors to non-elite collegiate athletes, as well as those for whom the primary goal was health and fitness.

Procedures - Instrument

Following institutional ethical approval from the institution of the authors, pre-service PE teachers were recruited via a number of different approaches (e.g., e-mail invitations, invitations in lectures). Participants completed a pencil-paper version of the SSREI, either before or after formal lectures. All pre-service PE teachers were informed about the purpose of the study, provided informed consent, and it was made clear that participation was voluntary, anonymous, and confidential.

The SSREI (Schutte et al., 1998) self-report inventory used has 33 items (e.g., 'I am aware of my emotions as I experience them'), focusing on trait EI. It uses a 1 (strongly disagree) to 5 (strongly agree) 5-point Likert-type scale for responses. Three items (i.e., 'I find it hard to understand the non-verbal messages people send'; 'It is difficult for me to understand why people feel they way they do'; and 'When I am faced with a challenge, I give up because I believe I will fail') are reverse-coded. Each sub-test score is graded and then added together to give the total score for the participant. SSREI demonstrated good reliability (e.g., .90) and validity, while it was unrelated to cognitive abilities and personality dimensions, except for openness to experience (Brackett & Mayer, 2003; Ng et al., 2010; Schutte et al., 1998).

Data analyses

Sample 1 was used for conducting CFAs using maximum-likelihood estimation in AMOS 21.0, to test for the following hypothesized factor models: Schutte et al.'s (1998) one-factor model; the 2 four-factor models proposed by Petrides and Furnham (2000) and Saklofske et al. (2003) with factors allowed to covary with one another; one-factor and five-factor models proposed by Lane et al. (2009); the Ng et al. (2010) model (see Figure 1). Following the initial CFAs, sample 2 was used to confirm the best fitted factor structure derived from the previous procedure. Goodness of fit was assessed through several indices based on Hu and Bentler's (1999) standards (see Table 1).

In addition, by the means of a multi-group confirmatory factor analysis (MGCFA) with maximum-likelihood estimation, we tested the assumption of SSREI measurement invariance across gender. The invariance of the model structure across gender was tested by examining whether the same parameters existed for both groups (configural invariance).

Next, additional constraints were investigated through factor loadings (metric invariance) and covariance between factors (structural invariance). Model fit was evaluated using CFI and RMSEA. A criterion change of -.01 in CFI paired with changes in RMSEA of .015 indicated non-invariance (Chen, 2007). The reliability scores (internal consistency) of the final scale version were then analysed using Cronbach's α coefficients.

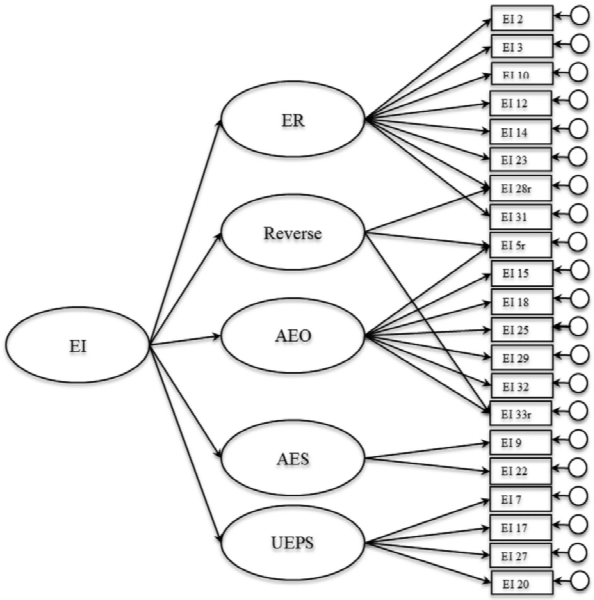


Figure 1. Confirmatory factor analysis of SSREI Model 2-Final model.
Source. Figure adapted from Ng et al. (2010).
Note. Ng et al.'s (2010) two-level factor model. SSREI = Schutte Self-Report Emotional Intelligence scale; ER = Emotion regulation of self; AEO = Appraisal of emotions of others; AES = Appraisal of emotions of the self; UEPS = Using emotions for problem solving; Reverse = A unique factor for reverse coding.

Results

Preliminary Data Analysis

Preliminary analyses were conducted (e.g., examination of frequencies and descriptive statistics) at the item and subscale levels, and assumptions for all analyses were met. Zero variance items were removed.

Initial CFAs

As shown in Table 1, the Lane et al. (2009) five-factor and Ng et al. (2010) models fit the data best. Because the Ng et al. (2010) model more adequately represented Salovey and Mayer's (1990) conceptual model (two-level factor models, with sub-factors loaded onto a general EI factor) and had a relatively better model fit across all fit indices, it was retained as the final model (see Figure 1).

Table 1. Goodness-of-fit indices for six CFA models of SSREI scale.

Models	χ^2	χ^2/df	NNFI	CFI	AGFI	RMSEA (90% CI)	AIC
Schutte et al. (1998)	1846.434	3.73	.50	.58	.76	.07 (.069-.076)	1978.43
Petrides and Furnham (2000)	1148.60	2.96	.69	.71	.82	.06 (.058-.065)	1592.60
Saklofske et al. (2003)	865.92	2.96	.68	.76	.87	.06 (.057-.066)	981.92
Lane et al. (2009): one-factor	696.14	4.58	.58	.63	.83	.08 (.077-.090)	772.14
Lane et al. (2009): five-factor	353.94	2.83	.86	.88	.90	.06 (.052-.067)	445.94
Ng et al. (2010)	463.87	2.59	.89	.90	.90	.05 (0.050-0.060)	434.51

Note. SSREI = Schutte Self-Report Emotional Intelligence scale; NNFI = Non-normed fit index; CFI = Comparative fit index; AGFI = Adjusted goodness of fit; RMSEA = Root mean square error of approximation; AIC = Akaike information criterion; CI = Confidence interval.

Follow-up CFA

Following the initial CFAs, sample 2 was used to re-confirm the factor structure of the accepted Ng et al. (2010) model. All fit indices were similar to the initial CFA ($\chi 2/df = 2.31$; NNFI = .88; CFI = .91; AGFI = .90; RMSEA (90% CI) = .05 (.046-.60); AIC = 430.55), providing further evidence of the validity of this specific factorial structure of the proposed scale. Factor loading of the items ranged from .39 to .74, and .42 to .80 of four factors on the general EI factor; all loadings were statistically significant ($p < .01$). When the Reverse factor (including the three reverse-coded items) was removed, all fit indices increased ($\chi 2/df = 2.03$; NNFI = .91; CFI = .95; AGFI = .92; RMSEA (90% CI) = .04 (.038-.46); AIC = 394.00).

Results from MGCFA (Table 2) indicate that there was no significant reduction in model adjustments between the configural, metric and structural invariance solutions for gender groups. Results from the metric invariance model suggested that all factor loadings were invariant for boys and girls (ΔCFI = .002; ΔRMSEA = .002). Finally, results from the structural invariance model demonstrated that the five-factor had similar correlations for gender (ΔCFI = .009; ΔRMSEA = .005).

Table 2. Goodness-of-fit indices for the chosen fitted factor structure of SSREI scale (Ng et al., 2010), as well as tests of measurement invariance for gender.

Models	CFI	ΔCFA	RMSEA (90% CI)	ΔRMSEA
Configural invariance	.910	-	.052 (.046-.058)	-
Metric invariance	.905	-.005	.060 (.055-.065)	.008
Structural invariance	.901	-.009	.063 (.059-.075)	.011

Note. SSREI = Schutte Self-Report Emotional Intelligence scale; CFI = Comparative fit index; ΔCFI = Difference comparative fit index; RMSEA = Root mean square error of approximation; ΔRMSEA = Difference root mean square error of approximation; CI = Confidence interval.

Lastly, the overall internal consistency of the final scale version was acceptable (SSREI scale α = .75). Cronbach α coefficients for the separate factors were: Emotional regulation α = .68; Appraisal of emotions of others α = .62; Appraisal of emotions of the self α = .73; and Using emotions for problem solving α = .85. The internal consistency of the two factors below the acceptable threshold (α ≥ .70) was affected by the reverse coded items. When these items were removed, Cronbach α coefficients for the overall SSREI scale, Emotional regulation and Appraisal of emotions of others improved significantly (.81, .75 and .68 respectively).

Discussion

The present study investigated the factorial validity and measurement invariance of the SSREI scale on Greek pre-service PE teachers. Current results did not support the one-factor (Lane et al., 2009; Schutte et al., 1998), or four-factor (Petrides & Furnham, 2000; Saklofske et al., 2003) models reported in relevant literature. However, findings supported that the five-factor models suggested by Lane et al. (2009) and Ng et al. (2010) fit the data best, while having a relative stable factor structure.

More specifically, the five-factor model advanced by Ng et al. (2010) had the best fit to the data, also capturing the components of Salovey and Mayer's (1990) EI model. The existence of a general EI was further supported (Gong & Paulson, 2018) and the model was complex with a high order factor (Petrides & Furnham, 2000). In particular, the loadings of the items on each of the five factors and the loadings from these factors to the general EI factor were satisfactory, with items adequately operationalizing trait EI measures across gender groups. The reliability of scores for the separate factors also indicated acceptable internal consistency levels.

The exclusion of the factor Reverse (including the three reverse coded items) made the current model structure more stable and interpretable. As noted elsewhere, reverse scored items may perform poorly on athlete populations by magnifying limitations in this type of scoring (Lane et al., 2009). Further, the reverse scoring of items may not translate clearly across cultures since people in each culture may differ in their ability to interpret emotional information (Maree & Pietersen, 2008) and there is a potential effect of linguistic skills (Suárez-Álvarez, Pedrosa, Lozano, García-Cueto, Cuesta, & Muñiz, 2018). In our case, even though reverse coded items were initially contained in the same factor and thus assessed the construct towards the same direction, a decision was made to exclude them since the scale included equivalent positively worded items that had an identical meaning with more acceptable factor fit indices. Based on these results, we suggest either to rephrase the three items including negations to a positive meaning, or to remove these items from the scale. This will result in a SSREI scale with a higher-order factor (EI), four main factors and either 18 or 21 items, while factor Reverse will be excluded. Although this study has limitations in terms of examining only particular types of validity and reliability, data on this sample support the utility of the SSREI scale among Greek pre-service PE teachers and students-athletes. Following the suggestions of Gong and Paulson (2018), we advocate for future studies that could investigate similar sample differences across various countries, as well as the factorial structure of the scale in different PE cohorts.

Conclusions

Given the incremental variance that trait EI can add to outcomes related with achievement, well-being, and career decision making, educational researchers might consider using SSREI as a measure of future professionals' ability to effectively handle emotionally laden information and set the pace of their growth. In accordance with this study's findings, the proposed four-factor structure of the SSREI measure is considered a valuable research instrument in the field of PE and sport and a valid alternative to ability based EI measures. The inclusion of trait EI measures in research carried with PE and sport students and athletes across cultures could offer a more comprehensive examination of their response patterns and further support to our proposed four-factor model.

Conflicts of interest - The authors do not have any conflicts of interest to declare.

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