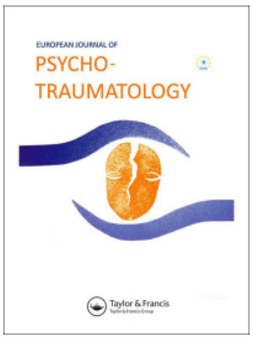

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UCLA PTSD reaction index for DSM-5 (PTSD-RI-5): a psychometric study of adolescents sampled from communities in eleven countries

Ana Doric [a], Dejan Stevanovic [b], Dusko Stupar[b], Panos Vostanis[c], Olayinka Atilola [d], Paulo Moreira [e], Katarina Dodig-Curkovic[f], Tomislav Franic [g], Vrljicak Davidovic [h], Mohamad Avicenna[i], Multazam Noor [j], Laura Nussbaum [k], Abdelaziz Thabet [l], Dino Ubalde[m], Petar Petrov[n], Azra Deljkovic[o], Monteiro Luis Antonio[p], Adriana Ribas[q], Joana Oliveira [r] and Rajna Knez [s,t,u]

[a]Department of Psychology (Center for Applied Psychology), Faculty of Humanities and Social Sciences, University of Rijeka, Rijeka, Croatia; [b]Child Psychiatry, Clinic for Neurology and Psychiatry for Children and Youth, Belgrade, Serbia; [c]School of Psychology, Leicester University, Leicester, UK; [d]Department of Behavioural Medicine, Lagos State University College of Medicine Ikeja, Lagos, Nigeria; [e]CIPD, Porto Lusíada University, Porto, Portugal; [f]Medical Faculty Osijek, Faculty for Dental Medicine and Health, University Health Center Osijek, Osijek, Croatia; [g]Child and Adolescent Psychiatry, School of Medicine, University of Split, Split, Croatia; [h]Department of Psychiatry, Clinical Hospital Centre Split, Split, Croatia; [i]Faculty of Psychology, State Islamic University Syarif Hidayatullah, Jakarta, Indonesia; [j]Psychiatry department, Dr Soeharto Heerdjan Mental Hospital Jakarta, Jakarta, Indonesia; [k]Department of Child and Adolescent Psychiatry, University of Medicine and Pharmacy "Victor Babes", Timisoara, Romania; [l]School of Public Health, Al Quds University, Gaza Branch, Palestine; [m]Department of Psychology, St. Dominic College of Asia, City of Bacoor, Philippines; [n]Department of Child and Adolescent Psychiatry, University Hospital St. Marina, Varna, Bulgaria; [o]Mental Health Center, Pljevlja, Montenegro; [p]Universidade Estacio de Sá in Rio de Janeiro, Rio de Janeiro, Brazil; [q]Federal University of Rio de Janeiro, Rio de Janeiro, Brazil; [r]CIPD, Lusíada University, Porto, Portugal; [s]Department of Women´s and Children´s health, Skaraborgs Hospital, Skövde, Sweden; [t]Department of Psychiatry and Psychological Medicine, Medical School, University of Rijeka, Rijeka, Croatia; [u]University of Gothenburg, Sahlgrenska Academy, Institute of Neuroscience and Physiology, Göteborg, Sweden

ABSTRACT

Background: Children and adolescents are often exposed to traumatic events, which may lead to the development of posttraumatic stress disorder (PTSD). It is therefore important for clinicians to screen for potential symptoms that can be signs of PTSD onset. PTSD in youth is a worldwide problem, thus congruent screening tools in various languages are needed.

Objective: The aim of this study was to test the general psychometric properties of the Traumatic Stress Disorder Reaction Index for children and adolescents (UCLA PTSD) Reaction Index for DSM-5 (PTSD-RI-5) in adolescents, a self-report instrument intended to screen for trauma exposure and assess PTSD symptoms.

Method: Data was collected from 4201 adolescents in communities within eleven countries worldwide (i.e. Brazil, Bulgaria, Croatia, Indonesia, Montenegro, Nigeria, Palestine-Gaza, Philippines, Portugal, Romania, and Serbia). Internal consistency, discriminant validity, and a confirmatory factor analysis of a four-factor model representing the main DSM-5 symptoms of the PTSD-RI-5 were evaluated.

Results: The PTSD-RI-5 total score for the entire sample shows very good reliability (α = .92) as well as across all countries included (α ranged from .90 to .94). The correlations between anxiety/depressive symptoms and the PTSD-RI-5 scores were below .70 indicating on good discriminant validity. The four-factor structure of the scale was confirmed for the total sample and data from six countries. The standardized regression weights for all items varied markedly across the countries. The lack of a common acceptable model across all countries prevented us from direct testing of cross-cultural measurement invariance.

Conclusions: The four-factor structure of the PTSD-RI-5 likely represents the core PTSD symptoms as proposed by the DSM-5 criteria, but there could be items interpreted in a conceptually different manner by adolescents from different cultural/regional backgrounds and future cross-cultural evaluations need to consider this finding.

Índice de Reacción TEPT de la UCLA para el DSM-5 (PTSD-RI-5): Un Estudio Psicométrico de muestras de Adolescentes de Comunidades en Once Países

Antecedentes: Los niños y adolescentes a menudo están expuestos a eventos traumáticos, que pueden llevar al desarrollo de un trastorno de estrés postraumático (TEPT). Por lo tanto, es importante que los médicos examinen los posibles síntomas que pueden ser signos del inicio de un TEPT. Este trastorno en jóvenes es un problema global, por lo que se necesitan herramientas de detección congruentes en varios idiomas.

Objetivo: El objetivo de este estudio fue probar en adolescentes las propiedades psicométricas generales del Índice de Reacción TEPT de la UCLA para el DSM-5 (PTSD-RI-5), que es un instrumento de auto-reporte destinado a evaluar la exposición al trauma y evaluar los síntomas de PTSD.

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Instrument; post-traumatic stress disorder; DSM-5; cross-cultural validation; measurement invariance

PALABRAS CLAVE
instrumento; Trastorno de estrés postraumático; DSM-5; validación intercultural; invariancia de medida

关键词
测量工具; 创伤后应激障碍; DSM-5; 跨文化验证; 测量不变性

HIGHLIGHTS

- The cross-cultural aspects of the DSM-5 PTSD reaction index for youth (PTSD-RI-5) across multiple, worldwide countries were addressed.
- The four-factor structure of the scale that follows the DSM-5 criteria for PTSD was confirmed.
- Not all PTSD symptoms as measured by the instrument are relevant to adolescents across different societies.

CONTACT Dejan Stevanovic stevanovic.dejan79@gmail.com Clinic for Neurology and Psychiatry for Children and Youth, Dr Subotica 6a, 11000 Belgrade, Serbia

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Método: Los datos se recopilaron de 4201 adolescentes en comunidades dentro de once países alrededor del mundo (es decir, Brasil, Bulgaria, Croacia, Indonesia, Montenegro, Nigeria, Palestina-Gaza, Filipinas, Portugal, Rumania y Serbia). Se evaluó la consistencia interna, la validez discriminante y un análisis factorial confirmatorio de un modelo de cuatro factores que representa los principales síntomas del DSM-5 del PTSD-RI-5
Resultados: La puntuación total de PTSD-RI-5 para toda la muestra reveló una muy buena confiabilidad (α = .92), así como en todos los países incluidos (α varió de .90 a .94). Las correlaciones entre los síntomas de ansiedad/depresión y las puntuaciones del PTSD-RI-5 fueron inferiores a .70, lo que indica una buena validez discriminante. La estructura de cuatro factores de la escala se confirmó para la muestra total y los datos de seis países. Las ponderaciones de regresión estandarizada variaron notablemente para todos los ítems en todos los países. La falta de un modelo aceptable común en todos los países nos impidió realizar pruebas directas de invariancia de medición intercultural.
Conclusiones: La estructura de cuatro factores del PTSD-RI-5 probablemente representa los síntomas centrales del TEPT según lo propuesto por los criterios del DSM-5, pero podría haber elementos interpretados de manera conceptualmente diferente por adolescentes con diferentes orígenes culturales/regionales, y futuras evaluaciones interculturales deben considerar este hallazgo.

UCLA DSM-5PTSD 反应指数（PTSD-RI-5）：对来自11个国家的社区青少年样本进行心理测量研究背景

背景：儿童和青少年经常接触创伤事件，这可能导致创伤后应激障碍（PTSD）。因此，临床医生必须筛查PTSD发病迹象的潜在症状。青年PTSD是一个世界性问题，因此一致使用的筛查工具需要有不同语言版本。目的：本研究的目的是在青少年样本中测试UCLA DSM-5 PTSD 反应指数（PTSD-RI-5）的一般心理测量学特性，PTSD-RI-5是用于筛查创伤暴露和评估PTSD症状的自我报告工具。
方法：收集来自全球11个国家（即巴西，保加利亚，克罗地亚，印度尼西亚，黑山，尼日利亚，巴勒斯坦 - 加沙，菲律宾，葡萄牙，罗马尼亚和塞尔维亚）4201名社区青少年的数据。评估了PTSD-RI-5的内部一致性和区分效度，并进行验证性因子分析考察代表主要症状的四因子模型。
结果：整个样本中（α= .92）和各个国家中（α范围从.90到.94），PTSD-RI-5总分显示出非常好的内部一致性。焦虑/抑郁症状与PTSD-RI-5评分之间的相关性低于.70，表明良好的判别效度。对来自六个国家的子样本和整体样本中，都验证了四因子结构。所有题目的标准化回归权重在各国之间存在显著差异。所有国家缺乏共同的可接受模型使我们无法直接考察跨文化的测量不变性。
结论：PTSD-RI-5的四因素结构可能代表DSM-5提出的PTSD核心症状，但由于来自不同文化/地区背景的青少年可能对有些题目有不同的理解，还需要以后的跨文化研究来验证这个发现。

1. Introduction

Exposure to adverse events appears to be common in children and adolescents (Gunaratnam & Alisic, 2017; Kolaitis, 2017). Exposure to potentially traumatic events (PTEs; i.e., exposure to actual or threatened death, serious injury, or sexual violence; American Psychiatric Association, 2013) is present worldwide among youth (Gunaratnam & Alisic, 2017; Kolaitis, 2017; Takada et al., 2018). For example, studies conducted in Europe show that 15% of Dutch primary school-aged children (Alisic et al., 2008), 56% of Swiss adolescents (Landolt, Schnyder, Maier, Schoenbucher, & Mohler-Kuo, 2013), and up to 79% of Icelandic adolescents (Bödvarsdóttir & Elklit, 2007), reported exposure to at least one traumatic event. In the USA, Copeland, Keeler, Angold, and Costello (2007) reported that more than two thirds of American children and adolescents had been exposed to one or more PTEs. McLaughlin et al. (2013) found a similar prevalence, where many adolescents included in that study (62%) had been confronted with more than one PTE. When a broader range of stressful events is included, such as parental divorce and bullying, the numbers of youth exposed to adverse childhood events tend to be higher (Gunaratnam & Alisic, 2017). In such cases, studies show that up to 87% of female and 78% of male Danish adolescents (Elklit, 2002), 78% of Malaysian students (Ghazali, Elklit, Balang, Sultan, & Kana, 2014), 86% of Greenland students (Karsberg, Lasgaard, & Elklit, 2012) and 95% of Kenyan students (Karsberg & Elklit, 2012) experienced at least one adverse childhood event.

Adolescents are very vulnerable to the exposure of adverse childhood events (Karsberg & Elklit, 2012). Impairments in emotion processing, cognitive functioning, and academic achievements (Hart & Rubia, 2012), as well as different internalizing and externalizing psychopathologies (Dvir, Ford, Hill, & Frazier, 2014; Teicher & Samson, 2016) with different underlying neurobiological changes in brain structure and function (Teicher & Samson, 2016) were found among adolescents exposed to trauma. Exposure to PTEs, combined with different temperamental, environmental, genetic and physiological factors (American Psychiatric Association, 2013), could lead to the development of posttraumatic stress disorder (PTSD; Cohen & Scheeringa, 2009; McLaughlin et al., 2013: Van Ameringen, Mancini, Patterson, & Boyle, 2008). A meta-analysis of data from 3563 youth

exposed to traumatic events showed a 16% prevalence of PTSD (Alisic et al., 2014). Another study showed that almost 25% of youth develop PTSD following exposure to interpersonal traumatic events and 10% following exposure to non-interpersonal traumatic events (Kolaitis, 2017). Besides classical PTSD symptoms, namely intrusion avoidance, negative alterations in cognitions and mood, and arousal and reactivity (American Psychiatric Association, 2013), adolescent PTSD could have some specificities compared to adult PTSD (e.g., Gerson & Rappaport, 2013; Herringa, 2017). At first place, symptoms expression could vary substantially, for example avoidant symptoms may be associated with restricted exploratory behavior, reduced participation in new activities or reluctance to pursue opportunities in adolescents (American Psychiatric Association, 2013). Recently, it has been found that symptoms related to intrusion, avoidance, negative affect, anhedonia, externalizing behavior, anxious, and dysphoric arousal best depict PTSD in adolescents (Cao, Wang, Cao, Zhang, & Elhai, 2017). In addition, there is heightened stress sensitivity of developing neural systems in adolescents, as well as delayed expression of the full effects of trauma exposure compared to adults (Herringa, 2017). Some structural and functional brain abnormalities were also found, like reduced ventro-medial prefrontal cortex volume and impaired recruitment of lateral prefrontal cortex, but not reduced hippocampal volume, and hyperactivity of the amygdala and insula as in adult PTSD (Herringa, 2017). In this regard, screening for exposure to PTEs and PTSD symptoms in adolescents is important for making the diagnosis timely and initiating treatment (Hawkins & Radcliffe, 2006; Kassam-Adams & Winston, 2004).

The UCLA Post-Traumatic Stress Disorder reaction index for children and adolescents (PTSD-RI), developed according to the Diagnostic and Statistical Manual of Mental Disorders (DSM) 4th Edition, has been one of the most accepted and used tool for PTSD screening in youth in clinical practice, as well as research, and it has been used in various countries worldwide (e.g., Hawkins & Radcliffe, 2006; Korb, 2013; Ohan, Myers, & Collett, 2002; Steinberg, Brymer, Decker, & Pynoos, 2004; Steinberg et al., 2013; Thabet & Vostanis, 1999). This instrument has been widely used for clinical evaluation, trauma research, and treatment outcome evaluation, and therefore translated and validated across sex, age groups and cultures (e.g., Koplewicz et al., 2002; Korb, 2013; Pynoos et al., 1993; Steinberg et al., 2004, 2013). Translations and psychometric evaluations of the tools are well reported (Korb, 2013; Lack, Sullivan, & Knight, 2008; Steinberg et al., 2004, 2013; Thabet et al., 2013). Overall, validation studies of the PTSD-RI showed appropriate internal consistency reliability (Goenjian et al., 1995; Steinberg et al., 2004, 2013).

In 2013, the PTSD diagnostic criteria were revised in the DSM Fifth Edition (DSM-5; American Psychiatric Association, 2013). These changes included an addition of three symptoms (i.e., negative expectations of oneself/world/others, distorted blame, and recklessness), a revision of existing symptoms, and a four-cluster rather than three-cluster structure (American Psychiatric Association, 2013). The PTSD-RI was revised accordingly into the PTSD-RI-5 (Pynoos & Steinberg, 2015). The instrument now includes past exposure to a traumatic event (criterion A) and related symptoms for each of the four clusters: intrusion (cluster B), avoidance (cluster C), negative alterations in cognitions and mood (cluster D), and arousal and reactivity (cluster E; American Psychiatric Association, 2013; Pynoos & Steinberg, 2015; Steinberg et al., 2013). Although studies in different cultures have addressed sound psychometric properties of the PTSD-RI in youth for the DSM-IV (Charak et al., 2014; Korb, 2013; Steinberg et al., 2004, 2013), two recent studies tested the psychometric properties of the PTSD-RI-5 self-report (Kaplow et al., in press; Takada et al., 2018). The first study reports on its sound internal consistency, criterion-referenced validity, and diagnostic accuracy in two independent samples of community and treatment-seeking youth (Kaplow et al., in press). Sound reliability and validity of the instrument was also showed in multi-site Japanese youth, namely child guidance centers, a psychiatric hospital, prefectures in a tsunami devastated area and a general population sample (Takada et al., 2018).

Considering culture-related diagnostic issues (American Psychiatric Association, 2013), the use of measures for youth psychopathology, including PTSD, across different regions/counties is still a challenge and more psychometric studies are needed (Stevanovic et al., 2017a). The prevalence rates and characteristics of youth psychopathology differ substantially across cultures and ethnic groups (e.g., Achenbach, Rescorla, & Ivanova, 2012; Canino & Alegria, 2008). Besides being may be genuine, such differences may be explained by biased estimations because of the assessment method of a given theoretical construct, that might not have the same structure for different cultures, and therefore lack measurement invariance (Borsboom, 2006; Dimitrov, 2010). This has also been reported for PTSD (Armour, 2015; Charak et al., 2014). In order to guarantee that a scale will operate equivalently across groups and that as such is suitable for cross-cultural comparisons of psychopathology prevalence, a theoretical construct of a scale developed in one language should be replicated across different language/cultural groups (Byrne & Watkins, 2003). Regarding the PTSD-RI-5, its proposed structure needs to be invariant across different cultural contexts. In addition to the whole structure, cross-culturally invariant items should be found when tested

simultaneously across these groups (Borsboom, 2006; Byrne & Watkins, 2003; Dimitrov, 2010; Gregorich, 2006; Milfont & Fisher, 2010). Thus, the aim of our study was to test the psychometric properties of the PTSD-RI-5 self-report among adolescents sampled from communities across eleven cross-culturally different countries.

2. Method

2.1. Participants and procedures

Data for the present study was collected in accordance to a project organized by the International Child Mental Health-Study Group (ICMH-SG) aiming to research mental health among children and adolescents living in low- and middle-income countries (LMIC – Atilola, Balhara, Stevanovic, Avicenna, & Kandemir, 2013). We obtained data from school-attending adolescents from at least one community in eleven countries available to the authors, namely Brazil, Bulgaria, Croatia, Indonesia, Montenegro, Nigeria, Palestine-Gaza, Philippines, Portugal, Romania, and Serbia. Participants represented a sample of convenience from rural and urban communities across these countries. Local project assistants with the authors in each country collected the data. Ethical approval and informed consent from parents were obtained for all participants. The same recruitment procedure was followed. First, it was sought permission from local authorities and/or appropriate ethical committees in each region to include adolescents in this study. Two to five high schools within communities in each country were randomly selected depending on the number of pupils and the vicinity or availability to the project assistant. School psychologists and/or project assistants informed the adolescents and their teachers of the research procedure. Only those who agreed to participate and returned the written consent were included. The adolescents completed instruments at school to prevent a low response rate. We provided adolescents with sealable envelopes in which completed instruments were returned to project assistants, in order to assure anonymity.

Overall, the sample consisted of 4201 adolescents (N_{male} = 1823; N_{female} = 2378) aged from 12 to 18 years (M_{age} = 15.38; SD = 1.68; Table 1). The amount of missing data for items varied between 1.1 and 2.5% across the countries. The missing items were replaced by series means for confirmatory factor analysis only.

Table 1. Characteristics of the sample.

Country	N participants	N males/N females	M age (SD)
Brazil	289	123/166	13.13 (1.24)
Bulgaria	263	120/143	14.88 (1.41)
Croatia	549	165/384	16.45 (1.01)
Indonesia	453	173/280	15.35 (1.33)
Montenegro	330	140/190	15.67 (1.51)
Nigeria	367	159/208	14.57 (1.42)
Palestine-Gaza	319	163/156	14.98 (2.01)
Philippines	286	158/128	16.53 (.68)
Portugal	628	303/325	15.67 (1.85)
Romania	329	163/166	15.28 (1.47)
Serbia	388	156/232	15.57 (1.51)

2.2. Instruments

2.2.1. PTSD-RI-5

The PTSD-RI-5 (Pynoos & Steinberg, 2015) is a self-report instrument to screen for trauma exposure and PTSD symptoms assessment in school-aged youth. The instrument consists of a comprehensive trauma history section, with provision to specify details regarding each type of trauma endorsed. For each traumatic event, respondents report whether they were a victim, witness, or learned/heard about the trauma. The next section is related to posttraumatic stress symptoms consisting of 27 items aiming to assess the nature of PTSD symptoms, as well as four additional items constructed to assess the Dissociative Subtype of PTSD. Young participants rated the frequency of experienced symptoms over the past month (ranging from 0 – none of the time; to 4 – most of the time). When answering questions, the youth should think about the traumatic event that is most bothersome to him or her currently. Scores range from 0 to 80. Items assessing main PTSD symptoms are classified into four subscales based on DSM criteria (American Psychiatric Association, 2013); five questions for Criterion B measuring intrusion, two questions for Criterion C measuring avoidance, seven questions for Criterion D measuring negative alterations in cognitions and mood, and six questions for Criterion E measuring alterations in arousal and reactivity (Pynoos & Steinberg, 2015), with four additional items combined into two main specifiers for the Dissociative Subtype of PTSD. For the purpose of the study, the PTSD-RI-5 was translated into ten languages (i.e., Arabic, Bulgarian, Bahasa Indonesian, Croatian, Montenegrin, Portuguese for Portugal, Portuguese for Brazil, Romanian, Serbian, and Yoruba languages for Nigeria). After obtaining the permission from the developers, the PTSD-RI-5 was translated and culturally adapted using the same approach of two forward translations, a single form development, a single back-translation, and pre-testing. Firstly, all items were translated from English into country native lan-

guages. After the first translation, independent translators recoded the items back into the original English language. All discrepancies were then searched for and questions were altered accordingly. Finally, cognitive debriefing in a group of with up to ten adolescents was held in each country as a form of pre-testing. During the cognitive debriefing, each adolescent firstly completed the PTSD-RI-5. Afterwards, each was asked to explain how he/she understood the meaning of every item and how an answer was created. Open discussion followed every item/term/concept which appeared to be ambiguous, confusing, unclear or problematic for responding anyhow. Following the cognitive debriefing and integration of reports from all sites, all items were considered comprehensive, precise and relevant; and no item was added, replaced or omitted in the translations. Thus, during this process of translation and cultural adaptation, conceptually equivalent language versions to the original English PTSD-RI-5 were developed. In a Japanese study, the PTSD-RI-5 total scale displayed satisfactory internal consistency reliability (α = 0.85) and sound convergent validity, while its four-factor structure of the PTSD-RI-5 was supported through confirmatory factor analysis (Takada et al., 2018), which is in line with the findings of a recent study (Kaplow et al., in press).

2.2.2. Revised child anxiety and depression scale (RCADS)

The RCADS is a 47-item scale for anxiety and depressive symptoms in youth (Chorpita, Moffitt, & Gray, 2005; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000). The six subscales correspond to separation anxiety, social phobia, generalized anxiety, panic, obsessive–compulsive, and major depressive disorders. The respondent indicates on a 4-point scale how often each symptom is present, ranging from 'never' (0 points) to 'always' (3 points). The RCADS has sound psychometric characteristics demonstrated in numerous international studied (Piqueras, Martín-Vivar, Sandin, San Luis, & Pineda, 2017). In this study, the RCADS Anxiety (sum of five anxiety subscales) and the RCADS Depression score were used. Cronbach's alpha of both measures was 0.93 and 0.88, respectively. For details on the RCADS as used in this project see Stevanovic et al. (2017b).

2.3. Statistical analysis

Internal consistency reliability was evaluated using Cronbach's α coefficient, for the total, B, D, and E subscales. Spearman–Brown coefficient was used for the C and Dissociation subscale, since they contain only two items. Internal consistency reliability was considered appropriate if the coefficients were ≥ .70. In order to provide comparable results to prior studies of PTSD's factor structure (e.g., Steinberg et al., 2004, 2013; Takada et al., 2018), we explored the original structure of four correlated factors, representing the main four DSM-5 criteria for establishing the diagnosis, by a confirmatory factor analysis (CFA). The dissociation items were not included in the CFA since they represent the extensions of the main criteria for a more specific diagnosis, namely PTSD with dissociative symptoms, thus could affect the general underlying factor structure of the four categories. A satisfactory degree of data fit requires the comparative fit index (CFI) and the Tucker–Lewis index (TLI) to be close to .95, and the model should be rejected when these indices are < .90 (Brown, 2006). The next fit index was root-mean-squared error of approximation (RMSEA), where values ≤ .06 indicate excellent fit, and a value of ≥ .08 indicates inadequate fit (Browne & Cudeck, 1993; Kline, 2011). We tested the factor structure of the model for the entire sample and for the countries separately. It was intended to implement multi-group CFA in order to assess cross-country measurement invariance (i.e., dimensional, configural, metric and scalar invariance) for the original model. If the original model were not represented by the data for each country (i.e., dimensional invariance), other aspects of measurement invariance would not be considered. In addition, standardized factor weights (λ) were analyzed in order to evaluate how all items behaves in relation to the proposed factors across countries. Besides being statistically significant ($p < .05$), λ should not be < .50 since this could indicate on possible problems with the local model fit (Joseph, Black, Babin, & Anderson, 2010). Finally, to determine whether the proposed PTSD subscales assess separate concepts from commonly present anxiety and depressive symptoms in youth, correlations between the two RCADS scores and the PTSD-RI-5 were computed using Pearson's correlation coefficient. The correlation coefficient should not exceed .70 in order to claim discriminant validity (Ravens-Sieberer, 2006). Analyses were performed using SPSS 22 and SPSS Amos 21.

3. Results

Table 2 shows the means, standard deviations, skewness, and inter-item correlation for each item with the total score. The smallest and the largest items' estimates were both present in the D subscale. Each of the items showed moderate to strong correlations with the total score (r ranging from .47 to .76). Item characteristics and correlations with PTSD-RI-5 total scores for each country are available on request.

Internal consistency reliability analyses for the PTSD-RI-5 total and subscales for the overall sample and individual countries are displayed in Table 3. The PTSD-RI-5 total score had Cronbach's α coefficient of .92 for the overall sample, while α ranged from .90 to .94 across the included countries. Subscales B and D had α of .83, whereas the E subscale of .71 for the overall

Table 2. PTSD-RI-5 item characteristics and correlations with PTSD-RI-5 total scores.

Item	M	SD	Skewness	r
B1	.84	1.23	1.01	.71*
B2	.97	1.25	.83	.68*
B3	.87	1.22	.10	.66*
B4	1.22	1.01	1.54	.72*
B5	1.03	1.29	.32	.69*
C1	1.16	1.33	.47	.65*
C2	1.02	1.37	.44	.60*
D1	.68	1.06	1.57	.59*
D2	1.73	1.20	1.14	.71*
D3	1.50	1.20	1.27	.66*
D4	1.56	1.18	1.07	.76*
D5	.68	1.15	1.36	.55*
D6	.95	1.25	.80	.64*
D7	.85	1.23	.98	.63*
E1	.97	1.16	.92	.53*
E2	.79	1.17	1.31	.59*
E3	1.19	1.23	1.01	.47*
E4	1.07	1.25	.83	.61*
E5	1.08	1.16	.92	.57*
E6	.83	1.17	1.31	.60*
Dis1	.82	1.18	1.32	.59*
Dis2	.92	1.21	1.18	.64*

Diss – Dissociation item; r – average inter-item correlation for an item with the total score; * p < .01

Table 3. Internal consistency reliability of the PTSD-RI-5 scores across countries.

Country	Total	B	C	D	E	Diss
Brazil	.91	.82	.43	.81	.67	.62
Bulgaria	.91	.84	.52	.77	.74	.76
Croatia	.94	.83	.69	.85	.76	.85
Indonesia	.90	.77	.63	.80	.67	.61
Montenegro	.93	.85	.67	.82	.72	.82
Nigeria	.91	.76	.38	.79	.67	.63
Palestine-Gaza	.90	.79	.64	.76	.65	.63
Philippines	.90	.78	.55	.82	.57	.77
Portugal	.94	.88	.62	.85	.75	.78
Romania	.90	.79	.51	.78	.66	.68
Serbia	.93	.87	.69	.82	.80	.68

Diss – Dissociation.

sample. Across the countries included, for the B subscale α ranged from .76 to .88, for the D subscale α ranged from .76 to .85, and for the E subscale α ranged from .57 to .80. Spearman–Brown coefficient for the C subscale was .60 for the total sample and ranged from .38 to .69 across the countries, while it was .76 for the dissociation subscale and ranged from .61 to .85 across the countries.

Table 4. Confirmatory factor analysis model fit indexes.

Country	χ^2	df	χ^2/df	TLI	CFI	RMSEA
Brazil	796.14	164	4.85	.72	.75	.12
Bulgaria	424.3	164	2.59	.84	.86	.08
Croatia	662.66	164	4.04	.89	.90	.07
Indonesia	391.58	164	2.39	.90	.92	.06
Montenegro	524.84	164	3.20	.85	.87	.08
Nigeria	330.24	164	2.01	.90	.92	.05
Palestine	354.16	164	2.16	.89	.90	.06
Philippines	2220.93	164	13.54	.41	.49	.21
Portugal	570.83	164	3.48	.92	.93	.06
Romania	505.35	164	3.08	.82	.85	.08
Serbia	511.58	164	3.12	.89	.91	.07

Comparative fit index (CFI); the Tucker–Lewis index (TLI); root-mean-squared error of approximation (RMSEA).

The four-factor structure of the PTSD-RI-5 on the overall sample was confirmed. The data showed an adequate model fit ($\chi^2_{(164)} = 2090.90$, $p < .01$, $\chi2/df = 12.75$, RMSEA = .05, CFI = .94, TLI = .93). The model does not show adequate data fit for the data from Brazil, Bulgaria, Montenegro, Philippines and Romania (Table 4). Therefore, due to a lack of a common acceptable model across all eleven countries, it was not possible to perform multi-group CFA and test all types of measurement invariance.

The standardized regression weights for all items in each country are given in Table 5. Across the countries, the standardized regression weights were statistically significant ($p < .01$), except for item E3 ('*on the lookout for danger or things that I am afraid of*'; $\lambda = .04$, $p = .48$) in the Philippines. Eight items (B2-5, C1, D2-4) had $\lambda > .50$ across all included countries, while 12 items had $\lambda < .50$ across one or more countries.

Finally, the RCADS scores and the PTSD-RI-5 scores correlated below .70 for the whole sample,

Table 5. Standardized regression weights for PTSD-RI-5 items for the overall sample and across eleven countries.

Item	Overall sample	Brazil	Bulgaria	Croatia	Indonesia	Montenegro	Nigeria	Palestine	Philippines	Portugal	Romania	Serbia
B1	.71	.64	.77	.71	.69	.75	.61	.71	.43	.77	.71	.72
B2	.68	.67	.69	.69	.68	.72	.61	.59	.67	.75	.59	.74
B3	.66	.62	.70	.70	.56	.66	.55	.50	.68	.77	.50	.75
B4	.74	.81	.70	.71	.68	.77	.63	.70	.88	.78	.68	.81
B5	.70	.66	.70	.73	.56	.70	.59	.73	.55	.77	.74	.75
C1	.69	.54	.62	.74	.56	.80	.50	.70	.68	.61	.76	.74
C2	.62	.50	.56	.69	.60	.61	.46	.67	.54	.73	.45	.70
D1	.57	.56	.51	.59	.58	.59	.54	.48	.32	.55	.51	.47
D2	.71	.71	.63	.74	.69	.70	.67	.65	.79	.70	.64	.70
D3	.63	.75	.61	.61	.62	.53	.67	.51	.62	.71	.65	.66
D4	.76	.84	.70	.78	.72	.75	.71	.65	.61	.79	.60	.74
D5	.53	.36	.39	.60	.46	.44	.35	.51	.42	.59	.56	.52
D6	.62	.52	.56	.66	.51	.73	.53	.52	.53	.74	.47	.69
D7	.61	.51	.53	.68	.57	.63	.45	.57	.86	.57	.55	.62
E1	.51	.46	.60	.54	.35	.46	.44	.48	.27	.55	.45	.63
E2	.59	.47	.61	.62	.53	.60	.58	.33	.68	.59	.52	.65
E3	.42	.58	.48	.50	.50	.44	.44	.50	.04*	.45	.34	.54
E4	.58	.56	.60	.59	.58	.61	.56	.55	.20	.68	.43	.68
E5	.55	.41	.53	.60	.44	.53	.45	.54	.74	.58	.60	.64
E6	.59	.57	.59	.65	.55	.60	.45	.47	.67	.60	.63	.70

* p > .05; All other standardized regression weights were statistically significant.

Table 6. Correlation coefficients among RCADS scores and the PTSD-RI-5 scores.

PTSD-RI-5 subscale	RCADS Anxiety score	RCADS Depression score
B	.54 (.23–.65)	.45 (.16–.63)
C	.44 (.16–.52)	.36 (.11–.42)
D	.59 (.25–.69)	.58 (.22–.73)
E	.57 (.48–.67)	.56 (.40–.69)
Diss	.48 (.20–.59)	.48 (.27–65)

Diss – Dissociation; Whole sample correlation and range of the correlations across countries.

and across all countries, except for the correlation between RCADS Depression score and D subscale for Portugal (.73; Table 6).

4. Discussion

The results of the inter-item and item-scale analyses demonstrated sound associations in-between and within the proposed subscales and the total score for all items in the PTSD-RI-5, which may indicate that all items the likely matching the proposed underlying construct of PTSD. However, further analysis demonstrated sound internal consistency reliability only for the total score, B and D subscale. The E and dissociation subscale had low internal consistency reliability in six out of 11 countries, while the internal consistency reliability of the C subscale was low across all countries. Aside that the C and dissociation subscale are created of only two items, insufficient internal consistency reliability indicates that the co-variances between the items are not similar, ideally identical, and these subscales may not be unidimensional and homogenous in measuring proposed symptoms of avoidance, alterations in arousal and reactivity, and dissociation symptoms. This is contrary to the findings of a Japanese study of the instrument that showed internal consistency reliability of .77 and .85 for the two subscales, respectively, and > .70 for the other two and the total of the instrument (Takada et al., 2018). Possible explanations for our result could be that there might be cultural factors affecting the homogeneity, not all items are equally relevant in these cultures/populations, or not all items contribute a similar amount of information for a proposed underlying construct for the C, E and dissociation subscale, which all was not necessary reflected through the items in the B and D subscale.

The results of the next analyses showed that the original factor structure of the instrument was confirmed for the overall sample indicating that the main four DSM-5 criteria for PTSD are unique to youth worldwide. However, some inconsistencies were observed within the measurement model across the included countries. The original four-factor model had inadequate fit degree for data from Brazil, Bulgaria, Montenegro, Philippines and Romania and the current structure was common only for six countries. Irrespective of the adequacy of data fit, not all items within the model had satisfactory association with the proposed subscales (Joseph et al., 2010). Eight items had standardized regression weights of > .50 across all countries; the B (four out of five items; B2-5) and D subscale (three out of seven; D2-4) and item C1. The other items had low values of standardized regression weights, of which eight had lower values across two or more countries compared to the others. Particularly problematic could be the left four D items (i.e., D1, D5-7) and three items in the E subscale (i.e., E1, E3, and E5). In addition, it was observed that the standardized regression weights for all PTSD-RI-5 items varied across all countries. For example, item B4 ('*When something reminds me of what happened I get very upset, afraid, or sad*') had values ranging from .63 in Nigeria to .81 in Brazil. Taken all findings together, although the four-factor structure of PTSD could be unique, not all items are common to or equally relevant to all adolescents worldwide, nor interpreted in a conceptually similar manner, which could be an indicator of cultural/society effects on the PTSD measurement. It appears that the least sensitive to these effects, with the most satisfactory level of cross-cultural undimensionality, could be items measuring symptoms of intrusions, while the most sensitive could be items measuring alterations in arousal and reactivity. Thus, the study confirmed only the configural invariance of the PTSD-RI-5, which seems to be an insufficient form of invariance for appropriate cross-cultural comparisons with the whole instrument (Gregorich, 2006). Compared to the others, the poorest model fit, with the lowest regression weights, was evident for the Philippines' sample, which could be largely due to very low item-total score relationships for B1, B5, D1, E1, E3, and E4 found. This finding could indicate that these items are highly sensitivity to and would be more affected by different group experiences, understandings, communication and behaviors in response to traumatic events in the Pilipino adolescents compared to others. Thus, it warrants further investigation and possibly reconsideration of how the PTSD-RI-5 is formulated in this country considering that some recent findings with adults, although reporting some specificities, largely agree with the DSM-5 PTSD symptomatology (e.g., Mordeno, Carpio, Nalipay, & Saavedra, 2017; Mordeno, Go, & Yangson-Serondo, 2017).

These above results for the factor structure open a long debate over the last two decades about the latent structure of PTSD (see for details Liu et al., 2014). Specifically, some studies on earlier versions of the instrument questioned the dimensionality of DSM criteria and their applicability across various nations (Charak et al., 2014; Liu et al., 2014). It is

mostly agreed upon that the four-factor models can provide a good representation of PTSD latent structure (Elhai & Palmieri, 2011; Gootzeit & Markon, 2011; Yufik & Simms, 2010). However, it remains unclear which structure is more suitable. The four structure models include the four-factor numbing model (King, Leskin, King, & Weathers, 1998), the four-factor dysphoria model (Simms, Watson, & Doebbeling, 2002), and the DSM-5 conceptualization of symptoms which is closer to the four-factor numbing model. Studies in general support the DSM-5 model. For example, Biehn et al. (2013) compared the DSM-5 model and the DSM-5 dysphoria model in a sample of trauma-exposed undergraduates and found support for the DSM-5 model. Elhai et al. (2012) tested four alternative models: the DSM-5 model, alternative four-factor and five-factor models, and the DSM-IV model. They reported that the DSM-5 model fit the data adequately. Armour, Műllerová, and Elhai (2016) conducted a systematic review of studies assessing the PTSD symptoms latent structure. They showed that the four-structure model proposed by DSM-5 (in an overall of 14 different samples) showed adequate fit to data. However, when compared to alternative models, only three studies showed optimal data fit (21%). In all studies, there were 18 different PTSD models assessed via CFA, ranging from one to seven factors. In another study, they proposed an alternative seven-factor hybrid model (Armour et al., 2015). Liu et al. (2014) showed that a six-factor model best described PTSD symptoms in a Chinese population. In summary, studies on the latent structure of DSM-5 PTSD symptoms are limited, and even though the current four structure model is mostly confirmed, mixed findings still arise (Yufik & Simms, 2010). The CFA results in our study suggest that the proposed DSM-5 model might not be culturally universal and suitable in different countries. Therefore, it is important to highlight the remaining unclear conceptualization of the PTSD clusters, which could also affect the psychometric properties of the PTSD-RI-5 instrument. Further research should shed light on the conceptualization and theoretical organization of the PTSD criteria and their cross-cultural validity (Liu et al., 2014).

The final analysis showed that the correlations among the RCADS and the PTSD-RI-5 scores were lower than expected indicating that the proposed PTSD subscales including dissociation symptoms likely assess separate concepts from common anxiety and depressive symptoms in youth, which provides preliminary evidence for discriminant validity. The only problematic correlation was between the RCADS Depression and D subscale scores for Portugal (r = .73). However, the strength of the association between the two instruments varied markedly from very weak to moderate/strong across the participating countries, which may indicate that the association between the measuring constructs is culturally dependent, too. On the other hand, a Japanese study demonstrated convergent validity only for the B and C subscales (Takada et al., 2018).

There are many potential sources of differences across cultures when one congruent quantitative scale is used among children and adolescents (Stevanovic et al., 2017b). Given so, some conceptual and methodological constraints need to be noted when interpreting the findings of this study. First, there may still be significant differences in evaluating, reporting, manifesting and/or expressing psychological symptoms among cultures (Achenbach et al., 2012; Charak et al., 2014; Goodman et al., 2012; Heiervang, Goodman, & Goodman, 2008; Lambert, Essau, Schmitt, & Samms-Vaughan, 2007). Conflicting findings have been reported regarding ethnic differences PTSD (Pole, Best, Metzler, & Marmar, 2005; Roberts, Gilman, Breslau, Breslau, & Koenen, 2011; Ruchkin et al., 2005). For example, studies with Asian samples indicate the collectivistic and fatalistic nature of expressing symptoms after a traumatic experience (Charak et al., 2014) as well as a predominance of somatic symptoms (Terheggen, Stroebe, & Kleber, 2001). Such behavior could alter the latent structure of PTSD. Second, it is possible that some items are more sensitive to one culture and less to another. Moreover, they could easily be confounded by the culture-specific attributes related to the construct. Considering the latter, some items might not represent specific psychopathology as intended, but rather the general propensity to a psychopathology, or some items could be of less important when comparing cultural specifics and reference norms (Heine, Lehman, Peng, & Greenholtz, 2002). Therefore, inherent economic, social, and cultural factors could attribute to cultural differences (Camras & Fatani, 2006; Hackett & Hackett, 1999; Lehman, Chiu, & Schaller, 2004; Mabe & Josephson, 2004; Nikapota & Rutter, 2008). In addition, in a specific culture, some items might be more sensitive to factors such as age and gender than others (Charak et al., 2014). For example, countries with traditional and non-traditional gender roles could show different patterns of PTSD in males and females, implying an influence of culturally sanctioned gender roles on PTSD symptoms (Charak et al., 2014; Norris, Perilla, Ibañez, & Murphy, 2001). Differences in the manifestation of symptoms and cultural construct interpretation could thus lead to differences in the factor structure of PTSD-RI-5 (Charak et al., 2014).

Regarding the methodology of our study, it should be noted that only adolescents who agreed to participate were included and that the response rates varied substantially between countries. For this reason, there were

less than 330 participants for five countries for which CFA results did not replicate the original factor structure of the instrument. In addition, we could not obtain enough data for different sub-cultural and sub-racial groups. Reasons for not participating remain unexplored. Furthermore, even though schools in the regions were randomly selected, participants were sampled from regions of convenience, which could limit the generalizability of the findings to adolescents from other regions in each country. Next, the data were based solely on self-reports, which could have affected the findings (Charak et al., 2014), since the authenticity of youth self-report depends on many factors, i.e. a child's developmental level and factors about the event itself (Hawkins & Radcliffe, 2006). Multimethod approaches, including corroborative parent and teacher reports, (Hawkins & Radcliffe, 2006; Jensen et al., 1999), were not obtained in this study. In addition, we included data from all adolescents who completed the instrument irrespective of trauma/adverse childhood event exposure, and the analyses of only these adolescents may have yielded different results. Of relevance could be youth experiencing complex trauma symptoms, which may not be fully reflected through a self-report. Related to this, since we have not tested how dissociative symptoms contribute to the overall model represented by four main DSM categories, it would be relevant to see how these specifiers contribute to a more specific diagnosis, namely PTSD with dissociative symptoms. Finally, no behavioral observations or clinical indices were used to confirm this self-report measure (Purgato & Barbui, 2012).

Summarizing, our study showed good internal consistency reliability of the PTSD-RI-5 in all eleven countries included in the study and for PTSD symptoms related to B and D DSM-5 criteria. E criteria and specifiers for PTSD with dissociative symptoms had low internal consistency reliability in some countries, while C criteria across all. However, evidence for discriminant validity was found for all PTSD criteria against anxiety and depressive symptoms. The four-factor structure of the PTSD-RI-5 likely represents the core PTSD symptoms in adolescents worldwide as proposed by the DSM-5 criteria. However, the PTSD-RI-5 items are likely interpreted in a conceptually different manner by adolescents from different cultural/regional backgrounds. Thus, besides reflecting the uniqueness of the current DSM-5 model, the findings imply that the PTSD-RI-5 self-report might not allow direct cross-cultural/region comparisons and every single cross-cultural comparison should explore the structure of the instrument first and consider the items for cultural/reginal relevance in the comparison. If further replicated, this finding has implications for epidemiological and clinical research, as well as for the conceptualization of PTSD. The inappropriateness to conduct cross-country comparison does not imply that the whole instrument cannot be used for within-country evaluations especially for those in which the structure was confirmed (i.e., Croatia, Indonesia, Nigeria, Palestine-Gaza, Portugal, and Serbia). Given our study, it is important to address possible revisions to the PTSD-RI-5, which could primarily be based on creating items that are more culturally independent, for them to be easily implemented in multicultural contexts. This could be achieved by providing experts with research attempting to contrast weaker items found in the present study with open-ended questions or, preferably, interviews to validate the meaning, understanding and rating of those items across different cultures. In this regard, more psychometric studies are needed to test different aspects of reliability and validity, as well as diagnostic accuracy in a multicultural context, but also cognitive interviewing studies to explore cultural sensitivity, relevance and appropriateness of PTSD items (Willis & Miller, 2011). Attempts to revise the measurement model should be based on a more precise sampling method; include parent, teacher and self-reports; and at risk and clinical samples. Given so, establishing the cross-cultural validity of the PTSD-RI-5 will improve the accuracy of childhood PTSD prevalence, and will facilitate both the recognition and evaluation of intervention, as is the case for all other youth psychopathology (Stevanovic et al., 2017a).

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author [DS].

ORCID

Ana Doric http://orcid.org/0000-0001-6681-3942
Dejan Stevanovic http://orcid.org/0000-0001-8236-5246
Olayinka Atilola http://orcid.org/0000-0001-9835-6432
Paulo Moreira http://orcid.org/0000-0002-5454-7971
Tomislav Franic http://orcid.org/0000-0002-5240-7166
Vrljicak Davidovic http://orcid.org/0000-0002-3547-9408
Multazam Noor http://orcid.org/0000-0002-0330-1664
Laura Nussbaum http://orcid.org/0000-0003-0422-918X

Abdelaziz Thabet http://orcid.org/0000-0003-3035-7142
Joana Oliveira http://orcid.org/0000-0003-3438-1035
Rajna Knez http://orcid.org/0000-0003-1278-4554

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