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Articles

Post Traumatic Reactions as Individual Differences: Latent Structure Analysis of the International Trauma Questionnaire in Italian Trauma-Exposed and Non-Trauma Exposed Adults

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Abstract

To evaluate the internal consistency and factor structure of the Italian translation of the 12-item International Trauma Questionnaire (ITQ), 382 trauma-exposed and 366 non-trauma exposed Italian community-dwelling Italian adults from a total group of 748 volunteers completed the ITQ. The ITQ Post-traumatic Stress Disorder and Disorder of Self-Organization scales showed adequate Cronbach's αs in both trauma-exposed and non-trauma-exposed participants. Confirmatory factor analyses showed that the a priori model of item-to-scale assignment of the ITQ items was consistently reproduced in both trauma-exposed and non-trauma-exposed participants, even when measurement invariance was formally assessed. Finally, taxometric analyses showed that the latent distribution of the six ITQ PTSD symptom items should be conceived as a latent dimension rather than a categorical latent construct. As a whole, our findings supported to the cross-cultural validity of the ITQ while extending its clinical usefulness.

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1. Introduction

Since its introduction in the 3rd edition of the *Diagnostic and Statistical Manual* (*DSM*) (American Psychiatric Association [APA], 1980), the diagnosis of posttraumatic stress disorder (PTSD) deeply influenced both clinical practice and scientific research, prompting an impressive amount of research over the decades (Brewin et al., 2017). The PTSD construct was revised and ameliorated in subsequent editions of the *DSM*, leading up to the current *DSM-5* definition of PTSD (APA, 2013). Notwithstanding its success, doubts were raised as to the adequacy of the *DSM-5* PTSD definition to capture the whole range of post-traumatic conditions (Brewin et al., 2017). Interestingly, the structure of *DSM-5* PTSD symptoms was essentially the same whether or not individuals have been exposed to traumatic event (Zelazny & Simms, 2015). This finding suggested that *DSM-5* PTSD symptoms may represent general reactions to adversity rather than trauma-specific manifestations (Brewin, 2003).

Against this background, the 11th revision of the World Health Organization's (WHO) *International Classification of Diseases* (*ICD-11*) proposed a sharply different approach to diagnosing PTSD, distinguishing between basic (i.e., PTSD) and complex configurations of the condition (CPTSD), while simplifying the construct conceptualization (Maeker et al., 2013). *ICD-11* (WHO, 2018) guidelines recommended that disorders include a limited but clinically relevant number of symptoms (Reed, 2010), because the *ICD* aims at maximizing clinical utility for the use of diagnoses worldwide, adopting a public health perspective.The *ICD-11* PTSD is defined by three clusters each containing two symptoms (Maercker et al., 2013): (1) re-experiencing of the trauma in the present (Re), (2) avoidance of traumatic reminders (Av), and (3) a persistent sense of threat that is manifested by increased arousal and hypervigilance (Th). In contrast, the definition of CPTSD includes the six PTSD symptoms as well as an additional set of symptoms that reflect 'Disturbances in Self-Organization' (DSO). These DSO symptoms are defined by three clusters: (1) affective dysregulation (AD), (2) negative self-concept (NSC), and (3) disturbances in relationships (DR).

Cloitre, Roberts, Bisson, and Brewin (2016) originally developed International Trauma Questionnaire (ITQ) as a 22-item measure to specifically assess the *ICD-11* PTSD and CPTSD symptoms; moreover, the ITQ provides also three items for assessing the PTSD/CPTSD-related impairment in the level of functioning. Previous findings showed that previous versions of the ITQ were provided with good psychometric properties in its English (e.g. Hyland, Shelvin, Brewin et al., 2017; Karatzias et al., 2016), Hebrew (Ben-Ezra et al., 2017), German (Maercker, Hecker, Augsburger, Kliem, 2018), Ukraininan (Shevlin et al., 2018), Luo (Murphy, Elklit, Dokkedahl & Shevlin, 2018), and Lithuanian (Kazlauskas et al., 2017) translations of the scale.

Recently, Cloitre and colleagues (2018) deeply refined the ITQ items using both item response theory and confirmatory factor analyses (CFAs), releasing the final 12-item version of the ITQ, which lists six items for PTSD and six items for DSO. In particular, two items were provided for PTSD Re-experiencing in the here and now (Re), Avoidance (Av), and Sense of current threat (Th) symptom clusters, respectively; similarly, the ITQ lists two items for each DSO symptom cluster (i.e., Affective dysregulation [AD], Negative self-concept [NSC], and Disturbances in relationships [DR]). The ITQ provides also three impairment items for both PTSD and DSO, which are required for categorical assessment of the syndromes.

The ITQ asks participants to indicate if they have experienced one or more traumatic events during their lifetime. For PTSD items, participants are asked to indicate how much have they been bothered by each of the symptoms during the past month. For DSO assessment, the ITQ instructs participants to rate each item stressing that questions refer to ways they typically feel, think about themselves, and relate to others. The 12 ITQ items are measured on a five-point, Likert-type scale ranging from 0 (*Not at all*) to 4 (*Extreme).*To generate dimensional PTSD and DSO scores, respectively, the ITQ item Likert scores are summed for each symptom cluster, and symptom cluster scores are then summed to yield the corresponding ITQ scale total score. The ITQ provides also categorical diagnostic scoring for PTSD and DSO. Following standard practice in trauma research (Karatzias et al., 2017), item scores ≥2 ('Moderately') should be used to indicate the presence of a symptom (Cloitre et al., 2018). For both PTSD and DSO categorical assessment, at least one indicator in each cluster must be scored positive, and at least one impairment item must be rated ≥2.

Then, PTSD is diagnosed if the criteria for PTSD are met but not for DSO. CPTSD is diagnosed if the criteria for PTSD are met and criteria for DSO are met. Not meeting the criteria for PTSD or meeting only the criteria for DSO results in no diagnosis. Recently, Cloitre and colleagues (2018) showed that the factor model based on six first-order factors and two PTSD and DSO second-order factor represented the best-fitting model of the 12 ITQ item correlation matrix in CFAs. To our knowledge no study addressed the issue if this factor structure was specific to trauma-exposed population, or if the ITQ items measured the same stress-related process in trauma-exposed and non-trauma-exposed populations, respectively. Although it may sound counter-intuitive, this issue is critical for extending the use of the ITQ to screening for PTSD/CPTSD in unselected populations whose exposure to trauma is unknown (e.g., general practitioner patients, community-dwelling subjects, etc.). Moreover, testing the ITQ measurement invariance in trauma-exposed and non-trauma-exposed participants would be helpful in extending trauma-related symptoms to general reactions to stressors/adversities (Brewin, 2003). Finally, the evidence for strong, or even weak factor invariance would be more consistent with a dimensional representation of PTSD/DSO than with a categorical assessment, as in the *ICD-11* (WHO, 2018).Testing whether the latent structure of the ITQ PTSD symptom items is categorical in nature represents a second major aim of our study. Indeed, the presence of an *ICD-11* PTSD diagnosis is central also for assessing the presence of *ICD-11* CPTSD (Brewin et al., 2017); thus, knowing the latent structure of the *ICD-11* PTSD symptoms is vital also for other trauma-related diagnoses. Mixture models gave evidence for separate PTSD and DSO latent classes; despite their mathematical elegance and sophistication, mixture models are likely to yield spurious evidence of latent groups when indicators are non-normally distributed

(Lubke & Neale, 2006). Moreover, any system of *k* factors may be described in terms of *k+1* latent classes (Lubke & Neale, 2006). Under these conditions, taxometric methods may represent a viable alternative to mixture models. Although a substantial body of studies evidenced the dimensional latent structure of *DSM* PTSD indicators, Kliem and colleagues (2016) yielded evidence for the categorical latent structure of the *ICD-11* six-item core set for PTSD.

This topic may have relevant implications for clinical decision-making as well as for providing individuals suffering from PTSD their own rights in the health system and in the social system (Kliem et al., 2016), although dimensional systems can be easily turned into categories by applying appropriate cut-offs (e.g., Walters et al., 2015). For instance, Intelligence Quotient (IQ) is dimensionally distributed; however, IQ measures may be easily converted to categories in order to provide treatment and social support to people suffering from cognitive disabilities.

Against this background, we aimed to evaluate the factor structure of the ITQ items in a sample of community-dwelling Italian adults who reported to have been exposed to one or more traumatic events during their lifetime, and in a sample of community-dwelling Italian adults who reported no exposure to traumatic events during their lifetime. Consistent with previous ITQ studies (e.g., Hyland et al., 2017) and the controversies in the CFA literature (e.g., Rhemtulla, Brosseau-Liard, & Savalei, 2012), we relied on both weighted least square mean and variance adjusted (WLSMV) and robust maximum likelihood (MLR) CFAs to test the fit of four competing models of the ITQ item factor structure.

Based on the *ICD-11* model of PTSD and DSO that represented the theoretical background for developing the ITQ model of item-to-scale assignment and the available empirical evidence from previous CFA studies, we expected that a six correlated first order factors – corresponding to PTSD Re, Av, and Th symptom clusters and to DSO AD, NSC, and DR symptom cluster – and two correlated second-order factors – corresponding to PTSD and DSO constructs – would represent the best fitting model. The issue of measurement invariance in the case of ordinal responses has not been fully clarified yet (e.g., Wu & Estabrook, 2016), particularly in the case of CFA models with second-order factors (Chen, Sousa, & West, 2005). Thus, we first assessed measurement invariance of the ITQ first-order factors; then, we saved ITQ item first-order factor scores as new variables to assess the measurement invariance of the ITQ second-order factors.

A second major aim of the present study was to investigate if the scores of the six ITQ items assessing the *ICD-11* PTSD showed a latent categorical distribution using non-redundant taxometric methods and simulated comparison data (Ruscio, Ruscio, & Carney, 2011). To put the dimensional hypothesis of PTSD to a "risky test", we performed taxometric analyses also using dichotomized ITQ item scores. Since impairment criteria are central to the ITQ categorical diagnosis of PTSD, we re-performed taxometric analyses of the dichotomous ITQ items including also the three dichotomously-scored impairment items. Following Ruscio and colleagues (2011) indications for taxometric studies, in the present study taxometric analyses were carried out in the full sample.

2. Materials and Methods

2.1 Participants

Participants were 873 community-dwelling adult participants who were recruited in train station waiting rooms and public libraries in Milan during 2018. These sampling facilities were chosen because they were thought a) to be attended by largely unselected community dwelling adults; and b) people usually had time enough to fill a short psychometric measure. All participants gave their written consent to participate in the study after it had been explained to them; all participants were volunteers and received no financial or academic incentive to take part in the study. One-hundred twenty-five participants (14.3%) yielded incomplete answers on the ITQ and were excluded from the study; however, Little's MCAR test showed that missing values were completely at random, $\chi^2(56) = 56.02$, $p > .40$.

The final sample was composed of 748 participants with a mean age of 35.50 years, $SD = 13.85$; 375 (50.1%) participants were male, 372 (49.7%) participants were female, whereas 1 (0.2%) participant refused to disclose his/her gender. Three hundred eighty-three (51.2%) participants were unmarried, 270 (36.1%) were married, 65 (8.7%) were divorced, and 30 (4.0%) were widow/widower. Two hundred seventy-seven (37.0%) participants had junior high school degree, 314 (42.0%) had high school degree, and 157 (21.0%) had university degree. Two hundred twenty-seven (30.3%) participants were students, 299 (40.0%) were white collars, 148 (19.8%) were freelance professionals, 21 (2.8%) were housekeepers, and 33 (4.4%) were retired; 20 (2.7%) participants were unemployed. One hundred seventy-four (23.3%) participants reported to be volunteer rescue workers. Before being administered the ITQ, participants were asked to report if they had experienced any extremely threatening or horrific event or series of events or situations either short- or long-lasting (Brewin et al., 2017); if they positively answered this question, they were asked to report the specific event (the latest event in the case of multiple events). In the case of negative answer, participants were asked to indicate if they have experienced any stressful, albeit non-traumatic event during their lifetime, detailing what happened. Based on this definition, 382 (51.1%) participants reported to have experienced at least one traumatic event during their lifetime; all the remaining participants indicated to have experienced at least one stressful situation during their lifetime. Sudden death of a person (n=190, 25.4%) and incident/disaster (n=109, 14.6%) were the most frequently reported traumatic events, whereas other traumatic experiences (e.g., terrorism, earthquake, eruptions, etc.) were reported by 39 (5.2%) participants; sexual abuse and aggression experiences were reported by 13 (1.7%) participants and 25 (3.3%) participants, respectively. In the present study, the inter-rater reliability for the presence of any traumatic event was excellent, Cohen's $\kappa(N=748)=.92$, $p<.001$. Cohen's κ for the individual traumatic events ranged from .62 to 1.00, all ps<.001, with a median Cohen's κ value of .99. The most frequently reported non-traumatic stressful events were problematic relationships (n=150, 39.9%), health problems (n=103, 27.4%), and trouble at school/university/work (n=56, 14.9%).

Forty-one (5.5%) participants reported that the trauma was experienced less than 6 months before entering the study, 32 (4.3%) reported that the trauma was experienced 6-12 months before entering the study, 126 (16.8%) reported that the trauma was experienced 1-5 years before entering the study, 79 (9.4%) reported that the trauma was experienced 5-10 years before entering the study, 59 (7.9%) reported that the trauma was experienced 10-20 years before entering the study, and finally 59 (7.9%) reported that the trauma was more than 20 years before entering the study. Based on Maercker et al.'s (2018) consideration, we considered a more restrictive definition of trauma exposure, excluding events like 'sudden death of a loved one' because they may be assigned to the event category "prolonged grief disorder". According to this restrictive definition of trauma, 182 (24.3%) participants reported that they had experience at least one traumatic event during their lifetime, while showing no significant difference in the time elapsed from trauma exposure from broadly-defined trauma-exposed participants (n=378), $\chi^2(5)=7.36$, $p>.20$, $V=.14$.

2.2 Measures

2.2.1 International Trauma Questionnaire (ITQ; Cloitre et al., 2016). The ITQ is a 12-item, Likert-type self-report questionnaire that was designed to assess the ICD-11 PTSD and DSO symptoms, as well as the related impairment in the level of functioning. Consistent with Cloitre and colleagues (2018), in the present study the ITQ was administered in its 22-item Italian translation. The procedure of translation of the ITQ into Italian had equivalence with the original meaning of the items as the guiding principle in the translation process (Denissen, Geenen, van Aken, Gosling, & Potter, 2008). First, the ITQ was independently translated into Italian by one of the authors (A. F.), and by another clinical psychologist who was fluent in English. After reaching a first consensus, we had an English mother-tongue professional translator translate the Italian version back into English, and this English back-translation (e.g., Cha, Kim & Erlen, 2007) was sent to one of the authors (M.C.) of the ITQ. If the latest version differed from the English original, the translators came to an agreement on the definitive Italian translation. In the present study, we computed Cronbach's α estimates for both Likert-type and dichotomized ITQ items; α values for dichotomous item scoring are listed between brackets. In the full sample, Cronbach's α values were .67 (.55), .81 (.77), and .83 (.75) for Re, Av, and Th, respectively; AD, NSC, and DR sub-scales showed Cronbach's α values of .51 (.41), .90 (.87), and .73 (.56), respectively. Cronbach's α values of .84 (.79) and .83 (.72) were observed for the ITQ PTSD and DSO scales, respectively. In our broadly-defined trauma group (n=382) Cronbach's α values of .66 (.51), .83 (.76), .84 (.76), .51(.29), .93 (.87), .77 (.64), .83 (.78), and .84 (.71) for the ITQ Re, Av, Th, AD, NSC, DR, PTSD and DSO dimensions, respectively. When we computed Cronbach's α coefficients for the ITQ Re, Av, Th, AD, NSC, DR, PTSD and DSO dimensions in the narrowly-defined trauma group (n=182), the corresponding values were .69 (.64), .86 (.78), .84 (.76), .53 (.34), .95 (.86), .83 (.70), .85 (.80), and .86 (.74), respectively. Among our 366 participants who did not report any broadly-defined traumatic event, Cronbach's α values were .68 (.58), .78 (.78), .83 (.74), .50 (.49), .89 (.86), .67 (.47), .85 (.81), and .81 (.73) for ITQ Re, Av, Th, AD, NSC, DR, PTSD and DSO dimensions, respectively. Finally, among the 566 participants who did not report any narrowly-defined traumatic event, Cronbach's α values for the ITQ Re, Av, Th, AD, NSC, DR, PTSD and DSO dimensions were .66 (.52), .79 (.76), .84 (.76), .50 (.42), .89 (.87), .69 (.52), .84 (.79), and .81 (.71), respectively.

In our study, dichotomizing the ITQ items yielded Cronbach's α values that were on average significantly lower than the corresponding values that were computed using the Likert-type item format in the broadly-defined trauma group, Wilcoxon z=-2.52, exact p<.01, narrowly-defined trauma group, Wilcoxon z=-2.53, exact p<.01, in the 366-participant no-trauma group, Wilcoxon z=-2.34, exact p<.05, and in the 566-participant no-trauma group, Wilcoxon z=-2.52, exact p<.01. No significant differences were observed among the median Cronbach's α values based on the ITQ dichotomous item scores that were computed in our sub-groups, Friedman $\chi^2(3)$=4.10, exact p>.20. Rather a significant omnibus effect was observed for the four sets of Cronbach's α values based on the ITQ Likert-type item scoring, Friedman $\chi^2(3)$=14.49, exact p<.001. Hochberg-Bonferroni step-up Wilcoxon contrasts showed that the median ITQ Cronbach's α value based on the narrowly-defined trauma group (*mdn* α=.85) was significantly larger than the corresponding median value that was observed in the broadly-defined no-trauma group (*mdn* α=.80), z=2.37, p<.05. None of the other contrasts reached statistical significance.

The median Spearman *r* value for the similarity among the four vectors of Cronbach's α values was .87, *SD*=.07, min.=.78, max.=.97, all *p*s<.05. Similar results were observed for Cronbach's α values based on dichotomous item scoring, *mdn* $r_{Spearman}$=.97, *SD*=.03, min.=.92, max.=.99, all *p*s<.01.

2.3 Data analysis

WLSMV and MLR CFAs were used to test the following models of the ITQ item factor structure: a) unidimensional model, in which all ITQ items loaded on a single factor; b) two correlated factor model, in which the six ITQ PTSD items loaded on a PTSD factor and the 6 DSO items loaded on a DSO factor; c) six first-order factors loading on a second-order general factor; d) six first-order factors loading on two corelated second-order factors (PTSD and DSO, respectively). Goodness-of-fit of individual models was assessed using fit indices and cut-off values suggested in Hu and Bentler' (1999) study. In MLR CFA, we computed also the Bayesian Information Criterion (BIC); the model with the smaller BIC value was deemed to be the best-fitting model. Although the topic is still controversial in the assessment of item-level measurement invariance (e.g., Sass & Schmitt, 2013), we tested the following invariance models: a) a configural invariance model with invariant factor loading pattern; b) a metric invariance model with equal number of factors and factor loadings across groups; and c) a scalar invariance model with invariant factor loadings and thresholds.

The DIFFTEST procedure was used to evaluate the presence of significant differences in goodness-of-fit function between nested models (Muthén & Muthén, 1998-2015). In line with methodological difficulties related to the assessment of measurement invariance in the case of second-order factors when ordinal indicators are used (e.g., Wu & Estabrook, 2016), to adequately assess the measurement invariance of the PTSD and DSO second-order factors first-order factor scores were computed and subsequently used in MLR CFAs to test the second-order factor invariance. All CFAs were carried out using Mplus 7.4 (Muthén & Muthén, 1998-2015). Consistent with Kliem and colleagues' (2016) approach, taxometric analyses of the six ITQ PTSD symptom item scores were carried out relying on three non-redundant methods, namely, mean-above-minus-mean-below-a-cut (MAMBAC), maximum eigenvalue analysis (MAXEIG), and latent mode (L-Mode) analysis (see Ruscio et al., 2011 for a description of the techniques). Since L-Mode cannot be used with dichotomous indicators, we relied only on MAMBAC and MAXEIG for taxometric analyses of dichotomized ITQ item scores. Based on Ruscio and colleagues' (2017) indications, we averaged a panel of curves to calculate a single comparison curve fit index (CCFI) value. CCFI values range from 0 to 1 with values close to 0 indicating dimensional distribution and values close to 1 indicating categorial distribution; CCFI values in the .45-.55 range are considered to indicate inconclusive findings. Initial estimates of the PTSD putative taxon base rate were provided based on the ITQ algorithm for PTSD categorical diagnosis. Taxometric analyses were carried out using default options of Rt axometric package (Ruscio et al., 2018).

3. Results

CFA fit indices for the six factor models of the ITQ items in trauma-exposed and non-trauma-exposed groups are summarized in Table 1.

Table 1. *Confirmatory Factor Analyses of the International Trauma Questionnaire Items: Fit Indices in Trauma-Exposed and Non-Trauma-Exposed Participants (N=748).*

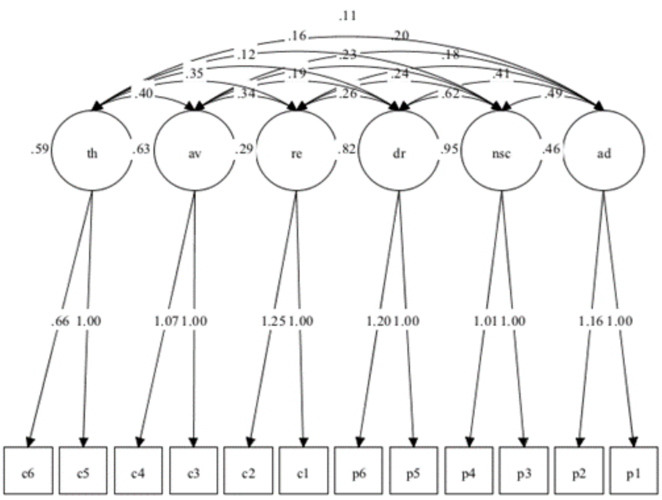
	Trauma-Exposed Participants (broad definition; *n*=382)				
Models	$\chi^2_{(df)}$	RMSEA	CFI	TLI	BIC
a) 1 factor	$718.02_{(54)}$***	.180	.544	0.443	11533.31
b) 2 correlated factors	$409.13_{(53)}$***	.133	.755	0.696	11127.77
d) 6 first-order factors, 1 second-order factor	$128.94_{(50)}$***	.065	.946	0.928	10785.98
e) 6 first-order factors, 2 second-order factors (PTSD and DSO)	**$68.57_{(48)}$***	**.034**	**.986**	**0.981**	**10719.69**
	Non-Trauma-Exposed Participants (*n*=366)				
Models	$\chi^2_{(df)}$	RMSEA	CFI	TLI	BIC
a) 1 factor	$665.55_{(54)}$***	.176	.495	0.383	11899.13
b) 2 correlated factors	$252.31_{(53)}$***	.102	.835	0.795	11349.50
d) 6 first-order factors, 1 second-order factor	$265.36_{(50)}$***	.109	.822	0.765	11379.26
e) 6 first-order factors, 2 second-order factors (PTSD and DSO)	**$95.95_{(48)}$***	**.052**	**.960**	**0.946**	**11171.49**
	Trauma-Exposed Participants (narrow definition; *n*=182)				
Models	$\chi^2_{(df)}$	RMSEA	CFI	TLI	BIC
a) 1 factor	$607.27_{(54)}$***	.238	.357	0.214	5447.33
b) 2 correlated factors	$251.21_{(53)}$***	.144	.770	0.714	5166.62
d) 6 first-order factors, 1 second-order factor	$131.80_{(50)}$***	.095	.905	0.874	5016.97
e) 6 first-order factors, 2 second-order factors (PTSD and DSO)	**$79.19_{(49)}$**[1]**	**.058**	**.965**	**0.953**	**4955.55**
	Non-Trauma-Exposed Participants (*n*=566)				
Models	$\chi^2_{(df)}$	RMSEA	CFI	TLI	BIC
a) 1 factor	$951.11_{(54)}$***	.172	.521	0.415	17960.81
b) 2 correlated factors	$411.95_{(53)}$***	.110	.808	0.761	17249.78
d) 6 first-order factors, 1 second-order factor	$295.21_{(50)}$***	.093	.869	0.827	17103.08
e) 6 first-order factors, 2 second-order factors (PTSD and DSO)	**$102.93_{(48)}$***	**.045**	**.971**	**0.960**	**16879.18**

Note. RMSEA: root mean square error of approximation; CFI: comparative fit index; TLI: Tucker-Lewis index; BIC: Bayesian Information Criterion; 1: Avoidance first-order factor residual variance was fixed at zero. *** p <.001. Bold highlights the best-fitting model.

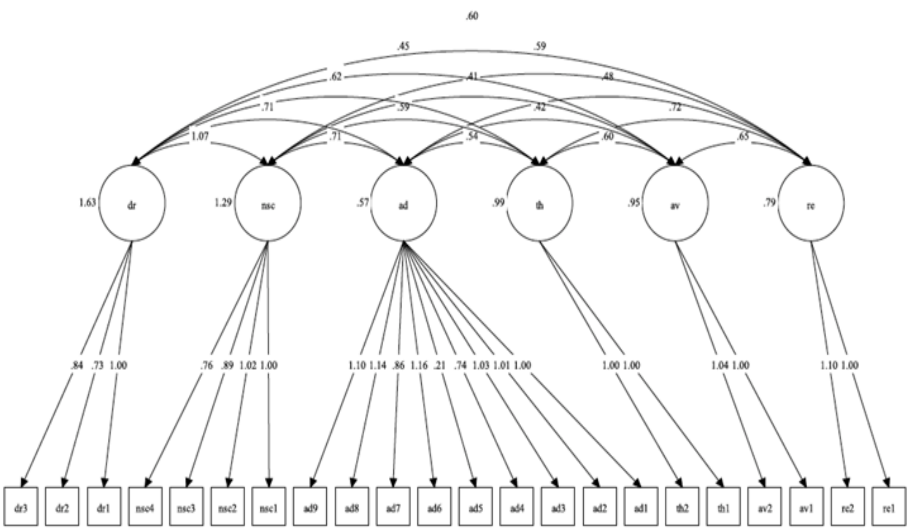
Because WLSMV and MLR CFAs yielded almost identical results, for ease of presentation only MLR estimators are shown. Factor loadings of the ITQ item CFA best fitting model are shown in Figure 1.

Figure 1a.

ITQ Item First-Order CFA Scalar Invariance Best-Fitting Model: Unstandardized Factor Loadings and Factor Covariances. For ease of presentation, only significant parameter estimates are displayed, and error variances are omitted.



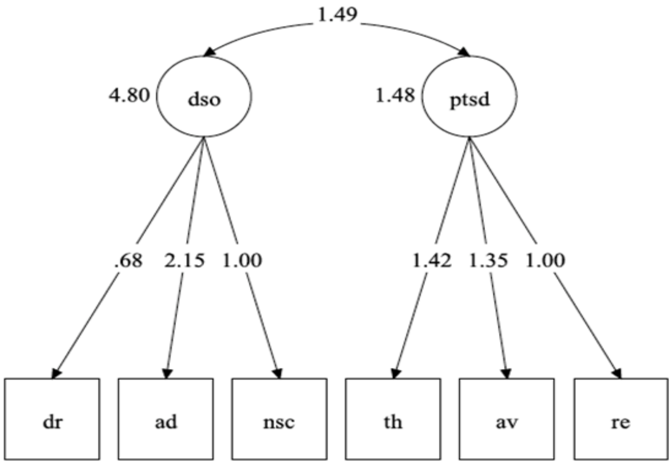
Narrowly-Defined Trauma-Exposed Group vs. Non-Trauma-Exposed Group



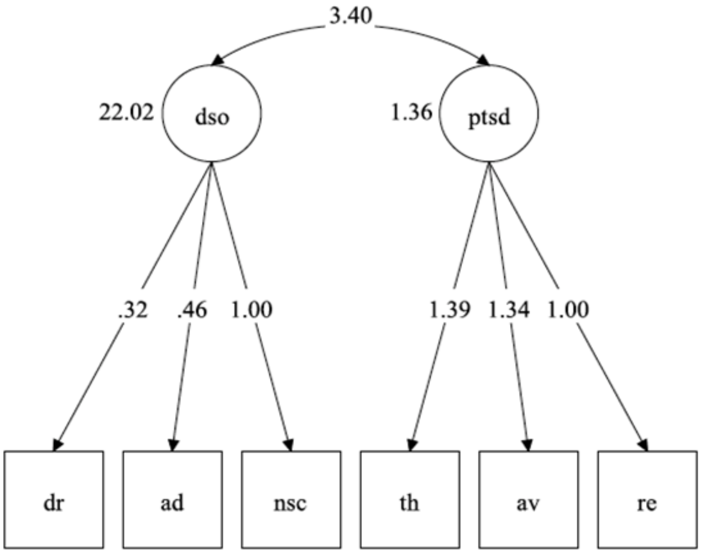
Broadly-Defined Trauma-Exposed Group vs. Non-Trauma-Exposed Group

Figure 1b.

ITQ Second-Order CFA Scalar Invariance Best-Fitting Model: Invariant Unstandardized Factor Loadings and Factor Covariances. For ease of presentation, only significant parameter estimates are displayed.



Narrowly-Defined Trauma-Exposed Group vs. Non-Trauma-Exposed Group



Broadly-Defined Trauma-Exposed Group vs. Non-Trauma-Exposed Group

Fit indices for the measurement invariance CFA models of the ITQ are summarized in Table 2.

Table 2.

Measurement Invariance of the International Trauma Questionnaire Best-Fitting Factor Model: Goodness-of-Fit Indices (N=748).

	Trauma-Exposed (Broad Definition) Group (n=382) vs. Non-Trauma Exposed Group (n=366)						
Invariance Models	χ^2	*df*	*DIFFTEST* $\chi^2(df)$	RMSEA	CFI	TLI	BIC
First-Order Factors							
Configural Invariance	123.874***	78	--	.040	.983	0.970	22067.14
Metric Invariance	131.808***	84	8.063 (6)	.039	.982	0.971	22039.13
Scalar Invariance	142.494***	90	11.106 (6)	.040	.980	0.971	22010.38
Second-Order Factors							
Configural Invariance	40.096***	16	--	.064	.975	0.952	16792.56
Metric Invariance	45.974***	20	6.403 (4)	.059	.973	0.959	16775.92
Scalar Invariance	53.730***	24	7.343 (4)	.058	.969	0.961	16756.78
	Trauma-Exposed (Narrow Definition) Group (n=182) vs. Non-Trauma Exposed Group (n=566)						
Invariance Models	χ^2	*df*	*DIFFTEST* $\chi^2(df)$	RMSEA	CFI	TLI	BIC
First-Order Factors							
Configural Invariance	138.341***	78	--	.046	.978	0.962	22019.16
Metric Invariance	141.893***	84	4.845 (6)	.043	.979	0.966	21987.39
Scalar Invariance	173.583***	90	41.619*** (6)	.050	.969	0.955	21984.87
Second-Order Factors							
Configural Invariance	45.568***	16	--	.070	.969	0.941	16816.42
Metric Invariance	45.653***	20	3.165 (4)	.059	.973	0.959	16795.76
Scalar Invariance	55.360***	24	9.828*(4)	.059	.967	0.958	16779.75

Note. ITQ: International Trauma Questionnaire; *DIFFTEST* χ^2: chi-square difference between nested models; RMSEA: root mean square error of approximation; CFI: comparative fit index; TLI: Tucker-Lewis index; BIC: Bayesian Information Criterion.

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

As a whole, 65 subjects (8.7%) out of 748 participants met the ITQ criteria for PTSD diagnosis. Nineteen (2.5%) participants met ITQ criteria for DSO, while nine (1.2%) participants met ICD-11 CPTSD criteria when the impairment criterion was ignored; eight participants (1.1%) met ICD-11 CPTSD criteria even considering the impairment criterion. Thus, the base of CPTSD among participants with possible ITQ PTSD diagnosis ranged from 8.18% to 12.31%. Trauma-exposed participants did not differ from non-trauma-exposed participants on ITQ PTSD base rate (7.1% vs 10.4%, $\chi^2[1]=2.59$, $p>.10$, $\varphi=-.06$). Similar considerations held when the narrow definition of trauma was considered (9.4% in non-trauma-exposed participants vs 6.6% in trauma-exposed participants), $\chi^2(1)=1.33$, $p>.20$, $\varphi=-.04$. Of course, even ITQ estimates of ICD-11 CPTSD base rate did not significantly differ both broadly-defined trauma-exposed participants (1.1% vs 1.2%, Fisher's exact test $p>.90$), and narrowly-defined trauma-exposed participants (1.1% vs 1.1%, Fisher's exact test $p>.90$), from non-trauma-exposed participants. Rather, female participants showed a significantly higher proportion of CPTSD (1.9% vs. 0.3%, Fisher's exact test $p<.05$) and PTSD (impairment not considered: 21.5% vs. 8.0%, $\chi^2[1]=27.13$, $p<.001$, $\varphi=.19$; impairment considered: 12.9% vs 4.5%, $\chi^2[1]=16.47$, $p<.001$, $\varphi=.15$) than male participants. These findings lead us to focus only on PTSD symptoms in taxometric analyses, because the putative taxon base rate estimate was definitively too low for CPTSD to be detected (Ruscio et al., 2011). In the present study, taxometric analysis were performed in the whole sample, as well as in the broadly-defined trauma-exposed groups defined, because they satisfied Ruscio and colleagues' (2011) $N\geq300$ criterion for taxometric analyses. Similarly, only the ICD-11 PTSD diagnosis based on ITQ indicators without taking into account impairment criteria satisfied both criteria of base rate estimate ≥.10 and number of participants in the putative taxon>30 that are deemed necessary for latent taxon detection in taxometric analyses (Ruscio et al., 2011). CCFI values based on MAMBAC, MAXEIG, and L-Mode are summarized in Table 3.

Table 3.

Taxometric Analyses of the Six International Trauma Questionnaire Post-Traumatic Stress Disorder Symptom Items: Comparison Curve Fit Indices and Base Rate Estimates (N=748).

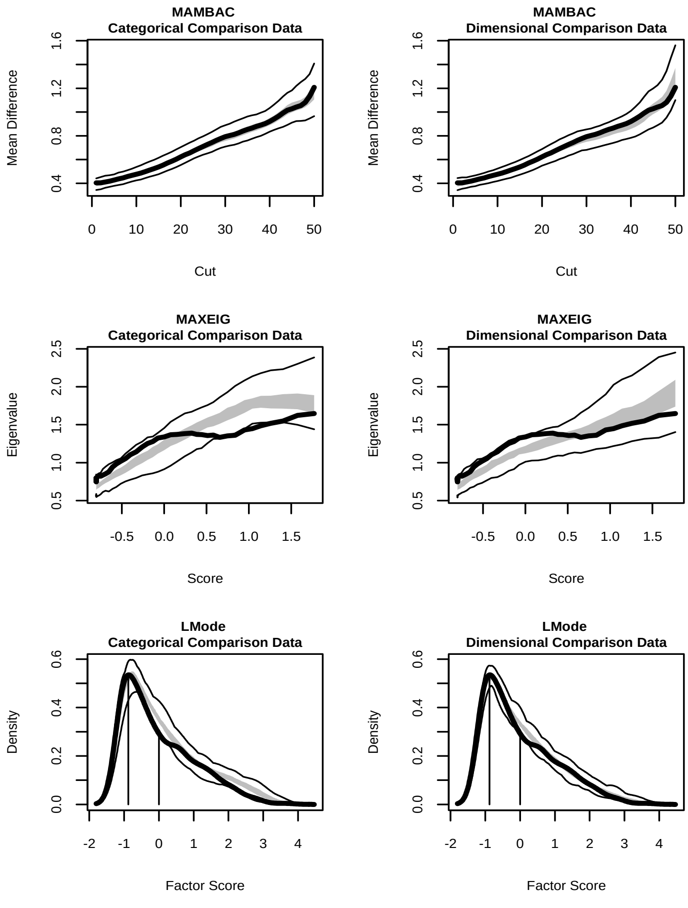
	Likert-type Scoring		Dichotomous Item Scoring	
Taxometric Analyses	CCFI	BR (Expected BR = .084)	CCFI	BR (Expected BR = .084)
MAMBAC	.529	.247	.417	.194
MAXEIG	.413	.256	.420	.158
L-Mode	.391	.718	--	--
M	.444	.407	.419	.176
SD	.074	.269	.002	.025

Note. MAMBAC: Mean-above-minus-mean-below-a-cut; MAXEIG: Maximum eigenvalue analysis; L-Mode: Latent mode analysis; BR: Latent taxon base rate estimates; --: Analysis not performed because it is not suited for dichotomous items.

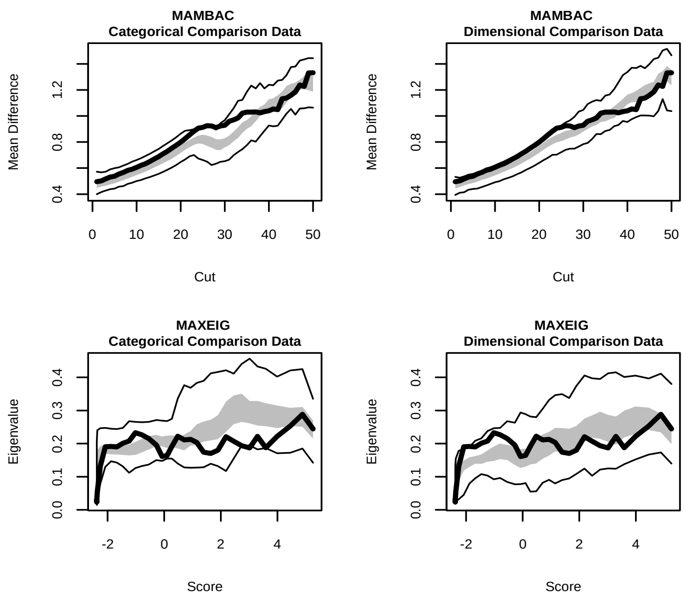
Taxometric analysis average curves are listed in Figure 2. ITQ indicator validities (i.e., Cohen's *d* values) ranged from 1.45 to 1.96 (*M*=1.64) for Likert-type indicators, and from 1.35 to 2.01 (*M*=1.60) for dichotomous ITQ items. When Likert-type indicators were used in taxometric analyses, the average within-group *r*s among the ITQ items were .12 and .37 in the taxon and in the complement, respectively. Rather, the average within-group *r*s were .00 and .28 in the taxon and in the complement, respectively, when dichotomous ITQ items were analyzed.

Figure 2.

MAMBAC, MAXEIG, and L-Mode (Only for Likert-type Item Scoring) Analysis Curves



Likert-type Scoring



Dichotomous Scoring

When we re-performed taxometric analysis including impairment items for PTSD (mean indicator validity d value = 1.67; mean within-taxon r=.03; mean within-complement r=.23), the average CCFI value was .444 (average base rate=.203), whereas CCFI values of .492 (base rate=.191), and .396 (base rate=.214) were observed for MAMBAC and MAXEIG analyses, respectively.

4. Discussion

Consistent with extant literature (Ben-Ezra et al., 2017; Cloitre et al., 2018; Hyland et al., 2017; Karatzias et al., 2016; Kazlauskas et al., 2018; Maercker et al., 2018; Murphy et al, 2018; Shevlin et al., 2018), our data showed that the Italian translation of the ITQ reliably assessed two *ICD-11* constructs, purportedly PTSD and DSO, at least in community-dwelling adults. As it was expected (Nunnally & Bernstein, 1994), item dichotomization yielded lower Cronbach's α estimates than Likert-type scoring for all ITQ scales, and particularly for the AD scale. However, adequate reliability estimates (i.e., $\alpha \geq .70$) were observed for the ITQ PTSD and DSO scale even when items were dichotomized in both trauma-exposed and non-trauma-exposed samples. Even considering that the ITQ first-order scales were composed only of two items, sub-optimal α values were observed only for Re and AD.

Our CFA findings suggested that the a priori model of item-to-scale assignment represented the best fitting model in Italian trauma-exposed community-dwelling adults, even when sudden death of a loved one was excluded from traumatic experiences. This finding landed further support to the cross-cultural replicability of the ITQ factor validity and proved that PTSD and DSO are likely to represent dissociable, albeit correlated constructs (Ben-Ezra et al., 2017; Cloitre et al., 2018; Hyland et al., 2017; Karatzias et al., 2016; Kazlauskas et al., 2018; Maercker et al., 2018; Murphy et al, 2018; Shevlin et al., 2018). The relevance of this finding should not be neglected considering that the *ICD-11* is thought to maximize the use of diagnoses worldwide, including PTSD and CPTSD (Brewin et al., 2017). In our study, the second-order factor inter-correlations were .54, .66, .44, and .72 (mdn r=.60), all ps<.001, in the 566-participant no-trauma group, 182-participant trauma group, 366-participant no-trauma group, and 382-participant trauma group, respectively. These data suggest that the ITQ first-order scales map onto two dissociable, albeit correlated second-order factors, which are thought to represent PTSD and DSO, respectively. Although the inter-factor r values were substantial, they suggested that PTSD may occur in the absence of DSO, as well as DSO may be observed in the absence of PTSD. In our opinion, these findings support both the ITQ diagnostic algorithm for CPTSD (Cloitre et al., 2018), as well as the *ICD-11* proposal indicating the need for clinically relevant PSTD and DSO for CPTSD diagnosis (WHO, 2018).

Despite the presence of several significant differences between our trauma-exposed and non-trauma-exposed participants, in our study the ITQ showed invariant psychometric properties in the two groups of participants. In all multi-group CFAs, the scalar invariance model of the ITQ items showed adequate fit indices in trauma-exposed and non-trauma exposed groups when factor invariance was assessed for first-order factors and second-order factors, respectively. All fit indices supported the scalar invariance model as the best-fitting model when the factor invariance of the ITQ first-order and second-order factors, respectively, was tested across the broadly-defined trauma group and the no-trauma group. Rather, the DIFFTEST suggested that the metric invariance model (i.e., identical factor loadings) should be preferred to the scalar invariance model when the comparisons were carried out across the narrowly-defined trauma group and the no-trauma group, although the BIC reached its minimum value for the scalar invariance model. As a whole, these data suggested that the ITQ items captures six first-order and two second-order (i.e., PTSD and DSO) latent processes that are common to both trauma-exposed and non-trauma-exposed subjects.

Far from raising issues as to the *ICD-11* PTSD and DSO constructs, we feel that our data confirm and extend the excellent psychometric properties of the ITQ to population that were not selected according to having been exposed to traumatic events. The evidence for scalar/metric invariance of the ITQ first- and second-order scales in trauma-exposed and non-trauma-exposed community-dwelling adults suggest that the ITQ could be safely used to screen for ICD-11 PTSD/DSO symptoms in community adult participants whose exposure to traumatic events was not ascertained in advance. The ITQ first- and second-order scale invariance in trauma-exposed and non-trauma-exposed community-dwelling adults is largely consistent with previous data suggesting a dimensional distribution of PTSD features (see, for a review, Brewin et al., 2017), which may be related to a latent disposition towards stress-related reactions.

Far from overlooking the devastating impact of traumatic events on people's lives (Brewin et al.., 2017; Kliem et al., 2017), our data suggest that severe symptom reactions to stressful events may happen, even if these events do not meet the *ICD-11* traumatic event definition (i.e., extremely threatening or horrific event or series of events; WHO, 2018). Interestingly, the ITQ scores seem able to capture also these reaction to stressful life events (e.g., divorce, job loss), allowing people manifesting them to access proper treatment. Our findings suggest that clinicians using the ITQ should not infer the existence of a traumatic event simply from the presence of self-reported PTSD symptoms; indeed, the lack of unique relationships between symptoms and syndromes is a well-known problem in psychiatry (Insel et al., 2010). For instance, even the so-called first-rank symptoms of schizophrenia differentiate schizophrenia from other types of psychoses with only 58% sensitivity and 76.7% specificity (Soares-Weiser et al., 2015).

The expected base rate estimates for PTSD and DSO based on the ITQ algorithm for categorical diagnosis allowed us to carry out taxometric analyses only for the PTSD indicators in the whole sample of trauma-exposed and non-trauma-exposed participants. Indeed, we expected at least 65 participants in the putative taxon, thus exceeding the n_{taxon} >50 and *N*>300 criteria for taxometric analyses indicated by Ruscio and colleagues (2011), although the base rate estimate for PTSD (8.4%) was slightly lower than the 10% criterion. Interestingly, according to Ruscio and colleagues' (2011) criteria (i.e., *d*>1.25), in our study all ITQ items were valid indicators of the putative PTSD taxon.

Confirming and extending previous studies based on PTSD latent structure (see, for a review, Brewin et al., 2017), our taxometric analysis results found no support for a categorial model of ITQ PTSD symptom items. Indeed, for both Likert-type scoring and dichotomous scoring of the ITQ indicators, the average CCFI values were all lower than .45; moreover, no one of the CCFI values for the individual MAMBAC, MAXEIG, and L-Mode analyses exceed the .55 value, which is deemed suggestive of a categorical latent structure (Ruscio et al., 2017). It should be stressed that the lack of support for the categorical latent structure of PTSD in our study should not be misunderstood as suggestive of a "it makes a never mind" attitude towards the right of individuals who suffered from the exposure to traumatic events to receive a clear PTSD diagnosis (Kliem et al., 2018). Rather, in this respect the ITQ has the advantage of providing accurate assessment of the ICD-11 PTSD categorial diagnosis (including PTSD-related impairment), while providing researchers (and clinicians) also with the flexibility of a dimensional assessment of PTSD.

Differences in sample size, sampling procedure, instruments, etc. may explain the differences in findings between our study and Kliem and colleagues' (2017) study. In particular, we feel that use of self-report instruments, like the ITQ, may yield different results as to the latent structure of the PTSD symptoms when compared to the use of interview-based measures of PTSD. Both measures have credits and limitations. For instance, interview-based instruments allow for accurate probing of the individual symptoms, whereas self-report questionnaires help controlling for interviewer's expectation bias - including expectation concerning the categorical-vs-dimensional structure. In any case, our findings suggest the need for further studies on the latent structure of the *ICD-11* PTSD indicators based on a multi-method perspective.

Of course, our findings should be considered in the light of several limitations. We relied on a moderately-sized sample of adult volunteers, rather than on a nationally-representative sample of the Italian population. Moreover, our data should not be uncritically extended to clinical or forensic populations. Sudden death of a loved one and car accidents/disasters were the most frequently reported traumatic events in our sample, whereas sexual abuse/violence was rarely reported; these sample characteristics may have influenced our findings leading to conservative estimates of both PTSD and DSO/CPTSD. In our study male participants were more frequently exposed to traumatic events, however, consistent with previous reports, PTSD and CPTSD diagnoses were more frequently observed among female participants than among male participants. We relied exclusively on the ITQ to assess *ICD-11* PTSD/CPTSD criteria, thus being unable to provide convergent-discriminant validity data. Model fit index values in measurement invariance assessment are known to be influenced by differences in group size (Sass & Schmitt, 2013); the slight differences in factor invariance results that were observed when we relied on a broad trauma definition and a narrow trauma definition, respectively, may be due to this method artifact. In the present study, we relied on taxometric analysis to assess the latent structure of the ITQ PTSD items; relying on different methods – e.g., mixture models - may have led to different results. However, mixture models are known to provide spurious evidence of latent classes when non-normal data are used. Mostly, we were not able to provide data on the ITQ DSO item latent structure; future studies should address the issue of the taxonic-vs-dimensional structure of the *ICD-11* DSO/CPTSD indicators, at least when they are measure using the ITQ. As a whole, these considerations strongly indicate the need for further studies before accepting our conclusions.

Even keeping these limitations in mind, we feel that the present study gave further evidence for the cross-cultural validity of the ITQ, while suggesting an extension of the range of its clinical usefulness.

References

1. American Psychiatric Association (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: American Psychiatric Association.
2. American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Association.
3. Ben-Ezra, M., Karatzias, T., Hyland, P., Brewin, C. R., Cloitre, M., Bisson, J. I., ... & Shevlin, M. (2018). Posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD) as per ICD-11 proposals: A population study in Israel. *Depression and Anxiety*, *35*, 264-274.
4. Brewin, C. R. (2003). *Posttraumatic stress disorder: Malady or myth?* New Haven, CT: Yale University Press.
5. Brewin, C. R., Cloitre, M., Hyland, P., Shevlin, M., Maercker, A., Bryant, R. A., ... & Somasundaram, D. (2017). A review of current evidence regarding the ICD-11 proposals for diagnosing PTSD and complex PTSD. *Clinical Psychology Review, 58*, 1–15.
6. Cha, E. S., Kim, K. H., & Erlen, J. A. (2007). Translation of scales in cross-cultural research: issues and techniques. *Journal of Advanced Nursing*, *58*, 386-395.
7. Chen, F. F., Sousa, K. H., & West, S. G. (2005). Teacher's corner: Testing measurement invariance of second-order factor models. *Structural Equation Modeling, 12*, 471-492.
8. Cloitre, M., Roberts, N., Bisson, J. I., & Brewin, C. R. (2016). *ICD-11 Trauma Questionnaire.* Self-Report Research Version.
9. Cloitre, M., Shevlin, M., Brewin, C.R. , Bisson, J.I., Roberts, N.P., Maercker, A., Karatzias, T., & Hyland, P. (2018). The International Trauma Questionnaire: Development of a self-report measure of *ICD-11* PTSD and complex PTSD. *Acta Psychiatrica Scandinvica*.
10. Denissen, J. J., Geenen, R., Van Aken, M. A., Gosling, S. D., & Potter, J. (2008). Development and validation of a Dutch translation of the Big Five Inventory (BFI). *Journal of Personality Assessment, 90*, 152-157.
11. Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1-55.
12. Hyland, P., Shevlin, M., Brewin, C. R., Cloitre, M., Downes, A. J., Jumbe, S., ... Roberts, N. P. (2017). Validation of posttraumatic stress disorder (PTSD) and Complex-PTSD using the International Trauma Questionnaire. *Acta Psychiatrica Scandinavica.*
13. Insel, T., Cuthbert, B., Garvey, M., Heinssen, R., Pine, D. S., Quinn, K., ... & Wang, P. (2010). Research domain criteria (RDoC): Toward a new classification framework for research on mental disorders. American Journal of Psychiatry, 167, 748-51.
14. Karatzias, T., Shevlin, M., Fyvie, C., Hyland, P., Efthymiadou, E., Wilson, D., ... Cloitre, M. (2016). An initial psychometric assessment of an ICD-11 based measure of PTSD and complex PTSD (ICD-TQ): Evidence of construct validity. *Journal of Anxiety Disorders, 44*, 73–79.
15. Karatzias, T., Shevlin, M., Fyvie, C., Hyland, P., Efthymiadou, E., Wilson, D., ... & Cloitre, M. (2017). Evidence of distinct profiles of posttraumatic stress disorder (PTSD) and complex posttraumatic stress disorder (CPTSD) based on the new ICD-11 Trauma Questionnaire (ICD-TQ). *Journal of Affective Disorders, 207*, 181-187.

16. Kliem, S., Kröger, C., Foran, H. M., Mößle, T., Glaesmer, H., Zenger, M., & Brähler, E. (2016). Dimensional latent structure of PTSD-symptoms reporting: Is it adding by subtracting?. *Psychological Assessment*, *28*, 1663-1673.
17. Lubke, G., & Neale, M. C. (2006). Distinguishing between latent classes and continuous factors: Resolution by maximum likelihood?. *Multivariate Behavioral Research*, *41*, 499-532.
18. Maercker, A., Brewin, C. R., Bryant, R. A., Cloitre, M., van Ommeren, M., Jones, L. M., ... Reed, G. M. (2013). Diagnosis and classification of disorders specifically associated with stress: Proposals for ICD-11. *World Psychiatry, 12*, 198–206.
19. Maercker, A., Hecker, T., Augsburger, M., & Kliem, S. (2018). ICD-11 Prevalence Rates of Posttraumatic Stress Disorder and Complex Posttraumatic Stress Disorder in a German Nationwide Sample. *The Journal of nervous and mental disease*, *206*, 270-276.
20. Murphy, S., Elklit, A., Dokkedahl, S., & Shevlin, M. (2018). Testing competing factor models of the latent structure of post-traumatic stress disorder and complex post-traumatic stress disorder according to ICD-11. *European Journal of Psychotraumatology*, *9*, 1457393.
21. Muthén, L. K., & Muthén, B. O. (1998-2015). *Mplus User's Guide, 7th edn*. Muthén & Muthén: Los Angeles, CA, USA, 2012.
22. Nunnally, J.C., & Bernstein, I.R. (1994) *Psychometric Theory*. McGraw-Hill: New York.
23. Reed, G. M. (2010). Toward ICD-11: Improving the clinical utility of WHO's International Classification of Mental Disorders. *Professional Psychology-Research and Practice, 41*, 457–464.
24. Rhemtulla, M., Brosseau-Liard, P. E., & Savalei, V. (2012). When can categorical variables be treatedas continuous? A comparison of robust continuous and categorical SEM estimation methodsunder suboptimal conditions. *Psychological Methods, 17*, 354–373.
25. Ruscio, J., Carney, L. M., Dever, L., Pliskin, M., & Wang, S. B. (2018). Using the Comparison Curve Fix Index (CCFI) in taxometric analyses: Averaging curves, standard errors, and CCFI profiles. *Psychological Assessment 30*, 744-754.
26. Ruscio, J., Ruscio, A. M., & Carney, L. M. (2011). Performing taxometric analysis to distinguish categorical and dimensional variables. *Journal of Experimental Psychopathology, 2*, 170-196.
27. Sass, D. A., & Schmitt, T. A. (2013). Testing measurement and structural invariance. In T. Teo, *Handbook of quantitative methods for educational research*, pp. 315-345. Springer: Rotterdam.
28. Shevlin, M., Hyland, P., Vallières, F., Bisson, J., Makhashvili, N., Javakhishvili, J., ... & Roberts, B. (2018). A comparison of DSM-5 and ICD-11 PTSD prevalence, comorbidity and disability: an analysis of the Ukrainian Internally Displaced Person's Mental Health Survey. *Acta Psychiatrica Scandinavica*, *137*, 138-147.
29. Soares-Weiser, K., Maayan, N., Bergman, H., Davenport, C., Kirkham, A. J., Grabowski, S., & Adams, C. E. (2015). First rank symptoms for schizophrenia (Cochrane diagnostic test accuracy review). *Schizophrenia Bulletin, 41*, 792-794.
30. Walters, G. D., Ermer, E., Knight, R. A., & Kiehl, K. A. (2015). Paralimbic biomarkers in taxometric analyses of psychopathy: Does changing the indicators change the conclusion?. *Personality Disorders: Theory, Research, and Treatment*, *6*, 41-52.

31. World Health Organization (2018). *International Classification of Diseases (ICD-11).* Geneva, Switzerland: World Health Organization.

32. Wu, H., & Estabrook, R. (2016). Identification of confirmatory factor analysis models of different levels of invariance for ordered categorical outcomes. *Psychometrika, 81*, 1014-1045.

33. Zelazny, K., & Simms, L. J. (2015). Confirmatory factor analyses of DSM-5 posttraumatic stress disorder symptoms in psychiatric samples differing in Criterion A status. *Journal of Anxiety Disorders, 34*, 15–23.

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