Received: 19 May 2024 | Revised: 16 October 2024 | Accepted: 17 October 2024

DOI: 10.1002/jts.23118

RESEARCH ARTICLE

Measurement invariance of the PTSD Checklist for *DSM-5* across eight countries and samples with diverse trauma experiences

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Abstract

The PTSD Checklist for *DSM-5* (PCL-5) is a well-known tool for measuring posttraumatic stress disorder (PTSD) symptoms. Although the tool has been translated into many different languages, only one study, conducted in European countries, has examined measurement invariance (MI) across these versions. The present study aimed to verify PCL-5 MI in eight countries: Argentina, Ireland, Japan, Kazakhstan, Poland, South Korea, the United Kingdom, and the United States. All samples included at least 200 participants. Regarding trauma type, the highest number of individuals reported experiencing a traffic accident ($n = 3{,}128$) and/or physical assault ($n = 2{,}609$), and the fewest reported captivity

($n = 575$) and/or contributing to someone else's harm, injury, or death ($n = 559$). A symptom structure model based on *DSM-5* criteria showed a satisfactory fit to the data, $\chi^2(164, N = 4{,}064) = 2{,}571.18$, $p < .001$, robust CFI = .931, robust RMSEA = .078, 90% CI [.075, .081], robust TLI = .920, SRMR = .037. Data fit and invariance were obtained with regard to identical structure and factor loadings (configural and metric invariance) as well as for the partial scalar invariance (equal intercepts). In all samples, PTSD symptoms were strongly or moderately positively correlated with levels of depressive, anxiety, and stress-related symptoms and moderately or weakly positively correlated with COVID-19–related stressors, emotional stability/neuroticism, and emotional reactivity. The results indicate that the PCL-5 is a generally effective measure of universal indicators of PTSD across different countries.

MEASUREMENT INVARIANCE OF THE PTSD CHECKLIST FOR *DSM-5* (PCL-5) ACROSS EIGHT COUNTRIES

Posttraumatic stress disorder (PTSD) is a condition that is characterized by a chronic and impairing reaction to extreme stress following a life-threatening or health-threatening event that an individual personally experiences or witnesses (including during work-related duties) or learns has affected loved ones. According to the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*: American Psychiatric Association [APA], 2013), a PTSD diagnosis requires the presence of symptoms in four categories: intrusions related to the traumatic event, the avoidance of stimuli and circumstances resembling the trauma, alterations in physiological stress responses and autonomic nervous system arousal and reactivity, and changes in mood and cognitions about oneself and the world. In addition, the diagnostic criteria require that symptoms persist for more than 1 month posttrauma. The chronicity of untreated symptoms and the clinical presentation of PTSD (Steinert et al., 2015), along with their significant negative impact on physical health, mental well-being, social functioning, and occupational performance (Arcaya et al., 2017; Rao et al., 2015), justify years of ongoing research to better understand typical posttraumatic reactions and the predisposing factors associated with their development (Tortella-Feliu et al., 2019). Such studies require the use of validated tools for measuring PTSD symptoms.

PTSD Checklist for *DSM-5*

One of the most well-known and frequently used tools for measuring PTSD symptoms as well as making a preliminary clinical diagnosis (Contractor et al., 2019) is the PTSD Checklist for *DSM-5* (PCL-5; Weathers, Litz, et al., 2013), a 20-item, self-report tool consisting of statements related to the PTSD outlined in the *DSM-5*. Each symptom is rated on a 5-point Likert scale ranging from 0 (*not at all*) to 4 (*extremely*). The PCL-5 has been translated into various languages, showing good psychometric properties. Forkus et al. (2023) found that the PCL-5 demonstrated satisfactory reliability and convergent and discriminant validity across different language versions. They also found positive correlations between PTSD symptoms and levels of experienced stressors, depressive symptoms, anxiety symptoms, negative beliefs, dissociation, and suicidal thoughts.

PCL-5 measurement invariance

Conducting cross-linguistic or cross-cultural comparisons of PTSD symptom levels requires proving the measurement invariance (MI) of the tools assessing these symptoms. MI analyses are used to determine whether a measurement conducted with a particular instrument is comparable (i.e., invariant) across different groups of people and, thus, whether it is acceptable to make comparisons between these groups (Putnick & Bornstein, 2016; Schmitt & Kuljanin, 2008). MI verification involves conducting a series of confirmatory factor analyses (CFAs) for nested models, imposing successive constraints—first on the equal structure of the construct in the studied groups (configural invariance); then on the equal factor loadings (metric invariance); and, finally, on the equal intercepts (scalar invariance).

Confirmation of MI at the configural level means that the structure of the examined construct is identical across the analyzed groups, with the same number of latent factors indicated by the same variables in all included groups. Metric invariance implies that each variable loads onto

the same latent factor to a comparable extent across all groups, which is synonymous with measuring the same variable in those groups. Scalar invariance means that factor loadings and item intercepts are equal across groups. Confirming invariance at the configural and metric levels justifies the examination of associations between variables in individual groups. A confirmation of scalar invariance allows researchers to test the mean differences of latent variables between groups (Putnick & Bornstein, 2016; Schmitt & Kuljanin, 2008); if scalar invariance is not confirmed, partial invariance can be calculated by releasing the parameters for the most noninvariant items. Comparisons between successive models are based on the differences in fit indices; confirmation of the lower level of MI justifies inferences about the next level.

Bockhop and colleagues (2022) conducted a study of MI for the PCL-5 by using data from six European countries and six different language versions of the questionnaire (i.e., Danish, English, Finnish, Italian, Norwegian, and Spanish). The sample sizes ranged from 212 participants (British sample) to 586 participants (Danish sample), and samples were limited to individuals who had experienced a serious brain injury. The comparison focused on the four-factor model of PTSD based on the *DSM-5* classification. The results provided evidence of MI, suggesting that the *DSM-5* symptom structure as measured using the PCL-5 was identical and equally loaded by individual symptoms across the examined countries, and the latent means could be compared between the groups. In another study, Contractor et al. (2018) found evidence of scalar MI when comparing the measurement of PTSD in individuals who experienced a single traumatic event with those who experienced multiple trauma types. In a study by Caldas et al. (2020), scalar MI was confirmed when comparing a group of students and a nonstudent group recruited through Amazon's Mechanical Turk (MTurk) platform. Thus, MI for the PCL-5 has been also confirmed in comparisons of diverse groups within the same country.

Study aims and hypotheses

The aim of our study was to verify the MI of the PCL-5 across eight countries from various continents. To achieve this goal, we utilized data collected in the international COVID-TEMPS research project (see Cyniak-Cieciura et al., 2024). We based our analyses on the four-factor model consistent with current *DSM-5* criteria, which delineates factors of intrusions, avoidance, negative alterations in mood and cognitions, and alterations in arousal and reactivity (APA, 2013).

We aimed to confirm the convergent validity of PCL-5 measurement across different countries. There is strong evidence that neuroticism and emotional reactivity are moderate or weak risk factors for PTSD development (Cyniak-Cieciura & Zawadzki, 2021; Ormel et al., 2013) and that PTSD symptoms are strongly related to depressive and anxiety symptoms, as well as the level of stressors an individual experiences (Forkus et al., 2023). Therefore, we expected that in each country, PTSD symptoms measured by the PCL-5 would be positively and strongly correlated with depressive symptoms, anxiety symptoms, and stressor-related symptoms and moderately or weakly correlated with emotional stability/neuroticism, emotional reactivity, and COVID-19–related stressors, the latter of which was included because the study was conducted in the time of COVID-19 pandemic.

METHOD

Participants and procedure

This study was conducted as part of the international COVID-TEMPS research project. The data used in the described study were collected in eight countries: Poland, the United States, Japan, Argentina, South Korea, Ireland, the United Kingdom, and Kazakhstan. Data collection took place from August 2020 to October 2021, during the second, third, and fourth waves of the COVID-19 pandemic. Study participants were asked to complete a series of self-report questionnaires, described in the Measures section. The study was conducted online in each country using a professional research platform, most commonly Qualtrics. Participants were recruited primarily through direct mail within the researchers' institutions, including university research platforms, which allowed both students and nonstudents to participate. Of note, in the United Kingdom, participants were recruited through the MTurk platform. These participants answered several additional validation questions to ensure they were completing the survey attentively (i.e., the questions instructed respondents to select specific responses from given options). Depending on a given university's policy, some participants received points in exchange for participating in the study. The only exclusion criterion for study participation was being under 18 years old. All participants provided informed consent to participate in the study. The work was approved by the Research Ethics Committee, Faculty of Psychology in Warsaw, SWPS University.

Sample details are presented in Table 1. The percentages of probable PTSD diagnoses were calculated based on the fulfillment of *DSM-5* Criteria B–E per PCL-5 responses. In the full sample, 26.4% of participants met the criteria for probable PTSD, with frequencies of 27.3% for Poland, 33.1% for the United States, 7.8% for Japan, 10.2% for Argentina, 10.7% for South Korea, 24.5% for Ireland, 39.9% for the United Kingdom, and 22.1% for Kazakhstan. The number

TABLE 1 Sample descriptions

Sample location	Sample size	Age (years)			Educational attainment	Residential population	Study period
		M	*SD*	Range			
Poland	$N = 945$	26.77	8.67	18–60	No data	> 500,000: 49.2%	August 2020–February 2021
	Women: $n = 810$					100,000–500,000: 15.4%	
	Men: $n = 129$					20,000–100,000: 15.1%	
						< 20,000: 7.8%	
						Village: 12.4%	
United States	$N = 596$	20.39	4.65	18–52	Grade school: 1.2%	> 500,000: 5.7%	November 2020–April 2021
	Women: $n = 407$				Vocational: 1.2%	100,000–500,000: 8.2%	
	Men: $n = 177$				High school: 54.5%	20,000–100,000: 30.7%	
					College: 41.9%	< 20,000: 32.9%	
						Village: 20.8%	
Japan	$N = 349$	22.22	8.11	18–86	Vocational: 0.6%	> 500,000: 61.6%	November 2020–October 2021
	Women: $n = 248$				High school: 26.4%	100,000–500,000: 24.9%	
	Men: $n = 69$				College: 66.8%	20,000–100,000: 5.7%	
						< 20,000: 1.1%	
						Village: 0.3%	
Argentina	$N = 634$	39.34	13.06	18–85	Grade school: 1.3%	> 500,000: 77.8%	May 2020–July 2020
	Women: $n = 495$				Vocational: 11.5%	100,000–500,000: 12.8%	
	Men: $n = 138$				High school: 12.1%	20,000–100,000: 6.3%	
					College: 75.1%	< 20,000: 2.5%	
						Village: 0.6%	
South Korea	$N = 551$	40.18	10.66	20–59	Vocational: 5.4%	> 500,000: 70.8%	November 2020–October 2021
	Women: $n = 280$				High school: 7.1%	100,000–500,000: 17.6%	
	Men: $n = 271$				College: 87.5%	20,000–100,000: 6.9%	
						< 20,000: 4.0%	
						Village: 0.7%	
Ireland	$N = 216$	26.17	9.83	18–69	Grade school: 3.2%	> 500,000: 30.6%	November 2020–October 2021
	Women: $n = 144$				Vocational: 3.2%	100,000–500,000: 6.0%	
	Men: $n = 72$				High school: 25.9%	20,000–100,000: 13.0%	
					College: 67.6%	< 20,000: 22.7%	
						Village: 27.8%	
United	$N = 271$	34.25	10.78	18–71	Grade school: 1.2%	> 500,000: 33.9%	November 2020–October 2021
Kingdom	Women: $n = 105$				Vocational: 1.2%	100,000–500,000: 25.1%	
	Men: $n = 164$				High school: 54.5%	20,000–100,000: 24.4%	
					College: 41.9%	< 20,000: 10.0%	
						Village: 6.6%	

(Continues)

TABLE 1 (Continued)

Sample location	Sample size	Age (years)			Educational attainment	Residential population	Study period
		M	*SD*	Range			
Kazakhstan	$N = 502$	21.81	6.14	18–59	Grade school: 4.8%	No data	November 2020 – October 2021
	Women: $n = 392$				Vocational: 4.8%		
	Men: $n = 104$				High school: 12.5%		
					College: 77.9%		

Note: The samples differed on gender, $\chi^2(7, N = 4{,}064) = 403.48$, $p < .001$, such that except for South Korea, $\chi^2(1, N = 4{,}064) = 0.147$, $p = .701$, there were significantly more women than men in a given sample. Samples also differed in terms of age, Kruskall–Wallis test; $\chi^2(7, N = 4{,}064) = 2{,}208.27$, $p < .001$, except for Poland and Ireland, Japan and Kazakhstan, Argentina and South Korea. The samples were unequal in size, $\chi^2(7, N = 4{,}064) = 987.69$, $p < .001$.

of participants who experienced each type of queried traumatic event is presented in Supplementary Table S4 along with the number who indicated that a given event was their "worst" traumatic experience. In total, across all samples, the highest number of individuals reported experiencing—whether directly or indirectly—a traffic accident (n = 3,128), physical assault ($n = 2{,}609$), or a life-threatening illness or injury ($n = 2{,}470$). The fewest individuals reported experiencing captivity ($n = 575$) and contributing to someone else's harm, injury, or death ($n = 559$). Transportation accidents, sudden accidental death, and life-threatening illnesses or injuries were among the reported worst traumatic experiences; however, only a minority of participants reported and described their worst trauma directly, with data from South Korea completely lacking this assessment. The sum of all experienced traumatic events was significantly related to PTSD symptom levels in all countries, with a mean overall correlation of .27 and country-specific correlations of .39 for the United Kingdom, .34 for Kazakhstan, .29 for the United States, .27 for Ireland, .25 for Japan, .21 for Poland, and .14 for Argentina. Probable PTSD was most frequent among participants who reported sexual assault (57.5%) or another unwanted or uncomfortable sexual experience (41.3%) as their worst traumatic event; a probable PTSD diagnosis was less frequent among individuals who experienced a serious accident at work, home, or during a recreational activity (16.4%) and those who experienced a natural disaster (9.8%).

Measures

Self-reported PTSD symptoms and probable PTSD diagnosis

PTSD symptom severity was assessed using six different language versions of the PCL-5 (Weathers, Litz, et al., 2013): Polish (Popiel et al., 2021), English (Ashbaugh et al., 2016; Weathers, Litz, et al., 2013), Japanese (Ito et al., 2019); Spanish (Martinez-Levy et al., 2021); Russian (Cheung et al., 2019), and Korean (Lee et al., 2020). As noted, the psychometric properties of PCL-5 have been established previously in independent studies (Blevins et al., 2015; Forkus et al., 2023). In this study, Cronbach's alpha values for the different versions ranged from .85 to .97.

Lifetime trauma exposure

The Life Events Checklist for *DSM-5* (LEC-5; Weathers, Blake, et al., 2013), with local translations, was used to assess lifetime exposure to traumatic events as well as to determine each participant's worst traumatic experience. Participants were asked to refer to symptoms related to their worst event when rating PCL-5 items except for individuals in the South Korean sample, as the measure was unavailable at the time of the study.

Demographic and COVID-19–related characteristics

Demographic data and other basic information regarding COVID-19 were obtained using a survey specifically developed for this study. The measurement of stressors related to the COVID-19 pandemic was conducted using a questionnaire that was also developed specifically for this study. The COVID-19 stressor questionnaire consisted of 17 questions regarding the need for mandatory quarantine, excessive household density related to isolation or quarantine, changes in daily routine and work mode, the need to give up favorite activities (e.g., sports, cultural activities), feelings of isolation and limited social contacts, loneliness, worsening financial situation, concerns about worsening material conditions or job loss, fear of contracting the virus and developing the disease, increased academic and/or work burden, stress related to changes in learning and/or work mode, the need for direct contact with people

from the outside, direct contact with infected individuals, the loss of opportunities to continue education and/or engage in employment, and the occurrence of COVID-19 among close and distant friends and family. Participants responded to each statement on a four-point scale ranging from 1 (*not at all applicable to me*) to 4 (*highly applicable and a significant problem*). Overall scores were calculated as the sum of item responses and used in the analyses. In this study, Cronbach's alpha ranged from .74 to .91.

Negative emotional states

The 21-item Depression, Anxiety, and Stress Scale (DASS-21; Lovibond & Lovibond, 1995) was used to assess negative emotional states. The scale includes subscales (i.e., Depression, Anxiety, and Stress), and responses are rated on a 4-point Likert-type scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). Higher scores indicate higher symptom levels. The measure's psychometric properties have been established, and strong correlations with the Beck Depression Inventory and Beck Anxiety Inventory have been demonstrated (Lovibond & Lovibond, 1995). In this study, Cronbach's alpha values were .87–.94 for the Depression subscale, .92–.95 for the Anxiety subscale, and .88–.94 for the Stress subscale.

Emotional stability/neuroticism

Emotional stability/neuroticism was measured using the relevant scale from the International Personality Item Pool–Big Five Factor Markers–20 questionnaire (IPIP-BFM-20; Donellan, et al., 2006). The full measure contains 20 items and is used to assess Big Five personality traits with four items per scale. Responses are scored on a 5-point Likert-type scale ranging from 1 (*describes me completely inaccurately*) to 5 (*describes me completely accurately*), with higher scores indicating higher levels of a given trait. IPIP-BFM-20 subscales have demonstrated acceptable internal consistency, test–retest correlations, and validity. Only the Emotional Stability/Neuroticism subscale was included in this analysis. In the present sample, Cronbach's alpha ranged from .52 to .75.

Emotional reactivity

Emotional reactivity was assessed using the six-item Emotional Reactivity subscale of the Formal Characteristics of Behavior– Temperament Marker Inventory (FCB-TMI; Cyniak-Cieciura et al., 2024), a culturally adapted short version of a temperament questionnaire used to investigate markers of temperamental traits in accordance with the regulative theory of temperament (Strelau, 2008). The FCB-TMI includes 7 subscales (i.e., Briskness, Perseveration, Rhythmicity, Activity, Sensory Sensitivity, Emotional Reactivity, and Endurance); only the Emotional Reactivity subscale was used in this analysis. Responses were rated on a 4-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), and a total score was obtained by summing item responses. Higher scores indicate higher levels of emotional reactivity. The full measure demonstrated metric invariance across nine samples from different countries, and the scale's reliability and validity were confirmed (Cyniak-Cieciura et al., 2024). In the present sample, Cronbach's alpha for the Emotional Reactivity subscale ranged from .70 to .77.

Data analysis

Only participants who responded to all measures were considered. This was necessary because the survey required responses to be entered, apart from open-ended questions; thus, any missing data were the result of participants dropping out during the study and leaving most items unanswered. There were no randomly missing responses to individual items.

In the first step, a series of first-order (i.e., four *DSM-5* PTSD factors of intrusions, avoidance, negative alterations in cognitions and mood, and alterations in arousal and reactivity) and second-order hierarchical (i.e., four aforementioned factors with a second-order factor of general PTSD) models describing the structure of PTSD symptoms according to the four-factor *DSM-5* conceptualization were compared based on the results of the CFA.

The MI of the PTSD symptom structure was verified for the model that presented the best fit to the data. This was accomplished by conducting multigroup CFA to analyze nested models, subsequently assuming the same internal structure, equal factor loadings, and intercepts. In the analyses, the robust maximum likelihood estimation method (MLR; Rhemtulla et al., 2012) was utilized. Model fit was evaluated based on the chi-square statistic, robust root mean square error of approximation (RMSEA), robust comparative fit index (CFI), robust Tucker–Lewis index (TLI), standardized root mean residuals (SRMR), Akaike information criteria (AIC), Bayesian information criteria (BIC), and sample-adjusted Bayesian information criteria (saBIC). Model fit was assessed according to the criteria proposed by Hu and Bentler (1999) and included CFI and TLI values of .90 or higher and RMSEA and SRMR values of .08 or less, indicating a good fit of the model to the data. For MI, we report the chi-square difference; however, due

to its sensitivity to the large sample sizes, MI was assessed based on the difference in fit indices per criteria proposed by Rutkowski and Svetina (2014) for multiple large groups, including a CFI difference of −.020 or less, (or −.010 or less for scalar invariance) and an RMSEA difference of .030 or less (or .010 or less for scalar invariance).

Finally, analyses were conducted to examine the convergent validity of the tool across different countries in terms of theoretical validity. Pearson's bivariate correlation coefficients were calculated between PTSD symptoms and depressive symptoms, anxiety symptoms, stress symptoms, COVID-19-related stressors, emotional stability/neuroticism, and emotional reactivity. All analyses were performed using R software (*lavaan* package with default settings; Version 0.6–18; R Core Team, 2018; Rosseel, 2012).

RESULTS

Both models presented satisfactory fit, with the first-order model outperforming the second-order model, first-order model: $\chi^2(164, N = 4{,}064) = 2{,}571.18$, $p < .001$, robust CFI = .931, robust RMSEA = .078, 90% confidence interval (CI) [.075, .081]), robust TLI = .920, SRMR = .037, AIC = 194,178.024, BIC = 194,464.863, saBIC = 194,318.697; second-order model: $\chi^2(165, N = 4{,}064) = 2{,}787.39$, $p < .001$, robust CFI = .925, robust RMSEA = .081, 90% CI [.079, .084]), robust TLI = .913, SRMR = .040, AIC = 194,538.377, BIC = 194,818.980, saBIC = 194,675.991. The standard factor loadings and fit indices across countries are shown in Supplementary Tables S2 and S3. Further analyses were conducted for the first-order model only.

Table 2 presents the results of configural, metric, and scalar MI analyses. Goodness-of-fit indices and model comparisons allowed for the confirmation of the configural and metric invariance when using the criteria proposed by Rutkowski and Svetina (2014). Scalar MI was not confirmed. Using chi-square tests and *p* values calculated for Lagrange multiplier tests, we identified the parameters of five items that should be freely estimated to obtain partial scalar invariance: Item 5 from the intrusions cluster; Items 9, 11, and 13 from the negative alterations in cognitions and mood cluster; and Item 17 from the alterations in arousal and reactivity cluster.

Correlation analyses (Table 3, Supplementary Table S1) revealed similar patterns of associations across different countries. We observed strong or moderate positive correlations between total PTSD symptom scores and depressive, anxiety, and stress symptoms. PTSD symptoms were also moderately or weakly positively related to levels of COVID-19–related stressors and emotional reactivity and negatively related to emotional stability/neuroticism.

TABLE 2 Measurement invariance of the PTSD Checklist for *DSM-5*

Model	$\chi^2(N = 4{,}064)$	*df*	$\Delta\chi^2$ diff	$\Delta\chi^2$	*p*	Robust CFI	ΔCFI	Robust RMSEA	90% CI	ΔRMSEA	SRMR	ΔSRMR
Configural invariance	4,059.152	1,312	-	-	-	.927	-	.081	[.078, .084]	-	.042	-
Metric invariance	4,602.287	1,424	< .001	543.135	< .001	.915	−.012	.083	[.081, .086]	.002	.074	.032
Scalar invariance	5,395.055	1,536	< .001	792.768	< .001	.900	−.015	.088	[.085, .090]	.005	.078	.004
Partial scalar invariance	5,069.287	1,501	< .001	467.000	< .001	.907	−.008	.085	[.083, .088]	.002	.076	.002

Note: PTSD = posttraumatic stress disorder; *DSM-5* = *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.); *df* = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval; SRMR = standardized root mean residual.

TABLE 3 Ranges and average correlations for the PTSD Checklist for *DSM-5* and its subscales and other variables

	PTSD	I		A		NACM		AR	
Variable	Range	M^a	Range	M^a	Range	M^a	Range	M^a	Range	M^a
C-19	.19–.37	.31	.17–.37	.29	.20–.29	.25	.17–.31	.27	.15–.34	.28
DPR	.56–.71	.66	.47–.75	.51	.34–.62	.45	.55–.78	.61	.56–.81	.66
ANX	.54–.84	.65	.42–.75	.48	.30–.62	.38	.55–.81	.63	.53–.81	.65
STR	.54–.85	.67	.44–.77	.56	.30–.62	.45	.55–.81	.66	.53–.81	.65
ES	−.22–−.48	−.38	−.22–−.43	−.33	−.15–−.32	−.28	−.35–−.44	−.34	−.29–−46	−.37
ER	.23–.40	.29	.14–.40	.24	.16–.34	.22	.24–.38	.29	.24–.38	.27

Note. PTSD = posttraumatic stress disorder; *DSM-5* = *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.); I = intrusions; A = avoidance; NACM = negative alterations in cognitions and mood; AR = alterations in arousal and reactivity; C-19 = COVID-19–related stressors; DPR = depressive symptoms; ANX = anxiety symptoms; STR = stress-related symptoms; ES = emotional stability; ER = emotional reactivity.

[a]Average correlation.

The strongest associations between PTSD symptoms and the symptoms of depression, anxiety, and stress were observed in South Korea and Argentina (.71–.85), whereas the weakest were observed in the United States and Ireland (.54–.58). COVID-19–related stressors were most strongly related to PTSD symptoms in Argentina (.37) and most weakly in Japan (.19). The weakest correlations between PTSD symptoms and emotional stability/neuroticism (−.22) and emotional reactivity (.14) were observed in Ireland; the strongest association between PTSD symptoms and emotional stability/neuroticism was observed in Poland (−.46), and the strongest association with emotional reactivity was observed in South Korea (.40).

As the findings did not confirm the scalar invariance of the PCL-5, we do not present direct comparisons of means based on overall PTSD scores. Based on PTSD scores calculated after removing the five items described previously, PTSD levels varied significantly across countries: $F(7, 3774) = 19.87$, $p < .001$. Significant differences were found between Japan, which had a lower overall PTSD symptom level, and all other countries except Kazakhstan, as well as between Argentina (also with a lower PTSD level) and all countries except Ireland and Kazakhstan. Finally, the United Kingdom, which had a higher overall PTSD symptom level, showed significant differences compared to all countries except Poland and the United States. In summary, the lowest levels of PTSD symptoms were found in Japan, Argentina, and Kazakhstan, whereas the highest levels were observed in the United Kingdom.

DISCUSSION

The main aim of our analyses was to verify the MI of the PCL-5 in eight countries (Argentina, Ireland, Japan, Kazakhstan, Poland, South Korea, the United Kingdom, and the United States) across four continents (Europe, Asia, North America, and South America). Participants had been exposed to diverse traumatic events, and the study was conducted during the challenging and stressful—and traumatic—COVID-19 pandemic. To the best of our knowledge, this is the only study to date to compare PCL-5 measurement data from such a diverse range of countries and samples.

In the first step, we compared the fit of different models describing the structure of PTSD symptoms in the full sample. Similar to results obtained by Blevins et al. (2015), Contractor et al. (2019), or Rasmussen et al. (2015), the *DSM-5*–based model demonstrated a good fit to the data. We obtained confirmation of MI in terms of the same structure and factor loadings at the configural and metric levels. However, we interpreted the results using relatively more liberal criteria proposed by Rutkowski and Svetina (2014). Traditional criteria by Chen (2007) only allow for the conclusion of configural MI. We opted for the more liberal criteria because of the nature of the samples included in our study, which were large (five out of eight samples had more than 500 participants), unequal in size, and incomparable in terms of demographic variables. Partial scalar invariance was obtained after removing five items from the intrusions, negative alterations in cognitions and mood, and alterations in arousal and reactivity symptom clusters.

Thus, based on the results, we can generally conclude that different linguistic versions of the PCL-5 are comparable within each country and that they measure the same construct in the same way. The findings confirmed the structure of the symptoms based on the current *DSM-5* criteria. Although cross-cultural comparisons likely require checking for scalar or partial scalar invariance each time, the *DSM-5* model generally proves to be invariant across diverse and heterogeneous samples, with only five items showing relatively stronger cultural specificity. In addition, this kind of analysis allowed us to examine culturally universal and specific PTSD symptoms.

The results for MI are consistent with previous studies. Researchers comparing two culturally homogeneous groups (e.g., gender, ethnicity) have confirmed scalar invariance of the measurement using the Harvard Trauma

Questionnaire (HTQ), as shown in studies by Caldas et al. (2020), Contractor et al. (2018), and Tay et al. (2017); however, in a multicultural and multilingual sample of refugees, Rasmussen et al. (2015) confirmed only configural invariance for the HTQ. Similarly, Rasmussen et al. (2023) found configural invariance only among some samples using the HTQ. In addition, Wind et al. (2017) confirmed configural invariance and partial metric invariance (for certain items) in five different language groups of refugees. Thus, due to the diversity of samples in terms of cultural and environmental factors (e.g., levels of trauma exposure, social support, health care systems), expecting equality in the means of latent variables between culturally diverse samples may be unrealistic. Dong and Dumas (2020) also raised this issue regarding the MI of personality measures.

The next conclusion highlights the methodological limitations of MI analyses, which are a separate concern. As demonstrated by Rutkowski and Svetina (2014), confirming MI across a larger number of diverse groups is more challenging and often requires adopting more liberal criteria. In our study, we included data from eight countries located on four different continents. These samples were not fully comparable in terms of sample size and demographic characteristics, and they were heterogeneous in terms of levels and types of trauma exposure. Country-specific circumstances related to the COVID-19 pandemic, such as varying infection rates, mortality rates, the severity of imposed restrictions, and quality of public health services, may have significantly influenced the results. Therefore, future research should prioritize gathering data from more homogeneous samples in terms of demographic factors and types of trauma exposure and ensure comparable sample sizes. On the other hand, comparisons between more diverse populations should likely include checks for partial scalar invariance. Finally, despite the sample diversity in our study, it is encouraging that the PCL-5 proved to be comparable in terms of item structure, factor loadings, and (partially) the intercepts.

Although the included samples were not recruited with regard to a specific traumatic experience but rather composed of participants who reported exposure to different trauma types, participants across samples exhibited substantial levels of PTSD symptoms. The number of probable PTSD diagnoses is comparable to or even higher than what has been reported in national studies. This seems logical, as data were gathered during a pandemic that resulted in serious health issues, life threats, and death. We obtained probable PTSD rates of 27.3% for Poland, 33.1% for the USA, 7.8% for Japan, 10.2% for Argentina, 10.7% for South Korea, 24.5% for Ireland, 39.9% for the UK, and 22.1% for Kazakhstan. In comparison, a Polish study on a representative sample revealed an 18.8% rate of probable PTSD (Rzeszutek et al., 2023). In the United States, the point prevalence of PTSD has been shown to range from 8.0% to 56.7%, with a lifetime prevalence of 3.4%–26.9% (Schein et al., 2021). In Ireland, the past-month prevalence of a positive PTSD screen was found to be 5.0% (Hyland et al., 2021). Lower lifetime prevalence has been reported in Japan, South Korea, and Argentina (i.e., 1.3%, 1.7%, and 2.8%, respectively; Cia et al., 2018; Jeon et al., 2007; Kawakami et al., 2014). High levels of PTSD symptoms were reported during the COVID-19 pandemic in Ireland (20%; Daly et al., 2021) and the United States (43%; Liu, et al. 2020). Gieorgieva et al. (2021) found that the prevalence of PTSD during the COVID-19 pandemic was 32.4% in a sample of individuals from 11 countries, with rates of 27% in the United Kingdom and 31.4% in Poland. It is important to note that higher rates of probable PTSD may be associated with the use of self-report measures, which have been shown to yield higher symptom levels compared to interview-based assessments (Stevens et al., 2013).

Comparing the country-specific mean PTSD symptom scores after excluding the five aforementioned items, we found the highest levels of PTSD symptoms in the United Kingdom and the lowest in Japan, Argentina, and Kazakhstan. Although these results are consistent with the data presented earlier regarding PTSD prevalence in different countries, they were likely influenced by different factors. On one hand, the United Kingdom reported some of the highest rates of COVID-19 infections and mortality; on the other hand, the same was true for the United States, Poland, and Argentina. Liu et al. (2020) found that loneliness, the ability to tolerate distress, and one's level of worry predicted symptoms of anxiety, depression, and PTSD among young adults in the United States. A detailed analysis conducted in 11 countries by Georgieva et al. (2021) identified several significant risk factors for the development of PTSD, including the level of stress experienced during the COVID-19 pandemic, which was the strongest predictor; fear of infection; country of residence; preexisting mental disorders; perceived restrictiveness of government-imposed containment measures; the number of hours spent following pandemic-related news on television or social media; concern for family members; and loss of a job or income.

The associations between PTSD symptoms and other included variables were similar across the examined samples, differing only in strength. As expected, these correlations were positive and stronger in relation to depressive, anxiety, and stress symptoms, which was anticipated given their strong overlap with PTSD symptoms. The associations with COVID-19–related stressors were moderate or weak, as these stressors were mostly nontraumatic in nature and there were only a few questionnaire items related to the severity of infection or infection-related

death. Weaker correlations were found in relation to emotional stability/neuroticism, and the weakest correlation was with emotional reactivity. The latter is a temperament marker considered the temperamental basis for emotional stability/neuroticism (Strelau, 2008) and has a strong biological background. As environmental factors have been shown to be stronger predictors of PTSD severity than biological factors, the weakest associations with emotional reactivity, which is strongly biologically determined, seem reasonable. In summary, these findings are consistent with previous research (see Forkus et al., 2023) and confirm the construct validity of PCL-5.

Although there were visible differences in the strength of the associations between PTSD symptoms and other variables, as well as in PTSD symptom levels, we failed to identify any specific patterns. This is likely due to the heterogeneity of the samples, which were not fully comparable in terms of gender, age, and trauma exposure. Differences may also be related to factors such as the way each country handles health, insurance, and legal cases associated with various traumatic events, which are difficult to control for.

The first major limitations concerning the conclusions drawn from our study involve the heterogeneity of the examined samples in terms of demographic variables, trauma exposure, and country-specific courses of the COVID-19 pandemic. The second major limitation of our study pertains to the degree of trauma that participants in the included samples experienced. Participants included individuals who had experienced various traumatic events throughout their lives, some of whom endorsed exposure only in the context of LEC-5 response options. On the other hand, the study was undoubtedly conducted among populations that experienced specific traumatic events, and the percentage of probable PTSD diagnosis based on the responses was significant and higher than what has been reported in many studies using representative samples; this is consistent with findings from research conducted during the COVID-19 pandemic (Georgieva et al., 2021; Liu et al., 2020). At the same time, PCL-5 items are rated using specific traumatic experiences as a reference point, and the reliability (i.e., internal consistency) of the measure was high in our study, implying that respondents answered the questions consistently rather than randomly. Additionally, the generalizability of the results is limited because the samples were mostly female and composed of young people and individuals able to access the online platform. Finally, the IPIP-BFM-20 Emotional Stability subscale exhibited less satisfactory internal consistency in six of eight samples, necessitating cautious interpretation of the analyses that include this scale.

In summary, our analyses conducted on data from eight different countries across four continents allow us to conclude that the PCL-5 measures universally culturally indexed PTSD indicators as classified in the *DSM-5*. Direct cross-cultural comparisons require the assessment of the scalar MI between preferably more homogenous samples.

OPEN PRACTICES STATEMENT

Data (apart from the Japanese sample because of ethical reasons) and codes are available at: https://osf.io/gcfp3/?view_only=a49aa517ac834854a69b3c8589dc37bc

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Cyniak-Cieciura, M., Popiel, A., Zawadzki, B., Cremeans-Smith, J. K., Fruehstorfer, D. B., Bielak, P., Camino, V., Cha, E. J., Cho, Y., Galarregui, M., Goldfarb, R., Hyun, M., Kalinina, Z., Keegan, E., Mambetalina, A., McHugh, L., Miracco, M., Oshio, A., Park, C., … Topanova, G. T. (2024). Measurement invariance of the PTSD Checklist for *DSM-5* across eight countries and samples with diverse trauma experiences. *Journal of Traumatic Stress*, 1–12. https://doi.org/10.1002/jts.23118