Portuguese Version of the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): Comparison of Latent Models and Other Psychometric Properties in a Sample of Fire Fighters

Teresa Carvalho[1], Carolina da Motta[1], and José Pinto Gouveia[1]

[1]Affiliation not available

June 12, 2019

Abstract

The PCL (Weathers et al., 1993) is a useful and widely used measure to assess PTSD symptoms in clinical and research contexts, exhibiting adequate psychometric properties across its several versions and translations (e. g. Carvalho et al., 2015; Wilkins et al., 2011). The current study analyzed the psychometric properties (latent structure, internal consistency, temporal reliability, and convergent validity) of the Portuguese version of the PCL for the DSM-5 (PCL-5, Weathers et al., 2013) in a sample of firefighters. This study also aimed to contribute with empirical data to clarify the best latent structure of DSM-5 PTSD symptoms. Specifically, the DSM-5 four-factor model and other competing models for PTSD symptoms (four-factor Dysphoria model, five-factor Dysphoric Arousal model, six-factor Anhedonia model, six-factor Externalizing Behavior model, and seven-factor Hybrid model) applied to PCL-5 were analyzed and compared in this paper.

Portuguese Version of the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): Comparison of Latent Models and Other Psychometric Analyses

Teresa Carvalho [a,b] *, Carolina da Motta [a], José Pinto-Gouveia [a]

[a] Center for Research in Neuropsychology and Cognitive and Behavioral Intervention (CINEICC), University of Coimbra, Coimbra, Portugal

[b] Instituto Superior Miguel Torga, Coimbra, Portugal

Author Note

* Correspondence concerning this article should be addressed to: Teresa Carvalho, CINEICC, Faculdade de Psicologia e de Ciências da Educação da Universidade de Coimbra, Rua do Colégio Novo, Apartado 6153, 3001-802, Coimbra, Portugal. E–mail: eresacarvalho.psi@gmail.com (Teresa Carvalho).

Portuguese Version of the Posttraumatic Stress Disorder Checklist for *DSM-5* (PCL-5): Comparison of Latent Models and Other Psychometric Analyses

Abstract

Objective: This psychometric study explores the Portuguese version of the Posttraumatic Stress Disorder (PTSD) Checklist (PCL-5). It aims to clarify the best-fitting latent structure among competing PTSD models (*DSM-5*, Dysphoria, Dysphoric Arousal, Anhedonia, Externalizing Behavior, and Hybrid models) and its implications for PTSD measurement. **Method**: Psychometric analyses were conducted in a sample from the general population of firefighters (N = 466), except the temporal stability, which was tested in a subsample of 100 participants. **Results**: The models presented significant differences in global fit. The Hybrid model presented the best-fitting structure, but the *DSM-5* model showed more favorable reliability and convergent validity in Confirmatory Factor Analyses. The *DSM-5* model also proved to be internal consistency, temporal reliability, and convergent validity. **Conclusion**: The Portuguese version of PCL-5 is reliable and valid. The findings suggest the appropriateness of the *DSM-5* model to assess PTSD symptomatology, encouraging its use in clinical and research settings.

Keywords: Posttraumatic Stress Disorder Checklist for *DSM-5* (PCL-5); Portuguese version; psychometric properties; PTSD model comparison; firefighters.

According to the *Diagnostic and Statistical Manual of Mental Disorders-fifth edition* (*DSM-5*; APA, 2013), Posttraumatic Stress Disorder (PTSD) diagnosis includes Intrusions, Avoidance, Negative Alterations in Cognition and Mood, and Alterations in Arousal and Reactivity symptoms clusters. These clusters were based on empirical studies that tested the construct validity of the PTSD models using Confirmatory Factor Analysis (CFA). However, since the *DSM-5* (APA, 2013) publication, the number of competing PTSD models has increased (Rasmussen, Verkuilen, Jayawickreme, Wu, & McCluskey, 2019). According to Amour, Műllerová, and Elhai's (2016) review study, the empirical literature supports alternative models to the *DSM-5* four-factor model, clustering symptoms into a four-factor Dysphoria model (Simms, Watson, & Doebbeling, 2002), a five-factor Dysphoric Arousal model (Elhai et al., 2011), two six-factor Anhedonia (P. Liu et al., 2014) and Externalizing Behaviors models, and a seven-factor Hybrid model (Armour et al., 2015a). Table 1 presents item mapping for those models.

The abovementioned Dysphoria and Dysphoric Arousal models have initially emerged as competing *DSM-IV/DSM-IV-TR* (APA, 1994, 2000) models of PTSD (Elhai et al., 2011; Simms et al., 2002). A meta-analytic study by Yufik and Simms (2010) on the latent structure of *DSM-IV/DSM-IV-TR* PTSD symptoms found stronger empirical support for the Dysphoria model (comprising Reexperiencing, Avoidance, Dysphoria, and Hyperarousal factors; Simms et al., 2002). However, the Dysphoric Arousal model (includes Reexperiencing, Avoidance, Emotional Numbing, Dysphoric Arousal, and Anxious Arousal factors (Elhai et al., 2011) was proposed later and, consequently, the empirical support to this robustness has not been considered for the *DSM-5* (APA, 2013) nosology. For these reasons, the Dysphoria and Dysphoric Arousal models were

adapted to the *DSM-5* PTSD symptoms (see Armour, Mullerova, et al., 2016), as shown in Table 1.

Table 1. *Item mapping for all tested models*

Abbreviated PTSD symptoms		Model					
		DSM-5 **(APA, 2013)**	**Dysphoria (Simms et al., 2002)**	**Dysphoric Arousal (Elhai et al, 2011)**	**Anhedonia (Lui et al., 2014)**	**Externalized Behavior (Tsai et al., 2015)**	**Hybrid (Armour et al., 2015)**
1.	Intrusive memories	IN	IN	IN	IN	IN	IN
2.	Recurring Dreams	IN	IN	IN	IN	IN	IN
3.	Flashbacks	IN	IN	IN	IN	IN	IN
4.	Stimulus-induced psychological distress	IN	IN	IN	IN	IN	IN
5.	Memory-induced physical reactivity	IN	IN	IN	IN	IN	IN
6.	Avoidance of internal stimuli	AV	AV	AV	AV	AVD	AV
7.	Avoidance of external stimuli	AV	AV	AV	AV	AV	AV
8.	Dissociative amnesia	NACM	D	NACM	NACM	NACM	NA
9.	Negative beliefs	NACM	D	NACM	NACM	NACM	NA
10.	Distorted guilt	NACM	D	NACM	NACM	NACM	NA
11.	Persistent negative emotional status	NACM	D	NACM	NACM	NACM	NA
12.	Loss of interest	NACM	D	NACM	AN	NACM	AN
13.	Feelings of social disconnection	NACM	D	NACM	AN	NACM	AN
14.	Inability to experience positive emotions	NACM	D	NACM	AN	NACM	AN
15.	Irritability/rage	AAR	D	DA	D	EB	EB
16.	Recklessness/self-harm	AAR	D	DA	D	EB	EB
17.	Hypervigilance	AAR	AA	AA	AA	AA	AA
18.	Alarm response	AAR	AA	AA	AA	AA	AA
19.	Difficulty concentrating	AAR	D	DA	D	DA	DA
20.	Sleep disturbance	AAR	D	DA	D	DA	DA

Note. PCL-5 = PTSD Checklist For *DSM-5*; *DSM-5 = Diagnostic and Statistical Manual of Mental Disorders* (5th ed.); IN = Intrusions factor; AV = Avoidance factor; NACM = Negative Alterations in Cognition and Mood factor; AAR = Alterations in Arousal and Reactivity factor; DA = Dysphoric Arousal factor; AA = Anxious Arousal factor; D = Dysphoria factor; AN = Anhedonia factor; EB = Externalized Behavior factor; NA = Negative Affect factor.

Among competing *DSM-5* models for PTSD (Table 1), the literature seems to provide stronger empirical support to the Hybrid model (comprising Intrusions, Avoidance, Negative Affect, Anhedonia, Externalizing Behaviours, Anxious Arousal, and Dysphoric Arousal dimensions; Armour et al., 2015b) because it presented the best fit statistic across several populations and PTSD measures for *DSM-5* (Armour, Contractor, Shea, Elhai, & Pietrzak, 2016; Armour, Mullerova, et al., 2016; Armour et al., 2015a; Bovin et al., 2016; Cao, Wang, Cao, Zhang, & Elhai, 2017; Lee et al., 2019; L. Liu, Wang, Cao, Qing, & Armour, 2016; Pietrzak et al., 2015; Sachser et al., 2018; Seligowski & Orcutt, 2016; Weathers et al., 2018; Wortmann et al., 2016; Zhou, Wu, & Zhen, 2017). Despite current findings pointing out to the Hybrid latent structure superiority, - irrespective of the nature of the tools used to assess the *DSM-5* PTSD symptoms (interview, questionnaires, etc.) - studies confirming these findings are unknown to this date (Lee et al., 2019).

The *DSM-5* (APA, 2013) changes for trauma and PTSD also required an update in the assessment tools, including the Posttraumatic Stress Disorder Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993). This self-report instrument was originally developed to assess PTSD symptom severity and/or perform a screening of this disorder according to *DSM-IV/DSM-IV-TR* diagnosis criteria (Weathers et al., 1993), and was widely used for clinical and research purposes. Although PCL for *DSM-IV/DSM-IV-TR* (Weathers et al., 1993) presented adequate psychometric properties (e.g. Carvalho, Pinto-Gouveia, Cunha, & Duarte, 2015; Wilkins, Lang, & Norman, 2011), it did not attain empirical consensus regarding its latent structure, possibly due the lack of clarity about the dimensionality of *DSM-IV/DSM-IV-TR* (APA, 1994, 2000) PTSD symptoms (Carvalho et al., 2015). More recently, Weathers et al. (2013) developed the PCL for the *DSM-5* (PCL-5) but its psychometric analyses are still scarce to date. In

general, the available findings suggest that the measure has adequate psychometric properties across different samples: war Veterans (Bovin et al., 2016; Wortmann et al., 2016), college students (Ashbaugh, Houle-Johnson, Herbert, El-Hage, & Brunet, 2016; Blevins, Weathers, Davis, Witte, & Domino, 2015), earthquake survivors (Demirchyan, Goenjian, & Khachadourian, 2015; P. Liu et al., 2014; Wang et al., 2015), trauma-exposed individuals (Krüger-Gottschalk et al., 2017; Seligowski & Orcutt, 2016), and parents of children with burns (Sveen, Bondjers, & Willebrand, 2016). Table 2 summarizes the main psychometric properties of the PCL-5 found in some of these studies.

Given the aforementioned aspects, and taking into account the increased risk of developing PTSD in firefighters (Berger et al., 2012), the present study aims mainly (a) to explore the latent structure and other psychometric properties of the Portuguese version of the PCL-5 in a sample of firefighters; (b) to compare the main alternative models highlighted in the empirical literature (four-factor *DSM-5* model, four-factor Dysphoria model, five-factor Dysphoric Arousal model, six-factor Anhedonia model, six-factor Externalizing Behaviors model, and seven-factor Hybrid model) applied to PCL-5, and help clarifying the best latent structure of *DSM-5* (APA, 2013) PTSD symptoms and its implications for PTSD measurement.

Table 2. *Psychometric properties of the PCL-5 in previous studies*

Study	**Sample**	**Best fitted Model (including *DSM-5* Model)**	**Internal consistency (Cronbach *α*)**	**Test retest reliability (*r*)**	**Convergent validity (*r*)**
Ashbaugh, et al. (2016):	College students (female and male):				
English PCL-5	N = 838	Hybrid model (Armour et al., 2015)	Global: .95; cluster: B = .88; C = .81; D = .90; E = .85	Not reported	IES-R: Global: .89; cluster: B = .80; C = .66; D = .92; E = .78
French PCL-5	N = 262	Hybrid model (Armour et al., 2015)	Global: .94; cluster: B = .83; C = .79; D = .87; E = .87	Global: .89; cluster: B = .80; C = .66; D = .92; E = .78 (M = 20.95 days)	IES-R: Global: .80; cluster: B = .71; C = .65; D = not reported; E = .78
Blevins et al. (2015):	College students (female and male):				
Study 1	N = 278	Anhedonia (Liu et al., 2014) and Hybrid (Armour et al.,2015) models.	Global: .94	Global = .82 (M = 6,14 days); cluster: B = .80; C = .66; D = .92; E = .78	PCL-S: .85; PDS: .85; DAPS: .84
Study 2	N = 557	Anhedonia (Liu et al., 2014) and Hybrid (Armour et al., 2015) models.	Global: .95	Global = .82 Item-wise = .39-83	DAPS: .81; PAI-: Traumatic Stress Subscale: .61; PAI-Depression Subscale: .55; PAI-Anxiety Subscale: .50
Bovin et al. (2016; Study 2)	468 War Veterans recruited through Healthcare Systems (female and male)	Anhedonia (Liu et al., 2014) and Hybrid (Armour et al., 2015) models	Global: .96	Global: .84	PCL-C: .87; PHQ-Depression: .74; PHQ- GAD: .67; PHQ-Panic: .50; PHQ-somatoform: .53; WHODAS 2.0: .68; IPF: .59
Demirchyan et al. (2014)	Earthquake survivors (female and male)	Dysphoric Arousal model (based on Elhai et al, 2011)	Global: .92	Not reported	Modified TSH – Lifetime trauma: .21; SCL-90-R-Anxiety Subscale: .57; CES-Depression Subscale: .56
Krüger-Gottschalk et al. (2017	352 trauma-exposed individuals (female and male)	Inconclusive	Global: .95; cluster: B = .89; C = .79; D = .86; E = .84	Global: .91	CAPS-5: .77

Liu et al., 2014)	1196 Chinese earthquake survivors (810 female and 386 male)	Anhedonia (Liu et al., 2014) model.	Global = .94	Not reported	Not reported
Sveen et al. (2016)	62 parents of children with burns (female and male)	Not reported	Global: .90; cluster: B = .57; C = .74; D = .78; E = .77	Global: .66; cluster: B = .58; C = .49; D = .63; E = .77	IES-R Global: .58; IES-R-Intrusion: 48; IES-R-Avoidance: 57; IES-R-Hyperarousal: .50; MADRS: .60; PSS-14 items: .56
Seligowski & Orcutt (2016)	403 trauma-exposed individuals	Hybrid model (Armour et al., 2015)	Cluster B = .89; C = .83; D = .90; E = .84	Not reported	PANAS (Negative Affect): .44 - .63; PANAS (Positive Affect): -.16 - -.39
Wang et al. (2015)	743 Chinese adolescent earthquake survivors (female and male)	Hybrid model (Armour et al., 2015)	Global: .91; cluster: B = .79; C = .77; D = .82; E = .82	Not reported	Not reported
Wortmann et al. (2016):	Military service members and retired Veterans (female and male):				
Baseline	N = 912	Hybrid model (Armour et al., 2015)	Global: .91; cluster: B = .80; C = .83; D = .82; E = .75	Not reported	Especially with: PCL-S: .87; PSS-I: .68; BDI-II: .64; BAI: .61; PHQ-15: .49; ISI: .48.
Follow-up (2 weeks posttreatment):	*n* = 439	Not reported	Global: .95; cluster: B = .92; C = .92; D = .89; E = .84	Not reported	Not reported

Note. PCL-5 = Posttraumatic Stress Disorder Checklist for *DSM-5*; *DSM-5 = Diagnostic and Statistical Manual of Mental Disorders* (5th ed.); IES-R = Impact of Event Scale–Revise; PTSD Checklist for *DSM-5*; PANAS = Positive and Negative Affect Schedule; PCL-S = PTSD Checklist for *DSM-IV*-Specific Version; PDS = Posttraumatic Distress Scale; DAPS = Detailed Assessment of Posttraumatic Symptoms–Posttraumatic Stress Scale; PAI = Personality Assessment Inventory; WES = War Exposure Scale; LEC-5 = Life Events Checklist for *DSM-5*; DHSCL = Hopkins Symptom Checklist; PCL-C = PTSD Checklist for *DSM-IV*, Civilian Version; PHQ = Patient Health Questionnaire; GAD = Generalized Anxiety Disorder; WHODAS 2.0 = World Health Organization Disability Assessment Schedule II; IPF = Inventory of Psychosocial Functioning; TSH = Trauma History Scale; SCL-90-R = Symptom Checklist 90 Revised; CES = Center for Epidemiological Studies; MADRS = *The Montgomery–Åsberg Depression Rating Scale; PSS-14* = The Perceived Stress Scale-14 items; PSS-I = PTSD Symptom Scale–Interview version; BDI-II = Beck Depression Inventory II; BAI = Beck Anxiety Inventory; PHQ-15 = Patient Health Questionnaire-15; ISI =Insomnia Severity Index.

Method

Participants

A convenience sample of 446 firefighters (males and females, currently active professional and volunteers) from Portuguese mainland and islands participated in this study. To analyze the temporal reliability, 100 of these participants filled out the PCL-5 a second time, three weeks after the first administration.

Measures

PTSD-Checklist for the *DSM-5* (PCL-5; Weathers et al., 2013). The PCL-5 is a 20-item self-report measure that assesses the 20 *DSM-5* PTSD symptoms. Respondents rate the degree to which they were affected by each symptom in the last month on a 5-point response scale (0 = *not at all*; 4 = *Extremely*). The PCL-5 can be used as a continuous measure to assess symptom severity and/or as a dichotomous measure to screen for a PTSD diagnosis according *DSM-5* criteria. Positive PTSD diagnosis requires respondents' scores obey to the following rules: (a) a total score equal to or greater than the cutoff value; (b) a single-item is considered symptomatic when rated equal to or above the respective cutoff point on the response scale; (c) the minimum number of symptomatic items required by *DSM-5* diagnostic rule (i.e., at least one Intrusion, one Avoidance, two Negative Alteration in Cognition and Mood, and two Alterations in Arousal and Reactivity symptomatic items) is endorsed (Blevins et al., 2015; Weathers et al., 2013). The definitive cutoff score for the original version of PCL-5 is still undefined, but the following combination of cutoff scores for a provisional *DSM-5* PTSD diagnosis was suggested: a total score of 33 or higher and a rating of 2 (*moderately*) or higher on each item, so that it can be considered symptomatic (Blevins et al., 2015; Weathers et al., 2013). Currently, the PCL-5 is available in three formats:

"without Criterion A", "with a brief Criterion A assessment", and "with the revised Life Events Checklist for *DSM-5* (LEC 5) and extended Criterion A assessment" (see Weathers et al., 2013). The original version of PCL.5 is internally consistent (α = .94 in Study 1 and α = .95 in Study 2; Blevins et al., 2015).

The "PCL-5 without Criterion A" was used and with one additional instruction requesting participants to rate the items only according to events experienced during the exercise of their functions as a firefighter.

Depression, Anxiety, Stress Scales (DASS-21, Lovibond & Lovibond, 1995; Pais-Ribeiro, Honrado, & Leal, 2004). This self-report questionnaire measures psychopathological symptoms of depression, anxiety and stress on a 4-point scale (0 = *did not apply to me at all*; 3 = *applied to me very much*, *or most of the time*). The original and the Portuguese versions showed adequate internal consistency for Depression (α = .91 and α = .85, respectively), Anxiety (α = .84 and α = .74, respectively) and Stress (α = .90; α = .81, respectively) scales. In this study, we obtained values of α = .83, α = .83 and α = .86 for Depression, Anxiety and Stress dimensions, respectively.

Procedures

Methodological Procedures

The forward-translation and back-translation method was applied to translate and adapt the PCL-5 to the Portuguese language spoken in Portugal. This task was performed by two independent senior clinical psychologists fluent in English and Portuguese and a native English speaker fluent in Portuguese. The linguistic and semantic equivalence between the original and Portuguese versions was warranted.

Next, an independent sample of 20 Portuguese firefighters volunteered to rate and confirm the comprehensibility of the Portuguese version. Participants in the study were recruited through a non-probabilistic sampling method (convenience sampling) at fire departments in which the unit's command has evaluated the goals and procedures of the current project and authorized data collection. These fire departments were geographically dispersed across the Portuguese mainland and island territory, allowing a greater diversity of potential participants. Participation in the study was voluntary. All participants received a description of the study aims, a written informed consent form and the self-report measures (in person or via mail). Out of 1000 protocols delivered, 466 (46.6%) were successfully returned, and 32 (6,87%) were removed from the sample because they presented 10% (or more) of missing data in one or more self-report questionnaires.

Analytic Procedures

Statistical analyses were carried out using IBM SPSS and AMOS (V. 25 for Microsoft Windows, IBM Inc. Armonk, NY).

The normal distribution of the variables was ensured by analysing values of Skewness (Sk) and Kurtosis (Ku): $|Sk| < 3$ e $|Ku| < 10$ confirmed the absence of severe deviations from normal distribution (Kline, 2011). The Mahalanobis quadratic distance (DM^2) allowed to identify possible outliers. Latent structure analysis of the models was performed through CFA with Maximum Likelihood method. Quality of models' adjustment was estimated using the following goodness-of-fit-indexes and respective reference values: Chi-Square Goodness of fit ($\chi 2$), $p > .05$, Goodness of Fit Index (GFI), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI) $\geq .90$ (Kline, 2011; Marôco, 2010); Root Mean Square Error of Approximation (RMSEA) $\leq .08$ with 90%

confidence interval (Schumacker & Lomax, 2004); Parsimony CFI (PCFI) ≥ .06 (Kline, 2011; Marôco, 2010). Local model adjustment was considered adequate when the items presented standardized factor weights (λ) ≥ .50 and individual reliability (R^2) ≥ .25 (Hair, Anderson, Tatham, & Black, 1998; Marôco, 2010). The Akaike Information Criterion (AIC) and Expected Cross-Validation Index (ECVI) allowed to compare models: smaller values of AIC and ECVI suggest better fit. The Chi-Square Difference Test, $\chi 2_{dif.}(gl_{dif.})$, identified nested models with a significantly better fit (Kline, 2011; Marôco, 2010).

Cronbach's alpha (α) and composite reliability (CR) values both ≥ .70 were used to verify the internal consistency (Hair, Black, Babin, & Anderson, 2013; Marôco, 2010). The criterion by Fornell and Larker (1981) to assess convergent validity of the items within its factor was employed: a value of Average Variance Extracted (AVE) ≥ .50 is adequate. Convergent validity of the PCL-5 with other related constructs was examined using Pearson's product-moment correlation coefficients (Cohen, Cohen, West, & Aiken, 2003). Test-retest reliability was also measured by the same coefficients.

Results

Sample Characteristics

The sample consisted of 357 (80%) men and 89 (20%) women firefighters. Participants' ages ranged from18 to 62 years old (M = 35.53; SD = 10.12) and its education ranged from 4 to 22 years (M = 11.02; SD = 3.03). Regarding marital status, 212 (47.5%) participants were married or cohabiting, 38 (8.5%) were divorced, 1 (0.2%) was widowed, and 195 (43.7%) were single. The service time as a firefighter

ranged from 1 to 43 years (M = 14.70; SD = 9.50). The firefighters were drawn from all hierarchical levels, consisting of 12 (2.7%) commanders, 15 (3.4%) adjuncts, 6 (1.3%) officials, 14 (3.1%) chiefs, 39 (8.7%) subchiefs, 64 (14.3%) 1st class firefighters, 88 (19.7%) 2nd class firefighters, 168 (37.7%) 3rd class firefighters, and 40 (9%) did not report their occupational status.

Descriptive Statistics for PCL-5

The *DSM-5* (APA, 2013) model presented the following scores for each symptom cluster: Intrusions, M = 2.27 (SD = 3.13); Avoidance, M = 1.11 (SD = 1.49); Negative Alterations in Cognition and Mood, M = 3.74 (SD = 4.19), and Alterations in Arousal and Reactivity M = 4.51 (SD = 4.07).

PCL-5' Latent Structure: Model Comparisons

All the PCL-5 items did not present serious deviations from normality. The MD^2 values indicate a small number of possible outliers. However, these cases were kept in the sample because they did not significantly influence the parameter estimations in the tested models (Kline, 2011; Tabachnick & Fidell, 2012).

Items were distributed across dimensions according to the models presented in Table 1. The fit statistics of these models are presented in Table 3.

Table 3. Fit statistics of all tested PCL-5 models (N = 446)

Model	χ^2/gl	GFI	TLI	CFI	RMSEA	90% CI RMSEA	PCFI	AIC	ECVI	$\chi^2_{dif}(df_{dif})$
1. *DSM-5* (APA, 2013)	767.40/164 = 4.68	.85	.87	.89	.09	.084-.097	.76	859.44	1.93	
2. Dysphoria model (Simms et al., 2002)	806.10/164 = 4.92	.85	.86	.88	.09	.087-1.00	.76	898.10	2.02	
3. Dysphoric Arousal model (Elhai et al, 2011)	755.37/160 = 4.72	.85	.87	.89	.09	.085-.098	.75	855.37	1.92	
Difference between Models 3 and 1										12.03(4)*
Difference between Models 3 and 2										50.73(4)***
4. Anhedonia model (Lui et al., 2014)	618.63/155 = 3.99	.88	.89	.91	.08	.075-.089	.74	728.63	1.64	
Difference between Models 4 and 1										148.77(9)***
Difference between Models 4 and 2										187.47(9)***
Difference between Models 4 and 3										136.74(5)***
5. Externalized Behavior model (Tsai et al., 2015)	720.75/155 = 4.65	.86	.87	.89	.09	.084-.097	.73	830.75	1.87	
Difference between Models 5 and 1										46.65(9)***
Difference between Models 5 and 2										85.35(9)***
Difference between Models 5 and 3										35.37(5)***
6. Hybrid model (Armour et al., 2015)	584.29/149 = 3.92	.89	.90	.92	.08	.074-.088	.72	706.29	1.59	
Difference between Models 6 and 1										183.11(15)***
Difference between Models 6 and 2										221.81(11)***
Difference between Models 6 and 3										171.08(11)***
Difference between Models 6 and 4										34.34(6)***
Difference between Models 6 and 5										139.46(6)***

Note. PCL-5 = *PTSD Checklist for DSM-5*; *DSM-5 = Diagnostic and Statistical Manual of Mental Disorders* (5th ed.); χ^2/gl = Normalized Chi-square; GIF = *Goodness of Fit Index*; TLI = *Tucker-Lewis Index*; CFI = *Comparative Fit Index*; RMSEA = *Root Mean Square Error of Approximation*; PCFI = *Parsimony* CFI; AIC = *Alkaike Information Criterion*; ECVI = *Expected Cross-Validation Index*; $\chi^2_{diff}(gl_{diff})$ = *Chi-square difference test*; * $p < .05$; *** $p < .001$.

The Model 1 (*DSM-5* model) presented an acceptable fit to the data (see fit index values; Table 3). All nested models statistically differed concerning their overall fit, and Model 6 (Hybrid model) presented the best fit to the data, as also suggested by lower AIC and ECVI values (Table 3). Regarding non-nested models, the comparisons between Models 1 (*DSM-5* model) and 2 (Dysphoria model) showed that the first model provided a better fit (lower AIC and ECVI values; Table 3). The values of AIC and ECVI also showed that the Model 4 (Anhedonia model) fitted better to the data than the Model 5 (Externalized Behavior model; Table 3).

When comparing previous nested Models 4 (Anhedonia model) and 1 (*DSM-5* model), Model 4 exhibited a significantly better fit and lower AIC and ECVI values (Table 3). Finally, in the comparison of the latter model (Model 4) with nested Model 6 (Hybrid model), Model 6 revealed a significantly better fit, and its AIC and ECVI values were lower (Table 3).

As for the overall adjustment, the comparative analyses described above allowed us to conclude that, statistically, the Model 6 (seven-factor Hybrid model) was the best-fitting model among all tested models, followed by model 4 (six-factor Anhedonia model) and Model 1 (four-factor *DSM-5* model). However, PCFI values for these three best-fitting models confirm that the more and less parsimonious models were the *DSM-5* and the Hybrid models, respectively (Table 3).

The correlation coefficients (*r*) between PTSD factors are overall moderate to strong, and the values of λ and R^2 indicate an adequate local adjustment of the models tested (Table 4).

Table 4. Between-factor correlations and local adjustment of the tested models

Model	**Between-factor correlations (*r*)**	**λ**	**R^2**
1. *DSM-5* (APA, 2013)	.74 - .87	.51 - .83	.26 - .69
2. Dysphoria model (Simms et al., 2002)	.76 - .90	.52 - .83	.27 - .69
3. Dysphoric Arousal model (Elhai et al, 2011)	.73 - .95	.51 - .83	.26 - .69
4. Anhedonia model (Lui et al., 2014)	.56 - .96	.51 - .89	.27 - .79
5. Externalized Behavior model (Tsai et al., 2015)	.65 - .92	.51 - .83	.26 - .69
6. Hybrid model (Armour et al., 2015)	.56 - .93	.52 - .83	.27 - .79

Additional analyses of the quality of latent adjustment can benefit the identification of the most appropriate model for clinical and research purposes. Thus, a more comprehensive analysis of the factors within the best-fitting models (Models 6, 4 and 1) was carried out using CR and AVE. Regarding Model 6 (Hybrid model), all factors presented adequate values of the CR and AVE (CR = .70 - .89; AVE = .52 - .62), except for Dysphoric Arousal factor (CR = .62; AVE = .46). A similar issue was found in model 4 (Anhedonia model), with adequate values of the CR and AVE for all factors (CR = .76 - .89; AVE = .52 - .62), except for Anxious Arousal factor (CR = .62; AVE = .46). Model 1 (*DSM-5* model) presented the least problematic values: three factors showed adequate CR (CR = .76 - .89) and AVE (AVE = .48 - .62) values, and only the Alterations in Arousal and Reactivity factor presented an AVE < .50, but very close to this threshold (AVE = .48). Therefore, among the models presenting best overall fit to the data, the *DSM-5* model exhibited more internally consistent factors and items within each factor presented more convergent validity.

The following sections present additional psychometric analyses of the PCL-5 according to the *DSM-5* model.

Internal consistency

All PCL-5 factors showed an adequate internal consistency (Intrusions: α =. 89; Avoidance: α =. 76; Negative Alterations in Cognition and Mood: α =. 87; Alterations in Arousal and Reactivity: α = .85), as well as the total scale (α = .94).

Test-Retest Reliability

A subgroup of 100 participants filled the PCL-5 after a 3-week time interval. All PCL-5 dimensions presented high temporal stability (Intrusions: r =.91, p <. 001; Avoidance: r = .88, p <. 001; Negative Alterations in Cognition and Mood: r = 90, p <. 001; Alterations in Arousal and Reactivity: r = .89, p <. 001), as well as the total scale (r = .91, p < .001).

Convergent validity

The PCL-5 factors and total scale showed statistically significant correlations (p < .001) with psychopathological symptoms. The Intrusions factor showed correlations of r = .44, r = .52, and r = .46, with depression, anxiety, and stress symptoms, respectively. For the Avoidance dimension, we obtained values of r = .40, r = .46, and r = .43, with Depression, Anxiety and Stress symptoms, respectively. The factor Negative Alterations in Cognition and Mood exhibited correlations of r = .63, r = .53, and r = .56, with Depression, Anxiety and Stress symptoms, respectively. Regarding the correlations between the factor Alterations in Arousal and Reactivity and Depression, Anxiety and Stress symptoms, the values were r = .55, r = .55, and r = .61, respectively. Finally, the

total PCL-5 showed correlations of *r* =. 60 with Depressive and Anxiety symptoms, and *r* =. 62 with Stress symptoms.

Discussion

The PCL (Weathers et al., 1993) is a useful and widely used measure to assess PTSD symptoms in clinical and research contexts, exhibiting adequate psychometric properties across its several versions and translations (e. g. Carvalho et al., 2015; Wilkins et al., 2011). The current study analyzed the psychometric properties (latent structure, internal consistency, temporal reliability, and convergent validity) of the Portuguese version of the PCL for the *DSM-5* (PCL-5, Weathers et al., 2013) in a sample of firefighters. This study also contributed to clarify the best latent structure of *DSM-5* PTSD symptoms by comparing competing models highlighted in the literature (four-factor *DSM-5*, four-factor Dysphoria, five-factor Dysphoric Arousal, six-factor Anhedonia, six-factor Externalizing Behavior, and seven-factor Hybrid models) applied to PCL-5.

Overall, the current *DSM-5* four-factor model (APA, 2013) and the other models tested presented an acceptable fit to the data. However, the Hybrid model (Armour et al., 2015a) exhibited the best overall fit to the data. This result is supported by the tendency of the Hybrid model to present a superior fit, as identified in a systematic review by Armour, Müllerová, and Elhai (2016) and by subsequent empirical contributions across several populations, using PCL-5 (Armour, Contractor, et al., 2016; Armour et al., 2015a; Ashbaugh et al., 2016; Blevins et al., 2015; Bovin et al., 2016; Cao et al., 2017; Seligowski & Orcutt, 2016; Wang et al., 2015; Wortmann et al., 2016; Zhou et al., 2017) and/or other PTSD measures (Lee et al., 2019; Sachser et al., 2018; Weathers et al., 2018).

Our results did not only show that models differed statistically in terms of their global adjustment, but also that the factors exhibited different internal consistency (CR) and convergent validity (AVE). From the three best-fitting models - *DSM-5*, Anhedonia and Hybrid models - the *DSM-5* model had more closely met the criteria for CR and AVE values across all dimensions, despite its suboptimal fit indices.

The authors consider that the identification of the most appropriate PTSD model should take into account the following aspects: (a) the overarching implications of choosing a model over another should be considered beyond standard statistical criteria used in Structural Equation Modeling research (Barrett, 2007); (b) most CFA studies solely rely on Goodness of Fit and similar indices, but lack further analyses on item cross-loadings and factor consistency within the tested models, which can point out to model specification problems (Hair et al., 2013). In this study, the more favorable CR and AVE values in the *DSM-5* model may be due to fewer items loading across different factors. On the other hand, our results o show that the larger inter-factor correlations were observed in competing PTSD models. Hence, alternative models tended to be more complex and include dimensions with fewer items (e.g. two symptoms), which raises important methodological and practical questions. As emphasized in the critical appraisal by Rasmussen et al. (2019), the high interfactor correlations and the “doublets” in the PCL-5 alternative models may reflect superficial similarities or causal relationships between symptoms that lead to improper solutions. Moreover, refining the PTSD cluster configuration necessarily impacts symptom evaluation and diagnostic procedures, so changes to the latent conceptual structure of PTSD should provide a substantial contribute to PTSD theoretical models and improve their predictive accuracy (Barrett, 2007; Hayduk, Cummings, Boadu, Pazderka-Robinson, & Boulianne, 2007; Rasmussen et al., 2019). Although providing evidence of

the predictive accuracy of competing PTSD models falls out of the scope of the current study, this is an important departure point for the reflection on the practical implications in clinical and research fields of the current findings and the remaining empirical literature. Regarding clinical utility, it is possible that the four-factor *DSM-5* model can yield solutions that best delimit the clusters of PTSD symptoms and lead to more replicable findings. The *DSM-5* PTSD diagnosis decision criteria is based on rules that dictate patients should endorse a minimum number of symptoms in each cluster (in PCL-5, combining the symptomatic items required and the cutoff point for the total score; Weathers et al., 2013). It is likely that model refinements (by increasing the number of dimensions of symptoms) may introduce considerable discontinuities in PTSD diagnosis according to *DSM-IV* or *DSM-5* criteria. Therefore, future studies on the necessary changes in diagnostic algorithms accounting for the increased model complexity should unequivocally demonstrate clinical advantages and theoretical contributions of adopting a less parsimonious model (e.g. Hybrid model) over the current one. These latter issues raise questions for future research, which should not disregard its impact on the life of individuals with PTSD (and their families and on public health) – for instance, imposing possible constraints to the access to health care and welfare assistance eligibility aimed at these individuals.

Our results did not only show that the *DSM-5* model applied to PCL-5 presented superior internal reliability and convergent validity, but it also proved that this model has internal consistency measured by Cronbach's alpha, is temporally stable and converged with related constructs (depression, anxiety, and stress symptomatology), similar to previous studies (e.g. Ashbaugh et al., 2016; Blevins et al., 2015; Bovin et al., 2016; Wortmann et al., 2016).

This first study on the Portuguese version of PCL-5 presents some methodological limitations to be considered in future studies: (a) *DSM-5* PTSD Criterion A (trauma exposure) was not evaluated. In this regard, it should be noted that future use of aforementioned measure without Criterion A should be complemented by the evaluation of this criterion in order to allow a more rigorous evaluation of the PTSD criteria for research and clinical purposes; (b) possible sample non-representativeness, due to the impossibility of comparing the characteristics of the sample with the Portuguese population of firefighters (due to the impossibility of accessing national databases). Nevertheless, sample non-representativeness may have been minimized through a diversified sample collection in fire departments that were scattered across the Portuguese territory (mainland and islands). Future studies should also (a) confirm the findings from this study using Portuguese samples with a PTSD diagnosis (from the population of firefighters and populations exposed to other types of potentially traumatic events); (b) include model invariance across groups, discriminant validity between samples with and without PTSD, and clinical utility (including cutoff points for a possible diagnosis).

Conclusion

The Portuguese version of PCL-5 based on *DSM-5* (APA, 2013) model proved to be a promising measure to be used in clinical contexts and scientific research. However, the present study identified the Hybrid model (Armour et al., 2015) as being statistically the best alternative *DSM-5* PTSD symptom model (i.e., the best fitted statistic model). On the other hand, regarding the internal consistency of the latent factors (measured by the CR) and the convergent validity of the items in the respective factors (estimated by AVE), the *DSM-5* model applied to PCL-5 seems to be more appropriate for the clinical

practice and research. Thus, the findings of this study, as well as previous studies (see Introduction), suggests the need for robust and conclusive new evidence on the best latent organization of the *DSM-5* PTSD symptoms, in order to be considered in the future *DSM* diagnostic criteria for PTSD.

Acknowledgments

The authors would like to thank the Fire Departments Command who authorized and helped contacting the participants, and C. T. for the support in data collection.

References

APA. (1994). *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.). Washington, DC: Author.

APA. (2000). *Diagnostic and statistical manual of Mental Disorders (4th ed, text rev.)*. https://doi.org/10.1176/appi.books.9780890423349

APA. (2013). Diagnostic and statistical manual of mental disorders. In *Diagnostic and statistical manual of mental disorders (4th ed.)* (5th Ed.). https://doi.org/10.1176/appi.books.9780890425596.744053

Armour, C., Contractor, A., Shea, T., Elhai, J. D., & Pietrzak, K. R. H. (2016). Factor structure of the PTSD Checklist for DSM-5: Relationships among symptom clusters, anger, and impulsivity. *Journal of Nervous and Mental Disease*. https://doi.org/10.1097/NMD.0000000000000430

Armour, C., Mullerova, J., & Elhai, J. D. (2016). A systematic literature review of PTSD's latent structure in the Diagnostic and statistical manual of mental disorders: DSM-IV to DSM-5. *Clinical Psychology Review*, *44*, 60–74. https://doi.org/10.1016/j.cpr.2015.12.003

Armour, C., Tsai, J., Durham, T. A., Charak, R., Biehn, T. L., Elhai, J. D., & Pietrzak, R. H. (2015a). Dimensional structure of DSM-5 posttraumatic stress symptoms: Support for a hybrid Anhedonia and Externalizing Behaviors model. *Journal of Psychiatric Research*, *61*, 106–113. https://doi.org/10.1016/j.jpsychires.2014.10.012

Armour, C., Tsai, J., Durham, T. A., Charak, R., Biehn, T. L., Elhai, J. D., & Pietrzak, R. H. (2015b). Dimensional structure of DSM-5 posttraumatic stress symptoms: Support for a hybrid Anhedonia and Externalizing Behaviors model. *Journal of Psychiatric Research*. https://doi.org/10.1016/j.jpsychires.2014.10.012

Ashbaugh, A. R., Houle-Johnson, S., Herbert, C., El-Hage, W., & Brunet, A. (2016). Psychometric validation of the English and French versions of the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5). *PLoS ONE*, *11*(10). https://doi.org/10.1371/journal.pone.0161645

Barrett, P. (2007). Structural equation modelling: Adjudging model fit. *Personality and Individual Differences*, *42*(5), 815–824. https://doi.org/10.1016/j.paid.2006.09.018

Berger, W., Coutinho, E. S. F., Figueira, I., Marques-Portella, C., Luz, M. P., Neylan, T. C., … Mendlowicz, M. V. (2012). Rescuers at risk: a systematic review and meta-regression analysis of the worldwide current prevalence and correlates of PTSD in rescue workers. *Social Psychiatry and Psychiatric Epidemiology*, *47*(6), 1001–1011. https://doi.org/10.1007/s00127-011-0408-2

Blevins, C. A., Weathers, F. W., Davis, M. T., Witte, T. K., & Domino, J. L. (2015). The Posttraumatic Stress Disorder Checklist for *DSM-5* (PCL-5): Development and Initial Psychometric Evaluation. *Journal of Traumatic Stress*, *28*(6), 489–498. https://doi.org/10.1002/jts.22059

Bovin, M. J., Marx, B. P., Weathers, F. W., Gallagher, M. W., Rodriguez, P., Schnurr, P. P., & Keane, T. M. (2016). Psychometric properties of the PTSD checklist for diagnostic and statistical manual of mental disorders-fifth edition (PCL-5) in veterans. *Psychological Assessment*, *28*(11), 1379–1391. https://doi.org/10.1037/pas0000254

Cao, X., Wang, L., Cao, C., Zhang, J., & Elhai, J. D. (2017). DSM-5 Posttraumatic Stress Disorder Symptom Structure in Disaster-Exposed Adolescents: Stability across Gender and Relation to Behavioral Problems. *Journal of Abnormal Child Psychology*, *45*(4), 803–814. https://doi.org/10.1007/s10802-016-0193-1

Carvalho, T., Pinto-Gouveia, J., Cunha, M., & Duarte, J. (2015). Portuguese version of

the PTSD checklist-military version (PCL-M) – II: Diagnostic utility. *Revista Brasileira de Psiquiatria*, *37*(1), 55–62. https://doi.org/10.1590/1516-4446-2013-1319

Cohen, J., Cohen, P., West, S., & Aiken, L. (2003). *Applied Multiple Regression/Correlation Analysis for the Behavioral* (3rd ed.). London: Lawrence Erlbaum Associates.

Demirchyan, A., Goenjian, A. K., & Khachadourian, V. (2015). Factor Structure and Psychometric Properties of the Posttraumatic Stress Disorder (PTSD) Checklist and DSM-5 PTSD Symptom Set in a Long-Term Postearthquake Cohort in Armenia. *Assessment*, *22*(5), 594–606. https://doi.org/10.1177/1073191114555523

Elhai, J. D., Biehn, T. L., Armour, C., Klopper, J. J., Frueh, B. C., & Palmieri, P. A. (2011). Evidence for a unique PTSD construct represented by PTSD's D1-D3 symptoms. *Journal of Anxiety Disorders*. https://doi.org/10.1016/j.janxdis.2010.10.007

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(3), 39–50. https://doi.org/10.2307/3151312

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th ed.). New York, NY: Prentice-Hall.

Hair, J. F., Black, W. C. W. C., Babin, B. J., & Anderson, R. E. (2013). *Multivariate data analysis* (7th ed., Vol. 7). https://doi.org/10.1016/j.ijpharm.2011.02.019

Hayduk, L., Cummings, G., Boadu, K., Pazderka-Robinson, H., & Boulianne, S. (2007). Testing! testing! one, two, three – Testing the theory in structural equation models! *Personality and Individual Differences*, *42*(5), 841–850. https://doi.org/10.1016/j.paid.2006.10.001

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd Ed.). https://doi.org/10.1038/156278a0

Krüger-Gottschalk, A., Knaevelsrud, C., Rau, H., Dyer, A., Schäfer, I., Schellong, J., & Ehring, T. (2017). The German version of the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): Psychometric properties and diagnostic utility. *BMC Psychiatry*, *17*(1), 1–9. https://doi.org/10.1186/s12888-017-1541-6

Lee, D. J., Bovin, M. J., Weathers, F. W., Palmieri, P. A., Schnurr, P. P., Sloan, D. M., … Marx, B. P. (2019). Latent factor structure of DSM-5 posttraumatic stress disorder: Evaluation of method variance and construct validity of novel symptom clusters. *Psychological Assessment*, *31*(1), 46–58. https://doi.org/10.1037/pas0000642

Liu, L., Wang, L., Cao, C., Qing, Y., & Armour, C. (2016). Testing the dimensional structure of DSM-5 posttraumatic stress disorder symptoms in a nonclinical trauma-exposed adolescent sample. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. https://doi.org/10.1111/jcpp.12462

Liu, P., Wang, L., Cao, C., Wang, R., Zhang, J., Zhang, B., … Elhai, J. D. (2014). The underlying dimensions of DSM-5 posttraumatic stress disorder symptoms in an epidemiological sample of Chinese earthquake survivors. *Journal of Anxiety Disorders*, *28*(4), 345–351. https://doi.org/10.1016/j.janxdis.2014.03.008

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behavior Research Therapy*, *33*(3), 335–343. https://doi.org/10.1016/005-7967(94)00075-U

Marôco, J. (2010). *Análise de equações estruturais: Fundamentos teóricos, software e aplicações [Structural equation analysis: Theoretical foundations, software and*

applications]. Lisbon: ReportNumber.

Pais-Ribeiro, J. L. J., Honrado, A., & Leal, I. (2004). Contribuição para o Estudo da Adaptação Portuguesa das Escalas de Ansiedade, Depressão e Stress (EADS) de 21 itens de Lovibond e Lovibond. *Psicologia, Saúde & …*, *5*(2), 229–239. Retrieved from http://www.scielo.oces.mctes.pt/scielo.php?pid=S1645-00862004000200007&script=sci_arttext

Pietrzak, R. H., Tsai, J., Armour, C., Mota, N., Harpaz-Rotem, I., & Southwick, S. M. (2015). Functional significance of a novel 7-factor model of DSM-5 PTSD symptoms: Results from the National Health and Resilience in Veterans Study. *Journal of Affective Disorders*, *174*, 522–526. https://doi.org/10.1016/j.jad.2014.12.007

Rasmussen, A., Verkuilen, J., Jayawickreme, N., Wu, Z., & McCluskey, S. T. (2019). When Did Posttraumatic Stress Disorder Get So Many Factors? Confirmatory Factor Models Since DSM–5. *Clinical Psychological Science*, *7*(2), 234–248. https://doi.org/10.1177/2167702618809370

Sachser, C., Berliner, L., Holt, T., Jensen, T., Jungbluth, N., Risch, E., … Goldbeck, L. (2018). Comparing the dimensional structure and diagnostic algorithms between DSM-5 and ICD-11 PTSD in children and adolescents. *European Child and Adolescent Psychiatry*, *27*(2), 181–190. https://doi.org/10.1007/s00787-017-1032-9

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to Structural Equation Modeling*. London: Routledge.

Seligowski, A. V., & Orcutt, H. K. (2016). Support for the 7-Factor Hybrid Model of PTSD in a Community Sample. *Psychological Trauma: Theory, Research, Practice, and Policy*, *8*(2), 218–221. https://doi.org/10.1037/tra0000104

Simms, L. J., Watson, D., & Doebbeling, B. N. (2002). Confirmatory factor analyses of posttraumatic stress symptoms in deployed and nondeployed veterans of the Gulf war. *Journal of Abnormal Psychology*. https://doi.org/10.1037/0021-843X.111.4.637

Sveen, J., Bondjers, K., & Willebrand, M. (2016). Psychometric properties of the PTSD checklist for dsm-5: A pilot study. *European Journal of Psychotraumatology*, *7*, 1–7. https://doi.org/10.3402/ejpt.v7.30165

Tabachnick, B. G., & Fidell, L. S. (2012). Using multivariate statistics. In *New York: Harper and Row* (4th ed.). https://doi.org/10.1037/022267

Wang, L., Zhang, L., Armour, C., Cao, C., Qing, Y., Zhang, J., … Fan, G. (2015). Assessing the underlying dimensionality of DSM-5 PTSD symptoms in Chinese adolescents surviving the 2008 Wenchuan earthquake. *Journal of Anxiety Disorders*, *31*, 90–97. https://doi.org/10.1016/j.janxdis.2015.02.006

Weathers, F. W., Bovin, M. J., Lee, D. J., Sloan, D. M., Schnurr, P. P., Kaloupek, D. G., … Marx, B. P. (2018). The Clinician-Administered PTSD Scale for DSM-5 (CAPS-5): Development and initial psychometric evaluation in military veterans. *Psychological Assessment*, *30*(3), 383–395. https://doi.org/10.1037/pas0000486

Weathers, F. W., Litz, B. T., Herman, D. S., Huska, J. A., & Keane, T. M. (1993). The PTSD Checklist (PCL): Reliability, validity, and diagnostic utility. *Paper Presented at the Annual Meeting of International Society for Traumatic Stress Studies, San Antonio, TX.*, Vol. 2, pp. 90–92.

Weathers, F. W., Litz, B. T., Keane, T. M., Palmieri, P. A., Marx, B. P., & Schnurr, P. P. (2013). The PTSD Checklist for DSM-5 (PCL-5). *National Center for PTSD*, *5*(August), 2002. https://doi.org/10.1037/t02622-000

Wilkins, K. C., Lang, A. J., & Norman, S. B. (2011). Synthesis of the psychometric

properties of the PTSD checklist (PCL) military, civilian, and specific versions. *Depression and Anxiety*. https://doi.org/10.1002/da.20837

Wortmann, J. H., Jordan, A. H., Weathers, F. W., Resick, P. A., Dondanville, K. A., Hall-Clark, B., … Litz, B. T. (2016). Psychometric analysis of the PTSD checklist-5 (PCL-5) among treatment-seeking military service members. *Psychological Assessment*, *28*(11), 1392–1403. https://doi.org/10.1037/pas0000260

Yufik, T., & Simms, L. J. (2010). A meta-analytic investigation of the structure of posttraumatic stress disorder symptoms. *Journal of Abnormal Psychology*, *119*(4), 764–776. https://doi.org/10.1037/a0020981

Zhou, X., Wu, X., & Zhen, R. (2017). Assessing the latent structure of DSM-5 PTSD among Chinese adolescents after the Ya'an earthquake. *Psychiatry Research*, *254*, 33–39. https://doi.org/10.1016/j.psychres.2017.04.029