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BASIC RESEARCH ARTICLE

Factor structure of the International Trauma Questionnaire in UK Armed Forces veterans residing in Northern Ireland

Cherie Armour [ID], Martin Robinson [ID] and Jana Ross [ID]

Stress Trauma and Related Conditions (STARC) Research Lab, School of Psychology, Queen's University Belfast, Belfast, Northern Ireland, UK

ABSTRACT

Background: Complex Posttraumatic Stress Disorder (C-PTSD) was recently included in the revised International Classification of Diseases (ICD-11) by the World Health Organization (WHO, 2018). C-PTSD is a new trauma related disorder which may develop after prolonged and multiple exposures to trauma. It is a sister disorder of PTSD and is further characterized by symptomatology of disorganized self-organization (DSO). To qualify for the diagnosis, individuals must first meet the diagnostic criteria for PTSD, then report DSO symptoms and functional impairment. A body of work is emerging which has focused on the underlying dimensionality of C-PTSD across both adult and more recently adolescent populations from differing index trauma groups and from across several nations and cultures. However, few studies have been conducted in populations exposed to combat trauma despite the obvious prolonged and multiple nature of their trauma histories.
Objective: To contribute to emerging evidence of the factor structure of ICD-11 C-PTSD in a novel population.
Methods: This is the first factor analytic study to explore C-PTSD in a sample of UK Armed Forces veterans residing in Northern Ireland (*N* = 732). C-PTSD was measured via the ITQ and we utilized CFA to assess the fit of 7 competing models.
Results: Based on established CFA fit indices, a correlated, first order, 6-factor model of C-PTSD, representing 3 PTSD and 3 DSO symptom groupings, was deemed to provide superior fit to the data compared to 6 alternative C-PTSD models. The superiority of the model was further supported by statistical comparisons of competing C-PTSD models. All factor loadings (0.866–0.998) and inter-factor correlations (.746-.975) of the optimally fitting model were statistically significant and high.
Conclusion: These results provide support for the construct validity of ICD-11 C-PTSD in a unique sample of Armed Forces veterans residing in Northern Ireland.

HIGHLIGHTS
- This is the first factor analytic study to explore C-PTSD in a sample of UK Armed Forces veterans residing in Northern Ireland.
- A correlated, first order, 6-factor model of C-PTSD, was deemed to provide superior fit to the data compared to 6 alternative C-PTSD models.
- These results provide support for the construct validity of ICD-11 C-PTSD.

Estructura Factorial del Cuestionario Internacional de Trauma en Veteranos de las Fuerzas Armadas del Reino Unido que residen en Irlanda del Norte

Antecedentes: El Trastorno de Estrés Postraumático Complejo (TEPT-C) fue recientemente incluido en la revisión de la Clasificación Internacional de Enfermedades (CIE-11) por la Organización Mundial de la Salud (OMS, 2018). EL TEPT-C es un nuevo trastorno relacionado con el trauma que puede desarrollarse posterior a exposición prolongada y múltiple a traumas. Es un trastorno hermano del TEPT, y se caracteriza además por su sintomatología de desorden en la auto-organización (DSO por sus siglas en inglés). Para calificar para este diagnóstico, los individuos deben cumplir primero con criterios para TEPT, y luego reportar síntomas de DSO y deterioro funcional. Un cúmulo de trabajo está emergiendo, y se ha concentrado en la dimensionalidad subyacente del TEPT-C en poblaciones de adultos y más recientemente en adolescentes, diferenciándolas de grupos de trauma índice y en numerosas naciones y culturas. Sin embargo, se han realizado pocos estudios en poblaciones expuestas a trauma de combate pese a la naturaleza obviamente prolongada y múltiple de sus historias de trauma.
Objetivo: Contribuir a la evidencia emergente de la estructura factorial del TEPT-C de la CIE-11 en una población nueva.
Métodos: Este es el primer estudio analítico factorial en explorar el TEPT-C en una muestra de Veteranos de las Fuerzas Armadas del Reino Unido que residen en Irlanda del Norte (*N*=732). El TEPT-C fue medido mediante el ITQ (Cuestionario Internacional de Trauma por sus siglas en inglés) y se utilizó análisis factorial confirmatorio (CFA por sus siglas en inglés) para evaluar el ajuste de 7 modelos en competencia.
Resultados: Basado en lo establecido por los índices de ajustes, un modelo de 6 factores correlacionado y de primer orden representando 3 agrupaciones de síntomas de TEPT y 3

agrupaciones de síntomas de DSO, fue encontrado que probó un ajuste superior a los datos comparado con los 6 modelos alternativos de TEP-C. La superioridad del modelo fue respaldada además por comparación estadística de los modelos en competencia de TEPT-C. Todas las cargas factoriales (0.866-0.998) y correlaciones inter-factoriales (.746-.975) del modelo con ajuste óptimo fueron estadísticamente significativas y altas.

Conclusión: Estos resultados aportan sustento a la validez del constructo TEPT-C del CIE-11 en una muestra única de veteranos de las Fuerzas Armadas que residen en Irlanda del Norte

居住在北爱尔兰的英国武装部队退伍军人中国际创伤问卷的因子结构

背景: 世界卫生组织 (WHO, 2018) 最近将复杂性创伤后应激障碍 (C-PTSD) 纳入了修订版《国际疾病分类》 (ICD-11) 。C-PTSD是一种新的创伤相关疾病, 可能在长期和多次创伤暴露后发展。它是PTSD的姐妹疾病, 其特征还在于自组织障碍 (DSO) 的症状学。要满足诊断条件, 个人必须首先满足PTSD的诊断标准, 然后报告DSO症状和功能损伤。大量工作集中在来自不同指数创伤组以及来自不同国家和文化的成年群体和更近期的青少年群体中, C-PTSD的潜在维度。但是, 但很少有研究在遭受战争创伤的群体中进行, 尽管其创伤史具有明显的长期性和多重性, 。

目的: 为一个新群体中ICD-11 C-PTSD因子结构的新兴证据做出贡献。

方法: 这是第一个对居住在北爱尔兰 (N = 732) 的英国武装部队退伍军人样本中C-PTSD进行因子分析的研究。C-PTSD由ITQ测量, 我们利用CFA评估了7种竞争模型的拟合度。

结果: 根据已确立的CFA拟合指数, 与6个替代C-PTSD模型相比, 表征3个PTSD和3个DSO症状组合的C-PTSD的相关一阶6因子模型被认为对数据拟合度更高。竞争性C-PTSD模型的统计比较进一步支持了该模型的优越性。最佳拟合模型的所有因子负荷 (0.866-0.998) 和因子间相关 (.746-.975) 在统计上均显著且很高。

结论: 这些结果为居住于北爱尔兰的武装部队退伍军人的独特样本中ICD-11 C-PTSD的构建效度提供了支持。

1. Introduction

The 11th revision of the International Classification of Disease (ICD-11; World Health Organisation [WHO], 2018) included a new chapter titled 'Disorders Specifically Associated with Stress'. Within this chapter was the inclusion of Complex Post-traumatic Stress Disorder (C-PTSD). The concept of C-PTSD is regarded as owing its origins to the seminal work of Judith Herman (1992). Herman posited that PTSD was not sufficient in its nosology to capture the true multi-faceted symptomatology expressed by individuals who had experienced prolonged and sustained traumatic life events; particularly those which had occurred in early and formative years. The development of C-PTSD in response to prolonged and multiple traumatic events has been further supported in recent years (Brewin et al., 2017; Cloitre et al., 2019). Hyland, Karatzias, Shevlin, Cloitre, and Ben-Ezra (2020) in comparing PTSD and C-PTSD rates across studies using data from several countries, concluded that CPTSD may occur as frequently (e.g. in US & Ireland) or indeed to a greater extent than PTSD (e.g. in the UK).

C-PTSD, as specified in ICD-11, requires that trauma exposed individuals first meet the diagnostic criteria for PTSD (characterized in ICD-11 by three symptom groupings of Re-experiencing, Avoidance, and a Heightened Sense of Threat), in addition to reporting at least one symptom from the three symptom groups of Disturbances in Self-Organization (DSO – comprising symptom groupings of Affective Dysregulation, Negative Self-Concept, and Difficulties in Sustaining Interpersonal Relationships). Both the symptoms of PTSD and DSO must correspond to functional impairment (WHO, 2018). Notably, the most recent edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) chose not to include C-PTSD as a new disorder within its nomenclature given view that C-PTSD as a concept lacked valid and reliable assessments (at the time the DSM-5 was being revised) and based on the strict criteria required for the inclusion of any additional disorders (Friedman, 2013; Resick et al., 2012).

Mirroring the factor analytic research that has focused on the underlying dimensionality of PTSD in the DSM (see Armour, Mullerova, & Elhai, 2016), albeit to a much lesser extent, there has been a recent academic focus on identifying which factor analytic model of C-PTSD best represents the constructs dimensionality (Brewin et al., 2017; Gilbar, Hyland, Cloitre, & Dekel, 2018; Hyland, Shevlin, Brewin, et al., 2017; Hyland et al., 2016; Kazlauskas et al., 2020; Knefel & Lueger-Schuster, 2013; Mordeno, Nalipay, & Mordeno, 2019; Nickerson et al., 2016; Shevlin et al., 2018). Within the extant literature several competing models have been specified and estimated ranging from a unidimensional model through to a model comprising 7 latent factors. The sum of models specified also comprise of a mixture of first and second order models (see Kazlauskas et al., 2020; Mordeno et al., 2019).

Noting that the ICD-11 is utilized worldwide (and far more extensively than the DSM nomenclature) and is specifically designed to be applicable and valid

across a variety of populations, nations, and cultures it is imperative that any resultant factor structure also provides optimal fit to data from a wide range of populations, nations, and cultures (Mordeno et al., 2019). To date the factor structure of C-PTSD, as measured via the International Trauma Questionnaire (ITQ; Cloitre et al., 2018), has typically focused on adult populations (e.g. Gilbar et al., 2018; Karatzias et al., 2016; Nickerson et al., 2016; Tay, Rees, Chen, Kareth, & Silove, 2015) but more recently there have been a number of studies assessing C-PTSDs dimensionality in adolescent populations (e.g. Haselgruber, Solva, & Lueger-Schuster, 2020; Kazlauskas et al., 2020; Sachser, Keller, & Goldbeck, 2017).

Of note, the existing factor analytic studies have been conducted across a variety of trauma populations from a multitude of countries. Gilbar et al. (2018) examined the construct validity of C-PTSD in Israeli perpetrators of intimate partner violence. Nickerson et al. (2016) focused on data from traumatized refugees of which 93% had been exposed to torture and were receiving psychological treatment in Switzerland. Tay et al. (2015) conducted a C-PTSD factor analytic study examining data from a sample of West Papuan refugees. Karatzias et al. (2016) utilized data from individuals exposed to a range of traumas in childhood and adulthood who were referred for psychological therapy to a National Health Service (NHS) trauma centre in Scotland. Kazlauskas, Gegieckaite, Hyland, Zelviene, and Cloitre (2018) recruited participants from primary mental health centres, outpatient mental health clinics and hospitals, private clinical psychologists' practice, and addiction rehabilitation centres across Lithuania.

To our knowledge, only two studies of the dimensionality of C-PTSD have been conducted in military populations using the ITQ. The first, Mordeno et al. (2019) utilized confirmatory factor analyses (CFA) to examine 7 competing models of C-PTSDs latent structure (as measured by an in-development version of the ITQ) in a sample of 450 Filipino combat exposed soldiers; of which the majority were male ($n = 440$; 98.9%). Of the 7 competing models, the preferred model, as based on a variety of established CFA fit indices, was a correlated 6-factor, first order model. This model has garnered prior support both as the best fitting model (Tay et al., 2018, 2015) and as a model with excellent fit (Gilbar et al., 2018; Hyland, Shevlin, Brewin, et al., 2017; Karatzias et al., 2016) across a variety of studies. The second, a recent study conducted by Murphy et al. (2020), examined the dimensionality of the ITQ among UK veterans recruited from a UK veterans' support charity. The results of this study indicated that the correlated 6-factor model and a two-factor second-order model provided acceptable fit to the data, however in contrast to the results of the Mordeno et al. (2019) they ultimately found that the two-factor second-order model provided the best fit to the data owing to slightly better fit indices.

Mordeno et al. (2019) also conducted nested and non-nested model comparisons and further found that the correlated 6-factor, first order model provided a statistically superior fit to the data than that provided by a model with two higher order factors of PTSD and DSO. This is notable as this latter model conceptualization is that most closely mapped to the ICD-11 premise of PTSD and DSO being higher order factors each represented by first order factors of intrusion, avoidance and threat for PTSD symptoms, and affective dysregulation, negative self-concept, and interpersonal relationship difficulties for DSO symptoms.

It is surprising that few C-PTSD factor analytic studies have focused on data gleaned from military populations given the fact that combat trauma is an umbrella term for a wide variety of traumatic life experiences that are known to be prevalent in such populations and the fact that these traumas are often prolonged and sustained by the nature of military deployments and active combat. Indeed, the UK Armed Forces initiated an Army Operation termed Operation BANNER (1969–2007); this was in response to civil conflict colloquially termed the 'Northern Irish Troubles'. Operation BANNER is notable as it is the longest military operation in the UK Armed Forces history spanning 38 years. The Ministry of Defence (2004) reported that around 300,000 military personnel served on Operation BANNER. Unique to Operation BANNER was the Army's utilization of Home Service battalions. Members of the Home Services were ordinarily resident in Northern Ireland prior to, during, and after joining the Army. Therefore, unlike those deployed to Northern Ireland from the remaining three nations of the UK, these individuals lived within the communities which they patrolled, and often worked second civilian jobs. All personal experienced high levels of threat to their safety and security and were regular targets of paramilitary organizations (Armour, Walker, Waterhouse-Bradley, Hall, & Ross, 2017). Moreover, multiple and prolonged exposures to trauma was commonplace for all residents of Northern Ireland; with 34,000 shootings and 14,000 bombings being attributable to the Troubles (Daly, 1999; Fay, Morrisey, & Smyth, 1998).

This is first study to assess C-PTSD and its resultant factor structure (as measured by the ITQ) in UK Armed Forces Veterans resident in Northern Ireland. We utilized CFA and specified and estimated 7-competing C-PTSD factor analytic models that have been previously examined in the literature. Based on the results of Mordeno et al. (2019), who specifically utilized data from combat exposed soldiers, in addition to a growing consensus within the literature for the

superiority of two models (Hyland, Shevlin, Brewin, et al., 2017; Hyland, Shevlin, Elklit, et al., 2017; Karatzias et al., 2016), we hypothesized that either the correlated 6-factor first order model (see Model 3, Figure 1) or the two-factor second-order model with six first-order factors (see Model 5, Figure 1) would provide the best fit to our data gleaned from UK Armed Forces veterans residing in Northern Ireland.

2. Method

2.1. Procedure and participants

The data for the current study comes from a larger cross-sectional self-report survey of the UK Armed Forces veterans living in Northern Ireland. Study procedures were approved by the Ulster University Research Ethics Committee (Ref: REC/17/0031) and the Queen's University Belfast's Faculty of Engineering and Physical Sciences Research Ethics Committee (Ref: EPS 19_156). Veterans were predominantly recruited through social media, local organizations that work with veterans, and recruitment via events focused on the armed forces community such as Armed Forces Day. Some were contacted directly if they had previously left their contact details with the research team and agreed to be contacted in relation to future research activities. The questionnaire was available online and in pen-and-paper format between December 2017 and June 2019.

Participants were included in the current study if they completed the relevant measures and reported a history of trauma (see the Measures section). Of the initial 1,329 veterans who provided consent for participating in the study, 266 were excluded, as they did not complete the trauma screen (see the Measures section). Of the remaining 1,063 veterans, 761 completed the International Trauma Questionnaire (ITQ; Cloitre et al., 2018). A further 29 had more than 80% of missing values on the ITQ and were excluded, leaving an effective sample size of $N = 732$ veterans.

2.2. Measures

Trauma exposure was assessed with 17 binary-scored (yes/no) items. Thirteen of these comprise the Stressful Life Events Screening Questionnaire adapted for DSM-5 by Elhai et al. (2012). The four other items enquiring about natural disasters, fire/explosion, exposure to a toxic substance, and causing serious injury/harm/death to someone else, were adapted from the Life Events Checklist for DSM-5 (Weathers et al., 2013). Participants were able endorse as many or as few events as they applied. Together this provides a more comprehensive coverage of trauma exposure in this population.

Symptoms of PTSD and CPTSD were assessed using the ITQ (Cloitre et al., 2018), which consists of 18 items enquiring about the ICD-11 PTSD and CPTSD, including the associated functional impairment. Six items assess PTSD's symptom clusters of re-experiencing,
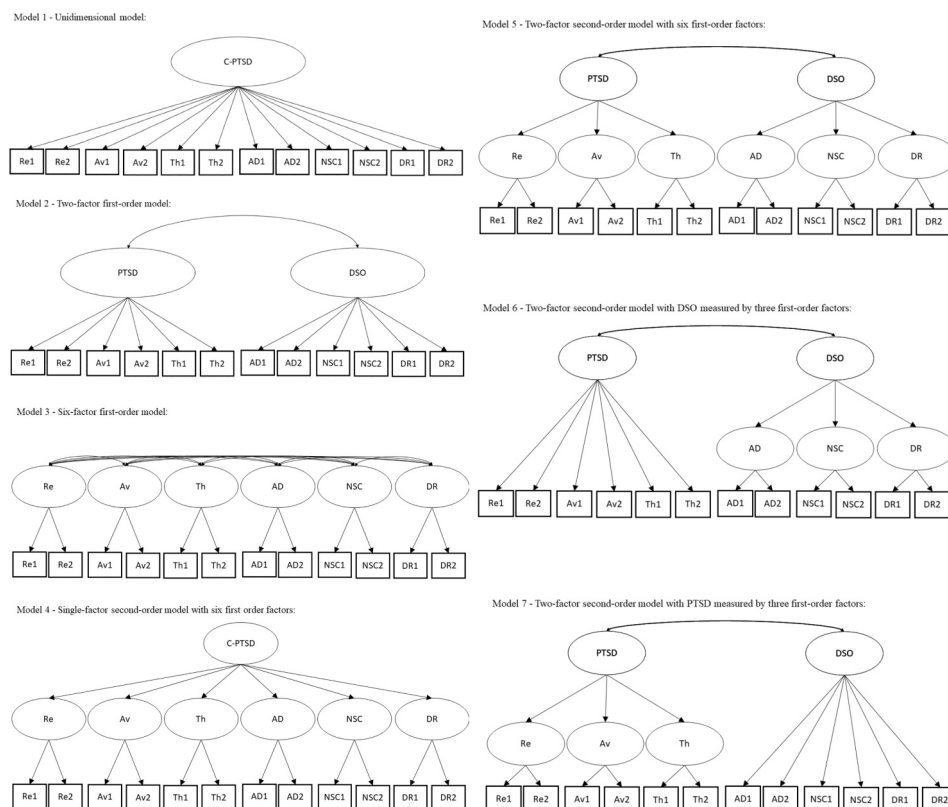

Figure 1. Competing CPTSD models.

avoidance and sense of current threat (two items each), six items assess the three symptom clusters of DSO – affective dysregulation, negative self-concept, disturbances in relationships (two items each), and the remaining six items assess functional impairment associated with the PTSD and DSO (three items each). Keeping their worst traumatic experience in mind (identified through the trauma screen), participants were asked to use a five-point Likert scale (0 = Not at all, 1 = A little bit, 2 = Moderately, 3 = Quite a bit, 4 = Extremely) to indicate how much each item bothered them over the past month. A probable diagnosis of PTSD is given to participants who report at least one symptom of re-experiencing, at least one symptom of avoidance and at least one symptom of sense of threat, rated as 'Moderately' or above, and additionally endorse at least one symptom of PTSD-related functional impairment ('Moderately' or above). A probable diagnosis of C-PTSD is given if participants meet the criteria for PTSD and additionally report at least one symptom of affective dysregulation, at least one symptom of negative self-concept, at least one symptom of disturbances in relationships, along with at least one symptom of DSO-associated functional impairment (all rated as 'Moderately' or above). Cronbach's alpha for all 18 items was .976 in the current study.

2.3. Data analysis

The fit of seven competing models of C-PTSD was assessed through CFA in Mplus 7.3 (Muthén & Muthén, 1998–2012). The models are depicted in Figure 1. Twelve items from the ITQ were used in the estimation of the models; six PTSD items and six DSO items. The items were treated as ordinal and the models were therefore estimated using the weighted least squares estimator with mean and variance-adjusted chi-square statistic and were based on polychoric covariance matrices, with probit regression coefficients. Model fit was assessed using the comparative fit index (CFI), Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA). CFI and TLI values ≥ .95 and RMSEA value ≤ .06 indicate excellent model fit. CFI and TLI values between 0.90–0.95 and RMSEA value between .06–.08 indicate adequate model fit (Browne & Cudeck, 2016; Hu & Bentler, 1999).

Nested models were compared using the chi-square difference tests through the DIFFTEST option in Mplus. Non-nested models were assessed using the Bayesian Information Criterion (BIC) and the Akaike Information Criterion (AIC), which were obtained by re-estimating the models with the robust maximum likelihood estimator. Lower relative values of BIC and AIC point to better-fitting models.

There was minimum amount of missing data in the effective sample (0.13% values) and this was handled using pairwise present deletion during model estimation.

3. Results

3.1. Sample characteristics

In the effective sample of 732 veterans, there were 71 (9.70%) females and 659 (90.03%) males (n = 2 missing). The mean age was 55.88 (SD = 10.59) years. Almost all participants (99.32%) self-reported their ethnicity as white. The vast majority (n = 539, 73.63%) were married or living with a partner (separated/divorced: n = 122, 16.67%; single/never married: n = 39, 5.33%; widowed: n = 30, 4.10%; other: n = 2, 0.27%). A total of 409 (55.87%) veterans were employed (retired: 168 (22.95%), unable to work/medically retired: 124 (16.94%); unemployed: 19 (2.60%); unemployed students: 5 (0.68%); other: 6 (0.82%); missing = 1). The vast majority of veterans served in the Army (n = 633, 86.48%), followed by the Navy (n = 78, 10.66%), the Royal Air Force (n = 58, 7.92%) and the Marines (n = 12, 1.64%; note that some served in more than one branch).

In terms of lifetime traumatic exposure, the most commonly experienced type of trauma was 'fire or explosion', reported by 600 (81.97%) participants. This was followed by 'any other situation where you were seriously injured or your life was in danger (e.g. involved in military combat or living in a war zone)?' (n = 502, 68.58%), 'being present when another person was killed, seriously injured, or sexually or physically assaulted' (n = 462, 63.11%), 'experiencing repeated or extreme exposure to horrifying details of another's death/injury/sexual violation' (n = 402, 54.92), and 'death of a family member/partner/very close friend due to accident/homicide/suicide' (n = 398, 54.37%). On average, participants experienced 6.39 (SD = 3.05) different trauma types. Using the diagnostic scoring for PTSD and C-PTSD (Cloitre et al., 2018), 165 (22.54%) participants met the criteria for probable C-PTSD, 46 (6.28%) met the criteria for probable PTSD only, and the remaining 521 (71.17%) met the criteria for neither.

3.2. Confirmatory factor analysis

As shown in Table 1, all models demonstrated an excellent fit based on CFI and TLI, but according to the RMSEA, only Model 3 (Six-factor first-order model) showed an excellent fit and Model 5 (Two-factor second-order model with six first-order factors) showed an adequate fit, with all other models fitting poorly. Inspection of the model fit indices, namely the AIC and BIC (Table 1), and statistical comparison of the models (Table 2) showed that Model 3 was the best fitting model. It was followed by Model 5, then Model 4, Model 6, Model 7, Model 2 and finally Model 1, which was the worst-fitting model. In Model 3, all items loaded highly and significantly onto their respective factors (Table 3). Inter-factor correlations (Table 4) were also high, ranging from .746 to .975.

Table 1. The fit of competing CPTSD models.

Model	χ^2 (p-value)	df	CFI	TLI	RMSEA (90% CI)	BIC	AIC
1	1694.099 (<.001)	54	.983	.979	.204 (.195–.212)	23646.218	23480.770
2	1029.825 (<.001)	53	.990	.987	.159 (.150–.167)	22952.387	22782.343
3	**134.629 (<.001)**	**39**	**.999**	**.998**	**.058 (.047–.069)**	**21708.468**	**21474.083**
4	563.010 (<.001)	48	.995	.993	.121 (.112–.130)	21884.287	21691.264
5	174.757 (<.001)	47	.999	.998	.061 (.051–.071)	21704.338	21506.720
6	751.684 (<.001)	50	.993	.990	.138 (.130–.147)	22272.834	22089.003
7	634.843 (<.001)	50	.994	.992	.126 (.118–.135)	22385.637	22201.805

Model 1 = Unidimensional model; Model 2 = Two-factor first-order model; Model 3 = Six-factor first-order model; Model 4 = Single-factor second-order model with six first order factors; Model 5 = Two-factor second-order model with six first-order factors; Model 6 = Two-factor second-order model with DSO measured by three first-order factors; Model 7 = Two-factor second-order model with PTSD measured by three first-order factors.

Table 2. Statistical comparison of competing CPTSD models.

Models compared	Chi-square difference test χ^2/df (p-value)	ΔBIC	ΔAIC	Better-fitting model
1 vs 2	237.476/1 (<.001)	-	-	2
1 vs 3	904.798/15 (<.001)	-	-	3
1 vs 4	595.614/6 (<.001)	-	-	4
1 vs 5	655.040/7 (<.001)	-	-	5
1 vs 6	450.937/4 (<.001)	-	-	6
1 vs 7	500.540/4 (<.001)	-	-	7
2 vs 3	535.629/14 (<.001)	-	-	3
2 vs 4	317.344/5 (<.001)	-	-	4
2 vs 5	388.508/6 (<.001)	-	-	5
2 vs 6	177.985/3 (<.001)	-	-	6
2 vs 7	215.224/3 (<.001)	-	-	7
3 vs 4	246.186/9 (<.001)	-	-	3
3 vs 5	43.492/8 (<.001)	-	-	3
3 vs 6	356.558/11 (<.001)	-	-	3
3 vs 7	294.930/11 (<.001)	-	-	3
4 vs 5	103.010/1 (<.001)	-	-	5
4 vs 6	109.284/2 (<.001)	-	-	4
4 vs 7	88.650/2 (<.001)	-	-	4
5 vs 6	214.332/3 (<.001)	-	-	5
5 vs 7	176.972/3 (<.001)	-	-	5
6 vs 7	-	112.803	112.802	6

Model 1 = Unidimensional model; Model 2 = Two-factor first-order model; Model 3 = Six-factor first-order model; Model 4 = Single-factor second-order model with six first order factors; Model 5 = Two-factor second-order model with six first-order factors; Model 6 = Two-factor second-order model with DSO measured by three first-order factors; Model 7 = Two-factor second-order model with PTSD measured by three first-order factors.

Table 3. Standardized factor loadings in the best-fitting model (Model 3).

Symptom	Factor	Factor loading
(1) Having upsetting dreams that replay part of the experience or are clearly related to the experience	Re	0.944
(2) Having powerful images or memories that sometimes come into your mind in which you feel the experience is happening again in the here and now	Re	0.959
(3) Avoiding internal reminders of the experience (for example, thoughts, feelings, or physical sensations)	Av	0.967
(4) Avoiding external reminders of the experience (for example, people, places, conversations, objects, activities, or situations)	Av	0.961
(5) Being 'super-alert', watchful, or on guard	Th	0.883
(6) Feeling jumpy or easily startled	Th	0.964
(7) When I am upset, it takes me a long time to calm down	AD	0.866
(8) I feel numb or emotionally shut down	AD	0.911
(9) I feel like a failure	NSC	0.981
(10) I feel worthless	NSC	0.998
(11) I feel distant or cut off from people	DR	0.946
(12) I find it hard to stay emotionally close to people	DR	0.906

All factor loadings were significant at $p < .001$. Re = re-experiencing, Av = avoidance, Th = sense of current threat, AD = affective dysregulation, NSC = negative self-concept, DR = disturbances in relationships.

4. Discussion

Consistent with prior factor analytic studies of C-PTSD (Hyland, Shevlin, Brewin, et al., 2017; Hyland, Shevlin, Elklit, et al., 2017; Karatzias et al., 2016; Mordeno et al., 2019), we hypothesized that of our 7 models, either the correlated 6-factor first order model (see model 3, Figure 1) or the two-factor second-order model with six first-order factors (see model 5, Figure 1) would provide the best fit to our data gleaned from UK Armed Forces veterans residing in Northern Ireland. Our hypothesis was confirmed in that a series of established fit indices (see Table 1) deemed that the correlated 6-factor first order model (see Model 3, Figure 1) provided superior fit to our data. The second-best

Table 4. Inter-factor correlations in the best-fitting model (Model 3).

	Re	Av	Th	AD	NSC	DR
Re	-	.836	.860	.843	.746	.760
Av	-	-	.841	.826	.746	.799
Th	-	-	-	.865	.749	.824
AD	-	-	-	-	.867	.975
NSC	-	-	-	-	-	.896
DR	-	-	-	-	-	-

All correlations were significant at $p < .001$. Re = re-experiencing, Av = avoidance, Th = sense of current threat, AD = affective dysregulation, NSC = negative self-concept, DR = disturbances in relationships.

fitting model, providing excellent fit to the data, was the two-factor second-order model with six first-order factors (see Model 5, Figure 1). These results are reminiscent of those reported by Murphy et al. (2020) and Mordeno et al. (2019) finding simultaneous acceptability of these models, however, are most aligned with that of Mordeno et al. (2019) finding the six-factor correlated model to provide slightly superior fit.

Mordeno et al. (2019) argued the superiority of the correlated 6-factor first order model contends that the six factors are related but independent and better represented as such rather than being merged into two higher order factors of PTSD and DSO as specified by the ICD-11. The superior fit of this model in the current study potentially calls into question the concept of C-PTSD as a 'sibling diagnosis', rather each of the six symptom clusters may be better understood as being more defined and independent from each other. The implication of this being that PTSD and DSO symptoms might be considered highly related, albeit lacking the hierarchical nature outlined by ICD-11

C-PTSD criteria. Researchers and practitioners might therefore be recommended to consider the potential for heterogeneous symptom presentations, possibly constituting 'subthreshold C-PTSD' (Folke, Nielsen, Andersen, Karatzias, & Karstoft, 2019).

It should be noted all items representing both the PTSD and DSO constructs were excellent representations of their corresponding factors due to their high standardized factor loadings (Table 3). The strongest of the standardized factor loadings was for the item 'I feel worthless' from the negative self-concept factor of DSO (0.998). This item as the best representative of the construct of CPTSD is pertinent in the context of a military veteran sample. Indeed, prior research which has been focused on meaning making in military and veteran populations post trauma experiences has suggested that a core component of a person's sense of their meaning in life is their sense of significance or mattering and thus the extent to which they judge themselves as worthwhile and of value to the world (Fischer, Shanahan, Hirsh, Stewart, & Rand, 2020).

Concerning inter-factor correlations in the best-fitting model (model 3), all were positive and high. PTSD factors correlated from .836 to .860, DSO factors correlated from .867 to .975 and the cross-construct factors correlated from .746 to .865. Overall correlations ranged from the lowest at .746 (negative self-concept [NSC] with re-experiencing and NSC with Avoidance) to the highest at .975 (affective dysregulation with disturbances in relationships). Concerning the latter, this strong correlation supports a wealth of prior literature which has concluded that affective (otherwise known as
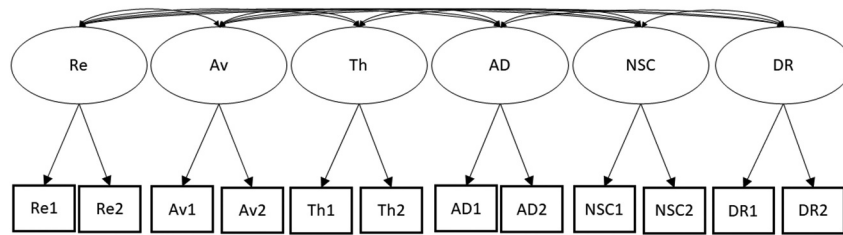

Model 1 - Unidimensional model:
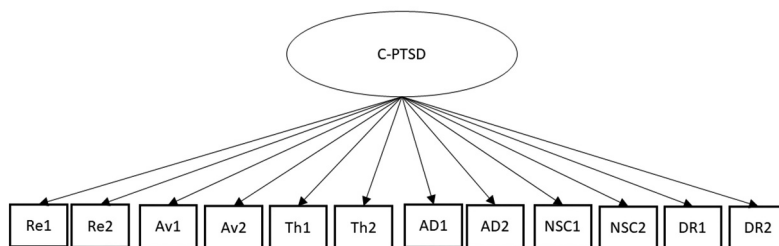
Model 1. Unidimensional model.
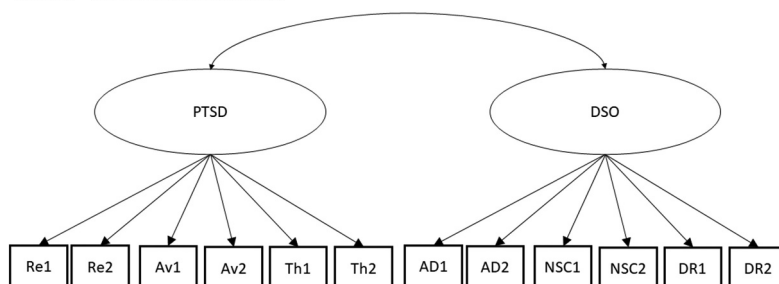
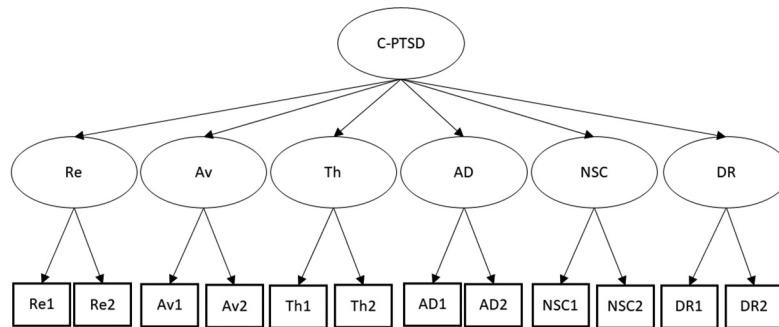

Model 2 - Two-factor first-order model:

Model 2. Two-factor first-order model.

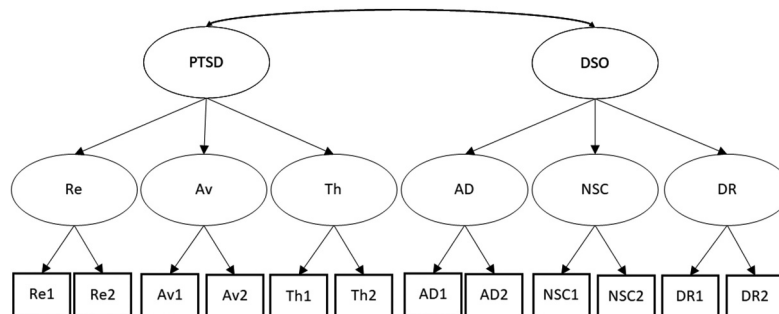Model 3 - Six-factor first-order model:

Model 3. Six-factor first-order model.

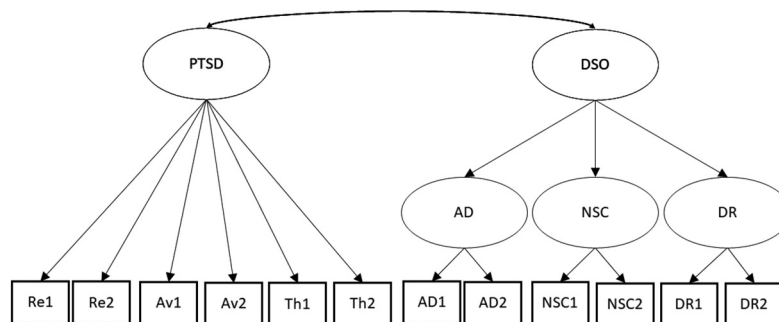Model 4 - Single-factor second-order model with six first order factors:

Model 4. Single-factor second-order model with six first order factors.

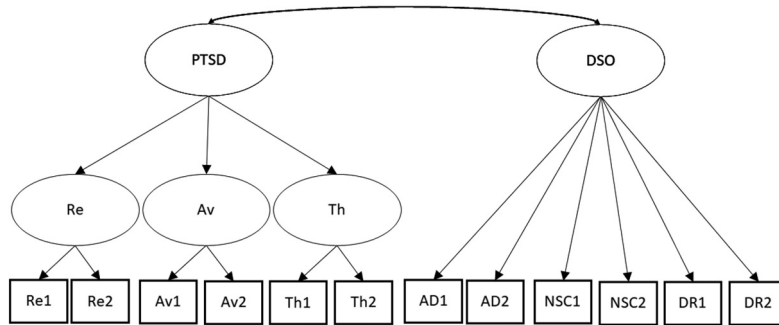Model 5 - Two-factor second-order model with six first-order factors:

Model 5. Two-factor second-order model with six first-order factors.

Model 6 - Two-factor second-order model with DSO measured by three first-order factors:

Model 6. Two-factor second-order model with DSO measured by three first-order factors.

Model 7 - Two-factor second-order model with PTSD measured by three first-order factors:

Model 7. Two-factor second-order model with PTSD measured by three first-order factors.

emotional) dysregulation impacts on a person's ability to create and maintain interpersonal relationships with others. In particular, it has been suggested that relationship insecurities, hostility, and a perceived lack of connectedness and closeness are possible pathways by which emotion dysregulation negatively impacts on relationship quality (Miano, Grosselli, Roepke, & Dziobek, 2017). From a statistical perspective, it should however be queried as to whether such a high correlation between two latent factors (.97) indicates that these factors are measuring the same construct.

Similarly of note is the heightened probable prevalence of C-PTSD relative to PTSD in this sample, 22.54% vs. 6.28% respectively. This trend is in line with prevalence of PTSD (14%) and C-PTSD (56.7%) reported by Murphy et al. (2020) among UK veterans. Of note, the sample investigated by Murphy et al. (2020) is considered a treatment seeking sample with all participants engaging with a national UK charity called Combat Stress. The current study investigated a community sample of military veterans' resident in NI, however recruitment was partly driven through local veterans support organizations which may have contributed to a greater representation of those experiencing clinically significant distress. While these results should be interpreted cautiously regarding C-PTSD prevalence given the sampling methods used, the heightened prevalence of C-PTSD relative to PTSD highlight the complex needs of military veteran group.

It is pertinent to note that prior research has reported high rates of childhood trauma in military populations, and that this has been commonly associated with C-PTSD (e.g. Folke et al., 2019; Murphy et al., 2020). Although not reported herein, an alternative study using the same data from UK Armed Forces Veteran in NI has reported high rates of childhood adversities (> 65.% reporting at least one event; Travers, McGlinchey, & Armour, under review) and so it is likely that this is in part related to the relatively high rate of C-PTSD (22.54%) compared to PTSD (6.28%) reported in the present study.

In sum, the current study which supported the fit of the correlated 6-factor first order model (see model 3, Figure 1) in a military veteran population extends previous findings from the limited studies to date conducted with data from combat exposed military personnel (Mordeno et al., 2019; Murphy et al., 2020). Of note, the Mordeno et al. (2019) study was based on data from a similar trauma exposed sample however the ethnicity and cultural characteristics of that sample were quite different; Filipino vs Northern Irish soldiers. This research contributes further supporting evidence for the ICD-11 implementation and for the ITQ as a reliable and valid measurement of PTSD and C-PTSD across various populations and contexts (see Karatzias et al., 2016).

4.1. Limitations

Despite the unique and valuable contributions of this study to the body of literature on the dimensionality of C-PTSD, there are some limitations which should be noted and considered. First, this was a cross-sectional study which relied on the collection of data from participants at a single and specific point in time. This study design was partly attributable to our desire to have complete and full anonymity of respondents given the complex social-political situation for veterans in Northern Ireland that often results in the concealment of past military involvement. Ideally, we would have collected participant contact details and data would have been collected longitudinally across multiple time points. This would have allowed us to understand the latent dimensions of C-PTSD across time such as investigating the temporal factorial invariance of C-PTSD models. To date, the temporal study of C-PTSD has rarely been investigated; however a recent study using a representative sample of Israeli participants examined C-PTSD stability over a one year period and concluded that both ICD-11 PTSD and CPTSD are indeed stable constructs (Hyland et al., 2020).

Second, we utilized a self-report measure of C-PTSD (the ITQ) and so the data is subject to the

various limitations associated with self-report measures rather than clinical diagnostic instruments. Of note, however, there are currently no diagnostic clinical interviews publicly available for ICD-11 PTSD and C-PTSD (Kazlauskas et al., 2020). An initial validation of the International Trauma Interview, a semistructured clinical interview currently in development in line with ICD-11 criteria, has indicated this to be a promising method of assessing ICD-11 PTSD and C-PTSD (Bondjers et al., 2019). Future studies should therefore collect data via clinical diagnostic instruments and existing self-report measures and investigate the diagnostic concordance rates.

Third and related to this, our current study collected data from a non-clinical sample given the wide and varied recruitment strategies required to maximize response rates within a hidden and hard to reach population. Arguably, however, as the authors worked very closely with organizations in the UK who directly provide services to veterans in Northern Ireland it is acknowledged that a higher proportion of the sample may be treatment seekers as a result.

5. Conclusion

In conclusion, this study provides novel evidence of the underlying dimensionality of C-PTSD in a rarely assessed population within this field, military veterans. Moreover, the population of UK veterans assessed are unique as they reside in Northern Ireland which has a legacy of socio-political factors resulting in military veterans often perceiving personal threat and concealing their veteran status. The results of the CFA of 7-competing models provides further support for a correlated, first order, 6-factor model of C-PTSD, representing 3 PTSD and 3 DSO symptom groupings. All factor-loadings were significant and high as were all inter-factor correlations; together providing further confidence for the viability of this model. Future research should further assess the dimensionality of C-PTSD in military veteran samples across a variety of geographies to determine whether the results of this study combined with those with Filipino soldiers (Mordeno et al., 2019) and UK veterans (Murphy et al., 2020) might generalize. Furthermore, studies should investigate whether the optimal factor analytic model is invariant across a variety of characteristics such as gender, clinical and sub-clinical C-PTSD caseness, time, and cultures.

ORCID

Cherie Armour http://orcid.org/0000-0001-7649-3874
Martin Robinson http://orcid.org/0000-0002-4276-2893
Jana Ross http://orcid.org/0000-0003-2794-1268

Data availability statement

Participants did not provide consent for their data to be made publicly available. The raw data corresponding to the paper may be made available upon reasonable request from the Principal Investigator (Armour) in conjunction with an appropriate data sharing agreement.

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