Research paper

The prevalence, latent structure and psychosocial and cognitive correlates of complex post-traumatic stress disorder in an adolescent community sample

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A B S T R A C T

Complex PTSD has received growing attention in recent years. However, the validity, prevalence and risk factors of this diagnosis remain unclear. This study examined PTSD presentations in adolescents using diagnostic criteria and latent class analysis (LCA). It then explored the role of demographics factors, trauma history factors, psychopathology factors and cognitive factors in predicting different PTSD presentations. A cross-sectional data comprising self-report measures of 342 community adolescents (12–15 years) were collected and analysed. 2.3 %, 5.6 % and 10 % of adolescents met the criteria for PTSD, CPTSD and disturbances in self-organisation (DSO) respectively. A three-class model (healthy class, CPTSD class and DSO class) were generated from LCA. Adolescents with CPTSD were most likely to be female and endorsed the most overall trauma types, interpersonal trauma types, depression, anxiety and maladaptive cognitive processes, followed by adolescents with DSO and subsequently healthy adolescents. CPTSD appeared to be a more common presentation than PTSD among community adolescents. The relatively high prevalence of DSO is noteworthy and suggests that DSO is not necessarily accompanied by PTSD. Given the strong associations between CPTSD and cognitive processes implicated in PTSD, CPTSD as a construct might be conceptually similar to PTSD.

1. Introduction

Introduced by the American Psychiatric Association (1980) initially as a means to conceptualise veterans' stress reactions, post-traumatic stress disorder (PTSD) historically reflects psychological difficulties arising from relatively circumscribed traumatic events (Herman, 1992). In recent decades, there have been concerns that PTSD as a diagnosis does not encapsulate the full variety and complexity of trauma-related psychopathology. This is thought to be particularly the case for individuals with chronic trauma history (Herman, 1995). To improve the relevance of stress-related diagnoses, the 11th version of the International Classification of Diseases (ICD-11) proposed the diagnosis of complex PTSD (CPTSD) alongside "simple" PTSD (World Health Organization, 2018). Research on CPTSD, especially those conducted with children and adolescents, is however still in its infancy.

1.1. Origins and definition of CPTSD

One of the earliest accounts of CPTSD can be found in Herman (1992). Examining victims of recurrent trauma such as torture, childhood abuse and domestic violence, the study identified a number of affective, dissociative and somatic post-traumatic stress symptoms (PTSS) that were not delineated in the criteria for PTSD. To account for such PTSS, Herman (1992) put forward a complex post-trauma syndrome that is purportedly a sequala of prolonged traumatisation. Cloitre et al. (2013) was the first study that provided empirical support for CPTSD when it was first recommended for inclusion within the ICD-11. The diagnostic criteria of CPTSD include 1) core PTSD symptoms, namely trauma-exposure, re-experiencing, avoidance and hypervigilance and 2) disturbances in self-organisation (DSO) symptoms, namely affect dysregulation, negative self-concept and relationship difficulties (World Health Organization, 2018).

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1.2. Current research on CPTSD

Research efforts in the past decade have focused on examining the validity of CPTSD in adults through latent class analysis (LCA) and latent profile analysis (LPA), both of which serve to identify latent sub-populations (i.e. classes) within a given population based on a set of variables. Cloitre et al. (2013) is one of the earliest studies to perform an LPA on individuals with interpersonal traumas. The findings revealed three distinct classes of individuals: a low symptom class (i.e. low in core PTSD symptoms and low in DSO symptoms), a PTSD class (i.e. high in core PTSD symptoms and low in DSO symptoms) and a CPTSD class (i.e. high in core PTSD symptoms and high in DSO symptoms), thereby supporting the ICD-11 conceptualisation of PTSD and CPTSD. Such findings were subsequently supported by multiple adult studies (Elklit et al., 2014; Hébert and Amédée, 2020; Kazlauskas et al., 2018; Murphy et al., 2016).

However, LCA/LPA findings were not consistent across all samples and ages. In addition to healthy, PTSD and CPTSD classes, an appreciable number of child and adolescent studies reported a fourth class with low core PTSD symptoms but high DSO symptoms (Kazlauskas et al., 2020; Li et al., 2021; Perkonigg et al., 2016; Tian et al., 2021). This "DSO only" class is not recognised within the current ICD-11 classification of post-traumatic stress disorders (i.e. PTSD and CPTSD). Furthermore, Palic et al. (2016) and Liddell et al. (2019) identified a "dissociative" class (i.e. high core PTSD symptoms, negative self-concept and relationship difficulties but low affect dysregulation) and an "affect dysregulation" class (i.e. low core PTSD symptoms, negative self-concept and relationship difficulties but high affect dysregulation) respectively. These symptom profiles again could not fit neatly into the PTSD/CPTSD classification, concomitantly raising questions around the validity of CPTSD in different populations.

1.3. Critique on current research

The current literature consists of a number of limitations and gaps. First, due to inconsistent LCA and LPA findings, there is a lack of consensus regarding the validity of CPTSD. Second, as most studies to date have been conducted with adult populations, our understanding of CPTSD among children and adolescents is limited (Brewin, 2020). Given the difference in developmental stage, children and young people could potentially react to recurrent trauma differently and thereby display differing symptom profiles compared to adults (Salmon and Bryant, 2002). Third, epidemiological studies on CPTSD are scant. Little is known about its prevalence in children and adolescents. To our knowledge there are also no epidemiological data on DSO-only presentation, despite repeated reports of the DSO class in child and youth studies. Fourth, correlates of CPTSD are understudied. It remains unclear whether or not CPTSD possesses risk factors distinct from that of PTSD and other trauma-related psychopathology.

1.4. Research questions

The current study addressed the above limitations with two research questions. First, post-trauma stress presentations among community adolescents were examined. Specifically, we first used diagnostic criteria to determine the prevalence of PTSD, CPTSD and DSO, then employed LCA to identify PTSD subgroups in a data-driven manner.

Second, the psychosocial and cognitive correlates of different post-trauma stress presentations from diagnostic criteria and LCA were investigated. Specifically, we compared the groups in terms of 1) demographic factors (i.e. age and sex), 2) trauma history factors (i.e. total trauma exposure, non-interpersonal trauma exposure and interpersonal trauma exposure), 3) psychopathology factors (i.e. anxiety and depression) and 4) cognitive factors (i.e. safety-seeking behaviours, cognitive avoidance, rumination and trauma-related appraisals). The cognitive factors were studied due to their implication in PTSD as illustrated by the Ehlers and Clark (2000) cognitive model of PTSD, Sibrava and Borkovec (2006) cognitive avoidance theory of worry and Nolen-Hoeksema (2004) response styles theory.

2. Methods

2.1. Design

Data were drawn from a cross-sectional survey of community-recruited youth. Data on the development of one measure have already been reported (Alberici et al., 2018).

2.2. Participants

The participants were adolescents recruited from two rural secondary schools in East Anglia. The inclusion criteria were fluency in English, under the age of 18 and absence of any intellectual or neuro-developmental disability. Among the 555 students of both schools, 391 (70.5 %) agreed to participate. Such a high response rate made our sample sufficiently representative of the entire population of students across the two schools. Our participants consisted of 331 (84.6 %) White British, 8 (2.1 %) minority ethnicity and 52 (13.3 %) unknown. 10.5 % of participants were eligible for free school meals (a commonly used UK metric for poverty). This was comparable to the national rate of 12.9 % (Department for Education, 2019), hence suggesting our participants' socioeconomic status was roughly representative of the wider UK population. After excluding participants with significant missing data (i.e. missing data >33.3 %), the sample size of the present study was 342.

2.3. Measures

2.3.1. Child and Adolescent Trauma Screening

The Child and Adolescent Trauma Screening (CATS) developed by Sachser et al. (2017) to assess DSM-5 PTSD was used to measure trauma exposure, PTSD, CPTSD and DSO. The scale consisted of three parts. The first part assessed trauma exposure with 15 items on exposure to potentially traumatic events and an item asking respondents which event bothered them the most. The 15 items were rated on a "yes" (1) or "no" (0) scale and a higher total score indicated exposure to more trauma types. The second part assessed PTSS with 20 items based on DSM-5 criteria. Items were rated on a 4-point scale of "never" (0), "once in a while" (1), "half the time" (2) and "almost always" (3) and a higher total score translated to higher PTSS. The third part assessed functional impairment with five items rated on a "yes" (1) or "no" (0) scale. The CATS was validated across different child and adolescent populations and was found to have excellent internal consistency, good convergent and discriminant validity and factorial validity (Nilsson et al., 2021; Sachser et al., 2017). In the present study, trauma exposure items, functional impairment items and 10 PTSS items from the CATS were used to assess PTSD, CPTSD and DSO (see Supplementary materials).

2.3.2. Child Post-Traumatic Cognitions Inventory Short-Form

The Child Post-Traumatic Cognitions Inventory Short-Form (CPTCI-S) developed by McKinnon et al. (2016) was used to measure negative trauma-related appraisals. It was an abridged version of the original CPTCI developed by Meiser-Stedman et al. (2012) and consisted of 10 items assessing respondents' endorsement of maladaptive post-traumatic cognitions on a 4-point scale from "don't agree at all" to "agree a lot". Higher total scores translated to more maladaptive trauma appraisals. It can be divided into two subscales, namely Permanent and Disturbing Change (PDC) subscale and Fragile Person in a Scary World (FPSW) subscale. In this study, alongside items from the CATS, three items from the FPSW subscale were taken to assess CPTSD and DSO (see Supplementary materials). To avoid overlapping items, only the PDC subscale was used to measure trauma appraisals as potential correlates of PTSD, CPTSD and DSO. CPTCI-S possesses good to excellent internal

consistency, test-retest reliability and construct validity (McKinnon et al., 2016; Lee et al., 2018). Its internal consistency (Cronbach's alphas) in this study was 0.94.

2.3.3. Child Safety Behaviour Scale

The Child Safety Behaviour Scale (CSBS) developed by Alberici et al. (2018) was used to measure safety-seeking behaviours. Comprising 13 items with two subscales, namely strategic hypervigilance (SH) and affective suppression (AS), it examined how much respondents engaged in different safety behaviours in the past two weeks. Items were rated on a 4-point scale ranging from "never" (0) to "always" (3) with higher total scores reflecting more safety seeking behaviours. The CSBS was reported to have excellent internal consistency, good test-retest reliability and good discriminant validity (Alberici et al., 2018). Its Cronbach's alpha value in this study was 0.92.

2.3.4. Cognitive Avoidance Questionnaire

The Cognitive Avoidance Questionnaire (CAQ) developed by Sexton and Dugas (2008) was used to measure cognitive avoidance. It consisted of 25 items that examined five worry-related cognitive avoidance strategies, namely thought suppression, thought substitution, distraction, avoidance of threatening stimuli and transformation of images into thoughts. Items were rated on a 5-point scale ranging from "not at all like me" (1) to "always like me" (5). Higher total scores were indicative of more employment of cognitive avoidance strategies. The CAQ was validated across samples and settings with good factor structure and psychometric properties (Postigo et al., 2020; Vanderveren et al., 2020). Its Cronbach's alpha value here was 0.94. In the current study, the five items on transformation of images into thoughts were excluded due to uncertainty concerning its conscious accessibility (Sexton and Dugas, 2008) and developmental considerations of the study sample.

2.3.5. Child Response Styles Questionnaire

The Child Response Styles Questionnaire (CRSQ) developed by Abela et al. (2007) was used to measure rumination. Based on the response styles theory posited by Nolen-Hoeksema (2004), it comprised three 13-item sub-scales: rumination, distraction and problem-solving. Only the rumination sub-scale was used in the present study. Items were rated on a 4-point scale from "never" (0) to "almost always" (3) and higher total scores corresponded to more rumination. The CRSQ demonstrated good internal consistency, test-retest reliability and convergent validity (Abela et al., 2007). Its Cronbach's alpha value in this study was 0.95.

2.3.6. Revised Children's Anxiety and Depression Scale-25

The Revised Children's Anxiety and Depression Scale-25 (RCADS-25) developed by Ebesutani et al. (2012) was used to measure anxiety and depression. An abridged version of the RCADS, the RCADS-25 comprises 25 items, with 15 items related to the anxiety subscale and 10 items related to the depression subscale. Each item is scored on a 4-point scale with response options ranging from never to always. The RCADS-25 was shown to have good factor structure, construct validity and test-retest reliability (Klaufus et al., 2020). The Cronbach's alphas of the anxiety and depression subscales were 0.91 and 0.92 respectively.

2.4. Procedures

The study was approved by the UK Health Research Authority (Derby Research Ethics Committee, reference 16/EM/0009). Contact was first made with secondary schools and colleges in the East Anglian region. Two secondary schools expressed interest in the study and were able to participate within the recruitment timeframe. An opt-out consent procedure based on previously successful study designs (e.g. Meiser-Stedman et al., 2012) was adopted. Participants' guardians were given a guardian information sheet and consent form containing study details and the opt-out procedure. Guardians' consent was presumed if no opt-out was received.

2.5. Data analysis

Preliminary analyses were conducted with IBM SPSS Statistics, version 25. Participants' demographic features, trauma history, anxiety and depression levels and endorsement of cognitive processes were reported using descriptive statistics.

Two approaches were used to examine post-traumatic stress presentations in the sample. First, diagnostic criteria based on ICD-11 were generated in SPSS syntax files to identify the prevalence of PTSD, CPTSD and DSO (see Supplementary materials). The diagnostic algorithm for PTSD was presence of trauma (i.e. ≥ 1 score in CATS items 1–15), functional impairment (i.e. ≥ 1 score in CATS items 36–40), reexperiencing (i.e. ≥ 2 score in CATS items 16, 17 or 18), avoidance (i.e. ≥ 2 score in CATS items 21 or 22) and hypervigilance (i.e. ≥ 2 score in CATS items 32 or 33) and absence of CPTSD. The diagnostic algorithm for CPTSD included the criteria for PTSD (except "absence of CPTSD") plus presence of affective dysregulation (i.e. ≥ 2 score in CATS items 26 or 30), negative self-concept (i.e. ≥ 2 score in CPTCI items 4 or 5) and relationship difficulties (i.e. ≥ 2 score in CATS item 28 or CPTCI item 2) Lastly, the algorithm for DSO was presence of affective dysregulation (i.e. ≥ 2 score in CATS items 26 or 30), negative self-concept (i.e. ≥ 2 score in CPTCI items 4 or 5) and relationship difficulties (i.e. ≥ 2 score in CATS item 28 or CPTCI item 2) and absence of PTSD and CPTSD. The above diagnostic algorithms were generated such that the PTSD, CPTSD and DSO groups were non-overlapping.

Second, LCA was conducted with the poLCA-package in R to classify individuals based on their pattern of symptoms. Due to a lack of universal rules on model selection, various fit statistics were used to determine the optimal class model. These included the Akaike Information Criterion (AIC; Akaike, 1987) and Bayesian Information Criterion (BIC; Schwarz, 1978), where lower values would suggest a better balance between model fit and parsimony and hence better fitting class models. Entropy was also assessed to ensure clear delineation between classes; the closer the entropy value is to one, the more differentiated the classes are (Celeux and Soromenho, 1996). Although there is no agreed upon cut-off criterion, Weller et al. (2020) recommended an entropy of 0.6 or above. The AIC, BIC and entropy are the only fit statistics reported by the poLCA package we used; these statistics have been shown to be reliable indicators of model fit (Nylund et al., 2007; Raftery, 1995; Weller et al., 2020).

To explore the psychosocial and cognitive correlates of different post-traumatic stress presentations as identified by diagnostic criteria and LCA, chi square tests of independence and analysis of covariance (ANOVAs) were conducted with IBM SPSS Statistics version 25. The independent variable (IV) was diagnostic groups derived from diagnostic criteria/class memberships generated from LCA. The dependent variables (DVs) were demographic factors (i.e. age and sex), trauma history factors (i.e. total trauma exposure, non-interpersonal trauma exposure, interpersonal trauma exposure), psychopathology factors (i.e. anxiety and depression) and cognitive factors (i.e. safety-seeking behaviours, cognitive avoidance, rumination and trauma-related appraisals). For ANOVAs, if significant differences were detected across classes, post hoc tests were conducted to examine the differences. To address the inflation of type 1 error due to multiple comparisons, the Bonferroni correction was applied in which the alpha value of 0.05 was divided by the number of tests performed.

3. Results

3.1. Sample characteristics

Our sample consisted of 177 males and 165 females with a mean (SD) age of 13.7 (0.6). Participants were exposed to a mean of 2.4 (SD = 2.0) trauma types; 86 % of them had been exposed to at least one traumatic event. Summary statistics for all measures are displayed in Table 1.

Table 1

Descriptive statistics on demographic, trauma history, psychopathology and cognitive factors and PTSS symptom clusters (*N* = 342).

Variables	Mean	SD	Range	Frequency (%)
Demographic factors				
Age	13.7	0.6	12–15	–
Gender				
Male	–	–	–	177 (52)
Female	–	–	–	165 (48)
Trauma history factors				
Trauma types	2.4	1.94	0–11	–
Non-interpersonal trauma	0.7	0.7	0–3	–
Interpersonal trauma	1.5	1.4	0–8	–
Psychopathology factors				
Anxiety (RCADS-25)	8.8	8.0	0–42	–
Depression (RCADS-25)	6.0	6.1	0–28	–
Cognitive factors				
Safety behaviours (CSBS)	19.1	12.3	0–60	–
Cognitive avoidance (CAQ)	36.2	20.3	0–98	–
Rumination (CRSQ)	9.3	10.1	0–39	–
Trauma appraisal (CPTCI-PDC)	2.4	3.8	0–18	–
PTSD symptom clusters				
Trauma exposure	–	–	–	293 (86)
Impairment	–	–	–	178 (52)
Reexperiencing	–	–	–	78 (23)
Avoidance	–	–	–	96 (28)
Hypervigilance	–	–	–	89 (26)
Affective dysregulation	–	–	–	89 (26)
Negative self-concept	–	–	–	109 (32)
Relationship difficulties	–	–	–	130 (38)
PTSD	–	–	–	8 (2.3)
CPTSD	–	–	–	19 (5.6)
DSO	–	–	–	35 (10)

Notes: CAQ = Cognitive Avoidance Questionnaire; CPTCI-PDC = Child Post-Traumatic Cognitions Inventory - Permanent and Disturbing Change subscale; CPTSD = complex post-traumatic stress disorder; CRSQ = Child Response Styles Questionnaire; CSBS = Child Safety Behaviour Scale; DSO = disturbances in self-organisation; PTSD = post-traumatic stress disorder; RCADS-25 = Revised Children's Anxiety and Depression Scale-25.

3.2. Post-traumatic stress presentation

3.2.1. Diagnostic criteria

Diagnostic criteria were applied to examine the prevalence of PTSD, CPTSD and DSO (see Table 1). The majority of participants reported exposure to at least one type of trauma. Over half reported that these traumatic experiences markedly interfered with at least one domain of their daily functioning. Based on their presentation, 8 participants (2.3 %) met the criteria of PTSD, 19 participants (5.6 %) met that of CPTSD and 35 participants (10 %) met that of DSO.

3.2.2. Latent class analysis

Latent class analysis was conducted to differentiate participants based on symptom patterns (see Table 2). Two to five class models were tested. Among the four models, the two-class and three-class models were superior to the others due to having lower Akaike information criterion (AIC) values, lower Bayesian information criterion (BIC) values and greater entropy values. Between the two-class and three-class models, different fit statistics supported different models as the optimal model. While the three-class model had a lower AIC, the two-class model had a lower BIC. Normally BIC would be prioritised over

Table 2

Fit indices of latent class analysis (N = 342).

Model	Log likelihood	Number of parameter	AIC	BIC	Entropy
2 classes	−930.8	13	1887.5	1938.5	0.86
3 classes	−914.2	20	1868.4	1943.8	0.73
4 classes	−907.8	27	1869.6	1971.4	0.51
5 classes	−905.3	34	1878.7	2006.8	0.67

AIC due to the former being shown as a more consistent indicator for the correct number of classes (Nylund et al., 2007). In this case, however, the BIC difference was only 5.3 which according to Raftery (1995) suggested "positive" but not "strong" evidence (i.e. BIC difference > 6). On the other hand, the AIC difference was 19.1 which was a more considerable difference (Hu, 2007). Despite each model having their merits and demerits, the three-class model was used for subsequent analyses due to its greater clinical relevance (the two-class model was unlikely to be clinically useful as it classified around one third of youths as having high levels of CPTSD symptoms). That said, due to its statistical validity, the two-class model and relevant analyses were presented in Fig. S1 and Table S5 of Supplementary materials.

The three-class model is presented in Fig. 1. Class 1 (*n* = 230; 67.2 %) could be considered as the "healthy class" due to low levels of PTSD and DSO symptoms, while Class 2 (*n* = 62; 18.1 %) could be considered as the "CPTSD class" due to high levels of PTSD and DSO symptoms. The additional Class 3 (*n* = 50; 14.6 %), given low levels of PTSD symptoms yet high levels of DSO symptoms, could be interpreted as the "DSO class". No "PTSD class" was identified in this model.

3.3. Correlates

3.3.1. Between groups differences across diagnostic groups

ANOVAs and chi square tests of independence were conducted to explore the correlates of different diagnostic groups (see Table 3). ANOVAs were used for continuous variables while chi square tests were used for categorical variables (i.e. sex). To adjust for multiple comparisons, the Bonferroni correction was applied in which the alpha level was set at 0.004.

For demographics, although no significant difference in age was found, the chi-square test revealed a significant difference in sex, X^2 (3) = 24.79, $p < 0.001$, V = 0.27. Specifically, the CPTSD group comprised more females than the PTSD and DSO groups, which in turn comprised more females than the healthy group. For trauma history factors, significant differences were found in overall trauma types and interpersonal trauma types but not non-interpersonal trauma types. For psychopathology factors, significant differences were identified in both depression and anxiety levels. Significant differences were also detected across all cognitive factors. With the exception of the safety-seeking behaviours strategic hypervigilance subscale, the effect sizes of the differences were all large in nature.

Post hoc tests indicated that CPTSD in general had the highest endorsement of trauma history factors, psychopathology factors and cognitive factors, followed by the DSO group and subsequently the healthy group. Although the PTSD group was roughly sandwiched between the DSO group and the healthy group in terms of endorsement of factors, results associated with the PTSD group were mostly insignificant. Because of its small group size (*n* = 8) and therefore low statistical power, results associated with the PTSD group should be interpreted with caution.

3.3.2. Between groups differences across latent classes

ANOVAs and chi square tests were conducted to examine the factors predicting class membership in the three-class model (see Table 4). ANOVAs were used for continuous variables whereas chi-square tests were used for categorical variables. The alpha level was set at 0.004 after applying the Bonferroni correction.

The results were consistent with that of diagnostic groups. No significant difference was found for age, but as above, the CPTSD class had proportionally more females than the DSO class, which in turn had more females than the healthy class, X^2(2) = 18.02, $p < 0.001$, V = 0.26. The CPTSD class was found to endorse the most overall trauma types, interpersonal trauma types (but not non-interpersonal trauma types), depression, anxiety and cognitive processes, followed by DSO class and subsequently the healthy class. A small effect was found for the safety-seeking behaviours strategic hypervigilance (SH) subscale; all other
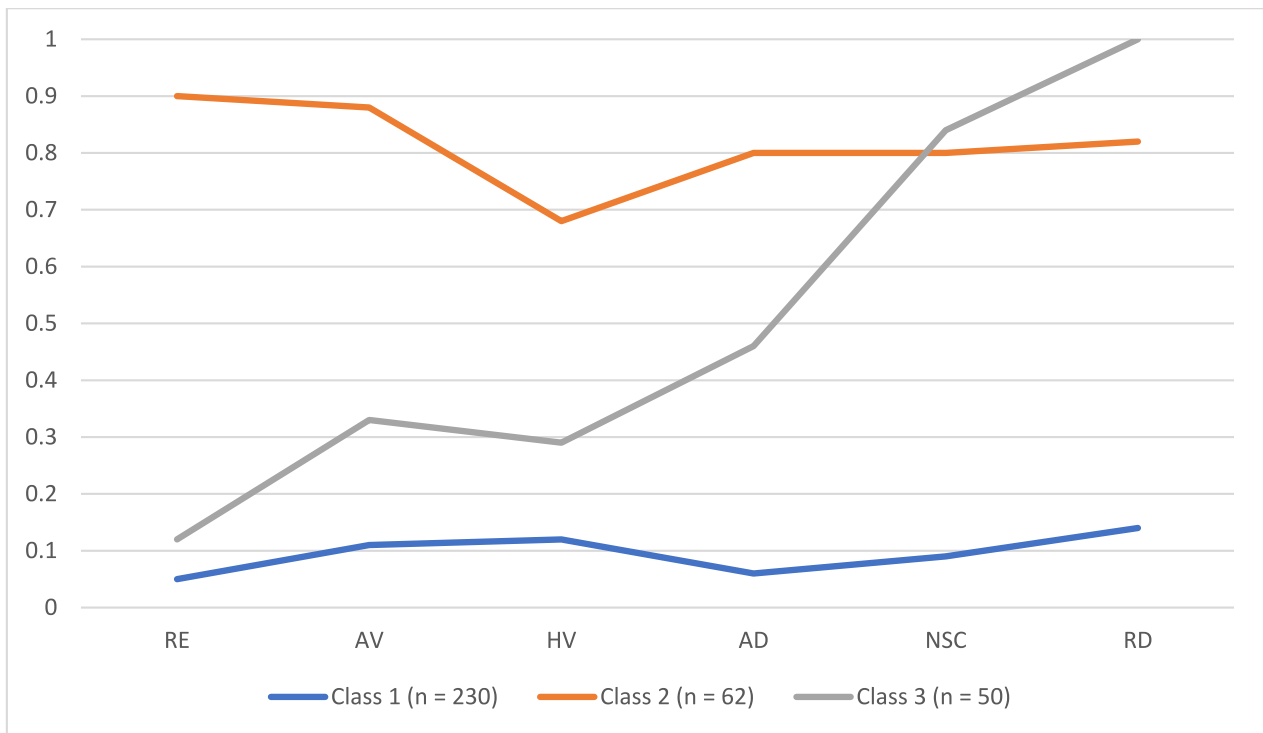
Fig. 1. Three-class model.
Note: AD = affective dysregulation; AV = avoidance; HV = hypervigilance; NSC = negative self-concept; RD = relationship difficulties; RE = reexperiencing.

Table 3
ANOVAs for diagnostic groups (N = 342).

Variables	Healthy group (N = 280)		PTSD group (N = 8)		CPTSD group (N = 19)		DSO group (N = 35)		Test statistic		
	M	SD	M	SD	M	SD	M	SD	F	p	η2
Demographic factor											
Age	13.71	0.59	13.79	0.50	13.80	0.76	13.69	0.48	0.19	0.90	0.002
Trauma history factors											
Trauma types	2.14[a]	1.76	3.65	1.39	4.88[c]	2.63	3.09[b]	1.76	16.63*	<0.001	0.13
Non-interpersonal trauma	0.63	0.69	1.00	0.76	1.05	0.85	0.74	0.61	2.89	0.04	0.03
Interpersonal trauma	1.33[a]	1.29	2.50	1.51	3.32[c]	2.06	2.02[b]	1.36	15.94*	<0.001	0.12
Psychopathology factors											
Anxiety (RCADS-25)	6.54[a]	5.77	11.13	5.33	26.95[c]	7.35	15.31[b]	6.78	85.83*	<0.001	0.44
Depression (RCADS-25)	4.14[a]	4.19	9.63[b]	5.42	20.16[c]	4.96	11.34[b]	6.25	95.60*	<0.001	0.46
Cognitive factors											
Safety behaviours – SH (CSBS)	7.10[a]	4.81	7.75	3.01	12.00[b]	4.90	7.60[a]	4.54	6.31*	<0.001	0.05
Safety behaviours – AS (CSBS)	4.40[a]	3.66	7.25	3.01	12.63[b]	3.48	9.43[a]	3.63	47.10*	<0.001	0.30
Cognitive avoidance (CAQ)	31.61[a]	17.37	44.25	9.95	72.16[b]	14.66	50.62[a]	19.21	42.11*	<0.001	0.28
Rumination (CRSQ)	6.49[a]	7.22	10.63[a]	9.61	28.21[c]	9.56	19.67[b]	11.75	64.80*	<0.001	0.38
Trauma appraisal (CPTCI-PDC)	1.15[a]	2.14	2.88[a]	3.72	11.16[c]	4.14	6.94[b]	3.97	130.58*	<0.001	0.54

Note: CAQ = Cognitive Avoidance Questionnaire; CPTCI-PDC = Child Post-Traumatic Cognitions Inventory - Permanent and Disturbing Change subscale; CPTSD = complex post-traumatic stress disorder; CRSQ = Child Response Styles Questionnaire; CSBS = Child Safety Behaviour Scale; DSO = disturbances in self-organisation; PTSD = post-traumatic stress disorder; RCADS-25 = Revised Children's Anxiety and Depression Scale-25. Superscript characters indicate significant post-hoc differences.
* $p < 0.004$.

effect sizes were large in nature.

4. Discussion

The current study aimed to investigate the trauma-related symptomatology of community adolescents as generated from diagnostic criteria and LCA and the correlates of these presentations. As a community sample, our adolescents presented with a high degree of trauma exposure: the majority (86 %) reported having exposed to at least one traumatic event in their lives. This was higher than what most epidemiological studies reported (i.e. around 60 %; McLaughlin et al., 2013)

but was nevertheless comparable to Joseph et al. (2000).

4.1. Prevalence of PTSD, CPTSD and DSO

Based on diagnostic criteria, 2.3 % and 5.6 % of adolescents were found to have PTSD and CPTSD respectively. Such rates were comparable with previous statistics that around 8 % of children and adolescents in the UK suffered from post-traumatic stress disorders (Lewis et al., 2019). Our sample revealed significantly more CPTSD cases than PTSD cases, which is consistent with findings from adult epidemiological studies (e.g. Karatzias et al., 2019; Langtry et al., 2021; Maercker

Table 4
ANOVAs for the three-class model (N = 342).

Variables	Healthy class (N = 230)		CPTSD Class (N = 62)		DSO Class (N = 50)		Test statistic		
	M	SD	M	SD	M	SD	F	p	η2
Demographic factor									
Age	13.71	0.61	13.71	0.57	13.73	0.42	0.02	1.00	0.00
Trauma history factors									
Trauma types	2.06[a]	1.78	3.61[b]	2.26	2.39[a]	1.66	16.46*	<0.001	0.09
Non-interpersonal trauma	0.65	0.72	0.90	0.69	0.49	0.55	5.02	0.007	0.03
Interpersonal trauma	1.26[a]	1.28	2.34[b]	1.83	1.70[a]	1.23	14.86*	<0.001	0.09
Psychopathology factors									
Anxiety (RCADS-25)	5.68[a]	4.85	18.40[c]	8.58	11.49[b]	7.39	108.54*	<0.001	0.41
Depression (RCADS-25)	3.53[a]	3.56	13.21[c]	7.23	8.47[b]	5.85	103.19*	<0.001	0.40
Cognitive factors									
Safety behaviours – SH (CSBS)	6.71[a]	4.62	9.73[b]	4.84	8.26	5.03	10.45*	<0.001	0.06
Safety behaviours – AS (CSBS)	3.75[a]	3.29	9.98[c]	3.77	7.77[b]	3.76	89.39*	<0.001	0.36
Cognitive avoidance (CAQ)	29.33[a]	14.17	59.37[c]	19.45	43.05[b]	17.75	88.92*	<0.001	0.36
Rumination (CRSQ)	5.52[a]	6.19	19.67[c]	12.24	13.61[b]	10.27	73.81*	<0.001	0.33
Trauma appraisal (CPTCI-PDC)	0.77[a]	1.77	7.21[c]	4.63	3.86[b]	3.82	128.03*	<0.001	0.50

Note: CAQ = Cognitive Avoidance Questionnaire; CPTCI-PDC = Child Post-Traumatic Cognitions Inventory - Permanent and Disturbing Change subscale; CPTSD = complex post-traumatic stress disorder; CRSQ = Child Response Styles Questionnaire; CSBS = Child Safety Behaviour Scale; DSO = disturbances in self-organisation; PTSD = post-traumatic stress disorder; RCADS-25 = Revised Children's Anxiety and Depression Scale-25. Superscript characters indicate significant post-hoc differences.

* p < 0.004.

et al., 2022). Notably, 10 % of our participants presented with DSO, representing a higher prevalence rate than PTSD and CPTSD combined. This indicated the significance of DSO-only presentation among adolescents.

4.2. Latent structure

Our three-class model from LCA grouped adolescents into those with CPTSD (i.e. high in all six symptoms), those with DSO symptoms (i.e. low in core PTSD symptoms, high in DSO symptoms) and healthy adolescents (i.e. low in all six symptoms). Based on this, several points are noteworthy. First, a clear CPTSD class is indicated. This substantiates the findings of previous LCA studies (e.g. Gilbar et al., 2018; Karatzias et al., 2017) and provides a strong statistical evidence for the construct validity of CPTSD. That said, not all adolescents from the CPTSD class belong to the CPTSD diagnostic group. This may suggest the limitations of using LCA as a way to derive clinical diagnoses. Indeed, Achterhof et al. (2019) argued that results from LCA alone do not necessarily possess nosological value due to their data-driven nature. Rather, to establish CPTSD as a separate diagnosis, an element of "clinical meaningfulness" is required alongside statistical evidence. This can be in the form of differential risk factors, comorbidities, prognoses, functional impairments or treatments in relation to other diagnoses (Achterhof et al., 2019; Dalenberg et al., 2012).

Second, there appeared to be no "simple" PTSD class. This ran counter to the findings of Sachser et al. (2017) which identified a PTSD class alongside a CPTSD class among a group of treatment-seeking children and adolescents. In fact, to our knowledge the present study is the first study that failed to identify a pure PTSD class in its LCA. Our data suggest that "simple" PTSD as defined by ICD-11 may not be sufficiently rich to capture the typical presentation of traumatic stress in youth. Conversely, it is possible that the more complex symptom profile associated with CPTSD is the modal presentation of clinically-significant post-traumatic stress.

Third, a considerable number of adolescents presented with low core PTSD symptoms but high DSO symptoms. Such exclusive DSO presentation does not fit readily into the current PTSD/CPTSD conceptualisation and is thus far not recognised by the ICD-11 as a proper diagnosis in its own right. However, as outlined above the DSO class has been documented in the literature (e.g. Li et al., 2021; Tian et al., 2021). Reflecting previous findings, our data suggest that it is possible for

adolescents to develop DSO symptoms but not core PTSD symptoms subsequent to trauma. Such presentation may constitute a unique form of post-trauma symptomatology currently understudied in the field. That said, given the moderate levels of depression in the DSO class, an alternative interpretation is that the DSO class simply represents adolescents experiencing or vulnerable to depression (Vibhakar et al., 2019). In this sense, DSO may or may not be related to trauma.

4.3. Correlates

Based on the combined results of diagnostic groups and symptom classes between-group analyses, a number of factors were found to be significant correlates of CPTSD and DSO. In terms of demographic factors, while age did not account for PTSS presentation, female sex was associated with a higher likelihood of having CPTSD and DSO. This corroborated previous research findings that females were more prone to post-traumatic stress disorders than males (Knefel et al., 2015; Perkonigg et al., 2016; Sachser et al., 2017).

With respect to trauma history factors, trauma exposure was found to correlate with post-traumatic stress presentations. Those with relatively high exposure to different trauma types were more likely to have CPTSD as opposed to DSO or no symptoms. This echoed previous findings concerning the relationship between prolonged traumatisation and CPTSD (e.g. Cloitre et al., 2013). In addition to overall number of trauma, specific forms of trauma were also associated with post-trauma symptomatology. Interpersonal trauma (but not non-interpersonal trauma) was associated with CPTSD but not DSO. This is consistent with the notion that interpersonal trauma exerts more far-reaching impact on one's self-regulation than non-interpersonal trauma, resulting in more complex presentation such as disturbances in relationship and emotion dysregulation (Bell et al., 2019).

Depression and anxiety severity was most elevated in adolescents with CPTSD, followed by those with DSO and subsequently healthy adolescents. While this is an important finding in and of itself, given the cross-sectional nature of the present analysis and therefore lack of information on directionality, the specific roles of depression and anxiety in PTSS profiles are unclear. Depression and anxiety could potentially act as risk factors, consequences or comorbid mental health difficulties – or a combination of such – in relation to different PTSS presentations.

Lastly, consistent with cognitive behavioural models of PTSD (e.g. Ehlers and Clark, 2000), adolescents with CPTSD exhibited more safety-

seeking behaviours (particularly behaviours related to affective suppression), cognitive avoidance, rumination and trauma-related appraisals (specifically of the "permanent and disturbing change" type), compared to adolescents with DSO and healthy adolescents. These differences mostly involved medium and large effect sizes, with an especially large effect for appraisals. Being some of the first data to consider cognitive correlates of CPTSD in youth, the current data suggest that the CPTSD construct is associated with cognitive psychological processes in a similar fashion as "simple" PTSD.

4.4. Theoretical and clinical implications

The present study has a number of theoretical and clinical implications. First, the finding that there are more CPTSD than PTSD cases justifies and echoes the current interest in CPTSD in the trauma literature. It also suggests that CPTSD applies to adolescents as well as adults. Clinically, it would be helpful for clinicians to look out for DSO symptoms alongside core PTSD symptoms when assessing trauma-exposed adolescents, holding in mind that presence of DSO symptoms might be the norm rather than the exception. This may create a better understanding of adolescents' risks (e.g. the presence of affect dysregulation may indicate higher risks) and allow for more accurate predictions of how they might respond to treatment (e.g. presence of DSO symptoms may indicate the need for longer treatment).

Second, the high rates of DSO-only presentation in our sample calls for more attention on this unique symptom profile. While uncertainties exist around the DSO construct (i.e. whether it represents a distinct form of psychopathology that occurs in response to trauma, or simply constitutes symptoms of other existing mental health disorders such as depression), it raises questions around the dual conceptualisation of post-trauma psychopathology (i.e. PTSD and CPTSD) in ICD-11 within the adolescent population, and supports the further investigation of DSO in the absence of clinically significant PTSD symptoms. Clinically, when it comes to working with trauma-exposed adolescents, the current findings suggest the importance of assessing and managing DSO symptoms even in the absence of core PTSD symptoms.

Third, our data suggest that cognitive factors commonly associated with "simple" PTSD, namely safety-seeking behaviours, cognitive avoidance, rumination and trauma-related appraisals, also apply to adolescents with CPTSD. This implies that as a construct CPTSD may not be as distinct as previously assumed, that is, it may not be caused and perpetuated by a distinct set of cognitive processes or trauma history. In clinical practice, this may mean that adolescents with complex trauma presentations could potentially benefit from traditional PTSD treatments that focus on cognitive processes, an example being Trauma-Focused Cognitive Behavioural Therapy (TF-CBT; National Institute for Health and Care Excellence, 2018). Such reasoning aligns with the findings of Sachser et al. (2017) which showed that adolescents with PTSD and adolescents with CPTSD responded similarly well to TF-CBT.

4.5. Strengths, limitations and future research

In terms of strengths, our sample was a fairly representative community sample with a high response rate, an appropriate sample size and a balanced number of male and female adolescents. To our knowledge, this study is the first study that combined a diagnosis-driven approach (i.e. diagnostic criteria) with a data-driven approach (i.e. LCA) in the analysis of PTSD presentations and their correlates. The two approaches complemented each other and helped shed light on the important subtleties around the PTSD/CPTSD conceptualisation.

In terms of limitations, diagnostic groups in our study were derived from self-reported symptoms instead of structured diagnostic interviews. Moreover, due to the use of community sampling, the sample sizes of our diagnostic groups were naturally small (e.g. only eight adolescents were found to have PTSD). This limits our ability to draw strong conclusions. Lastly, given the use of cross-sectional as opposed to

prospective longitudinal design, the present study is exploratory and unable to attribute causality between variables.

In light of the above limitations, more research on the area is warranted. Future research could replicate the current study design with structured diagnostic interviews, larger sample sizes and other adolescent samples (e.g. treatment-seeking samples) to increase generalisability of findings. Furthermore, studies that employ prospective longitudinal designs would be useful for delineating the causes, prognosis and long-term impacts of CPTSD and DSO symptoms, giving us further insights into the validity of CPTSD as a diagnosis.

4.6. Conclusion

This study examined PTSS presentation among community adolescents through diagnostic criteria and LCA and investigated the risk factors for different PTSS profiles. Important findings included CPTSD being more common than PTSD, high rates of DSO-only presentation and high endorsement of PTSD-related cognitive processes among adolescents with CPTSD. These have clinical implications for assessment, management and treatment of adolescents with complex trauma presentation. Future research could build on current findings by using interview-based measures, larger sample sizes and longitudinal designs.

CRediT authorship contribution statement

- Henry Tak Shing Chiu: Research design, literature review, data analysis and interpretation and write-up.
- Alice Alberici: Data collection.
- Jade Claxton: Data collection.
- Richard Meiser-Stedman: Research design, data analysis, critical revision of the manuscript.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2023.08.033.

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