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Distinguishing PTSD, Complex PTSD, and Borderline Personality Disorder using Exploratory Structural Equation Modeling in a Trauma-Exposed Urban Sample

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Abstract

There is debate about the validity of the complex posttraumatic stress disorder (CPTSD) diagnosis and whether disturbances in self-organization (DSO) in CPTSD can be differentiated from borderline personality disorder (BPD). How PTSD is defined may matter. The present study used exploratory structural equation modeling (ESEM) to replicate and extend prior work by including two models to examine how PTSD (*ICD-11, DSM-5*), DSO, and BPD symptoms relate. Participants (N = 470; 98.1% women; 97.7% Black) were recruited from medical clinics within an urban hospital. PTSD, CPTSD, and BPD were assessed using semi-structured interviews and trauma-related avoidance, aggressive behavior, and anxious attachment were assessed using self-report measures. ESEM models of PTSD, DSO, and BPD symptoms were run. We found a three-factor ESEM model of CPTSD (*ICD-11* PTSD and DSO symptoms) and BPD symptoms best fit the data and found support for discriminant validity between factors across trauma-related avoidance, aggressive behavior, and anxious attachment. For *DSM-5* PTSD, a two-factor ESEM model was best-fitting (PTSD and DSO/BPD). The findings demonstrate clear distinguishing and overlapping features of *ICD-11* PTSD, CPTSD, and BPD and the necessity to consider the diagnostic structure of PTSD in determining the additive value of CPTSD as a distinct construct.

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posttraumatic stress disorder; trauma; complex posttraumatic stress disorder; borderline personality disorder

1.1 Introduction

Psychological trauma can lead to significant distress, functional impairment, and the development of trauma-related psychological symptoms (Gluck et al., 2021). Posttraumatic stress disorder (PTSD) is one well known reaction to trauma that includes symptoms ranging from re-experiencing and avoidance to arousal and reactivity. PTSD commonly co-occurs with a range of psychopathology, and the presence of comorbid disorders can be related to greater severity of symptoms and worse outcomes (Galatzer-Levy et al., 2013). Importantly, two different diagnostic definitions of PTSD exist in the leading disease classification systems: the *Diagnostic and Statistical Manual of Mental Disorder* (*DSM-5;* American Psychiatric Association; 2013) and the 11th version of the *International Classification of Diseases* (ICD-11; World Health Organization [WHO], 2018). The *DSM-5* includes a more expanded definition of PTSD that includes symptoms related to negative cognitions and mood, whereas the *ICD-11* includes a narrower definition of PTSD reflecting six symptoms from the re-experiencing, avoidance, and hyperarousal clusters only.

The *ICD-11* also introduced a new traumatic stress disorder to the diagnostic nomenclature, complex PTSD (CPTSD), which requires the presence of PTSD, as well as disturbances in self-organization (DSO) across three symptom categories: affective dysregulation, negative self-concept, and interpersonal relationship difficulties. CPTSD is posited to arise following traumatic stressors that are especially severe or prolonged in nature, often where there is no ability to escape the trauma (e.g., childhood sexual abuse, human trafficking; Maercker et al., 2013). In the past decade, considerable data have accumulated in support of *ICD-11* PTSD and CPTSD as distinct constructs (Brewin et al., 2017), with numerous studies employing person-centered analyses showing that CPTSD and PTSD constitute distinguishable symptom profiles among several traumatized samples (Cloitre et al., 2013; Cloitre et al., 2014). Yet, a common concern about CPTSD as a distinct diagnostic category is the symptom overlap between CPTSD and borderline personality disorder (BPD) within the areas of affective instability, impulse control, and impaired relationships with others, and some have argued that CPTSD lacks clear discriminant validity from BPD (Resick et al., 2012). Thus, variable-centered approaches are needed to further delineate CPTSD symptoms from BPD symptoms.

Borderline personality disorder (BPD), a condition characterized by fear of abandonment, chronic suicidality, and difficulty within the realms of emotion regulation, interpersonal relationships, unstable sense of self, and impulsivity, is often comorbid with PTSD symptoms (Jowett, Karatzias, & Albert, 2020). Prior research using nationally representative samples has shown that roughly one fourth of those with PTSD also meet criteria for BPD (Pagura et al., 2010), and that as many as 50% of individuals that meet criteria for BPD have met criteria for lifetime PTSD (Scheiderer et al., 2015). Though the experience of

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trauma is not a prerequisite to obtaining a diagnosis of BPD, these high rates of comorbidity have led some scholars to conceptualize BPD as part of a larger collection of trauma-related symptoms. This notion has, in part, been shaped by a substantial body of research showing high rates of childhood sexual abuse and other forms of childhood maltreatment or severe interpersonal trauma in those with BPD (Rosenstein et al., 2018).

While BPD and CPTSD do exhibit overlap in the type of difficulties across affect regulation, self-concept, and interpersonal relationships, there are also important distinctions that are reflected in how symptoms manifest for either CPTSD or BPD. For example, in CPTSD, there is a persistent negative sense of self, while in BPD there is an unstable sense of self that can be internalizing or positive and may change back and forth between the two. Interpersonal difficulties in CPTSD are often characterized by avoidance and disconnection, while in BPD, they may include relationships marked by either ongoing or intermittent volatility and by efforts to connect with others to avoid feelings of abandonment (Cloitre et al., 2014). BPD is also marked by more extreme strategies to regulate affect. For example, suicidal or self-harming behaviors often result from attempts to escape from or change emotions that seem intolerable (Conklin et al., 2006).

To date, only a small number of studies have tested emerging classes or factor structures from *ICD-11* PTSD, BPD, and CPTSD symptoms in trauma-exposed samples, with mixed results. In a sample of 280 adult women with childhood physical or sexual abuse history, latent class analysis (LCA) yielded four distinct classes, including a non-symptomatic class, as well as *ICD-11* PTSD, CPTSD, and BPD classes (Cloitre et al., 2014). Specifically, though feelings of emptiness were likely to be endorsed by individuals in both the BPD and CPTSD classes, efforts to avoid abandonment, impulsivity, unstable sense of self, and unstable relationships significantly distinguished the BPD class from the CPTSD class. Another LCA study with women sexual trauma survivors found five classes, with distinct *ICD-11* PTSD and CPTSD classes, although included comorbid PTSD/BPD and CPTSD/BPD classes (Frost et al., 2020). LCA with treatment seeking adults with varied trauma history yielded two distinct CPTSD classes (with high and moderate BPD symptoms respectively) and a PTSD class endorsing low levels of BPD symptoms (Jowett, Karatzias, Shevlin, et al., 2020). Additionally, a study utilizing a network analysis among 216 adult survivors of childhood abuse found that CPTSD symptoms clustered together strongly and appeared to be separate from the BPD network of symptoms (Knefel et al., 2016). Finally, to test discriminant validity of these constructs using exploratory structural equation modeling (ESEM), Hyland et al. (2019) found a three-factor solution, supporting distinct factors of *ICD-11* PTSD, DSO, and BPD. Overall, these studies provide support that DSO and BPD symptoms are related, but also that both represent symptoms that can be empirically distinguishable from each other and *ICD-11* PTSD.

ESEM (Asparouhov & Muthén, 2009) is a latent variable modeling technique uniquely suited for identifying the location and magnitude of overlap between symptomatology such as PTSD, DSO, and BPD. Unlike confirmatory factor analysis (CFA), ESEM allows cross-factor loadings which allow for more appropriately modeling complex and conceptually similar constructs like CPTSD and BPD that are theoretically expected to overlap (Hyland et al., 2019). There is also evidence that CFA may not provide an

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accurate view of the relationships between complex latent constructs due to the Independent Clusters Model requirement that secondary factor loadings are fixed to zero. Inappropriately constraining even small, non-zero factor cross-loadings to zero (e.g., modeling with forced non-overlap) can produce biased model fit statistics and inflated factor loadings and factor intercorrelations, or even result in the incorrect rejection of an acceptable model (Asparouhov & Muthén, 2009; Marsh et al., 2014; Perry et al., 2015).

As highlighted above, as only a handful of studies have examined the overlap and interaction between these symptoms, more research is necessary to understand the distinctions among these debilitating psychological disorders. Importantly, there have been no studies to our knowledge that have examined models using both *ICD-11* PTSD and *DSM-5* PTSD symptoms; inclusion of both models within the same sample will allow for greater understanding of how CPTSD should be considered in the context of *DSM-5*, in addition to *ICD-11.* Furthermore, though recent work has included samples endorsing multiple types of trauma exposure (Jowett, Karatzias, Shevlin, et al., 2020), the majority of extant research in this area has been conducted using samples that endorsed specific types of trauma exposure, which may limit the generalizability of findings to high trauma-exposed populations. Lastly, existing work has included samples lacking racial diversity among participants. Therefore, more work in this area is needed to examine the boundaries between these disorders in community samples with greater diversity in types of trauma and level of trauma exposure. To this end, the current study sought to utilize an ESEM analytic approach to examine the distinctions between symptoms of PTSD, CPTSD, and BPD in a highly trauma-exposed urban sample of primarily Black adults with low socioeconomic status.

The current study serves as a replication and extension of the study conducted by Hyland et al. (2019). We replicated the original ESEM model including *ICD-11* PTSD, DSO, and BPD symptoms. We ran an additional exploratory model examining *DSM-5* PTSD, DSO, and BPD symptoms to better understand how conceptualization of PTSD may change how these symptoms relate to one another. Similar to Hyland and colleagues (2019), we hypothesized that a three-factor ESEM model of CPTSD (*ICD-11* PTSD and DSO symptoms) and BPD symptoms would be best fitting to the data. In line with the conceptual overlap between CPTSD and BPD symptoms, we expected to find salient cross-loadings of items onto non-primary factors, most likely the DSO symptom items. Since the ESEMs on *DSM-5* PTSD, DSO, and BPD symptoms were exploratory extensions of Hyland et al. (2019) we did not make specific hypotheses.

Following obtaining an ESEM model of *ICD-11* PTSD, DSO, and BPD symptoms, we subjected the resulting factors to tests of discriminant validity using Wald Chi-squared Tests of the difference in factor associations between *ICD-11* PTSD, DSO, and BPD with external latent factors of trauma-related avoidance, aggression, and anxious attachment. We estimated associations between latent traits based on the sample-estimated covariance matrix, then tested the decrement in model fit when pairs of factor associations were constrained to equality to ascertain if the factor associations were significantly different from one another. This allowed us to test hypotheses regarding the differential relationships PTSD, DSO, and BPD are expected to have with external constructs. For between-factor comparisons, we hypothesized *ICD-11* PTSD would have a stronger association with

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trauma-related avoidance than DSO or BPD; DSO would have a stronger association with anxious attachment than ICD-11 PTSD or BPD; and BPD would have a stronger association with aggression than ICD-11 PTSD or DSO. For within-factor comparisons, we hypothesized that ICD-11 PTSD would be more associated with trauma-related avoidance than aggression or anxious attachment; DSO would be most associated with anxious attachment followed by trauma-related avoidance, then aggression; BPD would be more associated with aggression than other external factors of trauma-related avoidance and anxious attachment.

1.2 Material and Methods

1.2.1 Participants and Procedure

Participants (N = 3072) were recruited from waiting rooms in primary care, gynecology and obstetrics, and diabetes medical clinics at a publicly funded, safety-net hospital in the southeast region of the United States as part of an ongoing study of risk and resiliency to the development of PTSD in a medical care seeking population (Gluck et al., 2021). Data for the present study was collected between February 2014 and September 2019. Interviewers approached anyone in the waiting room and did not restrict who to approach based on certain characteristics. Inclusion criteria were age between 18 and 65 and capacity to provide informed consent. The investigation was carried out in accordance with the latest version of the Declaration of Helsinki and informed consent of the participants was obtained after the nature of the procedures had been explained. The informed consent was approved by [redacted for blind review] Institutional Review Board and the [redacted for blind review] Research Oversight Committee. After signing the consent form, trained research assistants administered an interview with questionnaires regarding trauma history and psychological variables. This interview took approximately 45-75 minutes. Interviewers read questionnaires aloud to reduce potential bias related to low literacy level among some participants and recorded participant verbal responses onto a tablet. Interviewers for the study ranged in education from current bachelor's students to current doctoral students. Training included didactics on research interviewing in trauma-exposed populations, shadowing multiple interviews, and being observed conducting interviews. Didactics on diversity and cultural considerations were a part of ongoing education for all interviewers and staff including yearly implicit bias training led by licensed psychologists on the study team. Participants were paid $15.00 for participation in this phase of the study.

A subgroup of participants (N = 484) was contacted to return to our laboratory for a separate, but related study. These participants were given structured clinical interviews and additional self-report measures (approximately two weeks post-initial assessment). Participants were offered the opportunity to participate in this clinical assessment portion based on eligibility for other ongoing studies in the lab, including studies on risk and resilience for PTSD, intergenerational trauma in mothers and children, and comorbidities between physical health and psychiatric problems. This portion was conducted by interviewers with additional training in administering structured clinical interviews and who were supervised by a licensed clinical psychologist on staff. Participants were paid $60.00 if they returned to complete this phase of the study. Participants were included in the present

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analysis if they were administered the semi-structured DSM-5 PTSD assessment (described below), resulting in a final sample of 470.

Participants (N = 470) were 98.1% women (M_{age} = 41.43 years, SD_{age} = 12.02 years; 97.7% Black). In this sample, 19.6% of participants completed less than 12 years of education, 33.9% of participants completed high school or obtained a GED, 24.9% of participants completed some college, and 21.5% of participants obtained a post-secondary technical or college degree. In terms of household monthly income, 19.5% of participants reported less than $500 per month, 24.3% of participants reported between $500 and $1000 per month, 31.7% reported between $1000 and $1999 per month, and 22.1% reported $2000 or more per month.

1.2.2 Measures

Clinician-Administered PTSD Scale for *DSM-5* (CAPS-5; Weathers et al., 2013).—The CAPS-5 is an interviewer-administered psychometrically-validated semi-structured diagnostic instrument measuring current *DSM-5* PTSD. CAPS-5 scores were used to represent both *DSM-5* PTSD and *ICD-11* PTSD symptoms. The CAPS-5 was designed to ensure correspondence with *DSM–5* and streamline scoring and administration. It measures *DSM-5* PTSD symptoms, duration of symptoms, and global impairment and functioning related to symptoms. CAPS-5 yields a continuous measure of the severity of overall PTSD and of the four symptom clusters (re-experiencing, avoidance, negative alterations in cognition/mood, arousal), and presence/absence of PTSD diagnosis and presence/absence of the dissociative subtype. For each diagnostic criterion (20 total), interviewers rate on a scale from 0 (*absent*) – 4 (*extreme/incapacitating*) using information on both frequency and intensity of symptoms obtained during the interview. For the current study, CAPS-5 was scored for the two most impactful trauma exposures, one in childhood and one in adulthood (or two in adulthood if no childhood criterion A trauma was endorsed). PTSD severity measures were collapsed into total PTSD symptom severity based on the trauma that produced the highest level of PTSD symptoms. *ICD-11* PTSD includes a reduced number of symptoms including nightmares, flashbacks, emotional reactivity, avoidance of thoughts/feelings, avoidance of people/places/activities, hypervigilance, and exaggerated startle response. The CAPS has been used in both civilian and veteran populations and shown good to excellent reliability and validity across multiple studies (Blake et al., 1995; Bovin et al., 2016; Pupo et al., 2011; Weathers et al., 2001). Prior research in this population showed good Interrater reliability (IRR) for diagnosis of PTSD (k = 0.83) (Powers et al., 2017). Twelve participants (2.55%) in the sample had missing data for at least one CAPS-5 item.

***ICD-11* Trauma Interview (ICD-TI; Roberts et al., 2013).—**The ICD-TI is an interview-administered diagnostic instrument measuring disturbances in self-organization (DSO) which include four symptoms within three symptom domains: affect dysregulation (both hyperactivation and deactivation), negative self-concept, and disturbances in relationships (scale: 0-4 based on presence and severity; 0 = *absent*, 1 = *a little bit*, 2 = *moderately*, 3 = *very much*, 4 = *extremely*). The measure has shown satisfactory reliability and validity (Hyland, Brewin, et al., 2017; Hyland, Shevlin, et al., 2017; Karatzias et al.,

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2016). Prior research in this population showed excellent IRR for diagnosis of CPTSD (k = 1.00) (Powers et al., 2017). Eighty participants (17.02%) in the sample had missing data for at least one DSO symptom item.

Structured Clinical Interview for *DSM-IV* (SCID-IV; First & Gibbon, 2004).—The SCID-IV was used to assess BPD symptoms (e.g., "Inappropriate, intense anger or difficulty controlling anger) using a semi-structured interview. Participants received a symptom score (i.e., 1 = *no evidence of symptom*, 2 = *sub-threshold*, 3 = *symptom present*) based on the extent to which they were able to provide examples of each symptom from on their personal experiences. The items were summed to obtain the total score. Sixty-four participants (13.62%) in the sample had missing data for at least one BPD symptom item.

Posttraumatic Avoidance Behavior Questionnaire (PABQ; van Minnen & Hagenaars, 2010).—The PABQ is a 25-item questionnaire used to assess various posttraumatic avoidance behaviors. Items are rated on a Likert-type scale of 1 (*almost never*) to 4 (*almost always*) and are summed to yield a total score and subscale scores, with higher scores suggesting greater severity of avoidant behaviors, (α = .99). Sixty-nine participants (14.68%) in the sample had missing data on at least one items of the PABQ.

Behavior Questionnaire-Short (BQ-S; Gillikin et al., 2016).—The BQ-S is an internally constructed 5-item scale designed to assess aggressive behavior frequency. This measure was internally-developed based on the Conflicts Tactics Scale (Straus et al., 1996), a measure commonly used to assess conflict behaviors. Items from the BQ-S ask participants how often they have perpetrated violent acts (e.g., punched, hit, pulled a knife or gun, stabbed, or shot at someone) using a scale of 0 (*never*) to 4 (*more times than I can count*). The sum was computed to obtain the total score (α = .99). Twenty-five participants (5.32%) in the sample had missing data on the BQ-S.

Experiences in Close Relationships, Revised (ECR-R; Fraley et al., 2000).—The ECR-R is a 36-item self-report measure of adult attachment. It assesses two theoretically orthogonal dimensions in two subscales, attachment anxiety and avoidant attachment. Only the anxiety subscale was used for the present study. Attachment anxiety is preoccupation about others' affection and fear of abandonment by others. Attachment anxiety includes items like "I often worry that people do not really love me" and "My desire to be very close sometimes scares people away." In the present study we used "other people" rather than "romantic partner" in order to assess attachment more generally (Mikulincer & Shaver, 2007). Internal consistency was high for attachment anxiety (α = .99). Ninety-seven participants (20.64%) in the sample did not complete any ECR-R items, and an additional 3 participants (< 1%) had missing data on at least one ECR-R item.

1.2.3 Data Analysis

We conducted latent variable modeling in Mplus (Version 8; Muthén & Muthén, 2012) and all other analyses using IBM SPSS Statistics Version 27. First, we computed descriptive statistics for all observed variables used. We estimated ESEM analyses using mean and variance-adjusted weighted least squares (WLSMV) estimator for ordered categorical

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indicators and goemin rotation. Covariance coverage or pairwise proportion of data present among all variables was .739-.999. We handled missing data using full information maximum likelihood (FIML; Enders, 2010; Schafer & Graham, 2002), which allowed us to retain rather than exclude participants for missing data on some items to reduce potential statistical bias compared to listwise deletion.

First, we tested one- to six-factor ESEM solutions and determined the optional number of latent variables needed to explain the covariation between the 6 *ICD*-PTSD, 4 DSO, and 9 BPD symptoms. For the purposes of creating an *ICD-11* PTSD latent variable, we used DSM-5 measures to approximate the *ICD-11* criteria (e.g., selecting symptoms B2, B3, C1, C2, E3, and E4 from the CAPS-5). Then, we re-tested one- to six-factor ESEM solutions with the inclusion of all 20 *DSM-5* PTSD symptoms, 4 DSO, and 9 BPD symptoms.

For all models, we assessed model fit using multiple goodness-of-fit indices as is standard practice (Hu & Bentler, 1999): χ^2 ($p \geq .05$ indicates good fit), Standardized Root Mean Square Residual (SRMR < .08 indicates good fit) (Hu & Bentler, 1999), Bentler Comparative Fit Index (CFI > .90 or > .95 indicate adequate and good fit, respectively) (Bentler, 1990), Tucker-Lewis Index (TLI > .90 or > .95 indicate adequate and good fit, respectively) (Bentler, 1990), Root Mean Square Error of Approximation (RMSEA < .08 or < .06 indicate adequate and excellent fit, respectively) (Kline, 2015). Following Marsh et al. (Marsh et al., 2014; Marsh et al., 2009), we calculated the change in RMSEA (ΔRMSEA ≥ .015 indicates significant model fit improvement) (Chen et al., 2008) to determine the optimal number of factors for the final retained model. Following Perry et al. (2015), we also examined the magnitude and significance of primary and secondary factor loadings for the resulting optimal models. Cross-loadings were considered statistically significant ($p \leq .05$) and salient (magnitude ≥ .3 or half of the primary factor loading) according to recommendations by Brown (2015).

After an optimal factor solution was identified, we analyzed differential associations of the derived ESEM factors with external correlates of trauma-related avoidance, aggression, and anxious attachment. To do this, we ran a latent variable model with two CFA factors added to the final ESEM solution. For trauma-related avoidance, observed indicators were the 25 items of the PABQ. For aggression, observed indicators were five items assessing recent aggressive or violent behaviors (e.g., “pushed or shoved someone”). For anxious attachment, observed indicators were 18 items from the anxious attachment subscale of the ECR-R Adult Attachment Questionnaire. We computed the Wald test statistic to quantify the decrease in model fit that occurred when pairs of covariances were constrained to equality with one another. This allowed us to interpret whether holding two factor intercorrelations equivalent significantly worsened the model, meaning that the factor intercorrelations differed in magnitude. We also computed Cohen’s *q* effect size of the difference in magnitude between each pair of intercorrelations, and interpreted according to guidelines: *q* < .10 none, .10-.30 small, .30-.50 medium, > .50 large effect (Cohen, 1988). Given the number of pairwise tests, we used the Benjamini and Hochberg (1995) False Discovery correction of p values to maintain the Type 1 error at .05. Data is publically available through the Open Science Framework at https://osf.io/5wsn4/.

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1.3 Results

Descriptive statistics for total symptom scores for *ICD-11* PTSD, *DSM-5* PTSD, DSO, and BPD are presented in Table 1. For the ESEMs on *ICD-11* PTSD, DSO, and BPD symptoms, model fit statistics for one- to six-factor solutions are presented in Table 2. The one-factor model was rejected as it yielded unsatisfactory model fit results. The two-factor model had good fit according to the CFI, TLI, SRMR, and RMSEA indices and was statistically superior to the one-factor model, ΔRMSEA = .024. The three-factor model had good to excellent fit according to the CFI, TLI, SRMR, and RMSEA indices and was statistically superior to the two-factor model, ΔRMSEA = .015. The extraction of a fourth factor was not supported because the ΔRMSEA of .006 was below the critical threshold for acceptance of improved model fit. Therefore, we retained a three-factor solution as the optimal ESEM model for representing the latent structure of the 19 ICD-11 PTSD, DSO, and BPD symptoms.

Standardized factor loadings for the optimal three-factor ESEM are presented in Table 3. Factor One comprised the six *ICD-11* PTSD items with significant and large magnitude loadings. One BPD item (transient paranoia or dissociation) exhibited a significant and salient cross-loading onto Factor One. Factor Two comprised the four DSO items with significant and moderate to large magnitude loadings, and one BPD item (chronic emptiness) with a significant and moderately large loading. Two PTSD items (flashbacks, startle) and two BPD items (uncontrolled anger, transient paranoia or dissociation) exhibited significant, small magnitude cross-loadings on Factor Two. Factor Three comprised eight of the nine BPD items, with the final BPD item (chronic emptiness) exhibiting a significant and small magnitude cross-loading on this factor. One DSO item (hyperactivated affect) also had a significant and small magnitude cross-loading on Factor Two.

Overall, the three-factor ESEM model appeared to represent an *ICD-11* PTSD factor (Factor One), a DSO symptom factor (Factor Two) and a BPD factor (Factor Three), for which symptom overlap between factors was most present among DSO items. The DSO latent factor was highly intercorrelated with both the BPD ($r = .472$, $p < .001$) and PTSD ($r = .526$, $p < .001$) latent factors. The correlation between PTSD and BPD was significant and small ($r = .265$).

To test discriminant associations of the *ICD*-PTSD, DSO, and BPD ESEM factors with external correlates of trauma-related avoidance, aggression, and anxious attachment, we conducted Wald testing (see Table 4). The resulting mixed ESEM-CFA model had adequate fit according to most (SRMR = 0.066; RMSEA = .035, 90% CI [.33, .037], $P = 1.0$; CFI = .95; TLI = .95) but not all fit statistics ($\chi^2 = 3324.98$, $df = 2097$, $p < .001$). Standardized loadings for the additional CFA factors of avoidance, aggression, and anxious attachment were all statistically significant and ranged from moderate to large magnitude (.42-.90). All within-factor Wald test results corresponded with hypotheses. The *ICD*-PTSD ESEM factor had significantly stronger relationships with avoidance than with aggression or anxious attachment, with large effect sizes ($q = .79, .74$, respectively). *ICD*-PTSD did not have significantly different relationships with aggression and anxious attachment. The DSO ESEM factor had significantly stronger relationship with anxious attachment than avoidance

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(q = .40) and aggression (q = .68), and a significantly stronger relationship with avoidance than aggression (q = .28). The BPD ESEM factor had a significantly stronger relationship with aggression than avoidance (q = .43) but not anxious attachment, although the effect size of the difference in latent correlations was still moderate (q = .37).

Between-factor comparisons were also consistent with hypothesized factor relationships, in that the three ESEM factors had differential relationships with all three external factors. Trauma-related avoidance had the strongest relationship with *ICD*-PTSD, significantly and moderately stronger than with DSO (q = .47), and significantly and extremely stronger than with BPD (q = .79). Avoidance was also more strongly related to DSO than BPD, with a medium effect size (q = .33). Aggression had the strongest relationship with BPD, significantly stronger than with *ICD*-PTSD (q = .43) or DSO (q = .50). There was no significant difference in the relationship with aggression between *ICD*-PTSD and DSO. Anxious attachment had the strongest relationship with DSO, substantially stronger than with *ICD*-PTSD (q = .56) or BPD (q = .55). Slightly expectedly, BPD was not more related to anxious attachment than *ICD*-PTSD, and both had small latent factor intercorrelations (r = .362 and .356, respectively). Overall, Wald testing results matched expected patterns that *ICD*-PTSD is most related to traumatic avoidance, DSO is most related to relationship and attachment dysfunction, and BPD is most related to interpersonal dysregulation and aggressive behaviors. Although these factors are both conceptually and empirically overlapping, they can still be distinguished from one another on the basis of their relationship with external correlates.

For the ESEMs on *DSM-5* PTSD, DSO, and BPD symptoms, model fit statistics for one- to six-factor solutions are presented in Table 2. The one-factor model was rejected as it yielded unsatisfactory model fit results. The two-factor model had acceptable to good fit according to the CFI, TLI, SRMR, and RMSEA indices and was statistically superior to the one-factor model, ΔRMSEA = .032. The extraction of a fourth factor was not supported because the ARM SEA of .014 was below the critical threshold for acceptance of improved model fit. Therefore, we retained a two-factor solution as the optimal ESEM model for representing the latent structure of the 33 total *DSM-5* PTSD, DSO, and BPD symptoms.

Standardized factor loadings for the optimal two-factor ESEM are presented in Table 5. Factor One comprised 15 of the 20 *DSM-5* PTSD items, including the six *ICD-11* PTSD items (B2-Dreams, B3-Flashbacks, C1-Internal Avoidance, C2-External Avoidance, E3-Hypervigilance, E4-Startle) and items B1-Intrusive Memories, B4-Cued Psychological Distress, B5-Cued Physiological Distress, D2-Negative Beliefs, D3-Blame, D4-Negative Feelings, D5-Loss of Interest, E5-Concentration Problems, and E6-Sleep Problems. DSO item Deactivated Affect also had a primary factor loading on Factor One. All primary loadings were significant and moderate to large in magnitude. Three of the remaining five *DSM-5* PTSD symptoms (D6-Detachment, D7-Numbing, E1-Irritability/Aggression) had salient cross-loadings of moderate magnitude on Factor One. The three remaining DSO items (Hyperactivated Affect, Sense of Self Disturbance, Relationship Disturbance) and one BPD item (Chronic Emptiness) had significant and salient cross-loadings on Factor One.

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Two comprised all nine BPD items and three of the four DSO items (Hyperactivated Affect, Sense of Self Disturbance, Relationship Disturbance) with significant and moderate to large magnitude loadings, and five *DSM-5* PTSD symptoms (D1-Amnesia, D6-Detachment, D7-Numbing, E1-Irritability/Aggression, and E2-Reckless Behavior). In addition, four *DSM-5* PTSD items (D3-Blame, D4-Negative Feelings, D5-Loss of Interest, E5-Concentration Problems) and one DSO item (Deactivated Affect) exhibited significant, medium magnitude cross-loadings on Factor Two.

Overall, the two-factor ESEM model appeared to represent a *DSM-5* PTSD factor (Factor One) and a combined BPD and DSO symptom factor (Factor Two). Factor One and Two were significantly and moderately correlated ($r = .465$, $p < .001$). Notably, the main sources of significant cross-loadings between factors were the DSO symptoms, PTSD symptoms of negative alterations in cognition and mood (NACM), and PTSD symptoms capturing nonspecific psychological distress (concentration, sleep).

1.4 Discussion

This study sought to replicate and extend prior research distinguishing symptoms of *ICD-11* PTSD, CPTSD, and BPD by examining overlapping and distinct factors using an ESEM approach with *ICD-11* PTSD, DSO, and BPD symptoms as well as *DSM-5* PTSD, DSO, and BPD symptoms in a chronically trauma-exposed and primarily Black urban-dwelling sample. In the first ESEM using *ICD-11* PTSD, we replicated the three-factor structure identified by Hyland et al. (2019), finding three distinct, but overlapping *ICD-11* PTSD, DSO, and BPD factors. One notable exception to the three-factor structure was the primary factor loading of chronic emptiness symptom onto the DSO Factor rather than BPD Factor. Upon examining other salient factor loadings, there was some overlap of DSO symptoms onto other factors (hyperactivated affect onto BPD Factor) as well as BPD symptoms (chronic emptiness, uncontrolled anger, paranoia or dissociation) and PTSD (flashbacks, startle) onto the DSO factor. Additionally, we observed 11 significant, non-zero magnitude cross-loadings between the factors that did not meet criteria for salience, indicating smaller sources of overlap between factors. These results demonstrated that, as expected, DSO symptoms were the main source of shared variance between *ICD-11* PTSD and BPD, consistent with Hyland and colleagues' (2019) findings.

Despite these sources of overlap identified by the ESEM, the *ICD-11* PTSD, DSO, and BPD factors showed differential relationships with external correlates (trauma-related avoidance, anxious attachment, and aggression), supporting their discriminant validity. These relationships with external correlates may be useful in identifying key features of each disorder that distinguish them from one another despite their substantial overlap, such as angry outbursts more often amounting to aggression or violent behavior in BPD compared to CPTSD (*ICD-11* PTSD and DSO) or pervasive attempts to avoid internal and external trauma stimuli in CPTSD (*ICD-11* PTSD and DSO) compared to BPD. These distinctions support PTSD and DSO symptoms in the internalizing spectrum of psychopathology and BPD symptoms uniquely in the externalizing spectrum (along with internalizing) (Kotov et al., 2017). Further exploration of these constructs in relation to other external correlates

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will be helpful in establishing the overall nomological network that describes their co-occurrence.

Extending previous studies, overlapping and distinct factors using ESEM with *DSM-5* PTSD, DSO, and BPD symptoms were also examined. When all 20 symptoms of *DSM-5* PTSD were included in ESEM analyses, there was less clear separation of a set of DSO symptoms from PTSD or BPD, as evidenced by the optimal two-factor solution. In fact, most DSO symptoms had moderate magnitude primary loadings on Factor Two (BPD/DSO) and slightly lower magnitude secondary loadings on Factor One (PTSD), with the exception of deactivated affect for which the pattern was reversed. Additionally, *DSM-5* PTSD items with salient cross-loadings were predominately NACM items, possibly indicating that these items are less useful in distinguishing between the constructs of *DSM-5* PTSD and BPD. Unsurprisingly, some routinely criticized *DSM-5* symptoms were poorly performing on the PTSD Factor (amnesia, reckless behavior). The *DSM-5* PTSD items that hung together as one factor without cross-loading onto Factor Two included all six *ICD-11* symptoms, but also included intrusive thoughts, emotional distress when reminded, physiological response when reminded, negative beliefs, and sleep disturbance, indicating that these symptoms may be important to include in a PTSD criteria set. These results highlight that, in the debate on the utility of CPTSD, how one defines a PTSD diagnosis is critical, because key features of *DSM-5* PTSD not included in *ICD-11* affected the relationships between PTSD and self-other and personality functioning. Our findings indicated that using the broader *DSM-5* PTSD diagnosis along with BPD adequately captured DSO symptoms. Thus, a separate CPTSD diagnosis may not contribute incremental value beyond assessing symptoms of *DSM-5* PTSD and BPD. It is relevant to note that the field is moving toward dimensional models of personality pathology that more accurately captures the continuous nature of maladaptive personality traits (Zimmermann et al., 2019); it is possible that will reduce some of the concerns about overlap between these three constructs moving forward, although both the Alternative Model for Personality Disorders in *DSM-5* and Personality Disorders in the *ICD-11* have BPD specifiers and so how PTSD, DSO, and BPD relate will likely continue to be applicable.

It is important to highlight the authors' choice in statistical analyses for this study is not the only means to explore diagnostic comorbidity or structural validity. Given the large number of non-zero cross-loadings and salient cross-loadings observed, ESEM did appear to be a more appropriate statistical technique for examining factor structure of conceptually overlapping disorders, compared to the CFA method which constrains secondary loadings to zero. Future use of ESEM can aid in observing and quantifying both the source and magnitude of comorbidity between psychiatric disorders, especially as the *ICD-11* and *DSM-5* diverge in their inclusivity of broader symptoms of PTSD.

There are a number of important strengths to highlight in this study, including the use of clinician-rated interview measures of PTSD, depression, and BPD and a diverse, community sample with high levels of chronic trauma exposure and psychological symptoms. However, there are also limitations that should be noted. First, it is important to review our conclusions in light of the potential bias of cross-sectional design and presence of missing data for some participants on questionnaire and interview items. However, to mitigate these concerns,

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we utilized maximum likelihood available in Mplus, a robust data analytic strategy for handling even large amounts of missing data (Brown, 2015; Enders, 2010). Second, we used the CAPS-5, a *DSM-5* measure, to approximate *ICD-11* criteria. Additionally, we only included a few discriminating external correlates to compare groups and future research should further focus on the convergent and discriminant validity of CPTSD and BPD latent factors, including assessing whether they demonstrate different relationships with external correlates and are truly unique constructs. Generalizability of the findings may be limited by our sample, which was predominantly Black women with limited socioeconomic resources; however, potential issues with generalizability is countered by the public health importance of including marginalized groups (e.g., Black women with limited socioeconomic resources) in research where they have been historically underrepresented.

1.4.1 Conclusions

Overall, our findings support the distinct constructs of PTSD, DSO, and BPD when using *ICD-11* PTSD criteria but not when using *DSM-5* PTSD criteria, demonstrating that how PTSD is defined matters significantly when considering the construct of CPTSD and its value as a distinct diagnosis. Regardless of the diagnoses that are used, determining the constellation of symptoms present for an individual patient and incorporating that into one's treatment plan is key. Clear overlap between PTSD, DSO, and BPD symptoms exist and consideration of trauma-informed treatments that may address underlying transdiagnostic symptoms like emotion dysregulation (e.g., Dialectical Behavior Therapy or DBT; (Linehan, 2020)) in individuals exhibiting symptoms of DSO and/or BPD in the context of PTSD is warranted. At this time, there is not clear evidence that certain types of trauma-focused treatments are superior to others for individuals with DSO/BPD symptoms or whether phased-based treatments are necessary. Thus, continued research is needed into how symptom presentation across these varied diagnoses may impact trauma-focused treatment choice. We also found that the *DSM-5* PTSD factor included the six core symptoms of PTSD from *ICD-11* but also included additional ones, suggesting more research is necessary to understand how these differing PTSD definitions relate and what PTSD symptoms may be most critical to the diagnosis.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Exploratory SEM was used to identify overlap between complex PTSD and BPD
- Distinguishing features of *ICD-11* complex PTSD and BPD were found in urban sample
- There was more overlap between BPD and complex PTSD when using *DSM-5* PTSD symptoms
- Consideration of the diagnostic structure of PTSD used is critical

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Table 1.

Descriptive Statistics for Continuous Summary Variables

Variable	Items	*N*	*M*	*SD*	Range	α
ICD-11 Posttraumatic stress disorder (PTSD) symptoms	6	462	5.51	4.34	0-19	.79
DSM-5 Posttraumatic stress disorder (PTSD) symptoms	20	454	18.85	13.34	0-63	.92
Disturbance in self-organization (DSO) symptoms	4	390	3.64	3.47	0-13	.81
Borderline personality disorder (BPD) symptoms	9	402	12.37	4.21	0-27	.86

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Table 2.

One- to Six-Factor ESEM Model Fit Results for PTSD, DSO, and BPD Symptoms using ICD-11 and DSM-5 Criteria

Model	χ^2	*df*	CFI	TLI	SRMR	RMSEA	90% CI RMSEA	k-1 Factor ΔRMSEA[a]
ICD-11 PTSD, DSO, and BPD								
One factor	1197.3**	350	.905	.898	.120	.072	[.067, .076]	--
Two factors	276.6**	134	.981	.976	.043	.048	[.040, .056]	.024
Three factors	**178.0** **	**117**	**.992**	**.988**	**.032**	**.033**	**[.023, .043]**	**.015**
Four factors	135.0*	101	.996	.992	.028	.027	[.013, .038]	.006
Five factors	110.1*	86	.997	.994	.025	.024	[.005, .037]	.003
Six factors	85.9	72	.998	.996	.022	.020	[.000, .035]	.004
DSM-5 PTSD, DSO, and BPD								
One factor	1683.4**	495	.921	.916	.088	.071	[.068, .075]	--
Two factors	**1068.8** **	**463**	**.960**	**.954**	**.056**	**.053**	**[.049, .057]**	**.032**
Three factors	741.2**	432	.980	.975	.044	.039	[.034, .044]	.014
Four factors	627.7**	402	.985	.980	.041	.035	[.029, .040]	.004
Five factors	554.9**	373	.988	.983	.037	.032	[.026, .038]	.003
Six factors	486.3**	345	.991	.986	.034	.030	[.023, .035]	.002

Note. $N = 470$. *df* = degrees of freedom; CFA = comparative fit index; TLI = Tucker-Lewis index; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation

[a]Change in RMSEA value for each model relative to the model with one fewer factor (k)

*$p < .05$;

**$p < .01$

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Table 3.

Factor Loadings for Resulting Three-factor ESEM on ICD-11 PTSD, DSO, and BPD Symptoms

	1: *ICD-11* PTSD		2: DSO		3. BPD	
	λ	***SE***	**λ**	***SE***	**λ**	***SE***
ICD-11 PTSD symptoms						
Dreams (B2)	**.863** **	.037	−.009	.051	.008	.045
Flashbacks (B3)	**.542** **	.069	.282 **†	.092	−.033	.080
Internal Avoidance (C1)	**.581** **	.079	.130	.104	.078	.072
External Avoidance (C2)	**.844** **	.037	.034	.046	.153 **	.043
Hypervigilance (E3)	**.703** **	.036	.200 **	.055	.027	.051
Startle (E4)	**.604** **	.044	.353 **†	.067	−.130 *	.060
DSO symptoms						
Hyperactivated affect	.190 **	.047	**.476** **	.054	.309 **†	.052
Deactivated affect	.173 **	.063	**.709** **	.077	−.045	.062
Sense of self disturbance	.183 **	.053	**.570** **	.064	.198 **	.061
Relationship disturbance	.050	.051	**.832** **	.062	−.020	.053
BPD symptoms						
Abandonment avoidance	.092	.070	.202 *	.085	**.642** **	.061
Unstable relationships	−.029	.053	.080	.060	**.815** **	.044
Identity disturbance	.127	.070	−.083	.093	**.831** **	.071
Impulsive behaviors	.087	.067	.152	.082	**.608** **	.058
Recurrent suicidal behaviors	.074	.067	.243 **	.081	**.592** **	.067
Affective instability	.078	.057	.355 **	.061	**.565** **	.053
Chronic emptiness	.148 *	.063	**.549** **	.086	.298 **†	.073
Uncontrolled anger	.001	.061	.300 **†	.070	**.625** **	.055
Paranoia or dissociation	.257 **†	.068	.249 **†	.086	**.479** **	.076

Note. $N = 470$. ESEM = exploratory structural equation modeling; PTSD = posttraumatic stress disorder; DSO = Disturbances in self-organization; BPD = borderline personality disorder; λ = standardized factor loading; *SE* = standard error

† Salient cross-loading; Bold text indicates primary factor loading;

* $p < .05$;

** $p < .01$

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Table 4.

Standardized Within- and Between-cluster Correlations for ESEM factors with External Latent Correlates

	External Factor					
ESEM Factor	**1. AVOID**	**2. AGG**	**2. ATT**	**Wald W_{2-1}**	**Wald W_{3-1}**	**Wald W_{3-2}**
A. *ICD*-PTSD	.805	.308	.356	18.1** (*q* = .79)	14.4** (*q* = .74)	0.8 (*q* = .05)
B. DSO	.569	.240	.730	5.5* (*q* = .40)	13.7** (*q* = .28)	33.1** (*q* = .68)
C. BPD	.308	.635	.362	12.0** (*q* = .43)	2.5 (*q* = .06)	3.4 (*q* = .37)
Wald W_{b-a}	6.6* (*q* = .47)	0.4 (*q* = .07)	16.6** (*q* = .56)			
Wald W_{c-a}	42.6** (*q* = .79)	9.6* (*q* = .43)	0.0 (*q* = .01)			
Wald W_{c-b}	4.0* (*q* = .33)	18.7** (*q* = .50)	19.3** (*q* = .55)			

Note. ESEM = exploratory structural equation modeling; *ICD* = International Classification of Diseases, Version 11; PTSD = posttraumatic stress disorder; DSO = Disturbances in self-organization; BPD = borderline personality disorder; AVOID = posttraumatic avoidance; AGG = aggressive behavior; ATT = anxious attachment; *q* = pairwise Cohen's effect size

* *p* < .05 or

** *p* < 01 after applying Benjamini and Hochberg's (1995) procedure to control for the false discovery rate.

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Table 5.

Factor Loadings for Resulting Two-factor ESEM on DSM-5 PTSD, DSO, and BPD Symptoms

	1: *DSM-5* PTSD		2: BPP/DSO	
	λ	***SE***	**λ**	***SE***
DSM-5 PTSD symptoms				
Memories (B1)	**.868****	.030	−.105*	.047
Dreams (B2)	**.709****	.050	.036	.067
Flashbacks (B3)	**.605****	.052	.083	.069
Psychological Distress (B4)	**.870****	.027	.018	.038
Physiological Distress (B5)	**.808****	.028	.014	.042
Internal Avoidance (C1)	**.809****	.029	−.015	.044
External Avoidance (C2)	.708**†	.036	.070	.049
Amnesia (D1)	−.026	.064	**.383****	.087
Negative Beliefs (D2)	**.588****	.040	.284**†	.047
Blame (D3)	**.369****	.055	.294**†	.059
Negative feelings (D4)	**.607****	.038	.331**†	.043
Loss of interest (D5)	**.471****	.051	.345**†	.055
Detachment (D6)	.470**†	.051	**.476****	.054
Numbing (D7)	.408**†	.052	**.486****	.056
Irritability/aggression (E1)	.331**†	.050	**.421****	.050
Reckless behavior (E2)	.044	.094	**.631****	.093
Hypervigilance (E3)	**.574****	.046	.067	.059
Startle (E4)	**.548****	.048	.126*	.057
Concentration problems (E5)	**.523****	.045	.362**†	.048
Sleep problems (E6)	**.508****	.047	.240**†	.053
DSO symptoms				
Hyperactivated affect	.369**†	.046	**.538****	.043
Deactivated affect	**.481****	.052	.387**†	.059
Sense of self disturbance	.444**†	.048	**.498****	.046
Relationship disturbance	.454**†	.048	**.492****	.047
BPD symptoms				
Abandonment avoidance	.035	.064	**.758****	.053
Unstable relationship patterns	−.166	.051	**.869****	.037
Identity disturbance	−.055	.071	**.792****	.060
Impulsive behaviors	−.009	.056	**.729****	.049

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	1: *DSM-5* PTSD		2: BPP/DSO	
	λ	***SE***	**λ**	***SE***
Recurrent suicidal behaviors	.062	.061	**.724****	.052
Affective instability	.145**	.052	**.737****	.040
Chronic emptiness	.362**†	.055	**.578****	.053
Uncontrolled anger	.010	.052	**.798****	.037
Transient paranoia/dissociation	.275**	.068	**.573****	.065

Note. $N = 470$. ESEM = exploratory structural equation modeling; PTSD = posttraumatic stress disorder; DSO = Disturbances in self-organization symptoms; BPD = borderline personality disorder; λ = standardized factor loading; *SE* = standard error

† Salient cross-loading; Bold text indicates primary factor loading;

* $p < .05$;

** $p < .01$.