

## **Title**

Borderline Personality Disorder (BPD) and Complex Post Traumatic Stress Disorder (CPTSD):

A network analysis in a highly traumatised clinical sample

## **Running Head**

BPD and CPTSD

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## **Abstract**

Whether Complex Posttraumatic Stress Disorder (CPTSD) and Borderline Personality Disorder (BPD) diagnoses differ substantially enough to warrant separate diagnostic classifications, has been a subject of controversy for years. To contribute to the nomological network of cumulative evidence, the main goal of the present study was to explore, using network analysis, how the symptoms of ICD-11 PTSD and DSO are interconnected with BPD in a clinical sample of polytraumatised individuals (n=330). Participants completed measures of life events, CPTSD and BPD. Overall, our study suggests that BPD and CPTSD are largely separated. The bridges between BPD and CPTSD symptom clusters were scarce with “Affective Dysregulation” items being the only items related to BPD. The present study contributes to the growing literature on discriminant validity of CPTSD and supports its distinctiveness to BPD. Implications for treatment are discussed.

## **Introduction**

The overlap between Borderline Personality Disorder (BPD) and symptoms of Complex Post Traumatic Stress Disorder (CPTSD) and Post Traumatic Stress Disorder

(PTSD) has been a subject of debate in recent years and there have been multiple attempts to determine whether CPTSD and BPD diagnoses differ substantially enough to warrant separate diagnostic classifications. Some suggested that CPTSD and BPD are distinct disorders with similar pathways including neurological (Amad et al., 2019) and anthropogenic (Grant et al., 2008). Others have supported the notion that PTSD, CPTSD and BPD symptoms only occur together with no distinct BPD class (Saraiya et al., 2021) and others proposed that CPTSD is the by-product of comorbid BPD and PTSD (Kulkarni, 2017). Furthermore, Powers et al. (2022), by using exploratory structural equation models, compared the diagnosis of BPD and PTSD using DSM-5 criteria and BPD and CPTSD using the ICD-11 criteria. They concluded that under DSM-5 classifications, the overlap between BPD and PTSD is substantial. The same study also suggested that according to ICD-11 classification, which uniquely includes CPTSD as a diagnosis, the disorders are rather distinct.

To date, a number of studies have investigated the symptom overlap between BPD and CPTSD (e.g. Cloitre et al., 2014; Cyr et al., 2022; Knefel et al., 2016; Frías & Palma, 2015; Saraiya et al., 2021; Scheiderer et al., 2015; Amad et al., 2019) with varying findings. Several studies have used latent class or latent profile analyses. Cloitre et al. (2014), for example, found that in a sample of women experiencing childhood abuse, a CPTSD class was distinct from BPD classes. As opposed to CPTSD, BPD was most strongly associated with symptoms of frantic efforts to avoid real or imagined abandonment, unstable and intense interpersonal relationships characterized by alternating between extremes of idealization and devaluation, unstable self-image or sense of self, and impulsiveness—markedly distinguishing the two disorders. Notably, however, the BPD class also endorsed some CPTSD symptoms. Similarly, Frost et al., (2020), examining a sample of individuals from the US general population who have been victims of sexual assault, identified that CPTSD existed as a unique construct and, in addition, there was a separate and distinct comorbid group which

endorsed both BPD and CPTSD symptoms. In contrast, Jowett et al. (2020) found that in a highly traumatised (potential multiple traumas) clinical sample, CPTSD and BPD symptoms were consistently manifest together but at different levels of severity. A similar finding was obtained by Saraiya and colleagues (2021) in a U.S. community sample of young adults. Lastly, Cyr and colleagues (2022), also assessing a community sample, identified a BPD group, a CPTSD and a comorbid BPD and CPTSD group. Of the five LCA and LPA studies, three have found distinct CPTSD and BPD classes (Cloitre et al., 2014; Cyr et al., 2022; Frost et al., 2020), two have not found a distinction between CPTSD and BPD but that the symptoms exist comorbidly at different levels of severity (Jowett et al., 2020, Saraiya et al., 2021) and all have found that BPD frequently co-occurs with CPTSD symptoms.

Hyland et al. (2019), using exploratory structural equation modelling in a UK general population sample, found that BPD, PTSD and DSO factors were distinct. However, considerable cross-loadings between the DSO and BPD factors were also identified. Finally, Ford and Courtois (2021) in their review, suggest that BPD, PTSD and CPTSD may be comorbid but distinct syndromes that are distinguishable both empirically (e.g. through factor analysis) and phenomenologically. Examples of phenomenological distinction might not always be captured by the current self-report scales with the DSO symptom cluster involving emotion dysregulation centred around difficulty in self-calming and emotional numbing as opposed to the emotional lability, uncontrollable anger episodes, and overall lack of control of emotions characteristic of BPD. In other words, while both constructs involve emotional dysregulation, its manifestation may differ. Similarly, self-perception in CPTSD (captured by the “Negative self-concept” items of the DSO) tends to revolve around a chronic sense of guilt and worthlessness standing in contrast to an unstable and fragmented sense of self that is more characteristic of BPD.

Despite the high interrelatedness of symptoms of PTSD, CPTSD and BPD, as exemplified in both substantial factor analysis cross loadings (Powers et al., 2022), and latent

class analysis results showing high occurrence of BPD and CPTSD symptoms together (Frost et al., 2020; Jowett et al., 2020), there is currently only one study that investigated symptoms of PTSD, CPTSD and BPD using network analysis (Knefel et al., 2016). The network analysis approach is fitting in the case of contested validity of mental disorder classification as it assumes a bottom-up approach as opposed to a predefined approach by examining the interaction of symptoms as constituting a mental disorder. In other words, any potential comorbidity between conditions would arise from the interaction of individual symptoms as opposed to the presence of symptoms of two constructs at the same time. Knefel et al. (2016) utilised the network analysis in a sample of adult survivors of childhood abuse using a number of items measuring PTSD, DSO and BPD symptoms. Their results suggested that symptoms of BPD were only weakly connected to the other two constructs. However, items used to measure PTSD and DSO constructs within the Knefel et al. (2016) study (i.e. 23 items) were later replaced by the International Trauma Questionnaire (Cloitre et al., 2018) (i.e. 12 items), which is the only validated measure of ICD-11 PTSD and CPTSD. Furthermore, the sample in this study included only survivors of childhood abuse in foster care settings limiting the generalisability of the findings to other trauma populations.

To build upon this work and to contribute to the nomological network of cumulative evidence, the main goals of the present study were to explore how the symptoms of ICD-11 PTSD and DSO are interconnected with BPD in a clinical sample of polytraumatised individuals currently seeking treatment. As previous examinations range from criticising the CPTSD/BPD split to recognising their (limited) distinctiveness, attention was given to centrality measures of the network and the examination of cross-construct connections (edges) within the network. The present study is also the first to examine the network of CPTSD and BPD symptoms within a polytraumatised clinical sample. This is important considering that polytraumatisation has been suggested as a risk factor for co-morbid CPTSD and BPD (Ford and Courtois, 2021).

## **Method**

### *Methods*

#### *Participants and Procedure*

Participants were a consecutive sample of adults who self-referred to Rivers Centre for Traumatic Stress in Scotland (N = 330). The Rivers Centre is a Lothian-based specialist trauma service in Scotland, serving people of all ages as part of the National Health Service (NHS). All new patients (outpatient) over the 8-month recruitment period were asked to complete a set of standardised measures as part of their initial assessment with the service. Eligibility criteria for participation were as follows: Having self-referred to the service for psychological therapy within the recruitment period, being aged 18 years or over, possessing adequate competency in written English to allow for the completion of self-report questionnaires. Ethical approval for the collection and use of these data was provided by NHS Lothian Clinical Governance and Edinburgh Napier University Research Ethics Committee.

### *Measures*

#### ***Traumatic Life Events***

Life Events Checklist (LEC; Gray, Litz, Hsu, & Lombardo, 2004) is a 17-item self-report measure for potentially traumatic events in the respondent's lifetime. The LEC assesses exposure to 16 events plus one item assessing any other extraordinarily stressful event. The respondent checks whether they (a) directly experienced, (b) witnessed, (c) learned about, (d) are not sure, and (e) does not apply to them. The LEC has demonstrated adequate reliability and validity. It is a descriptive measure and therefore does not have a cut-off.

#### ***Childhood Trauma***

Childhood trauma histories were measured with the Childhood Trauma Questionnaire (CTQ; Bernstein and Fink, 1998). The CTQ is a 28-item self-report measure assessing the

perceived frequency of childhood trauma experienced, across five subscales: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. Responses are given on a 5-point Likert scale from 1 (never true) to 5 (very often true). The CTQ also contains a 3-item Minimisation/Denial scale, however this was not considered relevant to the current aims and it was not administered. In the current sample, internal consistency for the subscales was: Emotional abuse  $\alpha = .906$ , Physical abuse  $\alpha = .881$ , Sexual abuse  $\alpha = .968$ , Emotional Neglect  $\alpha = .919$  and Physical neglect  $\alpha = .718$ . Responses to the five subscales can be summed to generate a cumulative childhood trauma frequency score ( $\alpha = .947$ ).

### ***PTSD and CPTSD symptoms***

CPTSD symptoms were measured using The International Trauma Questionnaire (ITQ; Cloitre et al., 2018), which is a self-report measure designed to capture symptoms of PTSD and CPTSD as specified in ICD-11. There are six items measuring the three PTSD symptom clusters (Re-experiencing, Avoidance and Sense of threat) and six items measuring the three DSO symptom clusters (Affective dysregulation, Negative Self Concept, Disturbed Relationships). Participants rate how often they have been bothered by each of the symptoms in the period of past month using a five-point Likert scale ranging from 'Not at all' (0) to 'Extremely' (4). Cronbach's alpha for the PTSD ( $\alpha = .763$ ) and DSO ( $\alpha = .840$ ) sub-scales were respectively good and excellent in the current sample.

### **BPD Symptoms**

BPD symptoms were assessed using a 14-item self-report measure based on the BPD module of the Structured Clinical Interview (SCID-II) for DSM-IV. The items map onto nine domains of BPD. Six of these nine symptoms (abandonment, unstable relationships, impulsivity, affective instability, feeling empty, and dissociation) were measured using a single item. Three symptoms (unstable sense of self, suicidal/ self-injury, and anger) were measured using multiple items (four, two, and two, respectively) and endorsement of one symptom within each of these clusters indicates symptom endorsement. Each item was

responded to using a binary ‘Yes’ (1) or ‘No’ (0) response format. This is not a diagnostic tool and it was developed for the needs of the present project. Therefore, for the purposes of this analysis, a probable diagnosis is not estimated for each participant. Cronbach’s alpha for this sample was good ( $\alpha = .792$ ).

## **Analytical strategy**

### *Network Estimation*

Because the data included both binary and continuous variables, networks were estimated using R and the package ‘MGM’ (Haslbeck & Waldorp, 2015). This package utilises regularized generalized regressions to estimate a network model. Tuning parameter  $\gamma=0.5$ , which was previously suggested to be conservative, while not being prone to falsely include edges (Isvoranu & Epskamp, 2021), was used. Because this method does not handle missingness, listwise deletion is automatically applied to data (final sample is  $N=263$ ). However, Little’s MCAR test suggested the data was missing completely at random (Chi-Square = 1003.050, DF = 1046, Sig. = .826).

Qgraph package visualises networks as nodes, in this case - points representing questionnaire items. Additionally, the package visualises edges which can be interpreted as partial correlation coefficients, with thickness of the line being reflective of the strength of the association between two nodes while controlling for all other nodes. ‘Spring’ layout was used which places strongly associated nodes closer together (Epskamp et al., 2018).

### *Network Centrality*

The importance of each node within the network was estimated using "Expected Influence", "Betweenness" and "Closeness" centrality indices. Expected influence refers to the influence a symptom holds within the network over neighbouring nodes based on a raw value of edge strength. Betweenness reflects the importance of a node in connecting unconnected symptoms in the network calculated based on the incidence of a node being within the shortest path between two nodes. A node has high closeness centrality if the

information from this node can reach other nodes quickly or to put it in other terms and it is defined as the inverse of the sum of the distances of the node from all the other nodes in the network. Centrality was estimated using the ‘qgraph’ R package (Epskamp et al., 2012).

### *Network Stability*

The R package ‘bootnet’ was used for establishing accuracy and stability of the network (Epskamp et al., 2018). This was performed in three steps: (1) 95% confidence intervals (CI) of the edge weights were obtained through bootstrapping, (2) the correlation stability co-efficient for centrality indices was estimated (with values below 0.25 implying inadequate stability while values exceeding 0.5 implying adequate stability). Bootstrapping used 1000 iterations for each of the analyses.

### *Clique percolation*

Clique Percolation (CP) for weighted networks (Palla et al., 2005; Farkas et al., 2007) was used to identify communities of symptoms of within the network. The R package CliquePercolation (Lange, 2019) was used. CP allows a node to belong to more than one community, which is especially useful in psychometric networks when compared to other methods (e.g. the walktrap algorithm which only allows a node to belong to one community). For weighted CP, two parameters have to be set: parameter  $k$  and the intensity parameter  $I$ . The method identifies  $k$ -cliques, which are fully connected ‘sub-networks’ with ‘ $k$ ’ number of nodes and a parameter ‘ $I$ ’ determines the strength of average relations among a community needed for that community to be detected. The cliques are then defined as adjacent if they share all but one node in which case these cliques are defined as communities. For small networks, using an entropy permutation test, can establish an optimal value for these (Lange, 2019). In the present study  $k$  was allowed to vary between 3 and 4 and  $I$  between 0.01 and 0.70. Increments of 0.01 between these  $I$  values were tested.

## **Results**

### *Descriptive statistics*

Descriptive statistics are presented in Table 1. Three hundred and nineteen individuals aged between 18 and 78 ( $M=38.81$ ,  $SD=12.32$ ) were assessed. Most of the sample was comprised of women ( $N=205$ , 64.26%). A large part of the sample reported being employed ( $N=132$ , 41.38%) with unemployment also being high (95, 29.8%). The majority of the participants identified as British ( $N=297$ , 93.10%). In total, 214 (67.08%) participants satisfied the criteria for probable CPTSD (assessed using the ITQ) diagnosis and 42 (13.17%) participants satisfied the criteria for probable PTSD diagnosis. The mean sum score of BPD item endorsement was  $M=8.52$  ( $SD=3.39$ ) with scores ranging from 0 to 14. Traumatic life event endorsement is presented in Table 2. The most endorsed type of lifetime trauma was Physical assault ( $N=214$ , 64.8%) and the highest cumulative frequency scores of potential childhood trauma were Emotional Abuse ( $M=14.95$ ,  $SD=6.67$ ) and Emotional Neglect ( $M=14.72$ ,  $SD=6.254$ ) with Sexual Abuse being also highly endorsed ( $M=11.02$ ,  $SD=7.614$ ). The cumulative traumatic life experiences based on the LEC were also calculated ( $M=4.11$ ,  $SD=2.71$ ). All participants endorsed at least one trauma type and most were multiply traumatised with 96.7% ( $N=319$ ) endorsing at least two types of potentially traumatic life events.

(Table 1 about here)

(Table 2 about here)

### *Network analysis*

Out of the possible 312 edges, 33 (10.58%) were estimated as being different from zero using the 'MGM' estimation ( $\gamma=0.5$ ). The weights matrix is shown in Table 3 and the network is presented in Figure 1.

(Table 3 about here)

(Figure 1 about here)

When inspecting betweenness, closeness and expected influence of the network (Figure 2), BPD4 (“Does your sense of who you are often change dramatically?”) item showed the highest overall average centrality. BPD 11 item (“Do you often feel empty inside?”) also showed very high Betweenness and Closeness centrality despite showing low Expected Influence. Overall, BPD items were more central to the network than DSO and PTSD items. Notably, NSC 2 (“I feel worthless) showed medium Expected Influence, which was nevertheless highest among the PTSD and DSO items. AD2 (“I feel numb”) showed the highest betweenness and very high closeness and inspecting Figure 1 reveals it as a bridge node between BPD and 3 components of the ITQ – Avoidance, Disturbed relationships and Negative Self Concept.

Robustness was examined using the bootstrapping procedure (Supplementary Figure 1 and Supplementary Figure 2). Expected influence was supported, however, closeness and betweenness showed wide 95% CI ranges and should be interpreted with care. Conversely, Supplementary Figure 2 shows the results of the case-dropped correlation stability analysis and the results suggest sufficient stability. Furthermore, Supplementary Figure 3, presenting the bootstrapped difference test, indicated that the rank ordering of edge weights (i.e., thickness of edges) should be interpreted with caution. However, largest weights significantly differed from the smaller weights.

The clique percolation procedure identified an optimal solution based on entropy permutation with  $k=3$  and  $I=0.16$ . This solution (Figure 3) was chosen based on entropy threshold (1.475) that exceeded the 95% CI permuted solution that would be obtained by chance (0.915- 1.086). The results are presented in Figure 3. The solution included three communities spanning 9 nodes and seventeen isolated nodes. The identified communities were interpreted as ‘Volatility’ (BPD 2, BPD 10, BPD 12, BPD 13) including symptoms of mood changes and anger, ‘Stress’ (AD 1, BPD 10, BPD 14) including symptoms relating to

stress control and ‘Sense of self’ (BPD 3, BPD 4, BPD 6) including symptoms relating to sense of identity and self. BPD 10 was shared between the communities of ‘Stress’ and ‘Volatility’ while AD 1 was the only item of the ITQ (DSO) that was part of a community (Stress).

(FIGURE 3 ABOUT HERE)

Overall results suggest that, BPD and CPTSD symptoms are separate constructs with “Affective Dysregulation” items (AD1, AD2) contributing to potential cross-construct overlap.

## **Discussion**

We have used a network approach to examine the relationship between symptoms of BPD and CPTSD in a polytraumatised clinical sample. Network structure, node centrality and communities were all examined. Overall results indicate that the distinction between BPD and CPTSD symptoms was strongly supported. However, our results also suggest that two symptoms of CPTSD, namely, “When I am upset, it takes me a long time to calm down.” (AD1) and “I feel numb or emotionally shut down” (AD2), were the only symptoms connecting the BPD with CPTSD constructs and potentially contribute to the overlap of the two conditions (Powers et al., 2022; Frost et al., 2020). Both AD1 and AD2 are part of the “Affective Dysregulation” (AD) symptom cluster of the CPTSD. This overlap was previously observed in latent variable studies (e.g. Hyland et al., 2019), where statistically significant cross-loadings were observed for both AD items with AD1 being more predictive of BPD than DSO in exploratory structural equation modelling analysis. Powers et al. (2022) also suggest that AD1 presented salient cross loading with BPD. The present study reinforces this finding considering that the network model obtained provided no bridges between AD1 and other DSO, and indeed PTSD, nodes.

Expected influence was higher for the BPD than the PTSD and DSO constructs.

While these results would suggest that targeting symptoms of the DSO would exert influence on the nodes of the other two constructs, these have to be interpreted while considering the network structure. Because BPD is only scantily connected with PTSD and DSO nodes, the BPD nodes can be considered as exerting influence mostly on other BPD symptoms.

Closeness and Betweenness measures were shown to be highly unstable in the present sample, probably due to a high number of variables included when compared to the number of participants (Epskamp et al., 2018). However, from a theoretical point of view both of these measures rely on the identification and length of the shortest paths among nodes in the network (Opsahl et al., 2010) and identify the rate of change to the network (betweenness) and if paths between the nodes might be disrupted or reinforced (closeness). BPD 4 (“Does your sense of who you are often change dramatically?”), BPD 11 (Do you often feel empty inside?) and AD 2 items (“I feel numb or emotionally shut down”) were all high in terms of betweenness and closeness. These results indicate nodes that may be prime targets for intervention in the BPD construct (BPD 4 and BPD 11) and bridging nodes (BPD 11 and AD 2). It is important to note that thematically, BPD 11 and AD 2 measure conceptually overlapping symptoms, both describing a lack of affective response. This conceptual overlap might partially explain previously described overlap between BPD and CPTSD (e.g. Frost et al., 2020). Future research might explore the relationship between symptoms elected as central and their relationship to functional impairment. For example, the importance of emptiness in the BPD symptom cluster has previously been described as being a major contributor to functional impairment (Miller et al., 2018).

The present study also examined communities. The three communities obtained, “Stress”, “Volatility” and “Sense of self” were mostly composed of BPD items. The lack of communities observed within the PTSD and DSO constructs may be attributable to that no three nodes being interconnected (having bridges between every node). Nevertheless, only

one symptom from the ITQ was observed as being a part of a community (AD1: “When I am upset it takes me a long time to calm down”). The present results suggest that this item is more strongly connected with the BPD symptoms with no bridges between the node and any of the PTSD and DSO nodes. The communities also reflect the notion that BPD symptoms are largely separate from the PTSD and DSO symptoms in that the symptom communities, with the exception of AD1, do not span between constructs. While further research is needed, this highlights the need for future examination of thematic overlap between the measures of these constructs. Examining how the two constructs are interconnected reveals that the “Sense of self” community connects with AD2 (‘I feel numb and emotionally shut down’) through the BPD11 (‘Do you often feel empty inside’) node. This relationship might be reflective of a dissociative theme of the two constructs examined. However due to weak and indirect relationship between the two, that inference can only be made tentatively. As for the “Stress” and “Volatility” clusters, while sharing the sudden mood change node (BPD10), the two are distinct in that “Stress” cluster incorporates two items more related to stress and being upset (respectively BPD14 and AD1) and “Volatility” is more characterised by anger and temper outburst. In conjunction with the Affective Dysregulation factor of the ITQ which incorporates both high and low affect, the results suggest that the connection between CPTSD and BPD lies within the different aspects of regulation of affect- with other symptoms being largely separated cross-construct. Furthermore, it is important to note that out of all the symptom pairs of the subscales of the ITQ, the AD symptoms are the only ones that do not share an edge in the present results. Conceptually, this is to be expected as both of the symptoms measure opposite phenomena – high and low affect. While previously supported by factor analytical examinations (Hyland et al, 2017), the present study puts the utility of these items into question when differentiating BPD and CPTSD. Future research could explore the overlap between BPD and CPTSD while taking into account the low-high affect stratification, especially as only one of the affect items (AD1 “When I’m upset it takes me a

long time to calm down” or AD2 “I feel numb or emotionally shut down”) has to be endorsed for a probable diagnosis of CPTSD.

Only one previous study has examined the network structure of BPD and CPTSD symptoms. The present results contradict Knefel’s et al. (2016) findings in that they suggest a more sparsely connected network of PTSD and DSO symptoms. This may be due to the nature of the sample included as it was previously suggested that the network structure might vary depending on the type of traumatic exposure (Karatzias et al., 2020). The difference in the interconnectedness of the symptoms might also be to some extent attributable to different number of items in the measure used in the previous study (Knefel et al., 2016). Communities detected within Knefel et al. have also differed to the present results, however, both sets of results suggest weak cross construct bridges and only limited communities spanning between BPD and the constructs of PTSD and DSO. Notably, the lack of connection between the Disturbed Relationship and Negative Self-Concept items (ITQ) and any BPD items could be reflective of the notion mentioned in Ford and Courtois (2021)- with fear of rejection and abandonment being more pronounced in BPD as opposed to low self-concept being more characteristic of CPTSD. Another contributing factor to this distinction may lie within the high rates of probable CPTSD within the present sample which, while not unusual in polytraumatised samples (Jowett et al., 2020), is different to rates within Knefel et al. (16.9% CPTSD out of 54.1% meeting the criteria for PTSD). While the differences between the results might be attributable to a number of factors, the present study replicated the results of limited connection between BPD and CPTSD. Future research is however needed, to replicate the present findings in different trauma samples.

Although quite distinct, CPTSD and BPD symptoms can overlap in some patients. There is now a need to explore the effectiveness and efficacy of interventions for those with CPTSD or co-morbid BPD and CPTSD. It is important to note that, when considering treatment implications, only limited evidence exists suggestive of network analysis results

successfully informing therapeutic interventions as to which symptoms to target (Rodebaugh et al., 2018). For those who endorse symptoms of both conditions, following exposure to psychological trauma, targeting symptoms of affect dysregulation might be beneficial to their recovery, according to our findings. A trauma informed modular approach which has been suggested as a helpful treatment model for the treatment of CPTSD (Karatzias and Cloitre, 2019) might also be helpful for targeting comorbid CPTSD and BPD. The modular approach proposes that symptom clusters should be targeted using a formulation-based approach and on the basis of a client's readiness and severity of their symptoms. Alternatively, approaches that have been used for BPD, such as Dialectical Behavior Therapy (DBT) might also be helpful for those with comorbid BPD and CPTSD (e.g. Bohus et al., 2020). It is important to note that network approaches informing treatment is still a highly contested venture. While there exist some promising results, where centrality measures mapped well to how improvement of symptoms occurred after treatment (Papini et al., 2020), others suggest low supporting evidence for the centrality informed treatment (Spiller et al., 2020).

Despite its strengths, the present study also had several limitations. First, the BPD symptoms were measured using a dichotomous (binary) scale. This presents a challenge as some information about the intensity (or frequency) of the symptoms might have been lost. Future research should endeavour to replicate these results using a continuous scale. Indeed, data collected as part of a clinical interview and data collected through both implicit and explicit multimethod means including information provided by significant others, and data using performance-based measures of personality would provide a more accurate assessment of the participants. This would ensure collection of valid, reliable conclusions about an individual's functioning and adjustment which may be otherwise confounded unless one has accurate information about patterns of behaviour, cognitions, emotions, and interpersonal relationships of the person in question. In addition, the ITQ asks the participant to "identify the experience that troubles you most and answer the questions in relation to this experience"

which perhaps could be better facilitated in a therapeutic setting, ensuring that the individual indeed answers the question in relation to that event. Due to its design being concerned with symptom level interactions, the study also did not take anthropogenic and demographic factors into consideration which could have potentially influenced the results. Future research could examine whether the observed effects hold while stratifying for other known risk conditions like trauma type, socioeconomic status, gender, age, cumulative trauma. Due to the nature of the sample, namely, treatment seeking polytraumatised individuals, these findings might not be generalizable to other trauma samples. Future research is required to replicate these findings to general population samples. Furthermore, the results may have been influenced by the grouping of the items during data collection- i.e. the ITQ and the BPD parts of the questionnaire were presented together and in sequence to the participants. Despite its limitations, our study suggests that BPD and CPTSD are largely separated. The bridges between BPD and CPTSD symptom clusters were scarce with “Affective Dysregulation” items being the only items related to BPD. No cross-construct communities were detected. The present study contributes to the growing literature on discriminant validity of CPTSD and supports its distinctiveness to BPD.

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**Table 1. Descriptive statistics**

Category/variable	Mean/N	SD/%	Range
Sociodemographic			
Age	38.97	12.46	18-78
Gender (being female)	205	62%	
Employment status	N	%	
Unemployed	95	28.8%	
Employed	132	40.0%	
Homekeeper	25	7.6%	
Student	22	6.7%	
Retired	13	3.9%	
Illness	29	8.8%	
Nationality			
British	297	90.0%	
Other - European	15	4.5%	
Other - Asian	4	1.2%	
Other	5	1.5%	
International Trauma Questionnaire	Mean	SD	Range
Re1- Having upsetting dreams that replay part of the experience or are clearly related to the experience?	2.45	1.41	0-4
Re2- Having powerful images or memories that sometimes come into your mind in which you feel the	2.70	1.24	0-4
Av1- Avoiding internal reminders of the experience	3.01	1.18	0-4
Av2- Avoiding external reminders of the experience (for example, people, places, conversations, objects,	3.08	1.17	0-4
SoT1- Being "super-alert", watchful, or on guard?	3.23	1.05	0-4
SoT2- Feeling jumpy or easily startled?	3.01	1.20	0-4
AD1- When I am upset, it takes me a long time to calm down.	3.31	0.97	0-4
AD2- I feel numb or emotionally shut down.	2.92	1.39	0-4
NSC1- I feel like a failure.	2.96	1.23	0-4
NSC2- I feel worthless.	2.98	1.08	0-4
DR1- I feel distant or cut off from people.	2.76	1.24	0-4
DR2- I find it hard to stay emotionally close to people.	3.02	1.22	0-4
Borderline Personality Disorder			
BPD 1- Have you often become frantic when you thought that ... was going to leave you?	231	70%	
BPD 2- Do your relationships with people you really care about have lots of extreme ups and downs?	217	65.8%	
BPD 3- Have you suddenly changed your sense of who you are and where you are headed?	205	62.1%	
BPD 4- Does your sense of who you are often change dramatically?	172	52.1%	
BPD 5- Are you different with different people or ...hat sometimes you don't know who you really are?	198	60%	
BPD 6- Have there been lots of sudden changes in your goals, career plans, religious beliefs, and so on?	170	51.5%	
BPD 7- Have you often done things impulsively?	220	66.7%	
BPD 8- Have you tried to hurt or kill yourself or threatened to do so?	193	58.5%	
BPD 9- Have you ever cut, burned, or scratched yourself on purpose?	159	48.2%	
BPD 10- Do you have a lot of sudden mood changes?	237	71.8%	
BPD 11- Do you often feel empty inside?	269	81.5%	
BPD 12- Do you often have temper outbursts or get so angry that you lose control?	147	44.5%	
BPD 13- Do you hit people or throw things when you get angry?	76	23%	
BPD 14- When you are under a lot of stress, do you get ...people or feel especially spaced out?	239	72.4%	

Note. "Re" - Reexperiencing, "Av" - Avoidance, "SoT" - Sense of Threat, "AD" = Affective Disregulation, "NSC" - Negative Self Concept, "DR" - Disturbed Relationships, "BPD" - Borderline Personality Disorder

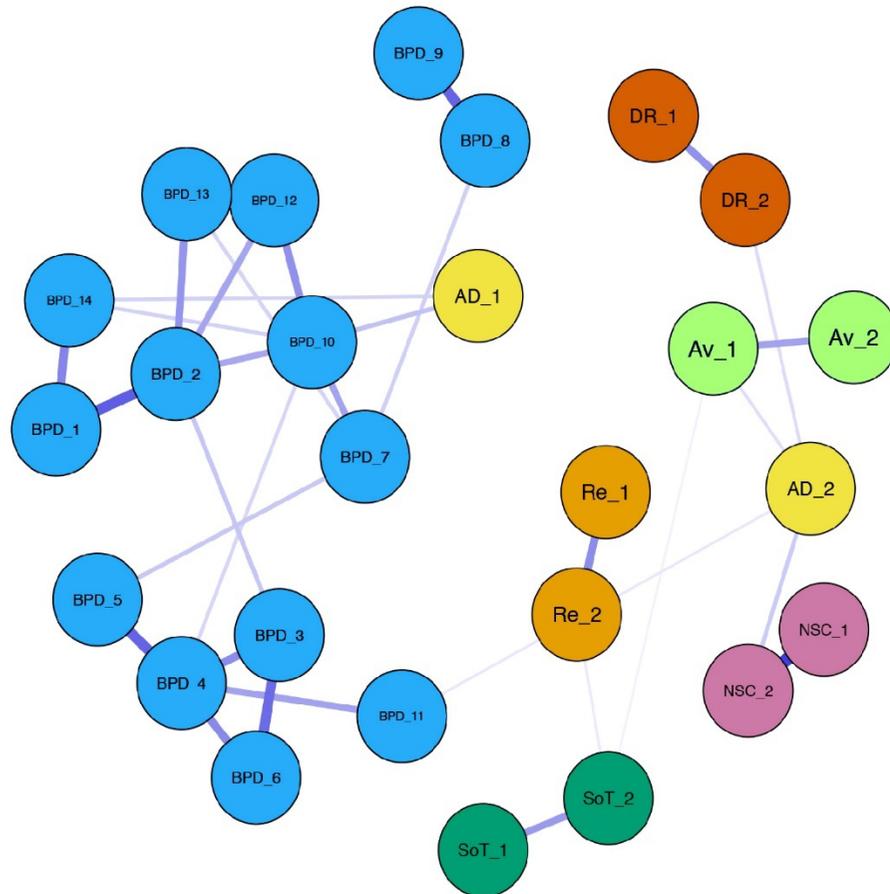
**Table 2. Self-reported traumatic events**

Life events checklist			Childhood trauma questionnaire				
item	N endorsed	%	item	Mean	SD	Min	Max
Natural disaster	19	5.8	I didn't have enough to eat	1.79	1.262	1	5
Fire or explosion	46	13.9	I knew that there was somebody to take care of me and protect me.	3.43	1.448	1	5
Transportation accident	109	33.0	People in my family called me things like "stupid", "lazy", or "ugly"	2.96	1.526	1	5
Serious accident at work, home, or during recreational activity	56	17.0	My parents were too drunk or high to take care of the family	1.93	1.369	1	5
Exposure to toxic substances	19	5.8	There was somebody in my family who helped me feel that I was important or special.	3.34	1.500	1	5
Physical assault	214	64.8	I had to wear dirty clothes.	1.61	1.208	1	5
Assault with a weapon	112	33.9	I felt loved	3.22	1.461	1	5
Sexual assault	174	52.7	I thought my parents wished I had never been born.	2.51	1.511	1	5
Other unwanted or uncomfortable sexual experience	182	55.2	I got hit so hard by somebody in my family that I had to see a doctor or go to hospital.	1.53	1.161	1	5
Combat or exposure to a war zone	14	4.2	There was nothing I wanted to change about my family.	2.19	1.470	1	5
captivity	48	14.5	People in my family hit me so hard that it left me with bruises or marks.	2.14	1.527	1	5
Life-threatening illness or injury	77	23.3	I was punished with a belt, a cord, or some other hard object	3.06	1.429	1	5
Severe human suffering	64	19.4	People in my family looked out for each other	3.25	1.453	1	5
Sudden, violent death	36	10.9	People in my family said hurtful or insulting things to me	2.54	1.706	1	5
Sudden, unexpected death	34	10.3	I believe I was physically abused	2.05	1.265	1	5
Serious injury, harm, or death you caused to someone else	28	8.5	I had the perfect childhood	1.62	1.242	1	5
Any other very stressful event or experience	126	38.2	I got hit or beaten so badly that it was noticed by someone like a teacher, neighbour, or doctor	3.09	1.644	1	5
			I felt that somebody in my family hated me	2.82	1.343	1	5
			People in my family felt close to each other	2.39	1.650	1	5
			Someone tried to touch me in a sexual way, or tried to make me touch them	1.88	1.476	1	5
			Someone threatened to hurt me or tell lies about me unless I did something sexual with them	2.33	1.381	1	5
			I had the best family in the world.	2.28	1.627	1	5
			Someone tried to make me do sexual things or watch sexual things	2.32	1.661	1	5
			Someone molested me	3.35	1.633	1	5
			I believe I was emotionally abused	4.00	1.302	1	5
			There was someone to take me to the doctor if I needed it	2.51	1.786	1	5
			I believe I was sexually abused	2.64	1.425	1	5
			My family was a source of strength and support	1.79	1.262	1	5
Scores for CTQ subscales							
			Emotional Abuse	14.95	6.674	0	25
			Physical Abuse	9.87	5.890	0	25
			Sexual Abuse	11.02	7.614	0	25
			Emotional Neglect	14.72	6.254	0	25
			Physical Neglect	9.80	5.020	0	25

**Table 3. Weights Matrix**

	PTSD				DSO				NSC				DR		BPD													
	RE1	RE2	AV1	AV2	SoT1	SoT2	AD1	AD2	NSC1	NSC2	DR1	DR2	BPD1	BPD2	BPD3	BPD4	BPD5	BPD6	BPD7	BPD8	BPD9	BPD10	BPD11	BPD12	BPD13	BPD14		
RE1	0																											
RE2	.395	0																										
AV1	0	0	0																									
AV2	0	0	.321	0																								
SoT1	0	0	0	0	0																							
SoT2	0	.069	.045	0	.348	0																						
AD1	0	0	0	0	0	0	0																					
AD2	0	0	.106	0	0	0	0	0																				
NSC1	0	0	0	0	0	0	0	0	0																			
NSC2	0	0	0	0	0	0	0	0	.176	.668	0																	
DR1	0	0	0	0	0	0	0	0	0	0	0	0																
DR2	0	0	0	0	0	0	0	0	.116	0	0	.374	0															
BPD1	0	0	0	0	0	0	0	0	0	0	0	0	0	0														
BPD2	0	0	0	0	0	0	0	0	0	0	0	0	0	.554	0													
BPD3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.194	0												
BPD4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.395	0											
BPD5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.534	0										
BPD6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.509	.407	0	0									
BPD7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.187	0	0								
BPD8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.160	0							
BPD9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.534	0						
BPD10	0	0	0	0	0	0	.208	0	0	0	0	0	0	0	.302	0	.137	0	0	.316	0	0	0					
BPD11	0	0	0	0	0	0	0	.075	0	0	0	0	0	0	0	0	.318	0	0	0	0	0	0	0				
BPD12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.309	0	0	0	0	0	0	0	0	.379	0	0		
BPD13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.368	0	0	0	0	.147	0	0	0	0	.885	0		
BPD14	0	0	0	0	0	0	.154	0	0	0	0	0	0	.424	0	0	0	0	0	0	0	0	.152	0	0	0	0	

**Figure 1. Network structure**



**Re-experiencing**

- Re\_1: Having upsetting dreams that replay part of the experience or are clearly related to the experience?
- Re\_2: Having powerful images or memories that sometimes come into your mind in which you feel the

**Avoidance**

- Av\_1: Avoiding internal reminders of the experience
- Av\_2: Avoiding external reminders of the experience (for example, people, places, conversations, objects,

**Sense of Threat**

- SoT\_1: Being "super-alert", watchful, or on guard?
- SoT\_2: Feeling jumpy or easily startled?

**Affective dysregulation**

- AD\_1: When I am upset, it takes me a long time to calm down.
- AD\_2: I feel numb or emotionally shut down.

**Negative self-concept**

- NSC\_1: I feel like a failure.
- NSC\_2: I feel worthless.

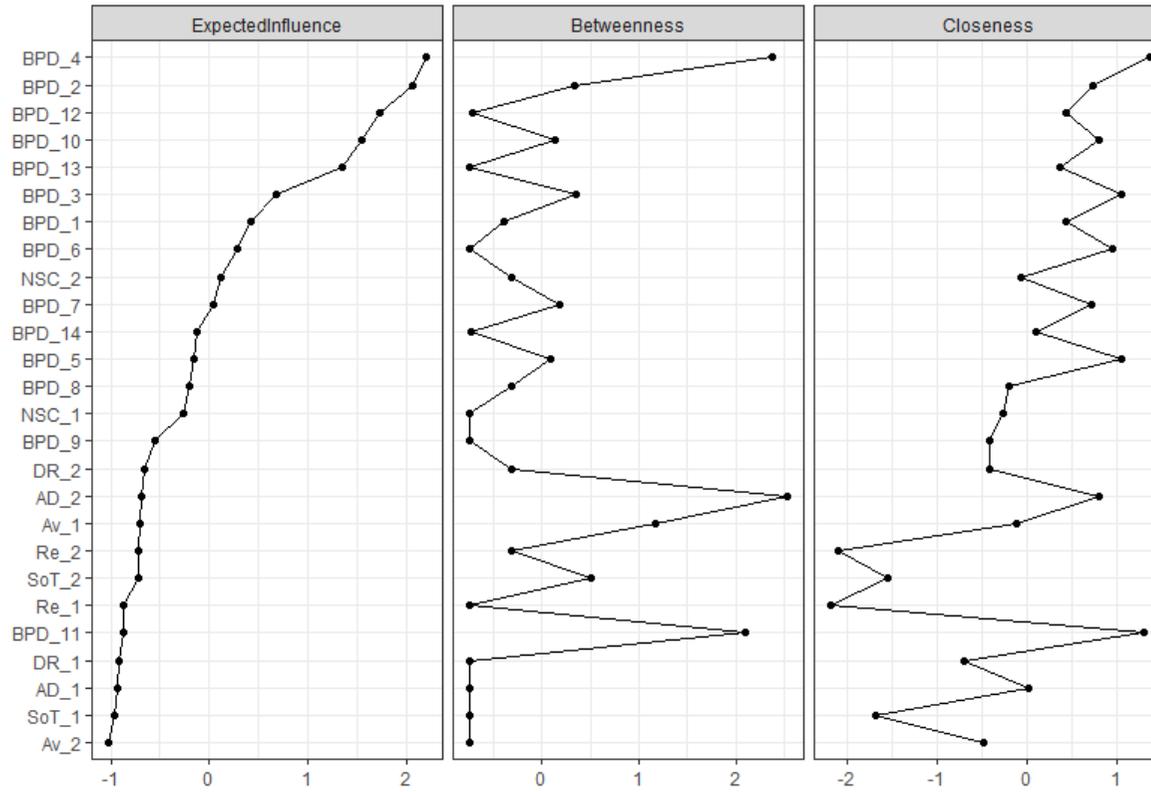
**Disturbed relationships**

- DR\_1: I feel distant or cut off from people.
- DR\_2: I find it hard to stay emotionally close to people.

**Borderline Personality Disorder**

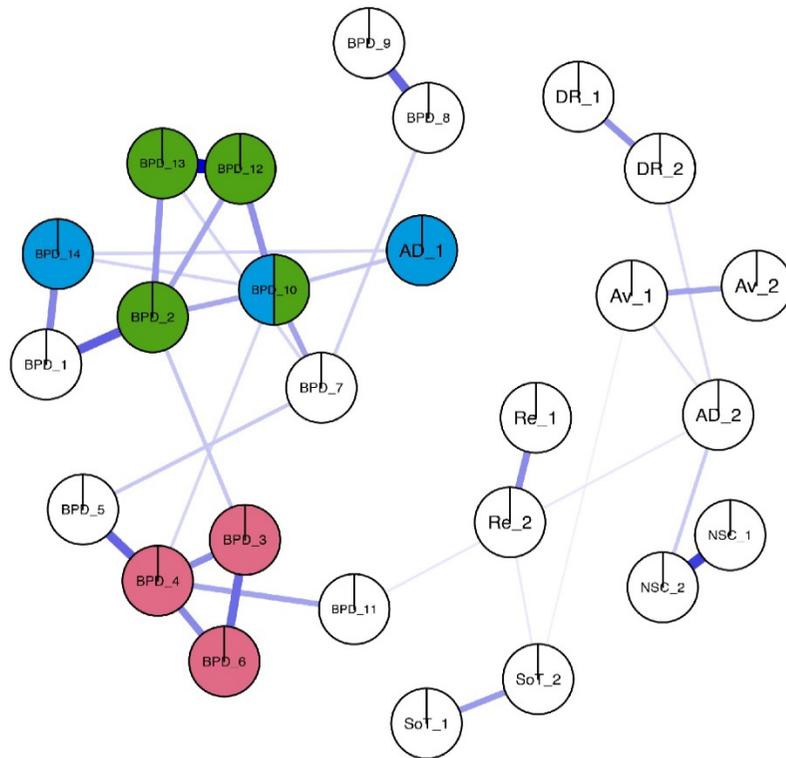
- BPD\_1: Have you often become frantic when you thought that ... was going to leave you?
- BPD\_2: Do your relationships with people you really care about have lots of extreme ups and downs?
- BPD\_3: Have you suddenly changed your sense of who you are and where you are headed?
- BPD\_4: Does your sense of who you are often change dramatically?
- BPD\_5: Are you different with different people or ...hat sometimes you don't know who you really are?
- BPD\_6: Have there been lots of sudden changes in your goals, career plans, religious beliefs, and so on?
- BPD\_7: Have you often done things impulsively?
- BPD\_8: Have you tried to hurt or kill yourself or threatened to do so?
- BPD\_9: Have you ever cut, burned, or scratched yourself on purpose?
- BPD\_10: Do you have a lot of sudden mood changes?
- BPD\_11: Do you often feel empty inside?
- BPD\_12: Do you often have temper outbursts or get so angry that you lose control?
- BPD\_13: Do you hit people or throw things when you get angry?
- BPD\_14: When you are under a lot of stress, do you get ...people or feel especially spaced out?

**Figure 2. Standardised Centrality Measures**



**Figure 3. Clique Percolation Results**

Communities based on Clique Percolation



**Re-experiencing**

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