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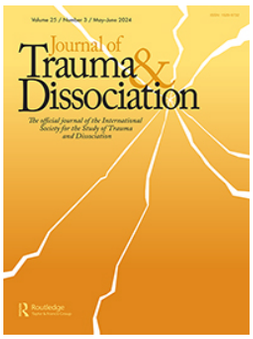

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Dissociative Experiences, Borderline Personality Disorder Features, and Childhood Trauma: Generating Hypotheses from Data-Driven Network Analysis in an International Sample

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ABSTRACT

Dissociation is a multifaceted phenomenon that occurs in various mental disorders, including borderline personality disorder (BPD), but also in non-clinical populations. Severity of childhood trauma (abuse, neglect) plays an important role in the development of dissociation and BPD. However, the complex interplay of different dissociative symptoms, BPD features, and self-reported childhood trauma experiences is not yet fully understood. Graph-theoretical network analysis can help to better understand such multivariate interrelations. Objective: This study aimed to investigate associations between self-reported dissociation, BPD features, and childhood trauma experiences using a graph-theoretical approach. Data was collected online via international mental health platforms and research sites. $N = 921$ individuals (77.4% female) were included; 40% reported pathological levels of dissociation. Variables were assessed with established psychometric scales (Dissociative Experiences Scale; Personality Assessment Inventory Borderline Features Scale; Childhood Trauma Questionnaire) and analyzed within a partial correlation network. Positive bivariate correlations between all variables were found. When accounting for their mutual influence on each other, dissociation was predominantly connected to BPD features with effect sizes between $rp = .028$ and $rp = .126$, while still showing a slight unique relationship with physical neglect ($rp = .044$). Findings suggest close associations between dissociative experiences and BPD features. While childhood trauma plays an important role in the development of dissociation and BPD, its recall may not fully explain their current co-occurrence. Prospective studies are needed to shed more light on causal pathways to better understand which factors contribute to dissociation and its link to BPD (features).

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Introduction

Dissociation is a complex multi-faceted phenomenon. It has been broadly defined as disruption of and/or discontinuity in normally integrated psychological processes (e.g., consciousness, memory, perception, emotions) and/or somatic functions (e.g., motor control, body representation and awareness, pain processing) (American Psychiatric Association, 2013; Spiegel et al., 2011). While different conceptualizations exist, three major domains of dissociative symptoms have been put forward: Experiential detachment (depersonalization / derealization), symptoms of compartmentalization (keeping conflicting experiences separated or isolated from each other), and dissociative absorption (E. M. Bernstein & Putnam, 1986; Spiegel & Cardena, 1991). Depersonalization/derealization is the subjective detachment from the own person (e.g., thoughts, emotions) and/or the environment (e.g., perceiving it as unreal, blurry, movie-like, or lacking significance). Compartmentalization can lead to an inability to access normally integrated functions, such as autobiographical memories, and involves dissociative amnesia (temporary loss of episodic memory) or fugue. Dissociative absorption describes a state of being totally immersed in an event or activity, while filtering out other input, which can lead to trance (–like) states and imaginative involvement (e.g., the tendency to escape to fantasy) (E. M. Bernstein & Putnam, 1986; Soffer-Dudek et al., 2015).

Currently, different competing conceptualizations of dissociation including its etiology exist, and controversies reach back to the beginning of modern psychiatry and psychology. The currently most influential models are the trauma model (TM) and the socio-cognitive model (SCM). While the TM emphasizes trauma as the key player in the development of a dissociative experience (e.g. Dalenberg et al., 2012), the SCM questions the exclusive direct causal relationship between trauma and dissociation and highlights the role of socio-cognitive and socio-cultural factors (e.g. Lynn et al., 2014). In a recent concept paper, Lynn et al. (2022) proposed a new framework integrating the TM and SCM which conceptualizes dissociation as a multifaceted construct that occurs across different manifestations and disorders.

Empirical evidence suggests that a history of (childhood) trauma, especially early abuse and neglect by primary caregivers, is an important risk factor for dissociation (Dalenberg et al., 2012; Reinders & Veltman, 2021; Tschoeke et al., 2021; Vonderlin et al., 2018). If occurring in traumatic (or otherwise highly stressful) situations, dissociation may be an adaptive self-regulatory strategy to immediately create distance from overwhelming experiences. If dissociation becomes a generalized response to stress in the long-run, it can critically interfere with daily-life (Lanius, 2015). Severe and persistent dissociation is a key symptom of various mental disorders (Lyssenko et al., 2018). According to meta-analytical evidence, levels of dissociation are the highest in dissociative disorders, followed by

post-traumatic stress disorder (PTSD), and borderline personality disorder (BPD; Lyssenko et al., 2018).

BPD is characterized by a pervasive instability in emotions, cognitions, and behaviors (American Psychiatric Association, 2013). Milder expressions can also manifest on a subclinical level. Core features of a `borderline personality` are affective instability, identity diffusion, impulsive self-harm, and interpersonal disturbances (Morey, 1991). The presence of these personality features has been linked to BPD pathology but can also occur in other disorders, separating individuals with a diagnosis from non-clinical samples (Jacobo et al., 2007; Stein et al., 2007). BPD features are linked to stress-related dissociation in BPD patients (Krause-Utz et al., 2021). Up to 80% of individuals with BPD experience transient dissociative symptoms and their severity is linked to aversive tension (Stiglmayr et al., 2001) and the severity of (childhood) trauma (Al-Shamali et al., 2022; Tschoeke et al., 2021). In general, patients with BPD report substantially higher rates of childhood trauma than other psychiatric groups and healthy people (Kleindienst, Vonderlin, et al., 2021; Porter et al., 2020).

Studies that investigated dissociation in patients with BPD have linked its acute severity to reduced emotional processing (e.g., Krause-Utz et al., 2018), and heightened pain thresholds (Ludascher et al., 2007). Reducing distress and terminating dissociation are main motives for non-suicidal self-injury (NSSI) in BPD (Kleindienst et al., 2008; Sommer et al., 2021). Patients with acute dissociation demonstrated dampened affective arousal and diminished neuronal reactivity in the amygdala (Barnow et al., 2012; Krause-Utz et al., 2018). Moreover, higher dissociative experiences were linked to a stronger coupling of the amygdala with brain regions involved in arousal modulation (Krause-Utz et al., 2014). This suggests that dissociation may promote emotion regulation, at the expense of basic cognitive functioning, such as learning and memory. During acute dissociation, patients with BPD, who showed diminished affective reactivity, also showed diminished emotional learning (Ebner-Priemer et al., 2009) and impaired working memory performance (Krause-Utz et al., 2018) compared to patients without acute dissociation and healthy controls. These impairments might explain why BPD patients who experience more severe acute dissociation during treatment show poorer outcome for dialectical behavioral therapy (Kleindienst et al., 2016; Wilfer et al., 2021) and psychodynamic therapy (Spitzer et al., 2007). Given these potentially devastating effects, it remains of utmost importance to further improve the understanding of dissociation in BPD.

An important step in this direction might be to investigate how specific dissociative experiences are linked to different BPD features and forms of traumatic childhood experiences. The afore-mentioned studies on dissociation in BPD have mostly used a categorical approach, comparing people who meet diagnostic criteria for the disorder to healthy control participants. However, there are current shifts in the conceptualization of personality disorders toward a more dimensional

model (Horz-Sagstetter et al., 2021; Reed, 2018; Skodol et al., 2011). Complementing previous findings with a dimensional assessment of BPD features may offer additional insights into relevant domains of malfunctioning that are linked to dissociation. Therefore, we focused on personality features, which have been linked to BPD but may also have relevance beyond the diagnosis, representing a trans-diagnostically relevant pattern.

Graph-theoretical network analysis has been increasingly used to explore complex interplays of interrelated clinical phenomena. More and more studies have shown this method to be a valuable data-driven tool for investigating inter-dependencies in complex clinical conditions where symptoms may have mutual influence on each other (Borsboom & Cramer, 2013). Within a graphical network, the associations (`edges´) between the elements of the network (`nodes´) can be calculated by estimating a partial correlation network. Beyond the visualization of these interrelationships, single nodes of the network can be characterized by their association with other nodes, quantified as "centrality" indices (Borsboom & Cramer, 2013). In this regard, network analysis is particularly helpful to generate hypotheses about possible pathways and bridge symptoms that connect clusters of elements. These pathways can later be tested using prospective data (Borsboom, 2017; Cramer et al., 2010) and may aid in identifying specific targets for interventions.

A growing number of studies have used network analysis to analyze the clinical complexity of BPD (Richetin et al., 2017; Schulze et al., 2022; Southward & Cheavens, 2018; von Klipstein et al., 2021) or associations between different psychopathologies and childhood trauma (Monteleone et al., 2021; Schouw et al., 2020). Using this methodological approach, a recent study demonstrated the particular importance of emotional abuse for different BPD features (Schulze et al., 2022). Moreover, Fung et al. (2023) used network analysis to investigate the interplay of (DSM criteria-related) BPD symptoms and dissociative experiences in a sample of community health service users. In this network, psychoform dissociation had a strong connection with self-harming behaviors and moderate connections with impulsivity and identity disturbance.

To our knowledge, however, no study so far has investigated the interplay of dissociative symptoms with different BPD features and self-reported childhood trauma types within a data-driven graph-theoretical framework. The aim of the present study was to explore these associations, i.e., the interplay of different dissociative symptoms (depersonalization/derealization, dissociative amnesia, absorption, and imaginative involvement), specific BPD features (affective instability, identity diffusion, relationship disturbances, and impulsive self-harm), and self-reported childhood trauma experiences (emotional, physical, sexual abuse, and neglect) using an exploratory data-driven graph-theoretical approach. Based on previous research, we expected to find significant bivariate correlations between all pairs of constructs – that is, positive correlations between BPD features and dissociative experiences (see Lyssenko

et al., 2018), between childhood traumatization and dissociation (Vonderlin et al., 2018), and between childhood traumatization and BPD features (see Porter et al., 2020). By using a partial correlation network to take the shared variance of all variables into account, we expected that this network would depict a lower interrelatedness between childhood trauma, dissociation, and BPD features. In general, graph-theoretical analysis is not a confirmatory testing approach, but a data-driven, exploratory and hypotheses generating method. Thus, it uncovers unique relationships between domains that are not explained by shared covariations with other constructs, without the aim to confirm direct or causal relationships.

Method

Participants and procedure

After approval by the local Psychology Ethics Committee, participants were recruited online via international mental health online platforms, social media, and the research participation website of Leiden University between February 2018 and April 2022. All participants were informed about the study and provided informed consent.

Inclusion criteria were age ≥ 18, sufficient English proficiency and completing all relevant scales. Data was collected online using software Qualtrics (© 2015, Qualtrics, Provo, UT). Participants were asked to provide basic demographic details before psychometric scales were presented in randomized order. The survey took approximately 30 minutes to complete. Participants had the opportunity to participate in a lottery (chance of winning Amazon© vouchers). Psychology students could alternatively gain study credits.

Several steps were undertaken to ensure data quality. Double responses indicating that the participant completed the same survey twice, invariant and extreme answers (e.g., always the same response, unrealistic values such as an age above 100) were checked and excluded. Out of $n = 976$ initial responses, $n = 921$ responses could be included. In this final sample, the majority of participants (age $M = 23.38$, $SD = 7.46$) were female (77.4%), European (86.6%), and had completed secondary school (53.8%). Full demographic characteristics can be found in Supplemental Table S1.

Measures

A more detailed overview and description of measures including their psychometric properties can be found in supplementary material A.

The Dissociative Experiences Scale (DES-II; Carlson & Putnam, 1993) was used to measure severity of three types of dissociation: "amnestic dissociation," "absorption and imaginative involvement" and "depersonalization/

derealization." This 28-item self-report scale asks participants to indicate the frequency of dissociative experiences on a scale from 0% to 100%.

The Borderline Scale from the Personality Assessment Inventory (PAI-BOR; Morey, 1991) was used to assess BPD features with subscales for 'affective instability,' 'identity disturbance,' 'negative relationships,' and 'self-harm.'

The Childhood Trauma Questionnaire (CTQ; D. P. Bernstein et al., 2003) was used to retrospectively assess traumatic childhood experiences in five subscales: childhood 'emotional abuse,' 'physical abuse,' 'sexual abuse,' 'emotional neglect,' and 'physical neglect' (see supplementary material A).

Data analysis

For the graph-theoretical analysis, we included the three DES-II subscales, the four PAI-BOR subscales and the five CTQ subscales.

Network estimation

We estimated a regularized Mixed Graphical Model (mgm) using the *mgm* function of the package *mgm* (Haslbeck & Waldorp, 2020) as implemented in the *bootnet* package (Epskamp et al., 2018). The least absolute shrinkage and selection operator (LASSO; Tibshirani, 1996) was used to avoid false positives. The parameter λ, which controls the strength of the penalty, was selected using the extended Bayesian information criterion (EBIC; Foygel & Drton, 2010) with the hyperparameter set to default ($\gamma = .25$). The edges estimated between the nodes can be interpreted like partial correlations and were calculated via nodewise regressions. We used *qgraph* and *bootnet* packages in R for visualizing the networks and centrality graphs. The arrangement of the nodes in the network follows the Fruchterman-Reingold algorithm (Fruchterman & Reingold, 1991), which places highly connected nodes in the center of the network and lesser connected nodes toward the periphery. Nodes which belong to different categories are colored differently. Additionally, we calculated Spearman correlations between nodes and displayed these in the same layout as the mgm network for compatibility with other studies.

Node predictability

Node predictability is defined as the proportion of variance of a node that is predicted by its neighbors. It was calculated using the residual R^2 error value from the estimation of the network using the *mgm* package (Haslbeck & Waldorp, 2020). It is represented in the graph as colored circles around the nodes. A completely colored ring would mean that the node is fully predicted by its neighbors.

Node strength and bridge strength

We calculated the strength of a node, i.e. the sum of the absolute edge weights connecting one node with other nodes in the network, and the bridge strength, i.e. the sum of the absolute edge weights of the node with nodes in other communities. So-called `communities´ were defined based on the investigated constructs in our study. Nodes with a high bridge strength act as central nodes with strong and/or many connections to nodes of other communities in the network. Alternative centrality indices such as betweenness and closeness could be misleading because they seem to be unstable and influenced by spurious covariance (Bringmann et al., 2019; Hallquist et al., 2021), therefore we refrained from including these parameters in our analyses.

Network accuracy and stability

To examine the accuracy and stability of our estimated parameters, we calculated the accuracy of edge weights and centrality parameters via a bootstrap procedure implemented in the R-package *bootnet* (Epskamp et al., 2018).

Results

Sample characteristics

Table 1 presents means and standard deviations for our measures. Forty percent of participants ($n = 389$) scored above the established cutoff for pathological dissociation (mean DES-II ≥ 30). This corresponds closely to the percentages determined by the 8-item taxon (37.6%) (Waller et al., 1996) which has been proposed to be a more accurate estimate for pathological dissociative experiences (DES taxon subscale cut off > 20). $N = 175$ (19%) scored above the cutoff for clinically relevant BPD features (PAI-BOR sum score > 37). Based on established cutoffs (D. P. Bernstein et al., 2003; Glaesmer et al., 2013), 13.79% of participants reported moderate to severe levels of abuse and neglect (emotional neglect: $n = 127$, 13.79%; emotional abuse: $n = 156$, 16.94%; physical abuse: $n = 78$, 8.47%; sexual abuse: $n = 94$, 10.21%; physical neglect: $n = 70$, 7.6%).

Network estimation

Figure 1(a) depicts Spearman correlation coefficients (r_s) for the variables used as nodes in the network (for further details see Table 2). Figure 1(b) displays the estimated regularized mgm network including edges that remained significant after controlling for other dependencies within the network. In the mgm network, 27 out of 66 possible edges (40.9%) were estimated to be non-zero. Of these, 17 edges indicated unique associations between the nodes of the same community, 10 connected nodes across communities.

Table 1. Sample description with parameters of network inference.

Measure	Mean	SD	Range	Node label	centrality strength	bridge strength	predictability R^2	Cronbach's alpha
PAI-BOR total	26.79	11.81	1–65					
Affective instability	7.29	3.93	0–18	PAI_AI	1.00	0.23	0.55	0.80
Identity disturbances	8.17	3.84	0–18	PAI_ID	0.90	0.16	0.52	0.70
Negative relationships	6.99	3.53	0–18	PAI_NR	0.71	0.09	0.49	0.69
Self-harm	4.35	3.39	0–17	PAI_SH	0.48	0.17	0.27	0.78
CTQ total	36.77	13.27	25–123					
Emotional abuse	8.80	4.34	5–25	CTQ_EA	1.20	0.19	0.65	0.87
Physical abuse	6.14	2.71	5–25	CTQ_PA	0.66	0.00	0.46	0.85
Sexual abuse	5.94	2.94	5–25	CTQ_SA	0.35	0.07	0.21	0.94
Emotional neglect	9.59	4.34	5–25	CTQ_EN	0.76	0.08	0.56	0.89
Physical neglect	6.30	2.37	5–24	CTQ_PN	0.79	0.04	0.51	0.73
DES total	27.47	15.64	0–88.6					
Amnestic dissociation	16.63	18.55	0–100	DES_AD	0.71	0.14	0.37	0.72
Absorption and imaginative involvement	38.87	19.56	0–100	DES_AI	0.56	0.04	0.35	0.71
Depersonalization and derealization	17.49	20.49	0–100	DES_DD	0.78	0.18	0.44	0.71

PAI-BOR = Personality Assessment Inventory – Borderline Scale, CTQ = Childhood Trauma Questionnaire, DES = Dissociative Experiences Scale.

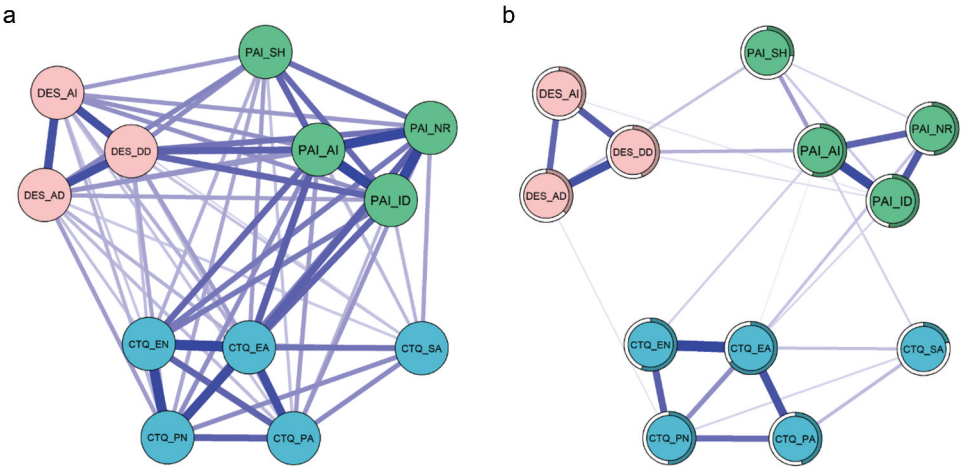

Figure 1. Network plots of a) Spearman correlations and b) regularized mgm network. The thickness of a line indicates the strength of the association. The blue color of a line indicates a positive association (note that there were no negative associations within the network estimation). The colored filled part of the ring around the nodes represents the predictability of the node by its connected neighbors (R^2).

Dissociative experiences (DES subscales) were predominantly connected to BPD features (PAI-BOR subscales). More specifically, non-zero edges connected DES amnestic dissociation to PAI-BOR self-harm, DES absorption/imaginative involvement to PAI-BOR identity disturbance, and DES depersonalization/derealization to PAI-BOR affective instability as well as PAI-BOR identity disturbances. Regarding the connections between dissociation and

Table 2. Spearman correlations of variables within the network.

	PAI_AI	PAI_ID	PAI_NR	PAI_SH	CTQ_EA	CTQ_PA	CTQ_SA	CTQ_EN	CTQ_PN	DES_AD	DES_AI	DES_DD
PAI_AI	–	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001
PAI_ID	.654	–	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001
PAI_NR	.613	.614	–	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001
PAI_SH	.397	.374	.357	–	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001
CTQ_EA	.424	.399	.422	.249	–	< .001	< .001	< .001	< .001	< .001	< .001	< .001
CTQ_PA	.251	.186	.264	.160	.527	–	< .001	< .001	< .001	< .001	< .001	< .001
CTQ_SA	.176	.188	.234	.160	.349	.291	–	< .001	< .001	< .001	.001	< .001
CTQ_EN	.383	.333	.335	.203	.636	396	.264	–	< .001	< .001	< .001	< .001
CTQ_PN	.282	.247	.326	.222	.551	.417	.290	.615	–	< .001	< .001	< .001
DES_AD	.267	.240	.267	.305	.194	.172	.139	.158	.245	–	< .001	< .001
DES_AI	.277	.275	.260	.257	.199	.152	.105	.145	.196	.519	–	< .001
DES_DD	.419	.395	.348	.289	.246	.167	.151	.170	.225	.520	.515	–

Spearman's correlation coefficients (below diagonal) and p-values (above diagonal). Coefficients in bold remain after Bonferroni correction (all except CTQ_SA to DES_AI). PAI_AI = affective instability, PAI_ID = identity disturbances, PAI_NR = negative relationships, PAI_SH = self-harm, CTQ_EA = emotional abuse, CTQ_PA = physical abuse, CTQ_SA = sexual abuse, CTQ_EN = emotional neglect, CTQ_PN = physical neglect, DES_AD = amnestic dissociation, DES_AI = absorption and imaginative involvement, DES_DD = depersonalization and derealization.

childhood trauma (CTQ subscales), a slight but unique relationship of amnestic dissociation and physical neglect was found, indicating a conditional independent association. This edge weight was less strong compared to the strongest edge connecting dissociative experiences with BPD features (between DES derealization/depersonalization and PAI-BOR affective instability).

Regarding the connections between the PAI-BOR and CTQ subscales, all BPD features were connected to one or more types of childhood trauma (either sexual or emotional abuse or emotional neglect). Information on bootstrapped difference test of edge weights can be found in Supplemental Figure S1

Centrality estimates

The centrality stability test using case-drop bootstrapping with 1000 bootstrap runs for node strength revealed a CS-coefficient of .75, which is above the recommended value of .5 (Epskamp et al., 2018). It indicates that if 75% of the cases were dropped, the correlation between the order of resulting centrality strength values and the original order would be at least .7 with 95% probability. The nodes with the highest centrality strength in the network were emotional abuse and affective instability (Supplementary Figure S1A). This indicates that these nodes have many and/or strong connections to the other nodes in the network (both connected to 7 out of 11 other nodes). Bootstrapped difference test for centrality strength (Supplementary Figure S1B) revealed that emotional abuse was significantly stronger connected than all other nodes in the network. An exception was affective instability, which was comparably strongly connected to the other nodes of the network as emotional abuse. While the centrality strength of affective instability was significantly stronger than that of most other nodes, there was no significant difference compared to the strength of identity disturbances and depersonalization/derealization, which was also the most central node in the domain of dissociation.

Bridge Centrality

Within the three communities included in the network, the highest bridge strength was found for emotional abuse, affective instability, and depersonalization/derealization. This indicates that they had many and/or strong inter-community edges bridging the theoretically defined clusters with each other (see Supplementary Figure S2A). Please note that the bootstrapped bridge strength difference test did not reveal significant differences in bridge strength among most of the nodes in the network suggesting that none of the nodes within the network clearly serves as a bridge more important than other nodes of the community (see Supplementary Material Figure S2B).

Analyzing the strength of the edges connecting nodes of one community to the two other communities separately revealed that BPD features serve as a bridge between childhood traumatization and dissociation. From the BPD community four nodes were uniquely related to nodes of the dissociation community (total edge weights: .311) and five nodes to the childhood traumatization community (total edge weights: .338). In contrast, there was only one weak edge (.044) directly linking dissociation and childhood trauma, that is, an association between amnestic dissociation and physical neglect.

Please note that different nodes of the BPD features community connected to different nodes of the dissociation community: Both the nodes affective instability and identity disturbances were uniquely linked to depersonalization/derealization (edge weights: .126 and .050), while identity disturbances additionally connected to absorption/imaginative involvement (.040). Additionally, a less central node in the BPD community, that is, self-harm, was associated to amnestic dissociation (.095).

Similarly, different nodes of the BPD features community were connected to different nodes of the childhood traumatization community: affective instability (.028), identity disturbances (.067) and negative relationships (.094) were uniquely related to emotional abuse. Affective instability was also uniquely related to emotional neglect (.077). Additionally, self-harm (as a less central node in the BPD community) was associated to sexual abuse (.072). With a total edge weight of .189, emotional abuse was the node of the childhood traumatization community that was particularly strongly associated with BPD features. For further details on edge weights see Table 3.

Table 3. Edge weights in mgm network.

	PAI_AI	PAI_ID	PAI_NR	PAI_SH	CTQ_EA	CTQ_PA	CTQ_SA	CTQ_EN	CTQ_PN	DES_AD	DES_AI
PAI_ID	.367										
PAI_NR	.259	.293									
PAI_SH	.155	.086	.068								
CTQ_EA	.028	.067	.094	0							
CTQ_PA	0	0	0	0	.319			.			
CTQ_SA	0	0	0	.072	.099	.108					
CTQ_EN	.077	0	0	0	.414	0	0				
CTQ_PN	0	0	0	0	.181	.203	.069	.268			
DES_AD	0	0	0	.095	0	0	0	0	.044		
DES_AI	0	.040	0	0	0	0	0	0	0	.246	
DES_DD	.126	.050	0	0	0	0	0	0	0	.328	.275

PAI_AI = affective instability, PAI_ID = identity disturbances, PAI_NR = negative relationships, PAI_SH = self-harm, CTQ_EA = emotional abuse, CTQ_PA = physical abuse, CTQ_SA = sexual abuse, CTQ_EN = emotional neglect, CTQ_PN = physical neglect, DES_AD = amnestic dissociation, DES_AI = absorption and imaginative involvement, DES_DD = depersonalization and derealization.

Discussion

In this study, we explored associations between dissociative experiences (derealization/depersonalization, amnestic dissociation, absorption/imaginative involvement), BPD features (affective instability, impulsive self-harm, identity diffusion, relationship problems), and self-reported traumatic childhood experiences (emotional, physical, and sexual abuse, neglect). Positive bivariate correlations between dissociative experiences, BPD features, and childhood trauma experiences were found with small to moderate effect sizes varying between r_s =.105 and r_s = .419. Within the partial correlation network (when taking all interdependencies into account), dissociation and traumatic childhood experiences were predominantly related to BPD features, while a slight unique link between (amnestic) dissociation and physical neglect remained.

With respect to the bivariate correlations, our findings support previous evidence. Higher levels of dissociation were related to higher severity of childhood trauma (Dalenberg et al., 2012; Reinders & Veltman, 2021; Tschoeke et al., 2021; Vonderlin et al., 2018). This finding aligns with assumptions of trauma models of dissociation (Dalenberg et al., 2012). Moreover, higher levels of dissociation were associated with more BPD features, which is in line with previous studies showing this relationship for groups with high BPD features and patients with a diagnosis of BPD (for review see Lyssenko et al., 2018). Finally, higher levels of childhood trauma were associated with more BPD features, which is in line with prominent diathesis-stress models of BPD (Linehan, 1993) and meta-analytical evidence (Porter et al., 2020) highlighting the role of interpersonal trauma as an important environmental vulnerability factor for BPD.

By using a partial correlation network analysis, we aimed to disentangle these bivariate correlations to identify unique associations between single constructs. When accounting for the mutual influence of all variables on each other, BPD features were still linked to dissociation as well as traumatic childhood experiences, with small effect sizes varying between r_p = .028 and r_p = .126. Differential associations between dissociative experiences and three BPD features were found: Amnestic dissociation was linked to self-harm, while dissociative absorption and depersonalization/derealization were associated with identity disturbance. Depersonalization/derealization was additionally linked to affective instability and this association showed the strongest edge weight.

Starting with this strongest connection in the mgm network, our findings support the link between dissociative symptoms and highly-instable affect in the context of BPD (Stiglmayr et al., 2001). Derealization/depersonalization possibly serve as a maladaptive coping strategy to detach from overwhelming emotions, which may not necessarily be restricted to traumatic childhood experiences but

also occur in other stressful situations. The link between dissociation and self-harm is also in line with previous research. Studies that included patients with a BPD diagnosis who reported self-harm found that one of their main motives for NSSI was to terminate states of dissociation (Kleindienst et al., 2008; Sommer et al., 2021). Moreover, acute dissociation is associated with increased pain thresholds, which may contribute to NSSI (Ludascher et al., 2007). This may not be specific to those with a diagnosis of BPD. Episodes of self-harm may particularly be linked to dissociative amnesia as a severe form of dissociation and compartmentalization. During dissociation, episodes of self-harm may be temporarily blocked from conscious awareness and memory.

The connection between identity disturbance and dissociation (depersonalization/derealization as well as absorption) is interesting as well. It is well in line with a previous network analysis by Fung et al. (2023), although they did not differentiate between different forms of psychoform dissociation. Our finding may also be more of trans-diagnostic nature, as identity disturbances occur in various disorders and are not restricted to BPD. However, individuals with BPD experience more rapid changes in self-image (Campbell et al., 2021) and a highly instable self-esteem (Santangelo et al., 2017). In general, perceiving one´s identity as incoherent, inconsistent, vague, or fragmented may go hand in hand with dissociative experiences of detachment and absorption or trance-like states. Such experiences may further aggravate preexisting identity problems, leading to a vicious cycle. Overall, our findings argue toward a strong association between dissociative experiences and features of BPD (affective instability, disturbed identity, and impulsive self-harm). Since these features do not only occur in people with a BPD diagnosis, the observed associations may be of a more trans-diagnostic nature, which should be explored in future studies.

In the partial correlation network, a slight unique relationship between amnestic dissociation and physical neglect was found, indicating a conditional independent association. This association points to an important role of neglect in the context of dissociation. If basal needs, such as safety and care, are not met, dissociation may serve as a coping mechanism, providing an inner distance from unsafe conditions and distressing experiences (Lanius, 2015; Vermetten & Spiegel, 2014).

Overall, the association between dissociation and self-reported childhood trauma was relatively weak, when accounting for BPD features in the partial correlation model, while the connection between BPD features and childhood trauma (either sexual or emotional abuse or emotional neglect) was still strong. In particular, emotional abuse (as a node of the childhood trauma `community`) was particularly strongly associated with BPD domains (affective instability, identity disturbances, negative relationships). This finding is well in line with a recent network analysis study (Schulze et al., 2022) and a growing number of studies, highlighting the particular role of emotional abuse in BPD psychopathology (see Porter et al., 2020).

When evaluating the strength of edges connecting nodes of one ´community´ to each of the other two ´communities´, BPD features linked dissociative experiences to severity of childhood trauma. This suggests that the presence of BPD features may play an important role in current dissociative experiences that are related to self-reported childhood trauma. Given our correlational design, longitudinal studies are needed to determine causality, e.g., whether any of the investigated factors plays a causal or mediating role. Our methodological approach does not allow us to draw such conclusions and to interpret them in the light of ongoing debates around the etiology of dissociation. Since we did not include documented cases of childhood trauma and their recall may be biased, we can only make restricted interpretations. Yet, our findings suggest that the presence of BPD features may be important for the understanding of current dissociative experiences linked to self-reported childhood trauma. This is of importance since it highlights the influence of personality features, which can be detected early and targeted in psychotherapy.

Although our findings need to be corroborated by future research, they illustrate the complex interplay of dissociative experiences, BPD features, and traumatic childhood experiences, which may guide prevention and intervention approaches. The need to address these symptoms simultaneously in treatment is underscored by recent studies, showing that persistent and severe dissociation is associated with poorer treatment outcome in BPD (Kleindienst et al., 2016; Wilfer et al., 2021). Dissociative states and BPD symptoms should be closely monitored and simultaneously targeted during trauma-focused treatment. In this context, our data suggest that affective instability as a core domain of BPD (showing the strongest unique association with dissociation) could be an important target for interventions. Targeting this association could mitigate the negative effects on (trauna-focused) treatment outcome of BPD (Kleindienst et al., 2016; Kleindienst, Steil, et al., 2021). A modified version of dialectical behavior therapy (DBT) for BPD and PTSD after childhood trauma has been shown to be effective, resulting in better treatment outcomes as compared to standard DBT, standard Cognitive Processing Therapy, and control treatment (Kleindienst, Steil, et al., 2021). This treatment includes constant monitoring and modulation of dissociation using skills training and skills-based exposure sessions.

To our knowledge, our study is the first to investigate the complex multivariate interplay of dissociation, BPD features, and traumatic childhood experiences in a relatively large international sample. While our findings offer valuable hypotheses for future research, the cross-sectional design of our study and the use of subjective (retrospective) self-report measures are important limitations. Recruitment via international mental health online platforms facilitated data collection in a large international sample, but participants needed to show willingness to complete

questionnaires and needed to have stable access to the internet. In addition, our sample is a mixture of healthy participants and participants with subclinical and clinical symptoms and we did not take possible cultural differences into account, limiting the generalizability of findings (Douglas, 2009). A substantial number of individuals reported dissociative symptoms within a potential pathological relevant range. However, we did not include patients with a verified diagnosis of dissociative disorders or BPD nor did we assess co-occurring PTSD. Therefore, findings should be replicated in clinical populations with well characterized characteristics using standardized diagnostic approaches to assess the presence or absence of mental disorders.

In conclusion, dissociative experiences were predominantly associated with BPD features. Childhood neglect was uniquely linked to (amnestic) dissociation, independent of the presence of BPD features, highlighting the importance of this particular childhood trauma subtype. More research is needed to understand if BPD personality patterns are an essential component for the association between dissociation and childhood trauma.

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Data Availability Statement

According to European law (GDPR), data containing potentially identifying or sensitive information are restricted; our data involving clinical participants are not freely available in the manuscript, supplemental files, or in a public repository. Data access can be requested on reasonable demand via the corresponding author.

Authors' Contributions

Anna Schulze, Stefanie Lis, and Annegret Krause-Utz designed the study and its rationale and drafted the manuscript. Anna Schulze performed the statistical analyses, supervised by Stefanie Lis and Annegret Krause-Utz. Natasha Hughes helped with drafting the manuscript. All authors contributed to the final version of the paper

Ethics Approval and Consent to Participate

All participants were informed about the background and aims of the study, inclusion criteria, potential risks, and the right to terminate participation without. The study was approved by the local Ethical committees (Psychology Ethic Committee of Leiden University).

Consent for Publication

All coauthors gave consent for publication.

References

Al-Shamali, H. F., Winkler, O., Talarico, F., Greenshaw, A. J., Forner, C., Zhang, Y. Burback, L. (2022). A systematic scoping review of dissociation in borderline personality disorder and implications for research and clinical practice: Exploring the fog. *The Australian and New Zealand Journal of Psychiatry*, *56*(10), 1252–1264. https://doi.org/10.1177/00048674221077029

Association, A. P. (2013). *Diagnostic and statistical manual of mental disorders* (*5th* ed.). American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890425596

Barnow, S., Limberg, A., Stopsack, M., Spitzer, C., Grabe, H. J., Freyberger, H. J., & Hamm, A. (2012). Dissociation and emotion regulation in borderline personality disorder. *Psychological Medicine*, *42*(4), 783–794. https://doi.org/10.1017/S0033291711001917

Bernstein, D. P., Stein, J. A., Newcomb, M. D., Walker, E., Pogge, D., Ahluvalia, T., Stokes, J. Zule, W. (2003). Development and validation of a brief screening version of the childhood trauma questionnaire. *Child Abuse and Neglect*, *27*(2), 169–190. https://doi.org/10.1016/s0145-2134(02)00541-0

Bernstein, E. M., & Putnam, F. W. (1986). Development, reliability, and validity of a dissociation scale. *Journal of Nervous & Mental Disease*, *174*(12), 727–735. https://doi.org/10.1097/00005053-198612000-00004

Borsboom, D. (2017). A network theory of mental disorders. *World Psychiatry*, *16*(1), 5–13. https://doi.org/10.1002/wps.20375

Borsboom, D., & Cramer, A. O. (2013). Network analysis: An integrative approach to the structure of psychopathology. *Annual Review of Clinical Psychology*, *9*(1), 91–121. https://doi.org/10.1146/annurev-clinpsy-050212-185608

Bringmann, L. F., Elmer, T., Epskamp, S., Krause, R. W., Schoch, D., Wichers, M. Snippe, E. (2019). What do centrality measures measure in psychological networks? *Journal of Abnormal Psychology*, *128*(8), 892–903. https://doi.org/10.1037/abn0000446

Campbell, S. M., Zimmer-Gembeck, M., & Duffy, A. (2021). At the junction of clinical and developmental science: Associations of borderline identity disturbance symptoms with identity formation processes in adolescence. *Journal of Personality Disorders*, *35*(Suppl B), 8–28. https://doi.org/10.1521/pedi_2020_34_484

Carlson, E. B., & Putnam, F. W. (1993). An update on the dissociative experiences scale. *Dissociation: Progress in the Dissociative Disorders*, *6*(1), 16–27.

Cramer, A. O., Waldorp, L. J., van der Maas, H. L., & Borsboom, D. (2010). Comorbidity: A network perspective. *Behavioral and Brain Sciences*, *33*(2–3), 137–150. https://doi.org/10.1017/S0140525X09991567 (discussion 150-193).

Dalenberg, C. J., Brand, B. L., Gleaves, D. H., Dorahy, M. J., Loewenstein, R. J., Cardena, E. Spiegel, D. (2012). Evaluation of the evidence for the trauma and fantasy models of dissociation. *Psychological Bulletin*, *138*(3), 550–588. https://doi.org/10.1037/a0027447

Douglas, A. N. (2009). Racial and ethnic differences in dissociation: An examination of the dissociative experiences scale in a nonclinical population. *Journal Trauma Dissociation*, *10* (1), 24–37. https://doi.org/10.1080/15299730802488452

Ebner-Priemer, U. W., Mauchnik, J., Kleindienst, N., Schmahl, C., Peper, M., Rosenthal, M. Z. Bohus, M. (2009). Emotional learning during dissociative states in borderline personality disorder. *Journal of Psychiatry & Neuroscience: JPN*, *34*(3), 214–222. https://www.ncbi.nlm.nih.gov/pubmed/19448852

Epskamp, S., Borsboom, D., & Fried, E. I. (2018). Estimating psychological networks and their accuracy: A tutorial paper. *Behavioral Research Methods*, *50*(1), 195–212. https://doi.org/10.3758/s13428-017-0862-1

Foygel, R., & Drton, M. (2010). Extended Bayesian information criteria for Gaussian graphical models. *Advances in Neural Information Processing Systems*, 23. https://doi.org/10.48550/arXiv.1011.6640

Fruchterman, T. M., & Reingold, E. M. (1991). Graph drawing by force-directed placement. *Software: Practice and Experience*, *21*(11), 1129–1164. https://doi.org/10.1002/spe.4380211102

Fung, H. W., Wong, M. Y. C., Lam, S. K. K., Wong, E. N. M., Chien, W. T., Hung, S. L., Lee, K. H. Ross, C. A. (2023). Borderline personality disorder features and their relationship with trauma and dissociation in a sample of community health service users. *Borderline Personality Disorder and Emotion Dysregulation*, *10*(1), 22. https://doi.org/10.1186/s40479-023-00228-x

Glaesmer, H., Schulz, A., Hauser, W., Freyberger, H. J., Brahler, E., & Grabe, H. J. (2013). Der Childhood Trauma Screener (CTS) - Entwicklung und Validierung von Schwellenwerten zur Klassifikation [The childhood trauma screener (CTS) - development and validation of cut-off-scores for classificatory diagnostics]. *Psychiatrische Praxis*, *40*(4), 220–226. https://doi.org/10.1055/s-0033-1343116

Hallquist, M. N., Wright, A. G. C., & Molenaar, P. C. M. (2021). Problems with centrality measures in psychopathology symptom networks: Why network psychometrics cannot escape psychometric theory. *Multivariate Behavioral Research*, *56*(2), 199–223. https://doi.org/10.1080/00273171.2019.1640103

Haslbeck, J. M. B., & Waldorp, L. J. (2020). Mgm: Estimating time-varying mixed graphical models in high-dimensional data. *Journal of Statistical Software*, *93*(8), 1–46. https://doi.org/10.18637/jss.v093.i08

Horz-Sagstetter, S., Ohse, L., & Kampe, L. (2021). Three dimensional approaches to personality disorders: A review on personality functioning, personality structure, and personality organization. *Current Psychiatry Reports*, *23*(7), 45. https://doi.org/10.1007/s11920-021-01250-y

Jacobo, M. C., Blais, M. A., Baity, M. R., & Harley, R. (2007). Concurrent validity of the personality assessment inventory borderline scales in patients seeking dialectical behavior therapy. *Journal of Personality Assessment*, *88*(1), 74–80. https://doi.org/10.1080/00223890709336837

Kleindienst, N., Bohus, M., Ludäscher, P., Limberger, M. F., Kuenkele, K., Ebner-Priemer, U. W. Schmahl, C. (2008). Motives for nonsuicidal self-injury among women with borderline personality disorder. *The Journal of Nervous and Mental Disease*, *196*(3), 230–236. https://doi.org/10.1097/NMD.0b013e3181663026

Kleindienst, N., Priebe, K., Gorg, N., Dyer, A., Steil, R., Lyssenko, L. Bohus, M. (2016). State dissociation moderates response to dialectical behavior therapy for posttraumatic stress

disorder in women with and without borderline personality disorder. *European Journal of Psychotraumatology*, *7*(1), 30375. https://doi.org/10.3402/ejpt.v7.30375

Kleindienst, N., Steil, R., Priebe, K., Muller-Engelmann, M., Biermann, M., Fydrich, T. Bohus, M. (2021). Treating adults with a dual diagnosis of borderline personality disorder and posttraumatic stress disorder related to childhood abuse: Results from a randomized clinical trial. *Journal of Consulting and Clinical Psychology*, *89*(11), 925–936. https://doi.org/10.1037/ccp0000687

Kleindienst, N., Vonderlin, R., Bohus, M., & Lis, S. (2021). Childhood adversity and borderline personality disorder. Analyses complementing the meta-analysis by Porter et al (2020). *Acta Psychiatrica Scandinavica*, *143*(2), 183–184. https://doi.org/10.1111/acps.13256

Krause-Utz, A., Frost, R., Chatzaki, E., Winter, D., Schmahl, C., & Elzinga, B. M. (2021). Dissociation in borderline personality disorder: Recent experimental, neurobiological studies, and implications for future research and treatment. *Current Psychiatry Reports*, *23*(6), 37. https://doi.org/10.1007/s11920-021-01246-8

Krause-Utz, A., Veer, I. M., Rombouts, S. A., Bohus, M., Schmahl, C., & Elzinga, B. M. (2014). Amygdala and anterior cingulate resting-state functional connectivity in borderline personality disorder patients with a history of interpersonal trauma. *Psychological Medicine*, *44*(13), 2889–2901. https://doi.org/10.1017/S0033291714000324

Krause-Utz, A., Winter, D., Schriner, F., Chiu, C. D., Lis, S., Spinhoven, P. Elzinga, B. M. (2018). Reduced amygdala reactivity and impaired working memory during dissociation in borderline personality disorder. *European Archives of Psychiatry and Clinical Neuroscience*, *268*(4), 401–415. https://doi.org/10.1007/s00406-017-0806-x

Lanius, R. A. (2015). Trauma-related dissociation and altered states of consciousness: A call for clinical, treatment, and neuroscience research. *European Journal of Psychotraumatology*, *6* (1), 27905. https://doi.org/10.3402/ejpt.v6.27905

Linehan, M. M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. Guilford Press.

Ludascher, P., Bohus, M., Lieb, K., Philipsen, A., Jochims, A., & Schmahl, C. (2007). Elevated pain thresholds correlate with dissociation and aversive arousal in patients with borderline personality disorder. *Psychiatry Research*, *149*(1–3), 291–296. https://doi.org/10.1016/j.psychres.2005.04.009

Lynn, S. J., Lilienfeld, S. O., Merckelbach, H., Giesbrecht, T., McNally, R. J., Loftus, E. F. Malaktaris, A. (2014). The trauma model of dissociation: Inconvenient truths and stubborn fictions. Comment on dalenberg et al. (2012). *Psychological Bulletin*, *140*(3), 896–910. https://doi.org/10.1037/a0035570

Lynn, S. J., Polizzi, C., Merckelbach, H., Chiu, C. D., Maxwell, R., van Heugten, D., & Lilienfeld, S. O. (2022). Dissociation and dissociative disorders reconsidered: Beyond sociocognitive and trauma models toward a transtheoretical framework. *Annual Review of Clinical Psychology*, *18*(1), 259–289. https://doi.org/10.1146/annurev-clinpsy-081219-102424

Lyssenko, L., Schmahl, C., Bockhacker, L., Vonderlin, R., Bohus, M., & Kleindienst, N. (2018). Dissociation in psychiatric disorders: A meta-analysis of studies using the dissociative experiences scale. *The American Journal of Psychiatry*, *175*(1), 37–46. https://doi.org/10.1176/appi.ajp.2017.17010025

Monteleone, A. M., Tzischinsky, O., Cascino, G., Alon, S., Pellegrino, F., Ruzzi, V., & Latzer, Y. (2021). The connection between childhood maltreatment and eating disorder psychopathology: A network analysis study in people with bulimia nervosa and with binge eating disorder. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, 1–9. https://doi.org/10.1007/s40519-021-01169-6

Morey, L. C. (1991). *Personality assessment inventory*. Psychological Assessment Resources Odessa.

Porter, C., Palmier-Claus, J., Branitsky, A., Mansell, W., Warwick, H., & Varese, F. (2020). Childhood adversity and borderline personality disorder: A meta-analysis. *Acta Psychiatrica Scandinavica*, *141*(1), 6–20. https://doi.org/10.1111/acps.13118

Reed, G. M. (2018). Progress in developing a classification of personality disorders for ICD-11. *World Psychiatry*, *17*(2), 227–229. https://doi.org/10.1002/wps.20533

Reinders, A., & Veltman, D. J. (2021). Dissociative identity disorder: Out of the shadows at last? *British Journal of Psychiatry*, *219*(2), 413–414. https://doi.org/10.1192/bjp.2020.168

Richetin, J., Preti, E., Costantini, G., De Panfilis, C., & Mazza, M. (2017). The centrality of affective instability and identity in borderline personality disorder: Evidence from network analysis. *Public Library of Science ONE*, *12*(10), e0186695. https://doi.org/10.1371/journal.pone.0186695

Santangelo, P. S., Reinhard, I., Koudela-Hamila, S., Bohus, M., Holtmann, J., Eid, M., & Ebner-Priemer, U. W. (2017). The temporal interplay of self-esteem instability and affective instability in borderline personality disorder patients' everyday lives. *Journal of Abnormal Psychology*, *126*(8), 1057–1065. https://doi.org/10.1037/abn0000288

Schouw, J. E., Verkes, R. J., Schene, A. H., & Schellekens, A. F. (2020). The relationship between childhood adversity and adult personality revealed by network analysis. *Child Abuse & Neglect*, *99*, 104254. https://doi.org/10.1016/j.chiabu.2019.104254

Schulze, A., Cloos, L., Zdravkovic, M., Lis, S., & Krause-Utz, A. (2022). On the interplay of borderline personality features, childhood trauma severity, attachment types, and social support. *Borderline Personality Disorder and Emotion Dysregulation*, *9*(1), 35. https://doi.org/10.1186/s40479-022-00206-9

Skodol, A. E., Bender, D. S., Oldham, J. M., Clark, L. A., Morey, L. C., Verheul, R., Krueger, R. F., & Siever, L. J. (2011). Proposed changes in personality and personality disorder assessment and diagnosis for DSM-5 part II: Clinical application. *Personality Disorders*, *2*(1), 23–40. https://doi.org/10.1037/a0021892

Soffer-Dudek, N., Lassri, D., Soffer-Dudek, N., & Shahar, G. (2015). Dissociative absorption: An empirically unique, clinically relevant, dissociative factor. *Consciousness and Cognition*, *36*, 338–351. https://doi.org/10.1016/j.concog.2015.07.013

Sommer, J. L., Blaney, C., Mota, N., Bilevicius, E., Beatie, B., Kilborn, K. El-Gabalawy, R. (2021). Dissociation as a transdiagnostic indicator of self-injurious behavior and suicide attempts: A focus on posttraumatic stress disorder and borderline personality disorder. *Journal of Traumatic Stress*, *34*(6), 1149–1158. https://doi.org/10.1002/jts.22726

Southward, M. W., & Cheavens, J. S. (2018). Identifying core deficits in a dimensional model of borderline personality disorder features: A network analysis. *Clinical Psychological Science*, *6*(5), 685–703. https://doi.org/10.1177/2167702618769560

Spiegel, D., & Cardena, E. (1991). Disintegrated experience: The dissociative disorders revisited. *Journal of Abnormal Psychology*, *100*(3), 366–378. https://doi.org/10.1037/0021-843X.100.3.366

Spiegel, D., Loewenstein, R. J., Lewis-Fernandez, R., Sar, V., Simeon, D., Vermetten, E., Cardena, E., Brown, R. J., & Dell, P. F. (2011). Dissociative disorders in DSM-5. *Depression & Anxiety*, *28*(12), E17–45. https://doi.org/10.1002/da.20923

Spitzer, C., Barnow, S., Freyberger, H. J., & Grabe, H. J. (2007). Dissociation predicts symptom-related treatment outcome in short-term inpatient psychotherapy. *The Australian and New Zealand Journal of Psychiatry*, *41*(8), 682–687. https://doi.org/10.1080/00048670701449146

Stein, M. B., Pinsker-Aspen, J. H., & Hilsenroth, M. J. (2007). Borderline pathology and the personality assessment inventory (PAI): An evaluation of criterion and concurrent validity. *Journal of Personality Assessment*, *88*(1), 81–89. https://doi.org/10.1080/00223890709336838

Stiglmayr, C. E., Shapiro, D. A., Stieglitz, R. D., Limberger, M. F., & Bohus, M. (2001). Experience of aversive tension and dissociation in female patients with borderline personality disorder – a controlled study. *Journal of Psychiatric Research*, *35*(2), 111–118. https://doi.org/10.1016/s0022-3956(01)00012-7

Tibshirani, R. (1996). Regression shrinkage and selection via the lasso. *Journal of the Royal Statistical Society: Series B (Methodological)*, *58*(1), 267–288. https://doi.org/10.1111/j.2517-6161.1996.tb02080.x

Tschoeke, S., Bichescu-Burian, D., Steinert, T., & Flammer, E. (2021). History of childhood trauma and association with borderline and dissociative features. *Journal of Nervous & Mental Disease*, *209*(2), 137–143. https://doi.org/10.1097/NMD.0000000000001270

Vermetten, E., & Spiegel, D. (2014). Trauma and dissociation: Implications for borderline personality disorder. *Current Psychiatry Reports*, *16*(2), 434. https://doi.org/10.1007/s11920-013-0434-8

von Klipstein, L., Borsboom, D., Arntz, A., & Oathes, D. J. (2021). The exploratory value of cross-sectional partial correlation networks: Predicting relationships between change trajectories in borderline personality disorder. *Public Library of Science ONE*, *16*(7), e0254496. https://doi.org/10.1371/journal.pone.0254496

Vonderlin, R., Kleindienst, N., Alpers, G. W., Bohus, M., Lyssenko, L., & Schmahl, C. (2018). Dissociation in victims of childhood abuse or neglect: A meta-analytic review. *Psychological Medicine*, *48*(15), 2467–2476. https://doi.org/10.1017/S0033291718000740

Waller, N., Putnam, F. W., & Carlson, E. B. (1996). Types of dissociation and dissociative types: A taxometric analysis of dissociative experiences. *Psychological Methods*, *1*(3), 300. https://doi.org/10.1037/1082-989X.1.3.300

Wilfer, T., Armbrust, M., Aalderink, T., & Spitzer, C. (2021). Einfluss dissoziativer Phanomene auf das Behandlungsergebnis stationarer Psychotherapie von Patienten mit einer Borderline-Personlichkeitsstorung. [Impact of dissociative phenomena on treatment outcome of inpatient psychotherapy of patients with borderline personality disorder]. *Zeitschrift fur Psychosomatische Medizin und Psychotherapie*, *67*(4), 435–450. https://doi.org/10.13109/zptm.2021.67.4.435