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A Network Approach to Trauma, Dissociative Symptoms, and Psychosis Symptoms in Schizophrenia Spectrum Disorders

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***Background*: Dissociative experiences commonly occur in schizophrenia spectrum disorders (SSD). Yet little is known about how dissociative experiences in SSD are related to SSD symptoms. Accordingly, we investigated the relations between dissociative experiences and SSD symptoms, focusing on symptoms bridging these 2 symptom clusters as well as their relation to reported trauma history. *Study Design*: Network analyses were conducted on the responses of 248 individuals with an SSD who enrolled from multiple mental health centers in The Netherlands. Dissociative experiences were assessed via the Dissociative Experience Scale, SSD symptoms using the Positive and Negative Syndrome Scale, and trauma history through the Trauma History Questionnaire. *Study Results*: The results indicated that dissociative symptoms in SSD are mostly independent of other symptoms, but that emotional distress bridges between the dissociative and SSD symptom clusters. Furthermore, results revealed associations between positive and negative SSD symptoms and trauma through emotional distress, whereas dissociative symptoms remained relatively isolated. *Conclusion*: Because SSD symptoms and dissociative experiences clustered relatively independent from each other, our findings promote the idea of tailored treatment approaches for individuals with an SSD with frequent dissociative experiences, specifically targeting these symptoms.**

Key words: dissociation/network analysis/psychosis/schizophrenia/trauma

Introduction

Dissociation encompasses feelings of detachment (ie, the loss of connection to the world, the self, and others in the form of depersonalization and/or derealization) and/or the subjective inability to access information or to control mental functions that normally are readily amenable to access or control.[1] Pathological levels of dissociation are a hallmark of dissociative disorders. However, they are not specific to these disorders; they frequently appear in other psychiatric syndromes such as Schizophrenia Spectrum Disorders (SSD).[2,3] Among others, the SSD include diagnoses of schizophrenia, schizoaffective disorder, delusional disorder, and brief psychotic disorder, each characterized by positive symptoms (ie, hallucinations), negative symptoms (i.e., apathy), disorganization, and cognitive deficits.[4] Dissociative symptoms in SSD are mainly associated with positive symptoms rather than with negative symptoms, or symptoms of disorganization.[2]

Psychosis and Dissociation

Psychopathologists have advanced several cognitive hypotheses to account for the association between dissociative and psychotic symptoms such as hallucinations and delusions. Some have suggested that dissociative detachment promotes disorientation, confusion, and defective reality testing, thereby heightening risk for psychotic experiences.[5,6] In addition, Varese and colleagues[7] suggested that dissociation may weaken cognitive inhibition, which in turn leaves patients prone to delusions and hallucinations. Conversely, Postmes and colleagues[8] argued that impaired multisensory integration in SSD (ie, "perceptual incoherence") may render individuals more susceptible to "incoherent self-experiences" such as depersonalization. That is, psychotic symptoms may foster vulnerability to dissociative symptoms as well as

vice versa. However, the direction of influence remains ambiguous.

Finally, it remains unclear whether dissociative experiences reflect an independent symptom cluster or epiphenomena of schizophrenia spectrum symptoms. Reporting more dissociative experiences could result from the aforementioned interplay between symptoms. Yet, the frequent occurrence of dissociative experiences in SSD might also be explained by a shared etiological factor: trauma history.

Psychosis, Dissociation, and Trauma History

Dissociation is often seen as a protective mechanism to cope with the aftermath of a traumatic event.[9] Proponents of this view hold that dissociative experiences may alleviate the emotional distress and anxiety accompanying trauma by decreasing the accessibility of the memories associated with the event. Some theorists hold that this, in turn, may result in psychopathology.[10] Another theoretical approach conceptualizes dissociation as resulting from intense bodily arousal rather than a defensive coping mechanism.[11] For instance, work by Sterlini and Bryant[12] demonstrated that hyperarousal and anxiety were predictive of peritraumatic (state) dissociation in first-time skydivers. Discerning the exact role that psychological effects of anxiety and the physiological responses linked to the emotion play in the occurrence of dissociation, remains a challenge. Regardless, congruent with the idea of an association between stressful life events and dissociative experiences, research has established a link between the presence and severity of dissociation and reported interpersonal traumas such as sexual, physical, and emotional abuse, with multiple traumas being linked to more severe symptoms (eg,[13–17] for a different explanation of reported trauma in dissociative disorders see Refs. [18–20]).

In SSD populations up to 60% of individuals report a history of interpersonal trauma.[21,22] The core explanation for the mechanism linking trauma and symptoms of SSD states that trauma leads to a vulnerability rendering the individual susceptible to the experience of perceptual and sensory intrusions.[23] In line with the idea of trauma as a vulnerability factor for psychotic as well as for dissociative symptoms, studies have shown that more frequent dissociative and more severe psychotic symptoms in SSD are linked to reported trauma in a dose-response relationship (for an overview, see Refs. [24,25]).

There is emerging evidence of a mediating effect of dissociative symptoms on the relationship between trauma and psychotic symptoms. In particular, a study using a cross-sectional design and an analog student sample found symptoms of dissociation (particularly absorption) to mediate the association of childhood adversities and delusional ideation as well as hallucinations proneness.[26] Varese and colleagues[7] likewise found evidence to the mediating role of dissociative symptoms in patient groups. Beyond these, only a few studies have investigated dissociative symptoms and their association with psychotic symptoms while including history of trauma. Şar and colleagues[27] found that childhood trauma was related to dissociative experiences rather than to SSD symptoms while indicating a more immediate association between dissociative experiences and psychotic symptoms (see also Ref. [28]). Another study including 100 individuals with a diagnosis of schizophrenia found associations between dissociative experiences and CTQ (Childhood Trauma Questionnaire[29]) scores, as well as between some delusions (persecutory and delusion of reference) but not hallucinations and the total score on the Dissociative Experiences Scale (DES[30,31]). Furthermore, CTQ and DES-Total scores were linked to most negative symptoms.[31] Consistent with studies pointing to trauma as a shared vulnerability factor for both psychotic and dissociative symptoms it is important to account for it when investigating the relationships between SSD and dissociative symptoms.

Network Analysis

The approach used in the previous studies concentrated on SSD as a common underlying "cause" of psychotic and dissociative symptoms in SSD as well as one symptomatic cluster causing another, rather than capturing the entire complexity of the symptoms and how they influence each other. An alternative way to investigate how a lifetime history of trauma, dissociative and psychotic symptoms in SSD are linked is the network approach to psychopathology.[32] Unlike categorical models of psychopathology assuming a latent common cause for symptoms, the network approach conceptualizes symptoms as causing one another, creating self-sustaining symptom networks (eg, see Refs [33–35]). Thus, network analysis holds that disorders emerge from the interactions among symptoms rather than being the latent cause of symptoms.[36] With regard to work on the heterogeneity of symptomatic presentations in SSD and frequent occurrence of dissociative experience within this population,[2] we assumed that merely scrutinizing correlation coefficients would be insufficient to grasp the complexity of the interplay between the symptom clusters. Regularized network models allow us to visualize all possible relationships between variables that otherwise may remain undetected.

According to network theory[37] mental disorders are characterized as networks comprising symptoms that vary in their connectedness to other symptoms. Recent studies have successfully utilized network analysis to investigate the link between trauma and psychosis symptoms[38,39] as well as the interconnection of dissociative experiences within the respective network of a community sample.[40] One study on a large community sample of 6941 participants explored the relationship of psychotic symptoms and dissociation (self-report

assessment).[41] This study revealed that dissociation was linked to hallucinations and post-traumatic stress symptoms. Accordingly, the authors highlighted the importance of dissociation within the psychosis symptom network and called for further research. Yet, the results of this study cannot be generalized to a clinical sample whose network structure may differ from a community sample. Accordingly, we conducted analyses on patients whose SSD symptoms were assessed via clinical interview.

Goal of the Present Study

In the current study, we used network analyses to model the relations among dissociative and psychotic symptom clusters. To this end, we used a network metric quantifying the bridging qualities of specific symptoms, identifying those most important in connecting the symptom clusters. In line with earlier research pointing towards the importance of dissociative detachment in promoting the risk for psychotic experiences,[5,6] we hypothesized that symptoms of derealization and depersonalization would be central in linking dissociative and SSD symptoms, particularly positive symptoms such as hallucinations and delusions.

Second, because previous studies suggested that trauma may be a common etiological factor for both SSD and dissociative symptoms, we included a trauma measure to test whether its inclusion affected the relation between dissociative and psychotic symptoms in the resultant networks. We assessed the change in connectivity of DES and Positive and Negative Syndrome Scale (PANSS)[42] items between networks with and without the trauma variable. The high resolution that network analysis provides, allows us to characterize the macrostructure of the connections between syndromes and to investigate the complex interplay on a symptom-by-symptom level. In addition, for the network including trauma, we hypothesized that if dissociative experiences in SSD are epiphenomena of schizophrenia spectrum symptoms, and not attributable to the shared etiology factor of trauma, they would display relatively strong interconnectedness with schizophrenia spectrum symptoms compared to traumatic experiences, instead of forming an independent symptom cluster.

Methods

Participants

Two hundred forty-eight individuals with a DSM-IV[43] clinical diagnosis of schizophrenia or related psychotic disorders (non-acute state) from 3 mental health centers in the Netherlands participated. Participants had a mean age of 40.77 years (SD = 10.5) and 38% were female.

Instruments

Dissociative Experiences Scale. The DES[30] is a screening instrument that assesses 28 dissociative experiences. Participants are asked to assess how commonly they have these experiences, ranging from 0% to 100% of the time. The validity and reliability of the DES were demonstrated in numerous studies, also including SSD samples.[44] Internal consistency for the DES in the current sample was high with Cronbach's alpha of .93 and McDonald's omega of .94. For our analysis, we used the DES-T,[45] a subset of 8 DES items deemed pathological (ie, "recurrent, jarring, involuntary intrusions into executive functioning and sense of self"[46]). These items (D3, D5, D7, D8, D12, D13, D22, and D27) included experiences such as "Feeling that one's body is not one's own".[45] Because overlap in meaning between items in a network will bias the estimates for centrality indices, we excluded D27 ("Heard voices inside head that told one what to do") as it coincides with the auditory hallucination component of the PANSS. This decision was further supported by a Spearman's rank correlation coefficient of .39 between the two items in the current study. A list of items and their corresponding labels appears in Supplement 1. Cronbach's alpha and McDonald's omega for the subset of DES-T items excluding D27 were both .83.

Positive and Negative Syndrome Scale. The PANSS[42] is a 30-item semi-structured interview that measures SSD symptoms. Interviewers rate items on a 7-point scale (ranging from "absent" = 1 to "extreme" = 7). The five-factor model established by van der Gaag and colleagues[47] was used as the basis for subscales since their factor analysis included the largest (n = 5769) and most comparable sample. The subscales are positive symptoms (6 items, α = .72, ω = .75 in the current study), negative symptoms (7 items, α = .83, ω = .84), disorganized symptoms (9 items, α = .73, ω = .75), excitement (4 items, α = .82, ω = .82), and emotional distress (4 items, α = .68, ω = .68) and were computed by summing the item scores. The PANSS displayed good validity and reliability.[48] Cronbach's alpha (.86) and McDonald's omega (.86) for the PANSS were high in this sample. All PANSS items are displayed in Supplement 2.

Trauma History Questionnaire. The Trauma History Questionnaire (THQ)[49] is a 23-item questionnaire that assesses traumatic experiences. Participants report whether they experienced these events in their life or not ("Yes" = 1, "No" = 0). The THQ subscales are crime-related events (eg, being robbed), general disaster and trauma (eg, natural disaster), and physical/sexual abuse. Subscale scores (crime = 4 items, general = 14 items, sexual abuse = 3 items, physical abuse = 3 items) were calculated by summing the item scores. The THQ scores showed satisfactory reliability and validity.[49] Cronbach's alpha (.70) and

McDonald's omega (.71) were acceptable. Supplement 3 depicts all THQ items.

Procedure

The participants were recruited from three mental health institutions (GGZ Friesland, GGZ Drenthe or UCP Groningen). Participants had to be at least 18 years old and meet the DSM-IV criteria for schizoaffective disorder, schizophrenia, or another psychotic disorder. Of those included in the program, 61.8% had a diagnosis of schizophrenia, 15.2% of schizoaffective disorder, and 23% of psychotic disorder. Of these individuals, 28.5% had experienced a psychotic relapse in the past year. An add-on study was created to the annual routine outcome monitoring program (ROM-PHAMOUS). For further details on the ROM-PHAMOUS procedure as well as a comprehensive overview of recruitment and selection criteria and sociodemographic characteristics see the work by Bartels-Velthuis and colleagues.[50] Participants were asked to complete the DES and the THQ as a voluntary addition to the yearly routine outcome assessment which included the PANSS. Only participants with data on all three measures were included.

The local ethics committee approved the study procedure and participants gave written informed consent before participating. The PANSS interviews for individuals with an SSD were conducted by trained PANSS raters, whereas the DES and THQ were self-report measures.

Analyses

Using the R-package qgraph (version 1.6.5), we computed regularized partial correlation networks.[51] Symptoms are represented as nodes and the relationship between these symptoms is displayed as edges. Edges represent the partial correlation between nodes, controlling for all other nodes within the model. A thicker edge between two nodes implies a stronger relation and the estimation algorithm places strongly linked nodes closer together than loosely associated nodes.[52]

Network Estimation. Network indices of the nodes were compared utilizing the "qgraph" package.[51,53] For the first step, we focused on nodes bridging the two clusters of dissociative and psychotic symptoms. To this end, we calculated *bridge expected influence* (BEI[54]) values. BEI quantifies a node's connectivity with another community (here referring to any other than the nodes pre-defined syndrome of origin—eg, the PANSS or DES). In other words, it expresses the degree of association between the node and nodes of the adjacent symptom cluster which permits conclusions to be drawn about its importance for bridging two clusters. In a next step, nodes representing the THQ subscales were introduced to the network to investigate the nodes bridging dissociative and SSD symptoms and trauma history. The network analysis was repeated for the second network, and the BEI estimated.

To compare the edge weights for the network with and without trauma, we bootstrapped 1000 times with a non-parametric bootstrap,[55] and computed CIs for the sampling distribution of the difference between edge weights of DES and PANSS node pairs.

Description of Analysis

Networks were computed and regularized using the graphical least absolute shrinkage and selection operator (gLASSO[56]) based on the Extended Bayesian Information Criterion (EBICglasso). The LASSO allows for *regularization*, which implies reducing the number of absolute partial correlation coefficients and thereby decreases some estimates to zero, removing likely spurious correlations from the model. Although the lasso generates a collection of networks, the EBIC assists in finding the network closest to the true network structure, assuming it is, indeed, sparse.[57] Additional information on the analysis appears in Supplements 4a and 4b (eg, explanations on handling missing values, assumption checks, predictability of nodes).

Results

There were missing data for only 0.86% of the DES scores and 0.66% missing data in the PANSS scores. Missing data analysis revealed a random pattern of missingness unrelated to location of recruitment, gender, and age. Lastly, there were 3.68% missing data in the THQ scores. Accordingly, we imputed missing values as noted in Supplement 4b.

Assumptions

Data for the PANSS and DES were strongly right-skewed. Therefore, instead of Pearson correlations, we used Spearman-rank correlations to estimate the networks as they only assume a monotonic relationship between variables and provide a more efficient solution to violations of normality than do non-paranormal transformations.[58] Furthermore, they adhere to the ordinal scale of the THQ items. To keep the networks comparable, we estimated both based on Spearman correlations. Finally, the results for the stability analysis of the network indices are displayed in Supplements 5 and 6.

Predictability

Predictability for both networks was estimated and visualized with a circle around each node indicating the degree of explained variance per node for figures 1 and 2, respectively. Additional information on the measure and interpretation as well as numeric estimates are available in Supplements 7 and 8.

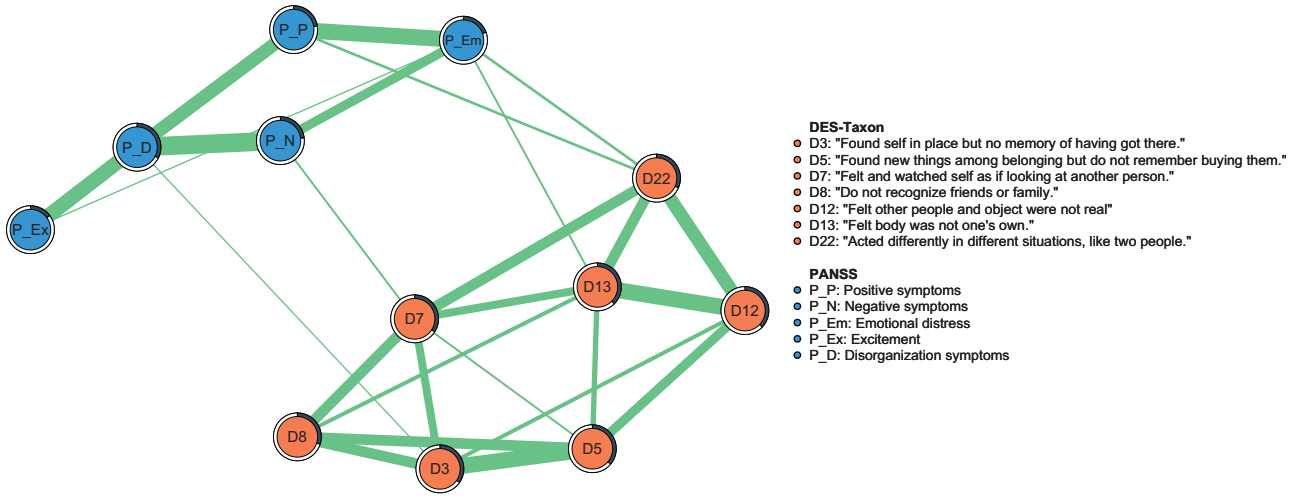

Fig. 1. EBICglasso network depicting DES-T and PANSS subscale responses of individuals diagnosed with an SSD (n = 248). Nodes represent symptoms and edges depict the relation between 2 symptoms controlling for all other symptoms. Thicker edges indicate stronger relations. Only edges with minimum weights of 0.05 are displayed. A pie chart for every node indicates the degree of predictability by other nodes in the network. A full circle indicates R^2 of 1 whereas an empty circle indicates R^2 of 0. DES-T, Dissociative Experiences Scale-Total; PANSS, Positive and Negative Syndrome Scale; SSD, schizophrenia spectrum disorder.

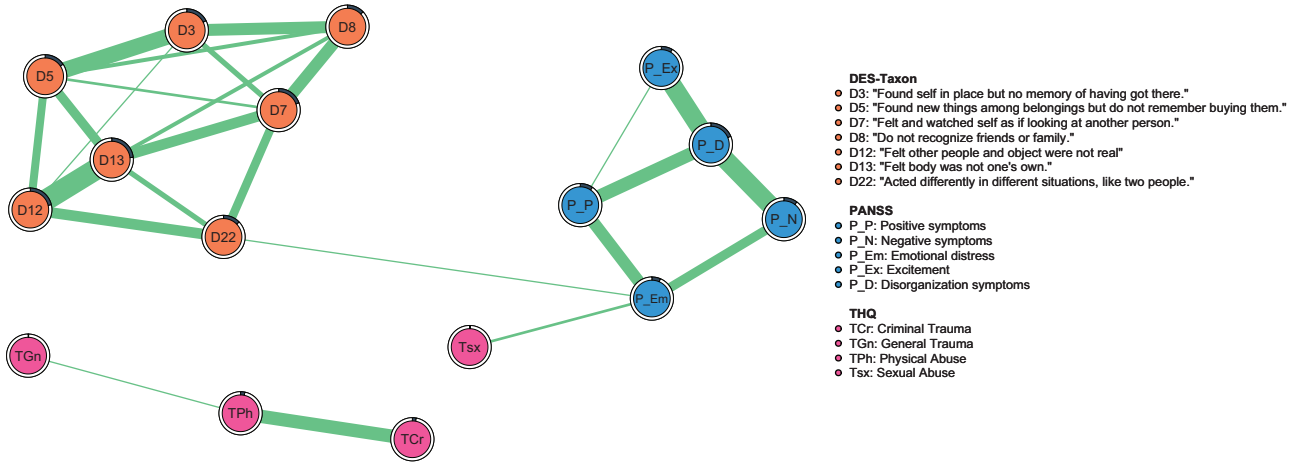

Fig. 2. EBICglasso network depicting DES-T, PANSS subscale and THQ subscale responses of individuals diagnosed with an SSD (n = 199). DES-T, Dissociative Experiences Scale-Total; THQ, Trauma History Questionnaire.

Network Estimation for Dissociation and SSD Symptoms

We first estimated the relations between dissociative and psychotic symptoms in SSD (figure 1). The samples size for the following networks was 248 for Network 1 and 199 for Network 2. Between Networks 1 and 2 49 participants were excluded (list-wise) due to missing values on the THQ measurements. Table 1 displays the mean frequencies of the DES, PANSS, and THQ subscales.

The results of the first network estimation implied that dissociative symptoms were relatively independent from the psychotic symptoms, yet there were 5 edges linking the clusters. Examining the BEI for nodes within the network provides additional evidence for a sparse connection between the syndromes, whereas the positive symptoms and emotional distress subscale of the PANSS as well as the item D22 ("acted differently in different situations, like two people."), demonstrated the largest bridge indices (table 2).

Taking Trauma into Account

In the second part of the analysis, relationships between lifetime prevalence of traumatic events and psychotic and dissociative symptoms in SSD were further examined. Of the sample, 58.3% reported being a victim of one or more crime-related event, general disaster, and trauma (76.4%), and physical or sexual abuse (each 25.6%). In total, the lifetime prevalence of at least one traumatic experience was 90.5%. Zero-order correlations for all included subscales are provided in table 3. In table 4 all edge weights for the first and the second network are displayed.

Table 1. DES-T, PANSS, and THQ Subscale Descriptives

	Network 1		Network 2	
	Mean	SD	Mean	SD
DES				
D3—"Found self in place but no memory of having got there"	7.87	15.03	6.94	13.27
D5—"Found new things among belonging but do not remember buying them"	6.02	13.93	4.78	10.83
D7—"Felt and watched self as if looking at another person"	9.49	18.49	8.35	17.61
D8—"Do not recognize friends or family"	5.20	13.14	4.38	11.91
D12—"Felt other people and object were not real"	9.07	18.47	8.40	17.65
D13—"Felt body was not one's own"	8.85	18.79	7.57	17.09
D22—"Acted differently in different situations, like two people"	14.23	22.93	13.72	23.10
PANSS				
Positive symptoms	10.63	4.38	10.51	4.47
Negative symptoms	11.46	4.67	11.20	4.36
Emotional distress	7.57	3.10	7.47	3.08
Excitement	4.76	1.86	4.79	1.99
Disorganization	11.84	3.78	11.70	3.83
THQ				
Crime trauma	—	—	1.88	0.94
General trauma	—	—	2.81	1.65
Physical abuse	—	—	1.31	0.58
Sexual abuse	—	—	1.40	0.77

Note: DES, Dissociative Experiences Scale; SSD, schizophrenia spectrum disorder PANSS, Positive and Negative Syndrome Scale; THQ, Trauma History Questionnaire. $a = N = 248$, $b = N = 199$.

Table 2. Indices of Bridge Expected Influence for Nodes of Network 1 and 2

Scale Items	Network 1	Network 2
D3—"Found self in place but no memory of having got there"	0.07	0.00
D5—"Found new things among belonging but do not remember buying them"	0.00	0.00
D7— "Felt and watched self as if looking at another person"	0.09	0.00
D8— "Do not recognize friends or family"	0.00	0.00
D12—"Felt other people and object were not real"	0.02	0.02
D13—"Felt body was not one's own"	0.10	0.02
D22— "Acted differently in different situations, like two people"	0.18	0.10
Positive symptoms	0.13	0.05
Negative symptoms	0.08	0.00
Emotional distress	0.16	0.07
Excitement	0.00	0.00
Disorganization	0.09	0.00
Crime trauma	—	0.00
General trauma	—	0.02
Physical abuse	—	0.00
Sexual abuse	—	0.02

Note: DES, Dissociative Experiences Scale; SSD, schizophrenia spectrum disorder.

For the network of DES-T, PANSS, and THQ items, depicted in Network 2, a similar observation as in the network without trauma was made. That is, dissociative and SSD symptoms clustered relatively independently. Bridges between the dissociative and psychotic clusters reduced compared to the network without trauma. Now, the only bridge was D22 ("acted differently in different situations, like two people") displaying the highest BEI as well. In addition, sexual abuse was the only traumatic experience linked to SSD symptoms and demonstrated the largest BEI for the trauma items (table 4). To quantify the degree of difference in connections between the DES and SSD cluster from figures 1 and 2, we computed confidence intervals for the sampling distribution of differences between edge weights of node pairs from 1000 bootstraps. This procedure revealed that all 5 edges connecting DES and PANSS symptoms in the first network substantially decreased in the second network once we included trauma in the analysis. This is indicated by the 95% CI around the mean of the bootstrapped sampling distribution of the difference not including zero (Supplement 9). In summary, the network illustrates that after controlling for the influence of all other nodes in the network, dissociative and SSD symptoms are relatively unconnected and that reported lifetime trauma only has indirect associations to dissociative symptoms via the SSD cluster, namely, via the emotional distress symptom component

Discussion

The first aim of this study was to investigate the relationship of dissociative with psychotic symptoms in SSD, by identifying specific symptoms linking these symptom clusters. Consistent with previous research,[6,59,60] positive psychotic symptoms as well as emotional distress and depersonalization were found as central bridge items connecting the two clusters.

The second aim was to investigate how introducing the shared etiology factor of trauma exposure in the network would impact the association between dissociative and psychotic symptoms. We hypothesized that if dissociative experiences in SSD are epiphenomena of schizophrenia spectrum symptoms, and are not merely attributable to trauma exposure, they would display relatively strong interconnectedness with schizophrenia spectrum symptoms compared to traumatic experiences. This second network analysis revealed that psychotic symptoms were

Table 3. Zero-Order Correlations of DES-T, PANSS and THQ Subscale Items

	D3	D5	D7	D8	D12	D13	D22	P_P	P_N	P_Emo	P_Ex	P_Dis	TCri	TGen	TPhy	Tsex
D3		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
D5	0.50		—	—	—	—	—	—	—	—	—	—	—	—	—	—
D7	0.51	0.43		—	—	—	—	—	—	—	—	—	—	—	—	—
D8	0.48	0.40	0.48		—	—	—	—	—	—	—	—	—	—	—	—
D12	0.38	0.44	0.39	0.33		—	—	—	—	—	—	—	—	—	—	—
D13	0.38	0.46	0.49	0.40	0.60		—	—	—	—	—	—	—	—	—	—
D22	0.33	0.32	0.42	0.27	0.50	0.45		—	—	—	—	—	—	—	—	—
P_P	0.20	0.13	0.19	0.09	0.22	0.21	0.27		—	—	—	—	—	—	—	—
P_N	0.07	−0.03	0.17	0.02	−0.01	0.07	0.13	0.31		—	—	—	—	—	—	—
P_Emo	0.08	0.05	0.14	0.01	0.20	0.25	0.28	0.39	0.37		—	—	—	—	—	—
P_Ex	0.14	0.06	0.09	−0.03	0.12	0.05	0.12	0.33	0.23	0.25		—	—	—	—	—
P_Dis	0.20	0.06	0.16	0.10	0.10	0.12	0.12	0.46	0.49	0.25	0.49		—	—	—	—
TCri	−0.02	−0.06	−0.04	0.05	−0.06	−0.06	0.05	0.18	0.08	0.11	0.13	0.09		—	—	—
TGen	0.14	0.02	0.08	0.06	−0.02	0.04	0.12	0.11	0.13	0.18	0.10	0.10	0.21		—	—
TPhy	0.04	0.03	0.05	0.08	0.06	0.02	0.14	0.20	0.10	0.11	0.15	0.11	0.38	0.26		—
Tsex	0.16	0.17	0.02	0.11	0.15	0.19	0.15	0.20	0.06	0.28	−0.01	0.04	0.18	0.23	0.14	

Note: All displayed correlation are Spearman-rank correlations. P_P, positive symptoms; P_N, negative symptoms; P_Emo, emotional distress; P_Ex, excitement; P_Dis, disorganization; TCri, crime-related trauma; TGen, general trauma; TPhy, physical abuse; Tsex, sexual abuse; PANSS, Positive and Negative Syndrome Scale; SSD, schizophrenia spectrum disorder; THQ, Trauma History Questionnaire. $N = 199$.

related to both lifetime trauma history, more specifically a history of sexual abuse, and dissociative symptoms. Whereas the first network disclosed some links between the SSD cluster and dissociative experiences. The second network revealed dissociative experiences to cluster relatively independently of SSD symptoms as well as trauma exposure.

Interplay of Dissociative Experiences and SSD Symptoms

First, the network computed on dissociative and psychotic symptoms revealed that symptoms within a category clustered relatively independently with some bridges between them, and bridges being less pronounced than what would be anticipated on the basis of previous research.[2] In line with our expectations the depersonalization experiences were bridging the symptom clusters, yet derealization and positive symptoms were less influential than expected; rather emotional distress that remained the key bridging node. Yet, the weak relation in our network between dissociative experiences and SSD symptoms suggests that dissociative experiences function as a relatively separate symptom cluster in SSD.

Scrutinizing the second network corroborates this observation. The introduction of lifetime trauma had an impact on the connections between psychotic and dissociative symptoms. In line with previous research, the network showed relations between reported sexual abuse and the psychotic symptom cluster, particularly the emotional distress component. However, there were no direct links between dissociative symptoms and reported trauma. As within the network without trauma, the psychotic and dissociative symptoms connected via the nodes with highest BEI, namely, the emotional distress component of the PANSS and D22 ("acting differently in different situations, like two people"). It is noteworthy that emotional distress appears to play a key role in this network. It is directly connected to the dissociative symptoms as well as the SSD cluster and trauma. We did not find a direct relationship between negative symptoms and trauma, though we did detect an indirect one via emotional distress. The same applies to positive symptoms which were also only indirectly linked to reported trauma via emotional distress. In contrast, the disorganization and excitement components of the PANSS were only indirectly related to emotional distress via positive symptoms and therefore showed almost no direct or indirect relationship to trauma.

A lack of relationships between symptoms of the two syndromes speaks against the epiphenomenon explanation for dissociative symptoms in SSD and implies that they constitute two comorbid manifestations of psychopathology within individuals with SSD. "Acting like different people in different situations" associated with emotional distress are the only symptoms connecting the dissociative symptoms and the SSD cluster. Therefore, the shortest path between each dissociative symptom and trauma runs along depersonalization via "acting differently in different situations, like two people," and the emotional distress component. Previous studies have found emotional distress expressed by e.g., "worry" to be linked to positive symptoms[61] which may render patients more vulnerable to dissociative symptoms such as "acting differently in different situations". Perhaps the combination of positive symptoms such as auditory or visual hallucinations and

Table 4. Edge Weights for Network 1 and 2

Node Pair	Network 1	Network 2
D3–D5	0.28	0.20
D3–D7	0.18	0.19
D5–D7	0.07	0.08
D3–D8	0.19	0.17
D5–D8	0.17	0.08
D7–D8	0.20	0.17
D3–D12	0.10	0.05
D5–D12	0.19	0.12
D7–D12	0.02	0.02
D8–D12	0.04	0.00
D3–D13	0.01	0.01
D5–D13	0.12	0.13
D7–D13	0.18	0.15
D8–D13	0.11	0.09
D12–D13	0.25	0.30
D3–D22	0.02	0.02
D7–D22	0.18	0.13
D12–D22	0.26	0.20
D13–D22	0.18	0.11
D12–P_P	0.02	0.00
D13–P_P	0.02	0.00
D22–P_P	0.10	0.05
D7–P_N	0.08	0.00
P_P–P_N	0.01	0.01
D13–P_Emo	0.07	0.02
D22–P_Emo	0.09	0.05
P_P–P_Emo	0.26	0.16
P_N–P_Emo	0.19	0.14
P_P–P_Ex	0.08	0.06
P_Emo–P_Ex	0.07	0.01
D3–P_Dis	0.07	0.00
D7–P_Dis	0.01	0.00
D13–P_Dis	0.01	0.00
P_P–P_Dis	0.23	0.20
P_N–P_Dis	0.35	0.26
P_Ex–P_Dis	0.29	0.25
TCri–TPhy	–	0.17
TGen–TPhy	–	0.06
P_Emo–Tsex	–	0.07
TGen–Tsex	–	0.02

Note: Edge weights indicate regularized partial correlations between nodes.

emotional distress trigger the perception of a detachment from reality as expressed by depersonalization/derealization experiences.

Limitations

One limitation to the generalizability of the findings is posed by the relatively low frequency of dissociative symptoms: a mean DES score of 13.87 opposed to the mean of 19.66 indicated by the pooled results over 1375 participants in Renard and colleagues.[2] If dissociative symptoms are partly responsible for the emergence and persistence of psychotic symptoms in SSD, the connection between them would only become evident if there is sufficient variability in dissociative symptoms. In other words, a restriction of range in our sample may have led to the inability to detect the relation between dissociative experiences and trauma measures.

Clinical Implication

The prevalence of dissociative experience in SSD is high, making it a relevant target for treatment. Our findings suggest that these dissociative symptoms in SSD are not just epiphenomena of psychotic symptomatology but rather cluster relatively independent, particularly after controlling for the impact of lifetime trauma. This suggests that treating psychotic symptoms may not necessarily lead to a reduction of dissociative symptoms and that targeted therapy is needed. To the best of our knowledge there is no specific therapy that aims to reduce dissociative symptoms in SSD, therapy focused on the impact of PTSD seems to be the treatment of first choice. Further research could focus on the effect of different therapeutic approaches on decreasing dissociative experiences in individuals diagnosed with an SSD.

Supplementary Material

Supplementary material is available at https://academic.oup.com/schizophreniabulletin/.

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Conflicts of Interest

The authors declare there was no conflict of interest.

Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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