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Dissociative symptoms in patients with substance use disorders

Dissertation

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1. Introduction

1.1. Definitions of Posttraumatic Stress Disorder, Dissociation, and the Dissociative Subtype of PTSD

1.1.1 Posttraumatic Stress Disorder (PTSD)

Trauma can be caused by a single event (such as a natural disaster) or a series of events (such as abuse or neglect; Schäfer & Najavits, 2007). Posttraumatic Stress Disorder (PTSD) is a psychological reaction to extremely distressing or disturbing events. According to the fifth version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013), a person must have had severe trauma exposure that has significantly impaired occupational and social function for over one month to be diagnosed with PTSD. Symptoms must include at least one intrusive symptom (recurrent, involuntary, distressing memories and/or dreams, flashbacks, intense or prolonged psychological distress to triggers, or marked physiological reactions to triggers); at least one avoidance symptom (avoidance of memories, feelings, or thoughts of trauma or avoidance of external reminders of trauma); at least two negative alterations to cognition or mood related to the trauma (dissociative amnesia, negative beliefs of self or the world, persistent negative emotional state, anhedonia, feelings of detachment or estrangement from others, inability to experience positive emotions); finally, at least two symptoms of marked changes in arousal and responsiveness (such as irritability or anger outbursts, reckless or self-destructive behaviors, hypervigilance, exaggerated startle response, problems with concentration, sleep disturbance) are necessary (American Psychiatric Association, 2013).

The prevalence of trauma and PTSD varies depending on the populations studied. In the general population, in international studies, the lifetime prevalence of PTSD is estimated to be around 8% (Kessler et al., 2005). For Germany, a 1-month prevalence of PTSD between 1,5% and 2,3% has been reported (Maercker, 2019).

In addition to the psychological burden related to PTSD, it can profoundly affect an individual's physical health and lead to long-term physical problems. Common physical symptoms related to trauma and PTSD include headaches, stomachaches, muscle tension, and fatigue (Schrader & Ross, 2021). Moreover, PTSD is associated with various issues, including difficulties at work and social dysfunction (Alonso et al., 2004; Galovski & Lyons, 2004).

Treatment for PTSD may vary depending on the type and severity of the trauma. The treatment of choice for PTSD is trauma-focused cognitive-behavioral therapy (TF-CBT) or Eye Movement Desensitization and Reprocessing (EMDR), which are both recommended by most treatment guidelines (Bryant, 2019; Schäfer et al., 2019). There are many variants of TF-CBT, including Prolonged Exposure, Eye Movement Desensitization and Reprocessing (EMDR), Cognitive Therapy, Cognitive Processing Therapy (CPR), and Imagery Rescripting Therapy. Although manifested differently, these cognitive-behavioral treatments, as well as EMDR, all essentially involve the emotional processing of traumatic memories and the integration of new corrective information. This form of treatment was reported to positively affect many populations, like victims of physical and sexual assault, both in childhood and over the lifespan (Bryant et al., 2008; Neuner et al., 2004; Schnurr et al., 2003).

1.1.2 Dissociation and the Dissociative subtype of PTSD

Dissociation is a psychological response to a traumatic event or a series of events. It is often seen as a coping mechanism that allows an individual to disconnect from the traumatic

event's reality and cope with the overwhelming emotions associated with it (Waller et al., 1996). Dissociative experiences have been associated with increased disease severity, chronicity, and, in some cases, poorer treatment outcome and suicidal behavior in traumatized patients (Herzog et al., 2020)

Pathological dissociative symptoms often emerge after exposure to traumatic life events, especially those that occur early in development, such as childhood abuse and neglect (Maaranen et al., 2005). They can manifest in various ways through disturbances of the typical integration of thought, memory, emotions, sense of self, body awareness, and perception of the external environment (American Psychiatric Association, 2013). Commonly experienced symptoms of dissociation include disengagement ("spacing out"), emotional constriction (reduced ability to experience emotions), dissociative amnesia (forms of memory loss in which an individual is unable to recall details, for instance, of the traumatic event), depersonalization (feelings of detachment from one's own body and thoughts), derealization (feelings of detachment from the environment), and identity problems (feeling as one consists of more than one personality) (Briere et al., 2005). The International Classification of Diseases (ICD) also calls attention to the importance of dissociative symptoms related to changes in body function. Other symptoms can include motor inhibition or loss of motor control, dissociative seizures, and alterations in perception, including alterations in the sensation of pain (Bob et al., 2013). Nijenhuis and colleagues suggested referring to such alterations as somatoform dissociation and distinguished bodily symptoms that cause a reduction or even a total impairment of sensory perception and/or impairment of motor control (negative somatoform dissociation), and symptoms including the involuntary perception of sensory (e.g., prickling), motor (e.g., tremor) and/or pain symptoms (positive somatoform dissociation) (Nijenhuis et al., 1996). In ICD-10 (World Health Organization, 1992), somatoform disorders consist of somatization disorder, undifferentiated somatoform

disorder, persistent somatoform pain disorder, somatoform autonomic dysfunction, hypochondriacal disorder, somatoform disorders - others and somatoform disorder-unspecified (World Health Organization, 1992).

The mechanisms of dissociation have become increasingly understood through studies examining trauma-related disorders, including the dissociative subtype of posttraumatic stress disorder (D-PTSD). D-PTSD was officially introduced in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013). The two salient features that define it are depersonalization and derealization. Depersonalization can be described as an experience of being an outside observer of oneself or feeling detached from oneself. Derealization is an experience of unreality, distance, or distortion regarding one's environment. In order to meet the criteria for the D-PTSD diagnosis, a person must meet the criteria for PTSD and display high levels of at least one of these dissociative symptoms (depersonalization or derealization; American Psychiatric Association, 2013; Spiegel et al., 2013).

Treatment for dissociation can include cognitive-behavioral therapy and medication. Screening for dissociation is not typically addressed in SUD treatments, although it appears to be of critical importance (Kleindienst et al., 2011). The expert consensus model for the treatment of dissociative reactions, particularly those that arise from repeated, early trauma, relies on a carefully paced, three-stage treatment (Courtois & Ford, 2009; International Society for the Study of Trauma and Dissociation, 2011). The first stage focuses on building a therapeutic relationship and helping the client increase safety and stability, which involves skill building to assist in regulating emotions and managing dissociation. Once the client can maintain present-moment awareness and safety, the processing of traumatic memories becomes the focus of treatment. The third stage emphasizes building an integrated sense of

self and further developing relationships and a life that the individual perceives as meaningful.

1.2. Epidemiological findings

The following findings provide further information on the epidemiology of the syndromes outlined above with a focus on dissociative symptoms and the dissociative subtype of PTSD, as well as their prevalence in patients with SUD.

1.2.1 Epidemiology of dissociative symptoms

The prevalence of dissociation on a symptom level is estimated to be around 5-10% in the general population and around 30% in clinical populations (Wolf et al., 2012). For instance, (Chu & Dill, 1990) found that 23% of 98 female inpatients who were admitted to a psychiatric hospital reported high levels of dissociation. Quimby and Putnam (1991) also found a high prevalence of dissociative symptoms in psychiatric hospital inpatients of 30%. Recent studies reported a prevalence of 37% in patients diagnosed with narcolepsy (Quaedackers et al., 2022) and 36% in patients diagnosed with psychosis (Sun et al., 2019). Findings have suggested that dissociative symptoms may become gradually less salient during adulthood due to maturation and other developmental aspects.

On the other hand, studies have also suggested that dissociative symptoms may be relatively common across the lifespan (Aderibigbe et al., 2001; Lieb et al., 2000). Furthermore, dissociative symptoms have been found to be relatively uncommon in some communities despite experiencing traumatic life events (Morgan et al., 2001). This distinct pattern of findings may be partly due to the use of different types of assessment procedures or the assessment of different types of dissociative symptoms (i.e., a broader or narrower scope)

in different studies (Johnson et al., 2006). Associations of dissociative symptoms with the female gender were reported by a few studies, for example, by Hulette et al. (2011), and other studies present contrary data (Lanius et al., 2012). The study conducted by (Spitzer et al., 2003) that included 2,153 participants suggested that men and women do not generally differ in dissociative psychopathology. In sum, these findings question the clinical notion that dissociative symptoms are phenomena typically associated with the female gender (Mergler et al., 2017; Spitzer et al., 2008).

Dissociation is an often overlooked public health concern that deserves the attention of health professionals (Sar et al., 2006). Studies examining its effects suggest that dissociation mediates the effects of childhood trauma on posttraumatic stress disorder (PTSD) and many other health and social risks (Franzke et al., 2015; Kratzer et al., 2018). Some of these risks are described in more detail in the sections below. In one study, 60% of individuals with dissociative symptoms reported disability and multidomain dysfunction (Leonard et al., 2005). Without access to appropriate treatment, individuals suffering from dissociation may have difficulties performing daily activities, accessing medical care, and fulfilling their job duty (Kendall-Tackett & Klest, 2009). Moreover, dissociation is associated with increased symptom severity across all diagnoses and a higher rate of psychiatric relapse, which can lead to disability if not accurately diagnosed and treated (Kendall-Tackett & Klest, 2009). Dissociation and trauma are both linked to poor physical health outcomes. The effect of this comorbidity increases risks of health issues like diabetes, and cardiovascular and inflammatory diseases, while also decreasing the individual's threshold for pain (Garland et al., 2013). On the other hand, it was established that chronic physical pain is a problem that has a complex relationship with substance use disorders (specifically opioid abuse and dependence). It was also reported that individuals who present dissociation after trauma often display somatic symptoms (Kratzer et al., 2022). Furthermore, there is research that confirms

that individuals with severe chronic pain often suffer from dissociation (Vogel et al., 2019). Therefore, it can be strongly hypothesized that such unaddressed comorbidity of dissociation, substance abuse, and trauma might negatively affect treatment outcomes and somatic representations of dissociation. Intimate partner violence and sexual assault are two types of revictimization highly associated with dissociative symptoms (Zamir et al., 2018). Dissociation is a natural defensive mechanism that serves as protection against trauma. Nevertheless, if it occurs too often, it interferes with a person's capacity to interpret signs of danger and separate harmful information from non-threatening information by keeping it out of consciousness (Zamir & Lavee, 2015).

Strong evidence links trauma, dissociation, and suicidal behavior, such as suicidal ideation (SI) and suicide attempts (SA). According to DSM-5, higher dissociation levels relate to more severe SI and increased probability of SA (American Psychiatric Association, 2013). Furthermore, it was suggested that dissociative disorders were an independent risk factor for multiple suicide attempts while controlling for age, gender, personality variables, PTSD, or substance abuse (Foote et al., 2008). A study by Kessler et al. (2015) reported that diagnosed dissociative disorder was a stronger predictor of suicide than SI, depression, or PTSD. A study in a veteran sample showed that SUD and PTSD comorbidity significantly increased the risk of SI (Finley et al., 2015). Moreover, a study in a sample of 459 patients with SUD reported that subjects with D-PTSD displayed more severe current SI and committed more SAs than subjects with PTSD without dissociative features (Mergler et al., 2017). Given the enhanced risk of suicidal behavior in patients with the comorbidity of dissociation, SUD, and PTSD, further exploring this complex association seems essential.

1.2.2 Epidemiology of the dissociative subtype of PTSD

The dissociative subtype of PTSD (D-PTSD) is diagnosed in approximately 15–30% of most samples of individuals with PTSD and is represented by additional symptoms of depersonalization and derealization. D-PTSD has been identified among individuals with differing traumatic experiences, including childhood abuse and war trauma (Stein et al., 2013). The prevalence of D-PTSD in samples with traumatic experiences ranged from 6% in a military sample Wolf et al. (2012) to 45% in a sample that suffered from incest trauma (Hansen et al., 2016). Two studies by Wolf et al. (2012) and Wolf et al. (2012) among veterans revealed that the prevalence of dissociative symptoms reached 15% in men and 30% in women.

Several studies investigated dissociative and non-dissociative PTSD structures (f. ex., severity of specific PTSD symptoms and severity of additional psychopathology) to explore the differences between the two constructs (Ross et al., 2018). For instance, a study by Wolf et al. (2015) presented results where the severity of three out of four DSM-5 PTSD symptom clusters, such as arousal, re-experiencing, and negative alterations in mood and cognition, were significantly higher in patients who showed severe PTSD and dissociative symptoms profile than in those who showed severe PTSD profile but without dissociative symptoms. According to a study by Stein et al. (2013), D-PTSD has been correlated with severe childhood trauma, higher psychiatric comorbidity, suicidal behavior, and functional impairment. Other significant results were reported by Steuwe et al. (2012), who found that a group of patients described by high PTSD and high dissociation had higher scores on depersonalization and derealization, higher dissociation symptoms severity, greater exposure to physical and sexual abuse and a higher prevalence of depression and specific phobias. In addition, it was found that high PTSD and dissociative comorbidity were associated with

psychopathological features of conversion, borderline, and schizophrenia (Blevins et al., 2014).

1.2.3 Dissociation and PTSD in patients with substance use disorders

Substance use disorders (SUD) belong to the most frequent behavioral consequences of childhood trauma (CT). It was shown that patients seeking treatment for SUD report high rates of childhood sexual abuse (16–61%) and childhood physical abuse (29–47%; Simpson & Miller, 2002). Conversely, a lifetime SUD is diagnosed in 14–35% of victims of CT in community samples and in 30–35% of subjects who seek treatment as a result of CT (Levitt & Cloitre, 2005). Both psychological and biological factors appear to play a role in the development of SUD after CT. The most important mediators include comorbid psychiatric disorders such as posttraumatic stress disorder (PTSD). However, PTSD is only one of the most frequent outcomes of CT, and many SUD patients with a history of CT suffer from more complex psychological consequences like dissociative psychopathology (Schäfer et al., 2017). Furthermore, individuals with dissociative and substance use disorders exhibit higher levels of substance dependence severity than those without dissociation (Kendall-Tackett & Klest, 2009).

Recent changes to the DSM-5 diagnosis of posttraumatic stress disorder (PTSD) emphasize the role of dissociation in experiencing and treating the disorder. This variation suggests that dissociation is a different pathological type of response from fear-based trauma responses and that when this comorbidity co-occurs with SUD, it can seriously affect an individual's well-being (Van Minnen et al., 2012). To date, there are very few studies on the comorbidity of dissociation, PTSD, and SUD. For example, Najavits and Walsh (2012) found that women in the high-dissociation group with PTSD and substance addiction reported more

psychological symptoms than those in the low-dissociation group. In addition, the highly

dissociated group had a more severe childhood history of emotional abuse and physical

neglect. They also reported higher expectations that the substance would help them manage

psychiatric symptoms. Another study in a traumatized female sample suggests that substance

abuse outcomes, such as nonfatal overdoses, were mediated through dissociation (Mildrum

Chana et al., 2021). Evren et al. (2011) found that 36% of individuals in their male sample

with diagnosed SUD and PTSD presented dissociative symptoms. A study of alcohol-

dependent patients, both men, and women, found significant associations between the degree

of dissociation and additional drug use and the duration and course of SUD (Langeland et al.,

2002). An interesting finding was presented by Goldstein et al. (2011), who reported that

dissociation was a significant predictor of substance abuse in a child welfare population. In

most studies, dissociation correlated with increased symptom severity across diagnoses and

higher psychiatric relapse rates (Boyer et et., 2022).

2. Relevance and goals of the dissertation

The prevalence and impact of dissociative symptoms are neglected perspectives among traumatized patients with SUD. The current findings suggest a more severe clinical profile and complex treatment needs in the patients concerned (Briere, 2006; Goldstein et al., 2011). However, associations between dissociation, trauma, and SUD remain unclear (Loewenstein, 2018; Najavits & Walsh, 2012). Moreover, many patients are not screened for dissociation when admitted to SUD treatment, regardless of reporting traumatic experiences (Schäfer & Najavits, 2007). Against this background, the dissertation addresses three important aspects.

The first study (Study I) addressed the phenomena of D-PTSD. We did not only want to examine the existence of this diagnosis in patients with SUD but also explore relationships with clinical symptoms and exposure profiles. To this aim, Latent Class Analysis (LCA) was used to identify and analyze subgroups in a large sample of female patients diagnosed with PTSD and SUD. It was hypothesized that at least one profile of high dissociation, severe psychopathology, and high childhood trauma burden would be identified, compared to other profiles that would emerge.

The second study (Study II) aimed at providing a psychometric validation of the extended German version of the Dissociative Experiences Scale (*Fragebogen zu Dissoziativen Symptomen*, FDS; Spitzer et al., 1998) as no findings on the psychometric properties of the scale existed in patients diagnosed with SUD so far. In order to reach our goals, we examined the component structure of the FDS and conducted principal component analyses (PCAs) in an extensive substance abuse population. The FDS differs from the original Dissociative Experiences Scale (DES) by including 16 additional items that assess

somatoform dissociation. Finally, we hypothesized that the FDS would also be a reliable tool for assessing dissociative symptoms in a population that suffers from SUD.

The aim of the third study (Study III) was to provide a better understanding of the potential mediating effects of dissociation between different forms of CT (sexual abuse, physical abuse, emotional abuse, physical neglect, and emotional neglect) and different forms of suicidal behavior (suicidal ideation and suicide attempts) in a sample of patients with SUD and PTSD in order to shed light on suicidal phenomena in this group of patients and suggest adequate concepts of care. Finally, we hypothesized that dissociation would mediate the relationship between CT and suicidal behaviors.

3. Studies summary

3.1. Study I - The dissociative subtype of PTSD in women with substance use disorders: Exploring symptom and exposure profiles

Gidzgier, P., Grundmann, J., Lotzin, A., Hiller, P., Schneider, B., Driessen, M., Schaefer, M., Scherbaum, N., Hillemacher, T., & Schäfer, I. (2019). The dissociative subtype of PTSD in women with substance use disorders: Exploring symptom and exposure profiles. *Journal of Substance Abuse Treatment*, *99*, 73–79. https://doi.org/10.1016/j.jsat.2019.01.004

Background: The dissociative subtype of posttraumatic stress disorder (PTSD) was officially introduced in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). Following this new classification, prior studies using Latent Class Analysis (LCA) to empirically identify subgroups of patients with PTSD that were characterized by a high severity of dissociative symptoms. Despite the high prevalence of PTSD in patients with substance use disorders (SUD), however, no such studies on the dissociative subtype of PTSD exist in this population so far. Therefore, the current study aimed to identify subgroups of patients with different symptom and exposure profiles in patients with SUD and PTSD. It was assumed that one symptom and exposure profile could be identified, characterized by higher dissociative symptoms, higher additional psychopathology, and a higher burden of childhood trauma compared to other subgroups.

Methods: In N = 258 female patients with SUD and PTSD, clinical characteristics of dissociative symptoms, PTSD severity, borderline personality disorder (BPD), depression, childhood trauma, and substance abuse were assessed. To identify symptom and exposure profiles, Latent Class Analysis was applied.

Results: A three-class solution indicated the best model fit our data. One class was characterized by a high probability of dissociative symptoms (D-PTSD class), whereas lower probabilities of dissociative symptoms characterized the other two classes. The D-PTSD class encompassed 18.7% of the patients. Following our hypothesis, the D-PTSD class showed higher probabilities of PTSD severity, borderline personality disorder symptoms, depressive symptoms, childhood emotional and sexual abuse, childhood emotional neglect, and drug abuse.

Discussion: Our results indicate that the dissociative subtype of PTSD could also be identified in a sample of female patients with SUD. Patients with SUD and PTSD characterized by the dissociative subtype showed more severe psychopathological symptoms than the remaining patients, indicating enhanced clinical needs for this vulnerable group.

3.2. Study II - Validation of the extended version of the Dissociative Experiences Scale
(DES) in patients diagnosed with substance use disorders

Background: The most extensively used instrument to measure dissociation is the Dissociative Experiences Scale (DES). To better represent dissociative disorders as mentioned in the ICD, an extended version of this instrument was provided, which also

measures somatoform symptoms of dissociation. The aim of this study was to examine the component structure and internal consistency of the extended version of the Dissociative Experiences Scale (FDS) in patients diagnosed with substance use disorders (SUD).

Methods: Principal component analyses (PCAs) were conducted in a large clinical sample of patients diagnosed with SUD (n = 459) for the 44 FDS items, the 28 original DES items, the 23 items of the original DES subscales that compose the FDS subscales of amnesia, absorption, and depersonalization/derealization, and the 9 conversion subscale items.

Results: PCA of all 44 FDS items yielded a 9-factor solution where the first factor explained 32% of variance. A 6-, 4-, and 2-factor solution, respectively, was found for the 28 DES original items, the 23 items of the original DES that compose the FDS subscales of amnesia, absorption, and depersonalization/derealization, and the 9 items of the conversion subscale of the FDS.

Conclusion: The FDS proved to be a reliable tool that can be used to screen patients with SUD for dissociative psychopathology within the ICD-10 and the DSM-5 framework.

3.3. Study III - Relationships between childhood trauma, dissociation, and suicidal behavior in female patients with PTSD and SUD

Gidzgier, P. A., Bari, M., López-Atanes, M., Lotzin, A., Grundmann, J., Hiller, P., Schneider, B., & Schäfer, I. (2022). Improving care for SUD patients with complex trauma– relationships between childhood trauma, dissociation, and suicidal behavior in female patients with PTSD and SUD. *Frontiers in psychiatry, 13*. https://doi.org/10.3389/fpsyt.2022.1047274

Background: Posttraumatic disorders are among the most frequent co-occurring diagnoses in patients with substance use disorders (SUD). Individuals with this dual diagnosis

often present with special treatment needs, especially after childhood traumatic experiences (CT). Along with posttraumatic stress disorder (PTSD) and dissociative symptoms, suicidal behaviors belong to the clinical challenges in this group of patients and may influence the course and outcome of SUD treatment. Therefore, a better understanding of the relationships between different forms of CT, psychopathology, and suicidal behaviors seems to be important to tailor adequate concepts of care.

Materials and methods: We examined 343 female patients with SUD and Posttraumatic stress disorder (PTSD). All patients completed the Childhood Trauma Questionnaire (CTQ), the Dissociative Experiences Scale-Taxon (DES-T), and the Structured Clinical Interview Axis I Disorders (SCID-I). To determine relationships between different symptoms with potential importance for concepts of treatment, we conducted analyses of moderated mediation for different models. We examined the direct and indirect effects of associations between the type of CT, dissociation and suicidal behavior, as well as the moderation effects of PTSD.

Results: All participants met DSM-criteria for either full PTSD (75.2%) or subsyndromal PTSD (24.8%). Almost all (94.5%) received at least one substance dependence diagnosis according to DSM-IV and the remaining 5.5% met substance abuse criteria. Most participants (93.3%) reported at least one type of childhood trauma. In all models, dissociation was a risk factor for suicidal ideation (SI) and for suicide attempts (SA). In both, participants with subsyndromal PTSD and participants with full PTSD, dissociation mediated the relationship between childhood sexual abuse and SI as well as SA. Moreover, we report direct effects between different types of childhood trauma and SI and SA. Furthermore, emotional abuse was a significant predictor of dissociation.

Discussion: In our sample of female patients with SUD and co-occurring PTSD, dissociation significantly increased suicidal behavior and served as a mediator of the

relationship between childhood sexual abuse and suicidal behavior. Our findings underline the need to include interventions to address dissociative symptoms and other more complex consequences of childhood trauma into concepts of care for patients with SUD.

4. Discussion

The first study sought to identify homogenous subgroups of patients with PTSD and SUD who share particular patterns of symptoms and exposures by utilizing the LCA methodology. We hypothesized that we would be able to identify at least one class that would be characterized by a high probability of dissociative symptoms, a higher probability of additional psychopathology, and a higher burden of childhood trauma, as compared to the other classes.

In our second study, we aimed to confirm that the FDS is a reliable diagnostic tool for use within the ICD (which also focuses on somatoform dissociation) and the DSM-5 framework to screen patients with SUD for a broad range of dissociative psychopathology. To answer our research question, we utilized PCA to analyze the factor structure of the questionnaire in our population.

The third study concentrated on dissociation as a potential mediator of the relationship between CT and suicidal behavior and on finding direct associations between CT, dissociation, and suicidal behavior. In order to reach our goals, we utilized moderated mediation analyses for different patterns of variables.

4.1 Dissociative symptomatology in traumatized patients with diagnosed SUD

At the time of publication of the article investigating D-PTSD in patients with SUD (Study I), it was, to the best of our knowledge, the first study that examined symptom and exposure profiles in a sample of patients with SUD and PTSD using LCA methodology (Gidzgier et al., 2021), and one of the very few studies with a focus on D-PTSD in patients with SUD (Mergler et al., 2017; Tsai et al., 2015). The results provided a 3-class solution in which one of the classes represented a high D-PTSD profile. Therefore it was named the "D-

PTSD Class". This class was characterized by high severity of clinical characteristics like dissociation, PTSD, drug use, childhood sexual abuse, depression, and borderline personality disorder (BPD). This finding is in line with other study findings, which reported that severe levels of childhood trauma were a predictor of D-PTSD (Cloitre et al., 2012; Hansen et al., 2017; Hill et al., 2020; Stein et al., 2013). We could also confirm other study findings suggesting that sexual trauma is strongly associated with D-PTSD (Armour et al., 2014; Ginzburg et al., 2006; Wolf, Miller, et al., 2012). We identified drug abuse as a type of SUD that was strongly related to D-PTSD. (Mergler et al., 2017; Tsai et al., 2015)A recent study in a female sample confirmed our finding that D-PTSD is associated with a greater prevalence of drug abuse but also pointed to relationships with more severe alcohol abuse (Killeen & Brewerton, 2023). It is also necessary to note that although alcohol abuse probability was not as high as drug abuse probability in our "D-PTSD Class", alcohol abuse, on a moderate level, was a feature of all three classes that were uncovered by our LCA. In addition to specific trauma patterns and drug-related SUD, the D-PTSD profile also reported higher severity of PTSD, depression, and borderline personality disorder. This is a valuable finding as it supports the growing scientific evidence that people with D-PTSD often fulfill a diagnosis of BPD. This should be considered when planning appropriate treatment models for people with D-PTSD (Vermetten & Spiegel, 2014; Wolf et al., 2012). Finally, the elevated scores of depressive symptoms also confirm previous findings in individuals with D-PTSD (Tsai et al., 2015).

Our study found an overall prevalence of the dissociative subtype of PTSD in patients with SUD of 31% (Gidzgier et al., 2019). It is noteworthy that the percentage of patients with D-PTSD was significantly higher than in studies examining mixed gender samples (15% - 25%; Frewen et al., 2015; Wolf, Miller, et al., 2012) but similar to other research conducted in

female patients diagnosed with PTSD (30% – 37%; Hansen, Mullerova, et al., 2016; Wolf, Lunney, et al., 2012).

Considering childhood trauma (CT) to be a substantial factor in developing a D-PTSD (Lanius et al., 2012; Steuwe et al., 2012), we decided to include different forms of CT in our analyses. The D-PTSD class showed higher scores for childhood sexual abuse, supporting the results from other Latent Profile Analysis (LPA) or LCA studies (Armour et al., 2014; Frewen et al., 2015; Steuwe et al., 2012; Wolf et al., 2017; Wolf et al., 2012). Notwithstanding, along with sexual abuse, the D-PTSD class also displayed high scores for emotional abuse and emotional neglect in our SUD sample. Although scores for physical abuse and physical neglect were also high in the D-PTSD group, these two distinct forms of trauma were not the best predictors of D-PTSD, as suggested in two other studies (Frewen et al., 2015; Steuwe et al., 2012).

4.2 Screening for dissociative psychopathology in patients with SUD

The main objective of Study II was to analyze the component structure of the German extended version of the DES, which also includes items on somatic dissociation (FDS; Spitzer et al., 2018), in a population of patients diagnosed with SUD. We hypothesized that the FDS is a reliable and valid diagnostic tool also in this group of patients, which can be used within the ICD and DSM-5 framework in German-speaking countries to screen individuals with SUDs for a broader range of dissociative psychopathology than the DES. The results of our study in a sample of 459 SUD patients show a different factor structure than the one suggested by the authors of the FDS. We utilized Principal Component Analysis (PCA) in an analysis that included all 44 FDS items. The results suggested a 9-factor structure, while the authors of the FDS reported a 6-factor structure (Spitzer et al., 2015). However, after analysis

of the indicators that assist in interpreting the results, such as the scree plot and the Kaiser criterion, we conclude that our results instead suggest a single dimension to the scale. This finding would be consistent with the findings of Spitzer et al. (2015). According to the scree plot, one factor explains 32% of the variance in our study, which is close to the results reported by Spitzer et al. (2015), where the first factor explained 35%. Moreover, the results from conducting the PCA of the DES subscales were consistent with the original FDS study. For the original 28 DES items incorporated into the FDS, we found 6 factors with 35% of variance explained by the first factor. This is in line with the results obtained by Spitzer et al. (2015), with a 35% explanation of variance by the first factor. For the 23 DES items representing the FDS subscales of amnesia, absorption, and derealization, our results yielded 4 factors. Again, the first factor explained 35% of the variance compared to 40% in the study by Spitzer et al. (2015), who identified 3 distinct factors. Our final finding was a 2-factor structure of the FDS subscale covering symptoms of conversion, where the first factor without rotation explained 40% of the variance. Again, this was in accordance with the findings of Spitzer et al. (2015), who also found 2 factors and an explanation for a variance of 44% by the first factor. Hence, all analyses met the required criteria, yielding results that led to similar conclusions of the initial psychometric validation of the FDS, indicating the single dimensionality of the instrument (Spitzer et al., 2015). Spitzer et al. (1998) found a high internal consistency (split-half = .90, Cronbach's alpha = .94) and good construct validity of the scale. Again, our results correspond with these findings (split-half = .91, Cronbach's alpha = .95). Different sample sizes could explain slight differences between the factors extracted by the two studies. Although our sample included a high number of 459 patients, the sample of Spitzer et al. (2015) consisted of 3839 patients representing many distinct disorders. Finally, our findings confirm the conclusion of Spitzer et al. (1998) that the adaptation of the

DES for German-speaking countries, which also includes items to assess conversion symptoms, does not affect the scale's reliability.

4.3 Suicidal behavior in traumatized patients diagnosed with SUD and dissociation

The main goal of Study III was to examine the mediating role of dissociation between different forms of childhood trauma and suicidal behaviors in patients with SUD and PTSD (Gidzgier et al., 2023). We hypothesized that a sequence of moderated mediation analyses would reveal that dissociation would be responsible for mediating the relationship between at least one type of childhood trauma (CT) and at least one type of suicidal behavior. We also tentatively hypothesized that our results might show independent risk factors that increase the frequency of suicidal behaviors.

The results from our third study showed that dissociation mediated the relationship between childhood sexual abuse and suicidal ideation (SI) as well as suicide attempts (SA) in women with PTSD (Gidzgier et al., 2023). Furthermore, our results provide evidence that dissociation may be an independent risk factor that increases the frequency of SI and SA in all models (Gidzgier et al., 2023). They also suggest that emotional abuse and emotional neglect may independently increase the risk of both forms of suicidal behavior in women diagnosed with full PTSD, whereas in women diagnosed with subsyndromal PTSD, emotional abuse, emotional neglect, and physical abuse only increase the risk of SA (Gidzgier et al., 2023). Finally, our results seem to suggest that emotional abuse may be a predictor of dissociation (Gidzgier et al., 2023). The latter finding is consistent with studies conducted in samples of patients with other diagnoses (Holowka et al., 2003; Şar et al., 2007; Schäfer et al., 2006), as well as in samples of individuals with SUD and PTSD (Bernstein et al., 1998; Schäfer et al., 2019; Zoroglu et al., 2003).

The results highlight the significance of dissociative symptoms and their impact on suicidal behavior, particularly among survivors of sexual abuse. Importantly, although some studies reported a direct association between sexual abuse and suicidal behavior (Berardelli et al., 2022; Bertule et al., 2021), our findings investigated these associations more deeply. They are consistent with the idea of a mediating role of dissociative symptoms reported in the scientific literature (Keefe et al., 2020). Interestingly, a recent study by Grandison et al. (2022) on vulnerabilities for suicidal histories among adults with PTSD found that emotional trauma was directly associated with suicidal behavior. Our study also supports these findings. However, these associations applied to both SI and SA in our study and the study by Grandison et al. (2022) only for SA. In a subgroup of subsyndromal PTSD patients, a direct relationship with SI was no longer observed, but an association with SA was still present. Although our analysis does not allow us to answer this question, it can be hypothesized that patients with full PTSD were exposed to more complex childhood trauma than subsyndromal PTSD patients, explaining the more consistent relationship with suicidal behavior (Gidzgier et al., 2023). For example, a recent meta-analysis by Angelakis et al. (2020) of 79 individual studies with 337.185 participants showed that childhood maltreatment was associated with significantly higher rates of SA. Across all forms of maltreatment, they observed 2.5-fold greater odds for SI and a 4.0-fold increase for SI in the case of sexual abuse. Moreover, "complex childhood abuse" was associated with a more than 5-fold risk of SA in adults (Angelakis et al., 2020).

Several variables could mediate this association. For instance, Duprey et al. (2019) suggested that the parallel development of pathological externalizing and pathological internalizing symptoms in childhood and adolescence due to childhood trauma might determine a specific developmental pathway that could lead to an elevated risk for suicidal behavior. Other studies mention factors like self-hatred (Currier et al., 2015) or hopelessness

(Lamis et al., 2014) as consequences of emotional trauma and potential mediators for suicidal behavior.

The strengths of this study relate to a large clinical sample of women diagnosed with both PTSD and SUD and to the inclusion of a wide range of potential variables in our analyses (Gidzgier et al., 2023). Moreover, we considered two different levels of PTSD severity. However, many recent studies still do not cover these aspects, like those of Berardelli et al. (2022) or Bertule et al. (2021), where PTSD status was not controlled for.

4.4. Implications for the treatment of patients with trauma and SUD

The findings from Study III support previous studies in the field of PTSD and SUD, claiming to specifically treat dissociative symptoms and suggesting that this should also apply to patients with combined SUD and PTSD. For example, research in recent years has shown that PTSD patients presenting dissociative symptoms respond poorly to standard trauma treatments and show high levels of treatment attrition. Atchley and Badford (2021), in their systematic review of dissociation in PTSD, concluded that specific interventions to address symptoms of dissociation should be integrated into the treatment of PTSD and that dissociation should be measured as a separate outcome. The same was found for SUD patients. In a study by Tamar-Gurol et al. (2008), 55% of substance abuse patients with dissociative symptoms discontinued substance abuse treatment prematurely compared to 29% of those without dissociative symptoms. Similarly, Somer (2003) found that dissociation predicted lower withdrawal rates in heroin users and highlighted the need to address trauma-related dissociation to improve their outcomes. Although not yet systematically addressed in the treatment of PTSD or SUD, evidence is accumulating on the effectiveness of interventions for dissociative symptoms and dissociative disorders. Brand et al. (2012) reported in their

review of the literature on dissociative disorders that even severely affected patients can benefit if treatment is clearly designed to address complex trauma and dissociation. However, evidence-based interventions to treat dissociation in patients with SUD are still lacking. One of the main reasons for this is that SUD is often an exclusion criterion in studies examining programs for the treatment of child abuse-related PTSD (Dorrepaal et al., 2014). This lack of appropriate interventions is increasingly recognized in the SUD field. For example, Hou et al. (2013) recently investigated the mediating role of dissociative symptoms between PTSD severity and alcohol-related problems, emphasizing the need to develop appropriate treatments. Such treatments could come from the field of trauma, where evidence-based interventions for patients with complex symptoms have grown significantly in recent years. For example, Narrative Therapeutic Skills Training for Affective and Interpersonal Regulation (STAIR-NT) is an evidence-based psychotherapy designed to treat people with cPTSD (Complex Post-Traumatic Stress Disorder; Cloitre et al., 2002). It has proven to be an effective intervention in various populations, including adults and adolescents, men and women, as well as hospitalized patients and community members (Cloitre et al., 2002). A study examining STAIR in people with PTSD and chronic psychiatric disorders showed that it could also be used successfully in groups with special needs (Trappler & Newville, 2007). Another intervention focusing directly on dissociative symptoms is the DBT-PTSD (Dialectical behavioral therapy) program, which focuses on skill training and cognitive strategies to improve emotion regulation and cope with dissociation (Bohus et al., 2019).

5. Limitations

When interpreting our results, several limitations have to be considered. One limitation of Study I is that we could not measure D-PTSD in line with the official DSM-5 criteria, as the study design occurred two years before DSM-5 was introduced. In addition to confirming PTSD diagnoses by SCID-I (First & Gibbon, 2004), the dissociative symptoms of derealization and depersonalization were evaluated employing the DES-T, a subscale of a broadly used self-report questionnaire very sensitive for extreme forms of dissociative psychology (Waller et al., 1996). Although we cannot rule out the possibility of bias associated with this method, previous research used similar methodological approaches. For instance, Armour et al. (2014) used the Harvard Trauma Questionnaire (HTQ; Mollica et al., 1992) to confirm the diagnosis of PTSD and the Trauma Symptom Checklist (TSC-33; Briere & Runtz, 1989) in order to confirm dissociative symptoms to investigate D-PTSD. A similar approach was chosen by (Hansen et al., 2016). Furthermore, it could be hypothesized that Latent Profile Analysis (LPA), instead of the conducted LCA, which utilizes continuous variables, would provide a broader range of results (i.e., more classes). The decision to utilize LCA was also taken due to the fact that few variables were originally categorical (e.g., BPD). Another limitation is that the sample included only female patients. There is a possibility that different results could be obtained in male patients who suffer from this comorbidity. It also needs to be noted that our dataset did not consist of measures with the same type of scoring, and some of our variables had to be dichotomized.

Several limitations should also be addressed concerning Study II (Gidzgier et al., 2021). Firstly, only a minority of patients showed severe dissociative symptoms. In effect, the average FDS score for the entire sample was low. Additionally, our internal consistency

analysis found that all items in the sample had a high Cronbach's alpha equal to 0.95. This score is comparable to the FDS results of Spitzer et al. (1998; Cronbach's alpha = 0.94) and to other English and French studies on validating the DES (e.g., Carlson and Putnam, 1993; Darves-Bornoz et al., 1999). Nevertheless, future research should focus on whether this indicator accurately measures the structure of the questionnaire since such a high internal consistency may be associated with item redundancy in the construct. We also would like to point out that this study monitored patients for alcohol and drug abstinence using breath and urine tests at least twice a week. However, the complete withdrawal of psychoactive substances was not guaranteed.

Our third study (Gidzgier et al., 2023) also has a few shortcomings. Firstly, there was some disparity concerning our research's diagnostic tools used to determine psychopathology. On the one hand, childhood trauma and dissociation data were assessed through self-report questionnaires (CTQ and DES-T, respectively). On the other hand, suicidal behavior and the diagnosis of PTSD were diagnosed using clinical interviews. Although this approach is common, we suggest that future studies, if possible, should unify their approach regarding the type of diagnostic tools and assessments. Another limitation is that, again, we did not include male patients, and it cannot be ruled out that gender influenced the results. Moreover, it could be stated that some other sociodemographic characteristics of our sample were somewhat atypical for patients diagnosed with SUD and PTSD (e.g., concerning the relatively high level of education and the low number of patients with migration background). Another methodological limitation of our research concerns the moderated mediation analysis of Hayes that yields unstandardized regression coefficients (*b*-values). Although this approach cannot describe a relationship's intensity, it determines the statistical significance and the direction (positive or negative) of the relationship. A higher value of *b* is only a potential indicator of effect strength. Finally, including additional variables, such as current medication

therapy and type of psycho-therapeutical treatment, might have been beneficial. We also

recommend that future studies consider further clinical variables such as emotional

dysregulation, depression, or a diagnosis of BPD.

6. Conclusion

The presented work was performed to provide new insights into the role of dissociation in patients with substance-related disorders and PTSD. This concerned different perspectives, including the dissociative subtype of PTSD, the assessment of dissociation in patients with SUD and PTSD, and relationships with clinically essential variables, namely suicidality. The findings from Study I (Gidzgier et al., 2019) provide empirical support for the existence of a dissociative subtype of PTSD in women with PTSD and SUD. Moreover, the result sheds light on relationships of D-PTSD with clinically essential variables, such as higher childhood sexual trauma, more drug-related SUD, and high BPD comorbidity, compared to profiles unrelated to D-PTSD. This strongly suggests a specific clinical profile of patients suffering from D-PTSD and could serve as evidence for designing the most beneficial treatment for this subgroup of patients with PTSD and SUD comorbidity.

Our second study (Gidzgier et al., 2022) focused on assessing dissociation in patients with SUD. We performed a psychometric validation of the extended German version of a widely used self-rating instrument to assess dissociation - FDS. In comparison to the original version (DES), the FDS includes 16 additional items to cover somatoform dissociation, which is given a high degree of consideration in the International Classification of Diseases (ICD) (World Health Organization, 1992). Our results provided evidence that the FDS is a reliable and valid instrument that can be used within the ICD and DSM-5 framework to screen individuals with SUD for dissociative psychopathology. The findings thus suggest that the instrument can also reliably be used in samples with SUD.

In our third study, we examined the hypothesis that dissociation mediates the relationship between different types of childhood trauma and suicidal behavior. In a sample of

female patients with SUD and PTSD, dissociation fully mediated the relationship between sexual abuse and both suicidal ideation (SI) and suicide attempts (SA). Moreover, we provided evidence that dissociation directly affected both SI and SA in our sample. This describes the high clinical vulnerability of this specific group of patients and indicates the need for specific treatments to address this critical domain.

After around 30 years of research into co-occurring PTSD in patients with SUD, our findings can contribute to highlighting the need to broaden the established perspectives and to incorporate interventions for more complex and severe consequences of childhood trauma into concepts of care for patients with SUD (Gidzgier et al., 2023).

7. Summary

7.1 English language summary

Traumatic experiences and their consequences, such as dissociative symptoms and post-traumatic stress disorder (PTSD), often co-occur with substance-related disorders (SUD) such as alcohol and/or drug abuse or dependence. The comorbidity of dissociation, PTSD, and substance-related disorders is often associated with a more severe course of illness and poorer treatment outcomes in affected patients compared to patients with each of these disorders alone. The exact relationship between traumatic experiences, dissociation, PTSD, and addictive disorders is not fully understood, and little research has addressed this complex comorbidity.

An open question concerns the prevalence of dissociative symptoms in the subgroup of patients with PTSD and SUD. Most existing studies on this topic are relatively small, use self-report instruments rather than clinical interviews, and include patients who are in early withdrawal or still actively using substances. Further, the relevance of the dissociative subtype of PTSD (D-PTSD), a new diagnostic category in the fifth version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), has hardly been studied in patients with SUD. Another open question concerns approaches to diagnose the full spectrum of dissociative symptoms in SUD patients as a prerequisite for specific treatment. Finally, one of the major challenges in this severely affected patient group is a better understanding of important clinical aspects, such as self-injury and suicidality.

Therefore, the aims of this dissertation were 1) to investigate the prevalence of the dissociative subtype of PTSD in patients with SUD, 2) to psychometrically validate a

commonly used instrument on dissociative symptoms in this group that also captures somatoform dissociation, and 3) to better understand potential predictors of suicidal behavior in SUD patients with complex trauma as a basis for improved therapeutic interventions.

To answer the above questions, latent clinical subtypes, including the dissociative subtype of PTSD, were examined in a large sample of female patients with SUD and PTSD (Study I). In addition, given the importance of the full spectrum of dissociative symptoms also in SUD patients, the factor structure of the extended German version of the Dissociative Experiences Scale (Fragebogen zu Dissoziativen Symptomen, FDS), which also measures somatoform dissociation, was examined in a large sample of SUD patients (Study II). Finally, in our last study (Study III), we examined direct and indirect associations between five different types of childhood trauma (CT), dissociation, and suicidal behaviors, such as suicide attempts (SA) and suicidal ideation (SI), taking into account moderating effects of PTSD.

Study I identified a substantial group of patients with the dissociative subtype of PTSD (D-PTSD). Patients with D-PTSD showed more severe psychopathological symptoms than the other patients, indicating increased clinical needs in this vulnerable group. Study II demonstrated that the FDS can be used to reliably screen SUD patients for dissociative psychopathology both within the conceptual framework for these symptoms in the DSM, and in the International Classification of Diseases (ICD). The results of Study III suggest that dissociation directly affects both SI and SA in patients with comorbid SUD and PTSD. In addition, dissociation was found to mediate the relationship between various forms of childhood trauma and suicidal behaviors.

7.1 German language summary

Traumatische Erlebnisse und ihre Folgen, wie dissoziative Symptome und die Posttraumatische Belastungsstörung (PTBS), treten häufig gemeinsam mit substanzbezogenen Störungen (SUD) wie Alkohol- und/oder Drogenmissbrauch bzw. -abhängigkeit auf. Die Komorbidität von Dissoziation, PTBS und substanzbezogenen Störungen wird häufig mit einem schweren Krankheitsverlauf und schlechteren Behandlungsergebnissen bei den betroffenen Patient:innen in Verbindung gebracht, verglichen mit Patient:innen mit jeder dieser Störungen alleine. Der genaue Zusammenhang zwischen traumatischen Erlebnissen, Dissoziation, PTBS und Suchterkrankungen ist noch nicht vollständig geklärt und bislang befassten sich nur wenige Forschungsarbeiten mit dieser komplexen Komorbidität.

Eine offene Frage betrifft die Prävalenz dissoziativer Symptome in der Untergruppe der Patienten mit PTBS und SUD. Die meisten vorliegenden Studien zu diesem Thema sind relativ klein, verwenden eher Selbstbeurteilungsinstrumente als klinische Interviews und schließen auch Patient:innen ein, die sich in der frühen Entzugsphase befinden oder noch aktiv Substanzen konsumieren. Weiter wurde die Relevanz des dissoziativen Subtyps der PTBS (D-PTSD), einer neuen diagnostischen Kategorie in der fünften Version des Diagnostischen und Statistischen Manuals Psychischer Störungen (DSM-5), bisher kaum bei Patient:innen mit SUD untersucht. Eine weitere offene Frage betrifft Ansätze zur Diagnose des gesamten Spektrums dissoziativer Symptome bei SUD-Patient:innen als Voraussetzung für eine spezifische Behandlung. Eine der größten Herausforderungen bei dieser schwer betroffenen Gruppe ist schließlich ein besseres Verständnis wichtiger klinischer Aspekte, wie Selbstverletzung und Suizidalität.

Die Ziele dieser Dissertation waren daher 1.) die Untersuchung der Prävalenz des dissoziativen Subtyps der PTBS bei Patient:innen mit SUD, 2.) die psychometrische

Validierung eines häufig verwendeten Instruments zu dissoziativen Symptomen bei dieser Gruppe, das auch somatoforme Dissoziation erfasst, und 3.) ein besseres Verständnis potenzieller Prädiktoren für suizidales Verhalten bei SUD-Patient:innen mit komplexen Traumatisierungen als Grundlage für verbesserte therapeutische Interventionen.

Zur Beantwortung der oben genannten Fragen wurden latente klinische Subtypen, einschließlich des dissoziativen Subtyps der PTBS, in einer großen Stichprobe von Patientinnen mit SUD und PTBS untersucht (Studie I). Angesichts der Bedeutung des gesamten Spektrums dissoziativer Symptome auch bei SUD-Patient:innen wurde außerdem die Faktorenstruktur der erweiterten deutschen Version der „Dissociative Experiences Scale" (Fragebogen zu dissoziativen Symptomen, FDS), die auch die somatische Dissoziation erfasst, in einer großen Stichprobe von SUD-Patient:innen untersucht (Studie II). In unserer letzten Studie (Studie III), untersuchten wir schließlich direkte und indirekte Zusammenhänge zwischen fünf verschiedenen Arten von Kindheitstraumatisierungen (CT), Dissoziation und suizidalem Verhalten, wie Suizidversuchen (SA) und Suizidgedanken (SI), unter Berücksichtigung moderierender Effekte der PTBS-Symptomatik.

In Studie I konnte eine beträchtliche Gruppe von Patientinnen mit dem dissoziativen Subtyp der PTBS identifiziert werden. Betroffene Patientinnen zeigten schwerere psychopathologische Symptome als die übrigen Patientinnen, was auf erhöhte klinische Bedarfe in dieser Gruppe hinweist. Studie II zeigte, dass der FDS für ein zuverlässiges Screening von SUD-Patient:innen auf dissoziative Psychopathologie sowohl innerhalb des konzeptuellen Rahmens dieser Symptome im DSM, als auch in der Internationalen Klassifikation der Krankheiten (ICD) verwendet werden kann. Die Ergebnisse von Studie III legen nahe, dass Dissoziation sowohl SI als auch SA bei Patientinnen mit komorbider SUD und PTSD direkt beeinflusst. Darüber hinaus wurde festgestellt, dass Dissoziation die

Beziehung zwischen verschiedenen Formen von Kindheitstraumatisierungen und suizidalen

Verhaltensweisen vermittelt.

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9. Appendix

9.1 Study I

The dissociative subtype of PTSD in women with substance use disorders: Exploring symptom and exposure profiles

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ABSTRACT

The dissociative subtype of posttraumatic stress disorder (PTSD) was officially introduced in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). In accordance with this new classification, prior studies using Latent Class Analysis (LCA) empirically identified a subgroup of patients that were characterized by a high severity of dissociative symptoms. Despite the high prevalence of PTSD in patients with substance use disorders (SUD), however, no LCA studies on the dissociative subtype of PTSD exist in this population so far. Therefore, the current study aimed to identify subgroups of patients with different symptom and exposure profiles in patients with SUD and PTSD. It was assumed that one symptom and exposure profile could be identified that would be characterized by higher dissociative symptoms, higher additional psychopathology and a higher burden of childhood trauma, as compared to other subgroups. In N = 258 female patients with SUD and PTSD, clinical characteristics of dissociative symptoms, PTSD severity, borderline personality disorder (BPD), depression, childhood trauma and substance abuse were assessed. To identify symptom and exposure profiles, Latent Class Analysis was applied.

A three-class solution indicated the best model fit to our data. One class was characterized by a high probability of dissociative symptoms (D-PTSD class), whereas the other two classes were characterized by lower probabilities of dissociative symptoms. The D-PTSD class encompassed 18.7% of the patients. In accordance with our hypothesis, the D-PTSD class showed higher probabilities of PTSD severity, borderline personality disorder symptoms, depressive symptoms, childhood emotional and sexual abuse, childhood emotional neglect, and drug abuse. Our results indicate that the dissociative subtype of PTSD could also be identified in a sample of female patients with SUD. Patients with SUD and PTSD characterized by the dissociative subtype showed more severe psychopathological symptoms than the remaining patients, indicating enhanced clinical needs for this vulnerable group.

1. Introduction

The co-occurrence of dissociative symptoms and traumatic experiences was introduced in the scientific literature more than a hundred years ago (Janet, 1907). As a psychological process, dissociation can be defined as "an experienced loss of information or control over mental processes that, under normal circumstances, are available to conscious awareness, self-attribution, or control, in relation to the individual's age and cognitive development" (Dalenberg & Carlson, 2012). Various models that aim to explain aspects of the relationship between

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dissociative symptoms and posttraumatic stress disorder (PTSD) have been proposed (Dalenberg & Carlson, 2012). The dissociative subtype model of PTSD (D-PTSD) received the most attention in the empirical research (Hansen, Ross, & Armour, 2017; Mergler et al., 2017; Wolf et al., 2012). The D-PTSD model assumes that individuals suffering from D-PTSD differ from individuals suffering from non-dissociative PTSD in their trauma characteristics and treatment outcomes (Dalenberg & Carlson, 2012). It is generally assumed that individuals with D-PTSD display different symptom patterns and a greater severity of PTSD symptoms than individuals with non-dissociative PTSD (Armour, Elklit, Lauterbach, & Elhai, 2014).

D-PTSD was officially introduced in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013). The two salient features that define it are depersonalization and derealization. Depersonalization can be described as an experience of being an outside observer of oneself or feeling detached from oneself. Derealization is an experience of un-reality, distance or distortion regarding one's environment. In order to meet the criteria for the D-PTSD diagnosis a person must meet the criteria for PTSD and display high levels of at least one of these dis-sociative symptoms (depersonalization or derealisation) (American Psychiatric Association, 2013; Spiegel et al., 2013).

Patients diagnosed with substance use disorders (SUDs) and co-existing PTSD present a more impaired clinical profile than patients with one of the disorders alone (Schäfer & Najavits, 2007). Their profile is described by an earlier onset of substance abuse (Johnson, Striley, & Cottler, 2006), extended duration of substance abuse (Read, Brown, & Kahler, 2004), higher rates of multiple drug use (Dragan & Lis-Turlejska, 2007) and more severe alcohol dependence and impaired mental health comorbidity (Sells et al., 2016). Furthermore, in contrast to patients without co-existing PTSD, they present worse adherence to treatment and a worse general outcome in a broad range of measures (Brown, Read, & Kahler, 2003; Najavits et al., 2007).

The prevalence of D-PTSD in samples with traumatic experiences ranged from 6% in a military sample (Wolf, Miller, et al., 2012) up to 45% in a sample that suffered from incest trauma (Hansen, Mullerova, Elklit, & Armour, 2016). Studies by Wolf, Miller, et al. (2012) and Wolf et al. (2012) of veterans revealed that dissociative symptoms may differ between women and men, as they found a lower prevalence in men (12% to 15%) than in women (30%).

Clinical aspects in patient populations that are closely linked to dissociative symptoms are childhood trauma (CT), especially sexual, physical and emotional abuse (Chaplo, Kerig, Bennett, & Modrowski, 2015; Dalenberg & Palesh, 2004; Ginzburg et al., 2006), high PTSD severity (Armour, Karstoft, & Richardson, 2014), high severity of de-pression (Armour, Karstoft, & Richardson, 2014; Steuwe, Lanius, & Frewen, 2012) and more frequent suicide attempts (Foote, Smolin, Neft, & Lipschitz, 2008). There is also evidence of an elevated comorbidity between borderline personality disorder (BPD) and dissociative symp-tomatology in traumatized samples (Heffernan & Cloitre, 2000; Wolf, Lunney, et al., 2012).

There is only a handful of studies about the comorbidity of dis-sociation, PTSD and SUD. For instance Najavits and Walsh (2012) found that their high-dissociation group of women with PTSD and substance dependence reported more mental health impairment than the low-dissociation group. Moreover, the high-dissociation group was asso-ciated with stronger expectation that substances could help them with management of their psychiatric symptoms. Also, the high-dissociation group presented more trauma-related symptoms and childhood his-

tories of emotional abuse and physical neglect.

Current research on the concept of D-PTSD went beyond examining relations between dissociative symptoms and clinical symptoms and started to analyse whether symptoms in patients with PTSD could be grouped into distinct symptom profiles (Hansen et al., 2017). Various

These studies identified three to five classes characterizing different PTSD symptom profiles, of which at least one class included a profile with a high level of dissociative symptoms (Frewen, Brown, Steuwe, & Lanius, 2015; Hansen, Mullerova, et al., 2016; Wolf et al., 2017).

Although studies that analysed symptom profiles in patients with PTSD exist, no study has so far examined such profiles in patients with SUD and comorbid PTSD. This is surprising as SUD and PTSD are highly interrelated. Among substance users, prevalence rates of PTSD ranges between 35 and 50% (Reynolds et al., 2005). The only existing study on the dissociative subtype of PTSD in SUD patients (Mergler et al., 2017) examined prevalence of D-PTSD and found that the prevalence of D-PTSD in SUD patients seemed to be comparable to the rates reported in other populations — 28.8% (Mergler et al., 2017). This study also found that D-PTSD is related to higher levels of depressive symptoms, current suicidal thoughts, lifetime anxiety and suicide attempts (Mergler et al., 2017). The D-PTSD group in this study also displayed a higher need for treatment of drug problems (Mergler et al., 2017).

The present study sought to extend these findings. In this study, we aimed to identify homogenous subgroups of patients with PTSD and SUD who share particular patterns of symptoms and exposures. We hypothesized that LCA would identify one profile characterized by a high probability of dissociative symptoms, a high probability of addi- tional psychopathology and a high burden of childhood trauma, as compared to other classes.

2. Methods

2.1. Participants

The present study was part of a German research network on sub-stance abuse as a cause and consequence of childhood trauma (Schäfer et al., 2017). The current analysis used the baseline data of a rando-mized controlled trial of a cognitive behavioral treatment for PTSD and SUD. Data were collected from October 2012 to June 2015 at the University Medical Center Hamburg-Eppendorf, Germany, and four cooperating study centers at hospitals in Northern and Western German cities (Bielefeld, Essen, Hannover and Cologne). All study centers were substance abuse treatment departments of the respective hospitals. Study participants were recruited via local substance abuse counseling agencies and other psychosocial services, substance abuse and mental health clinics, psychotherapists in private practice and in the commu-nity (e.g. advertisements on subway trains, in newspapers, at super-markets, and online classified advertisements). Participants of the clinical trial were women aged 18–65 with at least subsyndromal PTSD and substance use disorders according to DSM-IV criteria (American Psychiatric Association, 2013). Given that group treatments for post-traumatic disorders should preferably take place in gender-specific groups (e.g. Greenfield et al., 2007) and that the prevalence of PTSD is markedly higher in women with SUD as compared to men (Schäfer & Najavits, 2007), the study focused on female patients. Exclusion criteria were current psychosis, severe cognitive impairment and intravenous drug use within four weeks of the start of study participation. As the purpose of this study was to identify symptom and exposure profiles in patients with SUD and PTSD, patients who did not fulfill the criteria for a diagnosis of PTSD nor SUD were excluded from the study.

2.2. Measures

2.2.1. Dissociative Experiences Scale — Taxon (DES-T)

A subset of eight items of the Dissociative Experiences Scale

studies that used either latent class analysis (LCA) or latent profile analysis (LPA) examined profiles of symptoms in patients with PTSD.

(Bernstein & Putnam, 1986) the so-called DES-Taxon (DES-T), has been proven to be a sensitive self-rating tool to identify pathological dissociation (Waller, Putnam, & Carlson, 1996). The questions of the DES-T are answered by estimating the percentage of time (ranging from 0% to 100%), in which the subject goes through the experience described (e.g., 'Some people sometimes have the experience of feeling that their

body does not belong to them'). In order to fulfill a D-PTSD diagnosis in our study, a person had to display a score of 20 or higher on the depersonalization/derealization subscale of DES-T in addition to fulfilling all criteria of a PTSD diagnosis as measured by the SCID-I. Reliability testing of the DES-T showed that the scale had good test-retest and good split-half reliability. Internal consistency and construct validity were also described as good (Bernstein & Putnam, 1986). The current study focused on the depersonalization/derealization subscale and its reliability estimate was Cronbach's α = 0.69.

2.2.2. The Structured Clinical Interview Axis I Disorders (SCID-I)

The diagnosis of PTSD and SUD was established by using a structured clinical interview. The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) is a semi-structured interview for DSM-IV Axis I diagnoses. It was used to confirm the PTSD diagnosis according to DSM-IV. Studies on the SCID-I have shown a good to very good validity and reliability of the instrument (Lobbestael, Leurgans, & Arntz, 2011).

2.2.3. Posttraumatic Diagnostic Scale (PDS)

PTSD symptom severity was measured using the Posttraumatic Diagnostic Scale (Foa, 1995). The PDS consists of four different sections, with a total of 49 items. The first part addresses the A1 criterion of PTSD — the stressor. The second part addresses criterion A2 — the subjective emotional response. The third part assesses criteria B, C, and D on the subscales re-experiencing, avoidance and hyperarousal. Criterions E and F, duration of disturbance and significant impairment, are assessed in the last part. The PDS demonstrated a high internal consistency, test-retest reliability and good validity, sensitivity and specificity (Foa, Cashman, Jaycox, & Perry, 1997). For the purpose of this study, the total score of the PDS was dichotomized into patients with "none to moderate" PTSD severity and "moderate to severe" PTSD severity. The cut-off score to fall into "moderate to severe" group was 21. The reliability estimate of the scale in the current study was Cronbach's α = 0.86.

2.2.4. Addiction Severity Index-lite (ASI-lite)

In order to collect data on participants' substance abuse, the Addiction Severity Index-lite (ASI-lite; Kokkevi & Hartgers, 1995; McLellan et al., 1992) was administered. The ASI-lite is a rater-administered interview yielding composite scores from areas that include the severity of substance use, medical issues, employment/support, legal issues, family/social, and psychiatric issues. The ASI-lite is a short form of the full ASI. Studies suggest that the ASI is a reliable and valid instrument that has a wide range of clinical and research applications (Weisner, McLellan, & Hunkeler, 2000). The ASI-lite offers a continuous composite score that characterizes problem severity. This score can range from 0 to 1. For the purpose of this study, the scores were dichotomized resulting in two groups of patients with low and high alcohol use or drug use, respectively, using the median split. The reliability estimates of the subscales were Cronbach's α = 0.85 for alcohol use severity and Cronbach's α = 0.69 for drug use severity.

2.2.5. Beck Depression Inventory—II (BDI-II)

The Beck Depression Inventory (BDI-II; Beck, Steer, Ball, & Ranieri, 1996) was used to assess the severity of depressive symptoms. The BDI-II is a 21-item self-report questionnaire. Items are rated on a 4-point scale ranging from 0 to 3. The cutoff points are: 14–19 (mild), 20–28 (moderate), and 29–63 (severe depressive symptoms). The BDI-II demonstrated good reliability and validity in clinical and nonclinical samples (Osman, Kopper, Barrios, Gutierrez, & Bagge, 2004). For the purpose of this study, the BDI-II scores were dichotomized into "none to moderate" depression severity and "moderate to severe" depression severity. The cut off score to fall into "moderate to severe" group was 20. The reliability estimate of the scale in the current study was Cronbach's α = 0.90.

2.2.6. Childhood Trauma Questionnaire (CTQ)

The Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998) collects information on the type and severity of early traumatic experiences. The CTQ is a 28-item self-report questionnaire that assesses physical and sexual abuse, emotional neglect, emotional abuse and physical neglect. Items are rated on a Likert-scale from 1 (never true) to 5 (very often true). The five subscale scores range from 5 to 25. For each of the five subscales, the severity of abuse or neglect can be classified according to defined cutoff scores (none or minimal, low to moderate, moderate to severe, and severe to extreme). For the purpose of this study, the severity scores were dichotomized into "none to moderate" or "moderate to extreme" abuse or neglect. The instrument was proven to be reliable and valid in clinical and in community samples (Klinitzke, Romppel, Hauser, Brahler, & Glaesmer, 2012). The cut-off scores for "moderate to extreme" abuse/neglect subscales were: 13 for emotional abuse, 10 for physical abuse, 8 for sexual abuse, 15 for emotional neglect and for physical neglect — 10. The reliability estimates of the subscales were Cronbach's α = 0.86 for emotional abuse, α = 0.89 for physical abuse, α = 0.96 for sexual abuse, α = 0.88 for emotional neglect, and α = 0.71 for physical neglect.

2.2.7. Assessment of DSM-IV Personality Disorders (ADP-IV)

Symptoms of borderline personality disorder were self-rated by means of the Assessment of DSM-IV Personality Disorders (ADP-IV) (Schotte et al., 2004). ADP-IV is a 94-item questionnaire that allows for a categorical and dimensional assessment of the DSM-IV personality disorders. The cut-off score for fulfilling the Borderline Personality Disorder diagnosis is ≥43. Studies on its psychometric properties have shown that the ADP-IV has satisfactory reliability and validity (Doering et al., 2007). For needs of the study, we used the official cut-off score of 43 to fulfill the BPD diagnosis. The reliability estimate of the borderline subscale in the current study was Cronbach's α = 0.81.

2.3. Data analysis

We included the following variables in the analysis to examine symptom and exposure profiles in patients with SUD and PTSD: severity of PTSD (PDS); dissociative symptoms severity (DES-T); alcohol abuse and drug abuse severity (ASI-lite); depressive symptoms severity (BDI-II); severity of different childhood traumas: emotional, physical and sexual abuse, and emotional and physical neglect (CTQ); and Borderline Personality Disorder (ADP-IV). To detect such subgroups, we used LCA. LCA is considered to be an exploratory statistical method as the number of latent classes is not known a priori. The analyses for the current study were conducted stepwise. First, in order to fulfill the prerequisite of LCA, variables were categorized with SPSS into two values that represent either their severity (none-moderate level and moderate-severe level) or fulfilled a diagnosis of a disorder. As main analysis, LCA was performed to determine latent groups in the sample. Models between one and six classes characterized by a pattern of conditional probabilities were tested and compared. All models were estimated using default robust maximum likelihood estimator (Yuan & Bentler, 2000) with the assumption that all missing data were missing completely at random (Akaike, 1987). We confirmed this assumption with the MCAR test. The Little's MCAR test employed for this study's data resulted in a chi-square = 35.87 (df = 40; $p < 0.66$), which indicates that the data is indeed missing completely at random (i.e., no identifiable pattern exists to predict the missing data). The amount of missing data was very small: 2.4% (see notes in Table 1). LCA uses all the available data and not only complete cases by using full information maximum likelihood.

In order to confirm that the model reached the global maximum of likelihood and that the parameters were not estimated on local maxima solutions, the model was estimated using two different seeds and 500 random start values were utilized by 50 final stage optimizations.

We decided to choose a model with the optimal number of classes after considering different model comparison factors, including: the

Table 1

Clinical characteristics of the sample (N = 258).

Clinical domain	Clinical variables	M (SD)	n (%)
PDS	PTSD severity	28.3 (9.9)	
	None to moderate		177 (68.6)
	Moderate to severe		80 (31.0)
ADP-IV	Borderline personality disorder	43.6 (12.9)	
	Yes		83 (32.3)
	No		174 (67.7)
BDI-II	Depression	29.3 (11.6)	
	None to moderate		53 (20.5)
	Moderate to extreme		205 (79.5)
ASI-lite	Alcohol use severity	0.3 (0.3)	
	None to moderate		143 (55.4)
	Moderate to extreme		115 (44.6)
	Drug use severity	0.1 (0.1)	
	None to moderate		170 (65.9)
	Moderate to extreme		88 (34.1)
CTQ	Childhood trauma severity	73.9 (21.6)	
	Type of childhood trauma		
	Emotional abuse (EA)	17.7 (5.5)	
	None to moderate		50 (19.4)
	Moderate to extreme		205 (79.5)
	Physical abuse (PA)	11.9 (6.0)	
	None to moderate		120 (46.5)
	Moderate to extreme		138 (53.5)
	Sexual abuse (SA)	14.1 (7.0)	
	None to moderate		65 (25.2)
	Moderate to extreme		193 (74.8)
	Emotional neglect (EN)	18.3 (5.3)	
	None to moderate		53 (20.5)
	Moderate to extreme		204 (79.1)
	Physical neglect (PN)	11.7 (4.5)	
	None to moderate		94 (36.4)
	Moderate to extreme		164 (63.6)

Notes. *PDS*: *Posttraumatic Diagnostic Scale* (Foa et al., 1997), n = 257; *ADP-IV*: *Assessment of DSM-IV Personality Disorders* (Doering et al., 2007) n = 257; *BDI-II*: *Beck Depression Inventory-II* (Beck, Steer, & Brown, 1996), n = 258; *ASI-lite*: *Addiction Severity Index-lite* (McLellan et al., 1992), Alcohol use severity n = 258, Drug use severity n = 256; *CTQ*: *Childhood Trauma Questionnaire* (Bernstein & Fink, 1998), n = 254, EA n = 255, PA n = 258, SA n = 258, EN n = 257, PN n = 258. All patients were diagnosed with SUD.

Akaike Information Criteria (AIC; Akaike, 1987), the Bayesian Information Criteria (BIC; Schwarz, 1978), the sample size adjusted Bayesian Information Criteria (ssaBIC; Sclove, 1987) and the Lo-Mendell-Rubin's adjusted likelihood ratio test (LMRA-LRT). Lower values on the AIC, BIC and ssaBIC indicate better fit (Nylund, Asparouhov, & Muthén, 2007; Yang, 2006). As reported by Nylund et al. (2007) and Yang (2006), the most reliable indicator of fit is the BIC. It has been proven that a model with a ten-point lower BIC value has a 150:1 likelihood to be a more suitable model and is recognized as "very strong" evidence in comparison to the model with the more negative BIC value (Raftery, 1995). Hence, this particular indicator is considered a robust indicator for choosing the proper model. The LMRA-LRT in- dicator determines if a latent model with one additional class is more suitable than a latent model with one less class. A non-significant value (p > 0.05) for this test implies that the latent model with one less class

is the superior option. The bootstrapped likelihood ratio test (BLRT; Nylund et al., 2007) was also taken into consideration. Its significant value (p < 0.05) suggests that the specified model is more suitable compared to a model with one class less. The entropy score was taken into account as an indicator of classification quality of every particular model (Ramaswamy, Desarbo, Reibstein, & Robinson, 1993). Entropy is described to be a standardized measure of how precisely participants are classified to a latent class. Superior classification is defined by values which approach 1 (Ramaswamy et al., 1993). Descriptive statistical analyses for all variables were performed using SPSS, version 22. Latent Class Analysis (LCA), which employs categorical data, was carried out using Mplus 6.12.

3. Results

3.1. Sociodemographic characteristics

A total of N = 343 patients could be included in the study. N = 85 patients were excluded from the current analysis as they were diagnosed with subsyndromal PTSD leading to a sample of N = 258 patients with full-blown PTSD. All patients were female and ranged in their age between 19 and 65 years (M = 40.0; SD = 11.4). The majority were single (n = 222; 86.0%) and unemployed (n = 210; 81.4%) and nearly half of them had children (n = 126; 48.8%). The median of school years completed was 10 (range 7–13) and more than half of the patients re- ported a monthly household income of < 1000 € (n = 149; 58.9%).

3.2. Clinical characteristics

The overall prevalence of D-PTSD measured by DES-T in the sample was 31% (n = 80; M = 14.3; SD = 16.4). The clinical characteristics of the sample are presented in Table 1.

3.3. Results of latent class analysis

The results of LCA are shown in Table 2. The results favored a model that consisted of three latent classes. The BIC value, which has been suggested to be the most reliable indicator of fit (Nylund et al., 2007; Yang, 2006) was lowest for the three-class solution. The scores of AIC and ssaBIC indicators kept declining in models with higher class solutions, but the further reductions of scores in higher class solutions in comparison to the three-class solution scores were relatively small. Another model fit indicator, the LMRA-LRT test, was non-significant for all class solutions except the two-class solution. This score would favor the two-class solution, contrary to BIC factor (Wang & Wang, 2012). On the other hand, the BSLRT suggested the four-class solution. The class membership classification of participants in the study was measured by the entropy value. For the three-class solution it equaled 0.73. To sum up, the indicators were not consistent, but the strongest indicator (BIC) suggested the three-class solution.

Fig. 1 presents the latent profile plot for the three-class solution: one dissociative-PTSD class and two non-dissociative classes. The first class in the three-model solution was the smallest class (18.7%) and it was defined by very high dissociative symptoms, PTSD severity and

Table 2

Fit of the competing 2–6 class models.

	AIC	BIC	ssaBIC	Entropy	LMRA-LRT (p)	BSLRT (p)
2C	3292.383	3374.012	3301.095	0.717	178.035 (0.001)	180.709 (0.001)
3C	**3244.064**	**3368.281**	**3257.321**	**0.732**	**71.249 (0.158)**	**72.319 (0.001)**
4C	3222.571	3389.377	3240.373	0.776	44.820 (0.089)	45.493 (0.001)
5C	3217.362	3426.758	3239.710	0.817	28.776 (0.346)	29.208 (0.145)
6C	3209.998	3461.983	3236.891	0.817	30.900 (0.120)	31.364 (0.065)

Notes: AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion; ssaBIC: sample size adjusted Bayesian Information Criterion; LMRA-LRT: Lo-Mendell-Rubin adjusted likelihood ratio test; BSLRT (p): 2 times the Log-likelihood difference and associated *p*-value. Best model in bold.
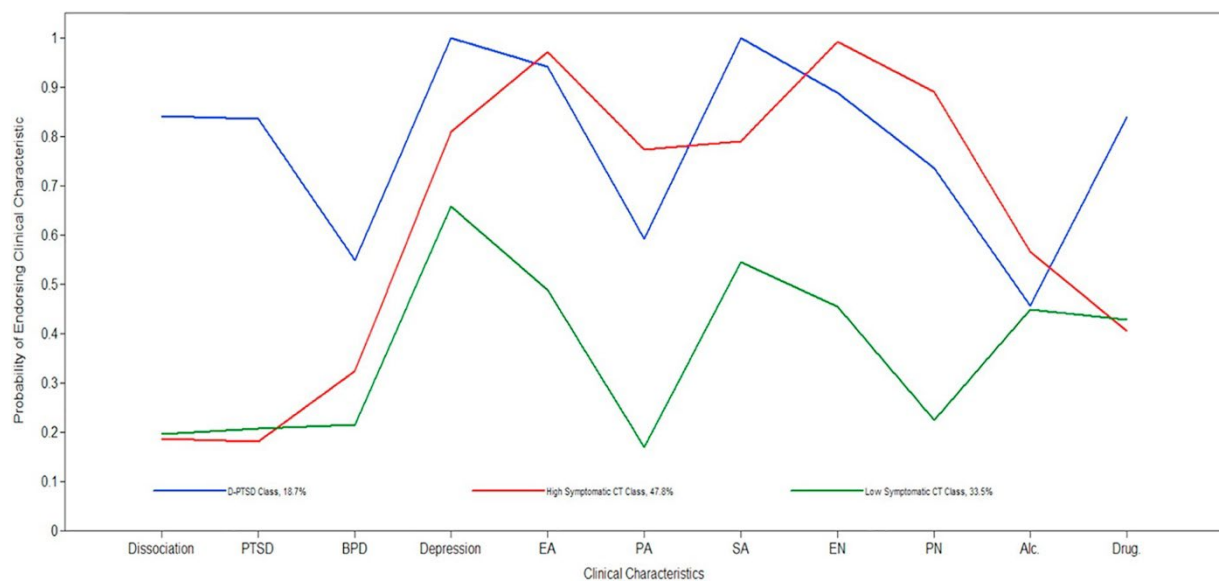
Fig. 1. Three-class latent class plot of clinical characteristics in the sample.

Notes: Dissociation represents the pathological dissociation; PTSD describes PTSD severity; BPD, borderline personality disorder severity; Depression, depression severity; EA, emotional abuse severity; PA, physical abuse severity; SA, sexual abuse severity; EN, emotional neglect severity; PN, physical neglect severity; Alc, alcohol use severity; Drug, drug use severity. Probability of Endorsing Clinical Characteristic is calculated and matched into latent classes.

prevalence of depressive symptoms. The occurrence of borderline symptoms was also higher than in the other two classes. In addition to the scores mentioned above, this class displayed extremely high scores of three specific childhood trauma types: childhood emotional and sexual abuse and childhood emotional neglect. Moreover, it encompassed the highest drug use severity. This class was termed 'D-PTSD Class'. The largest class was Class 2 (47.8%). It was characterized by very high scores regarding all types of childhood trauma except the score of sexual abuse which was still notable. Severe depression was also one of the characteristics endorsed in this pattern. This class was termed 'High symptomatic CT Class'. Finally, Class 3 (33.5%) was de- fined by lower scores for all childhood trauma types, but it had a comparable probability pattern to Class 2 for encompassing dissocia- tion, PTSD, alcohol and drugs use severity, and a lower endorsement of depressive and borderline symptoms. This class was termed 'Low symptomatic CT Class'.

4. Discussion

The aim of this study was to use LCA in order to identify subgroups of patients with different symptom and exposure profiles in female patients with SUD and PTSD. To our knowledge, this is the first study that examines symptom and exposure profiles in a sample of SUD and PTSD using LCA methodology. We expected to identify at least one class that would show a high probability of dissociative symptoms, combined with a higher severity of PTSD, SUD, additional psychopathology and a higher burden of childhood trauma. To our knowledge, this is the first study that investigates latent patterns (LCA or LPA) in such a sample. The analysis favored a 3-class solution of which one class represented a D-PTSD class. A notably higher severity of PTSD and BPD symptoms was found in the 'D-PTSD Class'. Moreover, this class was also characterized by considerably higher scores of drug use, depression, and childhood sexual abuse in comparison to the two non-dissociative PTSD classes. In contrast to 'D-PTSD Class', 'High symptomatic CT Class' was characterized by a lower probability of dissociative symptoms but also by the highest scores regarding all types of childhood trauma, except childhood sexual abuse. This class was also characterized by higher probabilities of BPD symptom severity and depressive symptom severity than the second non-dissociative class ('Low symptomatic CT Class'). This class was characterized by remarkably lower scores on all

of the clinical characteristics in comparison to the 'D-PTSD Class'. Moreover, 'Low symptomatic CT Class' was distinguished only by slightly higher scores on dissociative symptoms, PTSD severity and drug use in comparison to the 'High symptomatic CT Class'.

The prevalence rate of D-PTSD in our sample (31%) corresponded to the previously reported rates in samples of predominantly female patients with a high rate of exposure to sexual childhood trauma (Hansen, Mullerova, et al., 2016; Steuwe et al., 2012; Wolf, Lunney, et al., 2012) and it was markedly higher than in studies that examined mixed samples (Frewen et al., 2015; Wolf, Miller, et al., 2012). We also found a high prevalence of D-PTSD and of sexual abuse in our female sample.

Given the potential role of childhood trauma for D-PTSD (Lanius, Brand, Vermetten, Frewen, & Spiegel, 2012; Steuwe et al., 2012), it can be considered a strength of our study that we included different forms of CT in the analyses allowing to examine influences of different types of CT. The D-PTSD class displayed notably higher scores of childhood sexual abuse confirming the findings of other LPA or LCA studies (Armour, Karstoft, & Richardson, 2014; Frewen et al., 2015; Steuwe et al., 2012; Wolf et al., 2017; Wolf, Miller, et al., 2012). However, in addition to sexual abuse, the D-PTSD class also displayed high scores of emotional abuse and emotional neglect in our sample. Despite the high scores of physical abuse and physical neglect in the D-PTSD group, those two types of trauma were not the strongest indicators of endorsing D-PTSD, as has been reported by two other studies (Frewen et al., 2015; Steuwe et al., 2012). Given the scarcity of data among patients with SUD and comorbid PTSD, our study is, to our knowledge, the first study that explored the profiles of clinical characteristics in patients with SUD and PTSD using LCA. In our sample, drug abuse was identified as a form of SUD more strongly related to D-PTSD. This is in accordance with the only other study in a SUD sample so far (Mergler et al., 2017), and a study among US veterans, where drug-related SUD also increased the probability of endorsing D-PTSD (Tsai, Armour, Southwick, & Pietrzak, 2015).

Identifying patients with D-PTSD is of high clinical relevance. Aside from a specific trauma pattern and drug-related SUD, the D-PTSD class reported higher PTSD severity, depression and BPD. This is an important finding as it supports the growing evidence regarding the comorbidity of BPD in patients with D-PTSD and the need to take this into account when planning appropriate treatment models for patients with D-PTSD (Vermetten & Spiegel, 2014; Wolf, Lunney, et al., 2012).

Interestingly, one of the other two classes identified in our analyses ('High symptomatic CT Class') was also characterized by a high burden of childhood trauma and comorbid depression, but a markedly lower severity of BPD.

A limitation of our study is that PTSD was not assessed according to DSM-5 criteria as the planning phase of the study fell into the last two years before the introduction of DSM-5. In addition to a validated structured interview for PTSD according to DSM-IV, we therefore used the DES-T, a widely used self-report questionnaire, to assess symptoms of derealisation and depersonalization. While a potential bias associated with this procedure cannot be excluded, comparable methodological approaches have been applied in prior studies (Armour, Elklit, et al., 2014; Hansen, Hyland, & Armour, 2016). Secondly, it is possible that LPA, instead of LCA, that uses continuous variables, would have presented a broader range of results (i.e., more classes). Additionally, one of the main limitations of LCA is that the identified classes may not always entirely refer to existing subgroups within the population. LCA provides the best match based on that the assumption that heterogeneous data can be explained by homogeneous subgroups that are mixed together. Future studies should be aware of it before employing this method. The decision to use LCA, however, had to be taken due to the fact that some of our variables were categorical in nature (e.g. BPD diagnosis). Finally, the findings of this study are restricted to females diagnosed with SUD and PTSD and it cannot be excluded that different results would have been found in male patients with this comorbidity. Due to the fact that our dataset consisted of instruments with diverse type of scores, one the limitations of this study was the need of dichotomization of the variables. Future studies should use a data analysis approach that would not require dichotomization of variables.

In sum, our results provide an empirical support for the existence of a dissociative subtype of PTSD in women with PTSD and SUD. D-PTSD was related to more severe psychopathology, higher sexual abuse childhood trauma, more drug-related SUD and high BPD comorbidity indicating a specific profile in D-PTSD patients that should be considered when designing appropriate treatment models for patients with PTSD and SUD.

Declaration of interests

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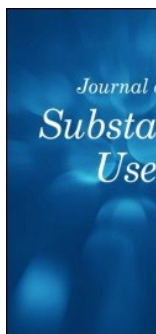
9.2 Study II

Validation of the extended version of the Dissociative Experiences Scale (DES) in patients diagnosed with substance use disorders

Piotr Gidzgier, Martin Driessen, Łukasz Gawęda, Ursula Havemann-Reinecke, Dirk Wedekind, Christel Lüdecke, Martin Ohlmeier, Steffen Weirich, Ulrich Kemper, Olaf Reis, Udo Schneider & Ingo Schäfer

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Validation of the extended version of the Dissociative Experiences Scale (DES) in patients diagnosed with substance use disorders

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ABSTRACT

Background: The most extensively used instrument to measure dissociation is the Dissociative Experiences Scale (DES). Recently, an extended version of this instrument was provided, which also measures somatoform symptoms of dissociation. The aim of this study was to examine the component structure and internal consistency of the extended version of the Dissociative Experiences Scale (FDS) in patients diagnosed with substance use disorders (SUD).
Methods: Principal component analyses (PCAs) were conducted in a large clinical sample of patients diagnosed with SUD ($n = 459$) for the 44 FDS items, the 28 original DES items, the 23 items of the original DES subscales that compose FDS subscales of amnesia, absorption, and depersonalization/derealization, and the 9 conversion subscale items.
Results: PCA of all 44 FDS items yielded a 9-factor solution where the first factor explained 32% variance. A 6-, 4-, and 2-factor solution, respectively, was found for 28 DES original items, 23 items of original DES subscales that compose FDS subscales of amnesia, absorption, and depersonalization/derealization, and 9 items of the conversion subscale of the FDS.
Conclusion: FDS proves to be a reliable tool that can be used to screen patients with SUD for dissociative psychopathology within the ICD and DSM-5 framework.

Introduction

The latest version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) introduced important changes that affect the current perspective of diagnosing dissociative disorders. As reported in DSM-5, dissociation is a state of "disruption of and/or discontinuity in the normal integration of consciousness, memory, identity, emotion, perception, body representation, motor control, and behavior (p. 291)," and dissociative disorders are described in three categories: dissociative identity disorder, dissociative amnesia, and depersonalization/derealization disorder.

Research showed that dissociative disorders and dissociative symptoms are also highly prevalent in patients with substance use disorders (Dunn et al., 1993; Gidzgier et al., 2019; Langeland et al., 2002; Myrick et al., 2017; Schafer et al., 2007). This comorbidity was found to be related to a more severe clinical profile than in SUD patients without dissociative disorders. Patients with SUD and comorbid dissociative disorders showed higher rates of suicidality and self-injuries

which had a negative impact on their treatment outcomes (Evren et al., 2008, 2007). Karadag et al. (2005) reported that a higher severity of dissociative symptoms was associated with drug dependence and combined alcohol and drug dependence rather than mere alcohol dependence.

Similar to the comorbidity of dissociative disorders, the diagnosis of posttraumatic stress disorders (PTSD) seems to have an important influence on the clinical profile of patients diagnosed with SUD. For instance, Johnson, Striley, and Cottler (2006) found that patients with SUD and PTSD presented an earlier onset of substance abuse. Furthermore, Read, Brown, and Kahler (2004) reported that SUD patients with comorbid PTSD had a longer history of substance abuse. Other authors reported that PTSD in patients with SUD was associated with higher rates of multiple drug use, and it was connected to a more severe alcohol dependence and psychiatric comorbidity (Dragan & Lis-Turlejska, 2007). Najavits and Walsh (2012) conducted a study that concentrated not only on dissociative phenomena but also on PTSD in 77 female patients with substance dependence. These authors found that experiencing higher levels of dissociation was a predictor

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of a stronger expectation that substances could help them with managing their psychiatric, dissociative, and PTSD symptoms.

The most extensively used instrument to measure dissociation is the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986). The DES measures dissociative symptoms on three subscales: absorption, amnesia, and depersonalization/derealization. It differentiates very well the non-clinical individuals and psychiatric patients with other conditions from the patients diagnosed with dissociative disorders (Bernstein & Putnam, 1986; Sar et al., 2007; Spitzer et al., 2006) and has therefore become a widely used screening tool (Carlson & Putnam, 1993). According to a meta-analytic validation of the DES study by Van IJzendoorn and Schuengel (1996), who retrieved a mean alpha reliability of .93 from 16 studies, the DES is an instrument with a very good reliability and validity in dissociative symptom assessment. The DES was translated into more than 20 languages.

The factor-analytic studies obtained different solutions when exploring the structure of the DES. The three-factor model, proposed by Carlson and Putnam (1993), that includes the factor absorption, amnesia, and depersonalization/derealization was confirmed by several other studies (Ruiz et al., 2008; Stockdale et al., 2002). However, there are also studies that suggest different factorial solutions for the DES that range from single-factor models (Bernstein et al., 2001; Lipsanen et al., 2003) to seven-factor models (Amdur & Liberzon, 1996; Dunn et al., 1993; Espirito Santo & Abreu, 2009; Sanders & Green, 1994).

While the DES has a focus on the cognitive representations of dissociative phenomena, the International Classification of Diseases (ICD) (World Health Organization, 1992) also highlights the importance of somatoform dissociative symptoms (Schafer et al., 2010). The "Fragebogen zu Dissoziativen Symptomen" (FDS; Spitzer et al., 1998) is an extended version of the DES that was constructed to screen for dissociation within the ICD framework. In addition to the original 28 DES items, the FDS includes 16 additional items to measure somatoform dissociation, especially conversion symptoms. It is to be noted that only 23 DES items belong to amnesia, absorption, and depersonalization/derealization subscales; the other 5 remaining original items do not belong to any of the FDS subscales and are only added to the total score. Conversion subscale in FDS consists of 9 items. Conversion is defined by one or more physical symptoms that are not under voluntary control and are not thought to be caused by neurological and medical conditions (Yakobov et al., 2017). The scale was found to have a good test–retest reliability of .88, high internal consistency (split-half = .90, Cronbach's alpha = .94), and a good construct validity. For all 44 FDS items, the authors of the FDS found six factors that explained 52% of the scale's variance where the first factor explained 35% of the variance (Spitzer et al., 1998). This finding suggests the single dimensionality of the instrument. Separate factor analyses for the 28 original DES items, the 23 original DES items representing the three DES subscales of absorption, amnesia, and depersonalization/derealization that constitute the same FDS subscales, and the 9-item conversion subscale of the FDS yielded results that also suggested the single dimensionality of the scale. While the FDS thus seems to be a valid measure to screen for a broader range of dissociative symptoms than DES itself by including somatoform dissociation, no findings on the psychometric properties of the scale in patients with SUD exist so far.

Given the high prevalence and clinical importance of dissociation in group of patients suffering from different SUDs, the aim of this study was to examine the component structure of the FDS in a substance abuse population.

Materials and methods

Participants

The participants were part of a multicenter cross-sectional study. The recruitment took place in 14 German addiction treatment centers. All the treatment centers that participated in the study were members of the Northern German Council on Addiction Research (www.nsfv.de). Subjects had to be able to read and write in German and were excluded if they had a current psychotic disorder or if they showed symptoms of neurological diseases. The inclusion criteria were met by 564 patients, and in this group of patients, 103 were not included as they completed the treatment before the assessment (n =31), a date for the assessment was impossible to be scheduled (n = 19), patients lacked motivation to participate in the study (n = 20), patients rejected participation without reporting specific reasons (n = 24), or patients perceived the assessment as too personal (n = 9). Two subjects had to be excluded due to incomplete data. The final sample size counted 459 patients, and it equaled for 81.4% of all initially accepted patients. 182 (39.7%) patients from the final sample were alcohol-dependent, 154 (33.6%) were drug-dependent, and 123 (26.8%) were dependent on both alcohol and drugs. 59.7% patients were male, and the mean age was 36.7 years (SD = 11.2; range: 15–67). 10 subjects (2.2%) were under the age of 18. About half of the patients (53.7%) were currently in a partnership, and the majority were never married (59.7%). 12.4% of the participants had no education degree, 35.5% had lower degree (9 years of education), 32.9% had high school degree (10 years of education), 14.8% finished upper secondary education (13 years), and 4.4% had a university degree. Around a quarter of all of the patients were currently employed or under education (25.9%). The participants were also screened for their trauma history. 24.2% of the participants reported severe childhood emotional abuse, 20% severe childhood physical abuse, 10% severe childhood sexual abuse, 22.4% severe childhood emotional neglect, and 3.3% severe childhood physical neglect. In addition, more than a quarter of the whole sample (25.3%) was diagnosed with current PTSD.

Participants gave their written informed consent. If the patients were less than 18 years old, the parents provided the consent. The study protocol and the informed consent forms were approved by the Ethics Committee of the University of Muenster, Germany.

During the assessment, all of the participants remained abstinent for at least 14 days, did not present signs of substance withdrawal as determined by the assigned clinician, or stayed under methadone or buprenorphine maintenance treatment (n = 19). Patients' abstinence from alcohol and drugs was inspected by breath and urinary analyses at least two times during a week.

Instruments

The extended version of the German Dissociative Experiences Scale (FDS)

The FDS is a 44-item self-report measure of the frequency of dissociative experiences of varying severity. To answer FDS questions, subjects circle the percentage of time (given in 10% increments ranging from 0 to 100) that they have the experience described. The total FDS score is the mean of all item scores. The procedure of translation of the DES into German began with two independent translations of the measure, one by a bilingual person who was unfamiliar with the concept of dissociation and the second one by the FDS authors. These two translations were discussed, improved, and assembled into one version. In the next step, a back-translation of this version was performed by a native English speaker. This back-translation was compared to the original DES, and changes to the German translation were made when necessary. Then, 16 items were added to the scale to assess additional dissociative symptoms from the ICD-10. These ICD-10 subscale items largely cover pseudoneurological conversion symptoms. The psychometric properties of the FDS were examined in 927 clinical and nonclinical subjects across various diagnostic samples and compared to the results of American studies. They were written with similar wording and format as the original DES items. The FDS is administered and scored in the same way as the DES. FDS had good test–retest reliability of .88, high internal consistency (split-half = .90, Cronbach's alpha = .94), and good construct validity (Spitzer et al., 1998).

The international diagnostic checklists for ICD-10 and DSM-IV

The International Diagnostic Checklists for ICD-10 and DSM-IV (IDCL; Hiller et al., 1993) were used to confirm the current diagnoses of alcohol or drug dependence. The IDCL assesses all DSM-IV criteria of the respective disorders on the basis of a clinical interview including focused diagnostic questions of the clinician as well as all other available information. The inter-rater reliability as well as the test–retest reliability of this instrument has been shown to be good to excellent (Hiller et al., 1993).

Data analyses

Statistical analysis of all data was performed using the 24.0 version of the SPSS. A confirmatory factor analysis (CFA) was performed with the AMOS software package; however, it did not provide satisfactory results as it did not confirm results of the factorial structure from studies on DES or FDS (Spitzer et al., 2015). Therefore, we decided to use principal component analysis (PCA) in order to extract the underlying factor components of FDS.

Principal component analyses (PCAs)

We used PCA without rotation in four separate analyses to check the component structure of 1) the 44 items of the FDS, 2) the 28 original DES items, 3) the 23 DES items that compose FDS amnesia, absorption, and depersonalization/derealization

is significant (Reise et al., 2000). Scree plot, the Kaiser criterion, and the Bartlett's test of sphericity were used to identify the structure of the questionnaire. To determine the number of factors, we followed the Kaiser criterion (eigenvalues less than 1 were dropped) and analyzed the scree plot that is an indicator to eliminate the factors after the point where the eigenvalue would drop markedly. Another indicator was Bartlett's test of sphericity that was significant, which supported the factorability of the correlation matrix (Zwick & Velicer, 1986).

Reliability

Reliability was examined by computing the split-half coefficient and Cronbach's alpha.

Results

Internal reliability and component structure of the FDS

The FDS mean score of our sample was 10.33 (SD = 9.62) which represents a low level of dissociation. Internal consistency analysis measured by split-half was .91 and by Cronbach's alpha was .95, which indicated good internal reliability.

The results of the four PCA analyses are presented in Table 1.

For the 44 FDS items, we identified 9 factors with eigenvalue >1 that together accounted for 59% of the variance. The first factor alone explained 32% of the total variance. All loadings of this first unrotated factor were over .34 (M = 0.59; range: .34–.73), and the scree plot line dropped rapidly after the first factor.

For the 28 original DES items and the 23 DES items that compose FDS subscales of amnesia, absorption, and depersonalization/derealization, a 6- and a 4-factor solution emerged, respectively, with eigenvalues >1. These solutions explained 58% and 53% of the variance, respectively. Again, a dominance of the first factors was found. They explained 35% (28 items and 23 items) of the variance. All item loadings were over 0.39 and both displayed the mean loading of 0.59. Item loadings above 0.4 are an indicator that a variable is significant. The scree plot lines again dropped rapidly after the first factors. A PCA of the 9 additional items that comprise the "conversion subscale" produced a similar finding. Here, we identified two factors with eigenvalue >1 that explained 52% and 12% of the variance, respectively. In addition, the loadings for the first factor were all above 0.46 (M = 0.62; range: .46–.78), and the scree plot again dropped rapidly dropping

Table 1. Results of principal component analyses (N = 459).

	FDS (44 items)	DES (28 items)	DES (23 items)	KONV (9 items)
Bartlett's test	p < .001	p < .001	p < .001	p < .001
KMO-value	0.919	0.926	0.913	0.833
Factors	9	6	4	2
Variance explained	59%	58%	53%	52%
Variance of the first unrotated factor	32%	35%	35%	40%
Loadings of the first unrotated	.56;	.57;	.59;	.62;

subscales, and 4) the 9 items of the conversion subscale. Item loadings above 0.4 were considered an indicator that a variable

factor (M/range)	.34–.73 .39–.72 .39–.70 .46–.78

FDS: Fragebogen zu Dissoziativen Symptomen, the extended version of the German Dissociative Experiences Scale; DES: Dissociative Experiences Scale; KONV: con- version subscale; KMO: Kaiser–Meyer–Olkin test.

after the first factor. All these results were suggestive of a single dimensionality of the instrument.

Discussion

Our main goal was to examine the component structure of an extended version of the DES, which also includes items on somatic dissociation (FDS). We conducted our study in a population of patients diagnosed with SUDs. The results of our study indicate that the extended version of the DES appears to be a good measure with a valid factorial structure to screen for dissociative symptoms in patients suffering from different SUDs.

The first PCA that focused on all 44 items yielded a 9-factor structure, which is different from the result of the developers of the FDS that reported 6 factors (Spitzer et al., 2015). However, after analyzing the scree plot and the Kaiser criterion, we conclude that our results can be interpreted that the scale has a single dimensionality. This would also be in accordance with the findings by Spitzer et al. (2015). According to the scree plot, one factor was responsible for 32% of the variance, which is also similar to the study by Spitzer et al. (2015). The PCAs for the DES subscales also corresponded to the initial FDS study. For the original DES 28 items that are incorporated in FDS, we found 6 factors with the 35% explained variance of the first factor, compared to the findings by Spitzer et al. (2015, p. 4) with factors with 35% explained variance of the first factor. For the 23 DES items that represent the FDS subscales of amnesia, absorption, and derealization, we found 4 factors. Again, the first factor explained 35% of the variance as compared to 40% in the study by Spitzer et al. (2015), which identified 3 different factors. Our last finding was a 2-factor structure of the last FDS subscale that covers symptoms of conversion. The variance of the first unrotated factor was explained in 40% (also 2 factors and 44% variance of the first factor were found by Spitzer et al. (2015)). All analyses met the required criteria, and the derived results provide similar results to the initial FDS psychometric validation that indicate the single dimensionality of the instrument (Spitzer et al., 2015). The small discrepancies between the extracted factors of the two studies can be explained by a different sample size. While our sample consisted of 459 patients, the sample in the study by Spitzer et al. (2015) consisted of 3839 patients who represented very diverse disorders. Furthermore, the adaptation of American DES for the German-speaking countries was prepared to be compatible with the ICD by including items covering conversion symptoms. The results of our study confirm that this extension did not influence the reliability of the scale, the same as in the study by Spitzer et al. (1998).

The strengths of this study are the sample size and the use of a structured instrument that also covers an often neglected type of dissociative symptoms, somatoform, or conversion symptoms in patients with SUD. Nevertheless, some limitations need to be considered. First, there was no control group and no other instrument that would explicitly measure dissociation in this study. Second, only a small number of patients displayed high levels of dissociation. The mean score of the FDS for the whole sample was therefore low. Moreover, in our internal consistency analysis, we found a high Cronbach's alpha coefficient for all items in our sample that was equal to .95. Despite this score is

comparable to FDS findings by Spitzer et al. (1998; Cronbach's alpha = .94) and to other scores from English and French studies of validation of DES (Carlson & Putnam, 1993; Darves-Bornoz et al., 1999), future FDS/DES studies should focus on exploring if the items measure the whole construct accurately as such high internal consistency might be an indicator of the existence of redundant items in the construct.

It is worth to note that the patients in the study were controlled for abstinence from alcohol and drugs by breath and urinary analyses at least two times during a week in order to prevent the "chemical dissociation" states. However, the withdrawal of substance use was not taken into consideration. Nevertheless, in order to avoid digression from the main core of our experiment, we decided to examine our data based on carefully diagnosed current pathology such as SUDs and dissociative symptoms to focus on a psychometric validation of FDS rather than examining a complex phenomenon of the "chemical dissociation."

In conclusion, we found that FDS is a reliable and valid instrument, which can be used within the ICD and DSM-5 framework, to screen individuals with SUDs for broader dissociative psychopathology than DES.

Disclosure statement

No potential conflict of interest was reported by the authors.

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9.3 Study III

Improving care for SUD patients with complex trauma–relationships between childhood trauma, dissociation, and suicidal behavior in female patients with PTSD and SUD

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Background: Posttraumatic disorders are among the most frequent co-occurring diagnoses in patients with substance use disorders (SUD). Individuals with this dual diagnosis often present with special treatment needs, especially after childhood traumatic experiences (CT). Along with posttraumatic stress disorder (PTSD) and dissociative symptoms, suicidal behaviors belong to the clinical challenges in this group of patients and may influence the course and outcome of SUD treatment. Therefore, a better understanding of the relationships between different forms of CT, psychopathology and suicidal behaviors seems to be important to tailor adequate concepts of care.

Materials and methods: We examined 343 female patients with SUD and Posttraumatic stress disorder (PTSD). All patients completed the Childhood Trauma Questionnaire (CTQ), the Dissociative Experiences Scale-Taxon (DES-T) and the Structured Clinical Interview Axis I Disorders (SCID-I). To determine relationships between different symptoms with potential importance for concepts of treatment, we conducted analyses of moderated mediation for different models. We examined the direct and indirect effects of associations between the type of CT, dissociation and suicidal behavior, as well as the moderation effect of PTSD.

Results: All participants met DSM-criteria for either full PTSD (75.2%) or subsyndromal PTSD (24.8%). Almost all (94.5%) received at least one substance dependence diagnosis and the remaining 5.5% met substance abuse criteria. Most participants (93.3%) reported at least one type of childhood trauma. In all models, dissociation was a risk factor for suicidal ideation (SI) and for suicide attempts (SA). In both, participants with subsyndromal PTSD and participants with full PTSD, dissociation mediated the relationship between childhood sexual abuse and SI as well as SA. Moreover, we report direct effects between different childhood traumas and SI and SA. Furthermore, emotional abuse was a significant predictor of dissociation.

Discussion: In our sample of female patients with SUD and co-occurring PTSD, dissociation significantly increased suicidal behavior and served as a mediator of the relationship between childhood sexual abuse and suicidal behavior. Our findings

underline the need to include interventions to address dissociative symptoms and other more complex consequences of childhood trauma into concepts of care for patients with SUD.

1. Introduction

Posttraumatic disorders are among the most frequent co-occurring diagnoses in patients with substance use disorders (SUD) (1). Patients with this comorbidity often report experiences of repeated childhood sexual and physical abuse and present complex treatment needs (2). While systematic studies on this topic are lacking so far, it can be assumed that a significant proportion of patients with SUD and comorbid PTSD fulfills the diagnosis of complex PTSD (cPTSD) (3). Although the concept of cPTSD was proposed about 30 years ago (4), it had not been adopted as a formal diagnosis before the 11th revision of the World Health Organization's International Classification of Diseases (ICD-11) (3). In addition to the core symptoms of PTSD, the diagnosis of complex PTSD includes three additional groups of symptoms: emotion regulation difficulties, difficulties maintaining relationships and negative self-concept (4). These symptoms may disrupt engagement in treatment, reduce the capability to attain new skills and knowledge and disturb resistance of the urge to use substances (5). For instance, in a randomized trial of contingency management compared to standard treatment in 146 cocaine- or heroin-dependent outpatients, complex PTSD symptoms were related to poorer treatment outcomes independent of the effects of demographics, baseline substance use, and treatment modality (6). The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (7) takes a different approach to describe more complex representations of PTSD. In addition to the inclusion of changes of cognitions and mood in the symptoms of PTSD, it allows to diagnose a dissociative subtype of PTSD (D-PTSD). D- PTSD is characterized by at least one of two characteristic features: dissociative depersonalization and derealization (7).

Along with the symptoms of PTSD and dissociation, suicidal behavior belongs to the most prominent clinical problems in patients concerned. For instance, in a study among veterans, SUD comorbidity with PTSD greatly elevated suicidal ideation risk (8). Moreover, in a study among 459 patients with SUD, patients with D-PTSD reported significantly more current suicidal ideation (SI) and more suicide attempts (SA) as compared to patients with PTSD without dissociative features (9). Despite their clinical importance, relationships between the symptoms of (complex) PTSD and suicidal behavior in SUD patients remain unclear. One hypothesis is that, in addition to the symptoms of PTSD, third factors, namely childhood trauma (CT), increase the risk for suicidal behavior later in life (10–12). Studies among patients in treatment for substance abuse found that CT was associated with a very high probability of SA. Over 75% of men and 87% of women which reported CT also had a history of SA (13, 14). A study of women in residential treatment for drug and alcohol abuse reported that childhood sexual abuse was uniquely associated with SA (15). Finally, a number of studies showed that dissociative symptoms might be a strong mediator between childhood trauma and SA (16–18).

Relationships between different types of CT, trauma-related symptoms and suicidal behavior may have implications for treatment concepts. If, for instance, dissociation would be a determinant of suicidal behavior, the integration of interventions to reduce dissociative symptoms into SUD treatment would be of special importance. This could be seen as less critical if both symptom areas would be independently related to childhood trauma. Similarly, specific interventions for victims of different types of childhood trauma, i.e., sexual abuse vs. emotional abuse or different forms of neglect, for SUD patients with traumatic experiences would be of higher importance if they would be independently related to suicidal behavior. The aim of this exploratory study therefore was to examine whether dissociation is a mediator between different types of CT and suicidal ideation as well as suicide attempts in female patients with SUD and PTSD. For both types of suicidal behaviors, we examined if the potential relationships were moderated by PTSD status (i.e., full or subsyndromal PTSD).

2. Materials and methods

2.1. Participants

The present study used data of a randomized controlled trial of a cognitive behavioral treatment for women diagnosed with PTSD and SUD (19). Data was gathered at the University Medical Center Hamburg-Eppendorf, Germany, and four other German research institutions (Bielefeld, Essen, Hannover, Cologne). All study centers were substance abuse treatment departments of the respective hospitals. All study procedures were approved by the ethics committees of the responsible chambers of physicians at each study site (reference number of the leading site: PV4178). Moreover, the trial was registered at the German Clinical Trials Register under the ID DRKS00004288. Study participants were recruited *via* local substance abuse and trauma counseling agencies, psychosocial services, substance abuse and mental health clinics, psychotherapists in private practice and from the community (e.g., adverts in city transport, in magazines, at stores and in online adverts). As the prevalence of PTSD is considerably higher in women with SUD as compared to men (2), the study concentrated on females with this comorbidity. Inclusion criteria were female sex, age 18–65, subthreshold PTSD (i.e., criterion A, B, and either C or D) or full PTSD and a substance use disorder with last substance use within the previous 12 months, both according to DSM-IV criteria (7). Exclusion criteria were current psychosis, severe cognitive impairment and intravenous drug use in the month before study

participation. Out of 610 individuals assessed for eligibility, $n = 234$ had to be excluded because they were not eligible ($n = 123$), declined to participate ($n = 47$), were lost to baseline assessment ($n = 34$), were lost for other reason (e.g., inpatient treatment, incomplete screening, imprisonment; $n = 30$) and discontinued baseline assessment ($n = 33$) resulting in a final sample of $n = 343$ participants.

2.2. Measures

2.2.1. Childhood trauma questionnaire

The Childhood Trauma Questionnaire (CTQ) (20) collects information on the type and severity of early traumatic experiences. The CTQ is a 28-item self-report questionnaire that assesses physical and sexual abuse, emotional neglect, emotional abuse and physical neglect. Items are rated on a Likert-scale from 1 (never true) to 5 (very often true). The five subscale scores range from 5 to 25. For each of the five subscales, the severity of abuse or neglect can be classified according to defined cutoff scores (none or minimal, low to moderate, moderate to severe, and severe to extreme). A German version of the CTQ demonstrated good internal consistencies, factorial, convergent and discriminant validity (21), also in clinical samples with diagnosed SUD, and PTSD (22). The reliability estimates of CTQ subscales in our study were Cronbach's $\alpha = 0.86$ for emotional abuse, $\alpha = 0.89$ for physical abuse, $\alpha = 0.96$ for sexual abuse, $\alpha = 0.88$ for emotional neglect, and $\alpha = 0.71$ for physical neglect.

2.2.2. Dissociative experiences scale-taxon

A subset of eight items of the Dissociative Experiences Scale (23), the so-called DES-Taxon (DES-T), has been proven to be a sensitive self-rating tool to identify pathological dissociation (24). The questions of the DES-T are answered by estimating the percentage of time (ranging from 0 to 100%), in which the subject goes through the experience described (e.g., "Some people sometimes have the experience of feeling that their body does not belong to them"). The mean score is calculated by dividing the total percentage of time by the number of answered items. Reliability testing of the DES-T showed that the scale had good test-retest and good split-half reliability. Internal consistency and construct validity were also described as good (23), also in clinical samples diagnosed with SUD and PTSD (22). The reliability estimate of DES-T scale in our study was Cronbach's $\alpha = 0.80$.

2.2.3. The structured clinical interview for DSM-IV axis I disorders

The diagnoses of PTSD and SUD were confirmed by using the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) (25). The SCID-I was also used to assess suicidal behavior such as SI and SA. Studies on the SCID-I have shown a good to very good validity and reliability of the instrument (26).

2.3. Data analysis

To investigate relationships between childhood trauma, dissociation and suicidal behavior, we 1) examined globally—in both, the PTSD and the subsyndromal PTSD group, the relationships between different types of CT and dissociation with a possible moderation effect of PTSD status (full PTSD and subsyndromal PTSD, respectively), we 2) examined globally—in both, the PTSD and the subsyndromal PTSD group, relationships between different types of CT and suicidal behavior with a possible moderation effect of PTSD status, we 3) examined relationships between dissociation and suicidal behavior, and 4) we examined direct effects of childhood trauma on suicidal behavior as well as indirect effects, taking the influence of dissociation on this relationship into account, as well as the influence of PTSD status on these effects. Both types of suicidal behaviors (suicidal ideation and suicide attempts) were considered separately, i.e., these analyses were performed for each of the two types.

In the first step, the normality of the data distribution was tested in the groups (full PTSD vs. subsyndromal PTSD) that were treated as a moderator of the mediation of the tested variables. The aim was to verify the assumption of normal distribution for continuous variables tested in moderated mediation models. The obtained results indicated that the normality of the distribution could be assumed for the vast majority of variables due to the skewness criterion. The only indicator that slightly exceeded this assumption was dissociation in the group of women with subsyndromal PTSD ($Sk = 2.19$). However, it was found that the direction of the skewness of the subsyndromal PTSD group was identical to skewness of the group of women with full PTSD, which suggests that both groups can be compared. We checked CT and PTSD for multicollinearity. They correlated at <0.20, meaning that they mutually explained $<5\%$ of the variance of each other, and the VIF coefficients between all predictors equalled <5 which means that multicollinearity did not occur. The moderated mediation analysis in Hayes method yields b-values, which is the non-standardized regression coefficient. The Hayes method concentrates on determining the direction of the relationship rather than on measuring its strength. Consequently, we decided to perform a moderated mediation analysis based on the quantitative indicators. The moderated mediation analysis in Hayes method yields b-values, which is the non-standardized regression coefficient. The Hayes method concentrates on determining the direction of the relationship rather than on measuring its strength. The level of significance in our study was assumed to be $\alpha = 0.05$. All analyses were carried out by using the IBM SPSS Statistics 27 (27) software together with the PROCESS 3.5 macro (28).

3. Results

3.1. Sample characteristics

In total, $n = 343$ treatment-seeking women with SUD and (at least subsyndromal) PTSD were included in the study. On average, the participants were 40.9 years old ($SD = 11.4$; range $= 18–65$). Completed years of education ranged from 7 to 13 years, with a median of 10 years. Almost all women were born in Germany ($n = 310$, 90.4%). The majority of women were unmarried ($n = 287$, 83.7%) and unemployed ($n = 267$, 77.8%). About half of them had a monthly income of less than €1000 ($n = 186$, 54.2%).

Nine in 10 women ($n = 324$, 94.5%) were diagnosed with a substance dependence, the remaining women ($n = 19$, 5.5%) were diagnosed with substance abuse. Multidrug use was the rule rather than the exception. Eight in 10 women ($n = 290$, 84.5%) were

diagnosed with an alcohol use disorder. About half of the women (n = 165, 48.5%) fulfilled the diagnostic criteria for a cannabis use disorder. About three in 10 women fulfilled the criteria for a sedative use disorder (n = 106, 31.2%), a cocaine use disorder (n = 97, 28.5%) and a stimulant use disorder other than cocaine (n = 96, 28.2%), respectively; finally, two in 10 women (n = 73, 21.3%) were diagnosed with an opiate use disorder. Almost eight in 10 women (n = 270, 78.7%) had consumed substances within the last 30 days and six in 10 women (n = 226, 65.9%) had previously participated in substance abuse treatment.

The majority (n = 258, 75.2%) met the criteria of a full PTSD diagnosis and the remaining individuals (n = 85, 24.8%) fulfilled the criteria for subsyndromal PTSD. About one in four women had participated in prior trauma-related treatment (n = 80, 23.3%). Nearly half of the women were diagnosed with Major Depression (n = 153, 44.6%), and two thirds of the women were diagnosed with an anxiety disorder (n = 221, 64.4%). Almost six in 10 women had attempted suicide in their life (n = 197, 57.4%) and the same amount (n = 197, 57.4%) reported suicidal ideation. Four in 10 women (n = 130, 37.9%) reported both suicidal ideation and consecutive suicide attempts. Among the women who attempted suicide the average count of SA was 2.0 (SD = 4.61). There was 1 woman who had attempted suicide 71 times and 50 women who had attempted suicide only once.

As defined by our inclusion criteria, all women were exposed to a traumatic event according to DSM-IV. The majority of women (n = 320, 93.3%) reported at least one type of childhood abuse or neglect. Eight in 10 women reported at least "moderate to severe" levels of emotional abuse (n = 267, 77.8%) or emotional neglect (n = 261, 76.1%); seven in 10 (n = 249, 72.6%) reported at least "moderate to severe" sexual abuse, six in 10 (n = 209, 60.1%) reported at least "moderate to severe" physical neglect; and half of women (n = 179, 52.2%) reported at least "moderate to severe" physical abuse.

3.2. Relationships between childhood trauma, dissociation, and suicidal ideation

No statistically significant relationships between the different types of CT and dissociation were found on the global level (in both, the PTSD and the subsyndromal PTSD group), and there was no moderation effect of PTSD (both full and subsyndromal) on these relationships (Table 1). The PTSD group was not related to the strength and direction of the presented relationships between CT and dissociation, as well as between CT and SI. This suggests that the obtained relationships for patients were similar in strength and direction regardless of PTSD group. We also didn't find any significant relationships when analyzing the relationships between different types of CT and SI on the global level. However, subgroup analyses showed that there was a positive and significant effect in women with subsyndromal PTSD [b = 0.082 (0.010; 0.155); p = 0.027], but not with full PTSD [b = 0.011 (−0.027; 0.048); p = 0.580]. This effect may suggest that a direct link between sexual abuse and SI is more common among women with subsyndromal PTSD rather than with full PTSD. The only variable on the global level that was associated with a significant increase in the frequency of SI in all CT models was dissociation (Table 2).

Finally, when analyzing direct and indirect effects, we found a direct effect between emotional abuse and dissociative symptoms that occurred only among individuals with full PTSD [b = 0.047 (0.001; 0.095); p = 0.044]. This could indicate that emotional abuse is more strongly associated with dissociation in patients diagnosed with PTSD than with subsyndromal PTSD. Moreover, it was noticed that there was a direct effect between emotional neglect and SI among women with full PTSD [b = 0.065 (0.016; 0.114); p = 0.010]. In addition, in women with full PTSD, we found an indirect mediation effect of dissociative symptoms related to sexual abuse and SI [b = 0.016 (0.005; 0.032)] which suggests that dissociation might mediate the relationship between sexual abuse and SI.

3.3. Relationships between childhood trauma, dissociation, and suicide attempts

The results showed that there were no statistically significant relationships between the examined types of CT and dissociation on the global level and there was no significant moderation effect of PTSD (full vs. subsyndromal) in these relationships (Table 2). Again, PTSD group was not related to the strength and direction of the presented relationships between CT and dissociation as well as between CT and SA, indicating that the obtained relationships for patients were similar in strength and direction regardless of PTSD type. When analyzing the relationships between different types of CT and SA, we found a statistically significant relationship on a global level between physical abuse and SA (p = 0.047). This effect may suggest that a direct link between physical abuse and SA is common in both subsyndromal PTSD and full PTSD individuals. We again found that dissociation was a significant variable that was associated with an increase in the frequency of SA in all presented models on the global level (Table 3).

Finally, the analysis of the direct effects for both PTSD groups (subsyndromal PTSD and full PTSD) showed a positive relationship between emotional abuse and SA, both in the subsyndromal PTSD group [b = 0.090 (0.004; 0.175); p = 0.039] and the full PTSD group [b = 0.056 (0.010; 0.102); p = 0.018]. This means that emotional abuse is potentially associated with dissociation in patients diagnosed with PTSD and with subsyndromal PTSD. There was also a significant positive direct effect between emotional neglect and SA in the subsyndromal PTSD group [b = 0.103 (0.013; 0.194); p = 0.025] and the full PTSD group [b = 0.051 (0.003; 0.100); p = 0.036]. Therefore, the results suggest that emotional neglect can be also associated with dissociation in patients diagnosed with PTSD and with subsyndromal PTSD. In addition, direct effect for the relationship of physical abuse on SA was found only in the subsyndromal PTSD group [b = 0.149 (0.045; 0.252); p = 0.005)] suggesting the respective association. Moreover, the analysis of the indirect effects showed that in women with full PTSD there was a significant indirect mediation effect of dissociation between sexual abuse and SA [b = 0.012 (0.003; 0026)] which suggests that dissociation might mediate the relationship between sexual abuse and SA.

4. Discussion

To our knowledge, this is the first study that examined the mediating role of dissociation between different forms of childhood

TABLE 1 Demographic and clinical sample characteristics.

Characteristics	Full PTSD[b] (n = 258)	Subsyndromal PTSD[b] (n = 85)	Total (n = 343)
		n (%)[a]	
Age, mean (SD)	40.03 (11.41)	43.69 (10.83)	40.9 (11.4)
Marital status			
Single	153 (59.3)	32 (37.6)	185 (53.9)
Married	36 (14.0)	20 (23.5)	56 (16.3)
Divorced	65 (25.2)	33 (38.8)	98 (28.6)
Widowed	4 (1.6)	0 (0.0)	4 (1.2)
Employment			
Unemployed	182 (70.5)	48 (56.5)	230 (67.1)
Minor employment	27 (10.5)	10 (11.8)	37 (10.8)
Part-time employment	23 (8.9)	16 (18.8)	39 (11.4)
Full-time employment	25 (9.7)	11 (12.9)	36 (10.5)
Children			
Yes	126 (48.8)	50 (58.8)	176 (51.3)
No	132 (51.2)	35 (41.2)	167 (48.7)
Substance use disorder[b]			
Alcohol	214 (82.9)	76 (89.4)	290 (84.5)
Sedatives	78 (30.2)	28 (32.9)	106 (31.2)
Cannabis	127 (49.2)	38 (44.7)	165 (48.5)
Stimulants	81 (31.4)	15 (17.6)	96 (28.2)
Opiates	55 (21.3)	18 (21.2)	73 (21.3)
Cocaine	73 (28.3)	24 (28.2)	97 (28.5)
Childhood trauma[c]			
Emotional abuse	205 (79.5)	62 (72.9)	267 (78.5)
Physical abuse	139 (53.5)	41 (48.2)	179 (52.2)
Sexual abuse	193 (74.8)	56 (65.9)	249 (72.8)
Emotional neglect	204 (79.1)	57 (67.1)	261 (76.5)
Physical neglect	164 (63.6)	45 (52.9)	209 (61.1)
Dissociation[d], mean (SD)	11.65 (12.6)	8.5 (12.5)	10.9 (12.6)
Suicidal behavior[b]			
Suicidal attempt	153 (59.3)	45 (52.9)	198 (57.7)
Suicidal ideation	162 (62.8)	36 (42.4)	198 (57.7)
Suicidal attempts count, mean (SD)	3 (4.7)	2.8 (4.2)	2.9 (4.6)

[a] If not otherwise specified.
[b] SCID-I.
[c] CTQ (At least "moderate to severe").
[d] DES-Taxon.

trauma and suicidal behaviors in patients with SUD and PTSD. To gain a better understanding of such associations, we studied a large sample of women with this comorbidity. A sequence of moderated mediation analyses revealed that, in women with full PTSD, dissociation mediated the relationship between childhood sexual abuse and SI, as well as SA. Moreover, our findings suggest that dissociation could be an independent risk factor that increases the frequency of both SI and SA in all models. In addition, our results indicate that in women diagnosed with full PTSD, emotional abuse and emotional neglect might independently increase the risk of both forms of suicidal behaviors, while in women diagnosed with subsyndromal PTSD, emotional abuse, emotional neglect, and physical abuse might only increase the risk of SA. Furthermore, our results seem to imply that emotional abuse may be a predictor

TABLE 2 Analysis of moderated mediation in the relationship between early childhood trauma and suicidal ideation.

Model	PTSD ↓ CT → Dissoc.	CT→ Dissoc.	Dissoc. → SI	CT → SI	PTSD ↓ CT → SI	Moderated mediation		χ²	p	R² Cox-Snell
						LLCI	ULCI			
Emot. Abuse	0.088	−0.165	0.033**	0.083	0.012	−0.017	0.023	29,109	<0.001	0.082
Phys. Abuse	0.129	0.272	0.035***	0.154	0.049	−0.031	0.015	25,129	<0.001	0.071
Sex. Abuse	0.228	0.198	0.032**	0.225	−0.071	−0.007	0.024	28,423	<0.001	0.080
Emot. Negl.	0.017	0.101	0.035***	0.068	−0.001	−0.026	0.024	31,617	<0.001	0.089
Phys. Negl.	0.642	1.913	0.034**	0.012	0.019	−0.057	0.004	25,438	<0.001	0.072

CT, five individual models: emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect; Dissoc, dissociation; PTSD, full vs. subsyndromal PTSD; SI, suicidal ideation; ** $p < 0.01$; *** $p < 0.001$; LLCI, lower limit of the confidence interval of the moderated mediation effect; ULCI, upper limit of the confidence interval of the moderated mediation effect.

TABLE 3 Analysis of moderated mediation in the relationship between early childhood traumsa and any suicide attempt.

Model	PTSD ↓ CT → Dissoc.	CT → Dissoc.	Dissoc. → SA	CT→ SA	PTSD ↓ CT → SA	Moderated mediation		χ²	p	R² Cox-Snell
						LLCI	ULCI			
Emot. Abuse	0.088	−0.165	0.027**	0.156	−0.034	−0.013	0.019	9,729	0.001	0.056
Phys. Abuse	−0.129	0.272	0.029**	0.367*	−0.109	−0.025	0.011	2,261	0.001	0.063
Sex. Abuse	0.228	−0.198	0.025**	0.118	−0.035	−0.004	0.021	2,602	0.013	0.036
Emot. Negl.	0.017	−0.101	0.028**	0.207	−0.052	−0.020	0.020	8,986	0.001	0.054
Phys. Negl.	−0.642	1.913	0.026**	0.322	−0.077	−0.049	0.003	7,041	0.001	0.076

CT, Variable differing in the five individual models: emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect; Dissoc, dissociation; PTSD, agnosed full-blown or subsyndromal posttraumatic stress disorder; SA, suicide attempt; * $p < 0.05$; ** $p < 0.01$; LLCI, lower limit of the confidence interval of the moderated mediation effect; ULCI, upper limit of the confidence interval of the moderated mediation effect.

of dissociation. The latter is in line with research across different populations (29–31) and has also been reported in previous studies of patients with SUD and PTSD (18, 22).

Our findings underline the importance of dissociative symptoms for suicidal behaviors, especially in survivors of sexual abuse. While other studies reported direct associations between sexual abuse and suicidal behaviors (32, 33), our findings are consistent with the literature that reports a mediating role of dissociative symptoms (34). The fact that these associations were only observed in women with full PTSD suggests that overall severity of psychopathology plays a role and dissociation could be part of cPTSD in these patients. Another interesting aspect concerns the direct links between emotional trauma and suicidal behaviors, which support the results of previous research (35). Again, these relationships were more prominent in patients with full PTSD, where relationships with both SI and SA were observed. In patients with partial PTSD, direct relationships were no longer observed in relation to SI, but still in relation to SA. While our analyses do not allow to answer this question, it could be assumed that patients with full PTSD had been exposed to more complex childhood trauma, explaining the more consistent relationships with suicidal behaviors. For instance, a meta-analysis by Angelakis et al. (36) suggested that all different types of childhood maltreatment were associated with two- to three- fold increased risk for suicide attempts. Complex childhood abuse, however, was associated with a more than five-fold increased risk for suicide attempts in adulthood. Similar results were found for the association between childhood maltreatment and suicidal ideation (36). The direct relationships between emotional trauma and both SI as well as SA suggest other mediators than dissociative symptoms between these forms of childhood trauma and suicidal behaviors. Relevant factors could be low self-esteem as a result of enduring emotional abuse and neglect, which has been reported to mediate the relationship between childhood maltreatment and suicidal ideation (37), but also other consequences of emotional trauma like self-hatred (38) and hopelessness (39).

Our study has implications for the treatment of patients with SUD and PTSD. The findings support claims by previous studies in the fields of PTSD or SUD to specifically address dissociative symptoms, and suggest that this should also be the case in patients with comorbid SUD and PTSD. For instance, research in the past years has indicated that PTSD patients with dissociative symptoms show a poor response to standard trauma therapies and exhibit high levels of attrition from treatment. In their systematic review of dissociation in PTSD, Atchley and Badford (40) therefore conclude, that special interventions to address dissociative symptoms need to be integrated in PTSD treatment and that dissociation should be assessed as a separate outcome. The same has been found for patients with SUD. In a study by Tamar-Gurol et al. (17), 55% of drug dependent patients presenting dissociative symptoms prematurely dropped out of treatment for drug abuse compared to 29% of those without dissociative symptoms. Similarly, Somer (41) found that dissociation predicted lower rates of abstinence among heroin users in treatment and stressed the necessity of addressing trauma-related dissociation to improve their outcomes. While not systematically addressed in treatment for PTSD or SUD so far, evidence for the effectiveness of interventions for dissociative symptoms and dissociative disorders is accumulating. Brand et al. (42) concluded in her review of the dissociative disorders literature that if treatments are explicitly shaped to address complex trauma and dissociation, even highly effected patients may benefit. However, there still is a glaring lack of evidence-based interventions to address dissociation in patients with SUD, one obvious reason for this being that SUD is often an exclusion criterion in studies investigating programs for the treatment of child abuse-related PTSD (40, 43). This lack of interventions is increasingly perceived in the SUD field. For instance, Patel et al. (44), who recently investigated the mediating role of dissociative symptoms between the severity of PTSD and alcohol related problems, stressed the need to develop corresponding treatments. These could, again, come from the trauma field, which has seen strong developments in evidence-based interventions for patients with complex symptoms in recent years. For instance, Skills Training in Affective and Interpersonal Regulation-Narrative Therapy (STAIR-NT) is an evidence-based psychotherapy designed to treat individuals affected by cPTSD (45). It has been shown to be an effective intervention for a variety of populations, including adults and adolescents, males and females, as well as inpatients and community members. An RCT comparing STAIR to treatment as usual (TAU) in VA primary care found significant reductions in PTSD, depression, emotion regulation and social functioning (46). A comparative study of STAIR group vs. TAU among individuals with PTSD and chronic mental illness suggested that it can also be successfully used in groups with special needs (47). An easy to integrate intervention with a direct focus on dissociative symptoms could also be the third phase of the DBT-PTSD program, which focuses on skills training and cognitive strategies to improve emotion regulation and dealing with dissociation (48).

Strengths of our study concern the large clinical sample of females with a dual diagnosis of PTSD and SUD, and the inclusion of a wide range of potentially relevant variables in our analyses. It extends previous research (32, 33) by including PTSD status in the analyses of potential relationships between dissociative symptoms and suicidal behaviors, to examine the impact of other trauma-related psychopathology. A limitation is the use of self-report scales like CTQ and DES-T, while all data regarding suicidality and PTSD were collected by means of clinical interviews. Also, we only included women because of the higher prevalence of co-occurring PTSD in female patients with SUD. Moreover, some characteristics of our sample suggest that it might also not be fully representative of female patients with SUD and PTSD. Indicators for this could be the comparatively high level of education and the low level of women with a migration background. Conclusions about other samples of patients with SUD and PTSD, e.g., male patients and patients with PTSD related to adulthood trauma, must therefore be drawn with caution. Bertule et al. (33), in their study on depression as a mediator between dissociation and SI, found more SI in men than in women. This further highlights the importance to address predictors of suicidal behaviors in male populations of patients with SUD and PTSD in future studies. One limitation of our study is that the moderated mediation analyses in Hayes method yield a non-standardized regression coefficient (b-value). Although the method cannot determine the strength of the relationship, it determines the significance and the direction of the relationship—positive vs. negative. The higher b-value is only a potential indicator of the effect's strength. It should be mentioned that we did not include substance use in our analyses, which can serve as a mechanism of emotion regulation and interfere with the examined variables in our models.

In addition, variables like psychiatric family history might have been of help to further stratify the sample and the inclusion of treatment variables, for instance, current pharmaco- and psychotherapy, might have led to differing results. Future studies should include further potentially relevant variables like emotion dysregulation, depressive symptoms or the presence of a diagnosis of borderline disorder.

In conclusion, our findings suggest that dissociation has direct effects on both suicidal ideation and suicide attempts in patients with the dual diagnosis of SUD and PTSD, and that it mediates the relationship of some forms of childhood trauma, namely childhood sexual abuse, with suicidal behaviors. The direct relationships between emotional trauma and suicidal behaviors suggest that further important mediators, like self-esteem and self-concept, should be addressed in future studies. After several decades of research into co-occurring PTSD in patients with SUD, our findings underline the need to widen the established perspectives and to include interventions for more complex consequences of childhood trauma into concepts of care for patients with SUD.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

All study procedures were approved by the Ethics Committees of the responsible chambers of physicians at each study site. The patients/participants provided their written informed consent to participate in this study.

Author contributions

PG and IS contributed to the conception and design of the study. AL, JG, and PH organized the database. PG performed the statistical analysis and wrote the first draft and final sections of the manuscript. ML-A and MB performed manuscript reviews. All authors contributed to manuscript revision, read, and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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10. Eidesstattliche Erklärung

Ich versichere ausdrücklich, dass ich die Arbeit selbständig und ohne fremde Hilfe verfasst, andere als die von mir angegebenen Quellen und Hilfsmittel nicht benutzt und die aus den benutzten Werken wörtlich oder inhaltlich entnommenen Stellen einzeln nach Ausgabe (Auflage und Jahr des Erscheinens), Band und Seite des benutzten Werkes kenntlich gemacht habe.

Ferner versichere ich, dass ich die Dissertation bisher nicht einem Fachvertreter an einer anderen Hochschule zur Überprüfung vorgelegt oder mich anderweitig um Zulassung zur Promotion beworben habe.

Ich erkläre mich einverstanden, dass meine Dissertation vom Dekanat der Medizinischen Fakultät mit einer gängigen Software zur Erkennung von Plagiaten überprüft werden kann.