

other psychopathology (e.g., depression and anxiety). Taken together, the current literature suggests that the PTSD+DS phenotype may be one of greater complexity and chronicity of both trauma history and overall burden of illness. Association with demographic factors, specific comorbidities and types of trauma, and overall PTSD severity has been mixed.

There have been several latent class analyses of non-clinical/general population samples (typically university students) that have overall suggested that while only depersonalization and derealization currently meet DSM-5 criteria for PTSD+DS, other dissociative symptoms are frequently associated with this subtype, as is other comorbid psychopathology. Blevins, Weathers, and Witte (2014) found that PTSD+DS was not associated with a difference in core PTSD symptoms but was associated with higher levels of dissociative symptoms overall as well as associated psychopathology, such as conversion, borderline, and schizophrenia spectrum symptoms. In a general population sample derived from an online survey platform, the group of patients with severe PTSD and dissociative symptoms were more likely to have experienced childhood physical or sexual abuse and were more likely to report difficulties in interpersonal relationships, emotion dysregulation, and reckless behaviour, similar to the complex PTSD phenotype described in the ICD 11, but not currently recognized in the DSM-5 (Frewen, Brown, Steuwe, & Lanius, 2015). The dissociative subtype was associated not just with depersonalization and derealization, but with other dissociative symptoms including memory disturbance, disengagement, time loss, and trance (Frewen et al., 2015). Müllerová, Hansen, Contractor, Elhai, and Armour (2016) similarly found that PTSD+DS was associated with three other subsets of dissociative symptoms: gaps in awareness, re-experiencing (e.g., flashbacks), and sensory misperception; very similar results were found by Ross and colleagues in university students, where those with PTSD+DS reported greater gaps in awareness and memory, re-experiencing, sensory misperception, and reckless or self-destructive behaviour (Ross, Baník, Dědová, Mikulášková, & Armour, 2018). In a sample of Northern Irish university students, Armour, Contractor, Palmieri, and Elhai (2014) found that scores on the amnesia (in the present) and absorption/imaginative involvement (e.g., in fantasy or daydream) items of the Dissociative Experiences Scale (DES) were as strongly associated with PTSD symptom clusters as depersonalization/derealization. This suggests that PTSD+DS may be associated with a broader range of dissociative symptoms than is currently captured by the diagnostic criteria.

There have also been several studies involving clinical populations, including those that have attempted to address the impact of specific types of trauma. While results were again heterogeneous, severity of trauma and comorbid psychopathology were frequently identified as correlates of PTSD+DS. Steuwe, Lanius, and Frewen (2012) studied a civilian clinical sample (PTSD with a high prevalence of childhood abuse) and found an association between PTSD+DS and increased DSM-IV Axis 1 comorbidity and increased childhood abuse and neglect. Burton, Feeny, Connell, and Zoellner (2018) also studied a clinical sample of patients with chronic PTSD and found an association between the high dissociation group and re-experiencing symptoms. Mergler et al. (2017) found that in patients with PTSD and substance use disorder, the dissociative subtype was associated with more depressive symptoms, suicidal thoughts and suicide attempts, drug overdoses, and need for treatment due to drug problems.

In Ginzberg et al.'s (2006) signal detection analysis of a group of patients with PTSD from childhood sexual abuse, the dissociative subtype was associated with increased hypervigilance, sense of foreshortened future, and sleep difficulties. At higher levels of maltreatment, level of maltreatment was correlated with membership in the dissociative group. In Hansen, Müllerová, Elklit, and Armour's (2016) sample of motor vehicle accident (MVA) victims and sexual abuse survivors, the dissociative subtype was associated with emotion focused coping in both, and with decreased social support in the MVA victims. Overall, across these populations, it is notable that PTSD+DS was associated with complex, polysymptomatic presentations including severe PTSD symptoms (particularly re-experiencing and hyperarousal symptoms), comorbid psychiatric disorders, and high levels of childhood maltreatment.

There is also a body of literature on PTSD+DS in Veterans. In their latent class analysis of a sample of trauma-exposed Veterans and their intimate partners, Wolf, Miller, et al. (2012) did not find any gender difference but found that the class representing the dissociative subtype had greater severity of flashbacks, and was associated with more childhood and adulthood sexual abuse. Wolf, Lunney, et al. (2012) conducted latent profile analyses of a sample of male Vietnam war Veterans and a sample of female Veterans and active duty personnel and found that the dissociative subtype, characterized by high levels of PTSD symptoms and high levels of depersonalization/derealization, was more frequent in the female sample. In the female sample specifically, PTSD+DS compared to the high PTSD low dissociation group was also associated with less physiological and psychological reactivity to trauma-related cues, non-white racial identity, and with comorbid personality disorder, specifically borderline and avoidant. Overall, this supports the idea that PTSD+DS is associated with high symptom severity, high comorbidity (including personality disorder), and may be associated more with specific types of trauma (e.g., childhood and/or sexual trauma).

There is some emerging literature on the prevalence and correlates of PTSD+DS in children. In one small study, PTSD+DS in children was associated with female sex, sexual abuse, higher number of traumatic events, and parental avoidance symptoms (Hagan, Gentry, Ippen, & Lieberman, 2018). Modrowski and Kerig's (2017) sample of justice-involved youth (detained in a short-term juvenile detention center) found a 50% prevalence of PTSD+DS, and found an association between PTSD+DS and both peritraumatic dissociation and emotion dysregulation. These data suggest that as in adults, PTSD+DS in children may be associated with differences both in demographic factors and in symptomatology.

Unfortunately, how PTSD+DS has been assessed has varied considerably across studies, with many studies relying on the DES or another similar instrument that was not specifically designed for assessing PTSD+DS. Toward that end, Frewen, Brown, Steuwe, and Lanius (2015) developed two survey items to assess depersonalization and derealization symptoms that can be added to the PTSD Checklist for DSM-5; the items exhibited convergent validity with other more lengthy measures of dissociative experiences. In addition, a 15-item measure developed for administration in either questionnaire or interview form, titled the Dissociative Subtype of PTSD Scale, has been introduced by Wolf et al. (2017).

Neurobiological Correlates of the Dissociative Subtype

The concept of PTSD+DS as a disorder of emotion overmodulation is supported by the literature on the neurobiology of PTSD+DS compared to PTSD. Overall, as reviewed in Fenster, Lebois, Ressler, and Suh (2018) and as will be reviewed below, PTSD+DS is associated with greater activity of areas of the frontal cortex that are involved in inhibiting brain areas that coordinate fear responses, such as the limbic system (especially the amygdala) and the periaqueductal grey matter in the midbrain. This may help explain the emotional numbing and detachment that characterizes the response to traumatic cues in this subtype. Critically, however, it is clear from the literature that the fear system is not the only part of the brain affected by PTSD, nor are these alterations only seen in response to traumatic cues. PTSD+DS is characterized by alterations in structure and function across a wide variety of regions and pathways, particularly those involved in sensory integration and self-perception, which makes sense given the prominent sensory alterations (e.g., depersonalization and derealization) seen in these patients.

Using voxel-based morphometry, Daniels, Frewen, Théberge, and Lanius (2016) compared brain volumes of patients with PTSD with and without the dissociative subtype. In this sample, dissociation severity was associated with increased grey matter volume in the right middle frontal gyrus. This would be expected in patients who experience symptoms of overmodulation given that this area is involved in downregulating emotional arousal. Additionally, in patients with PTSD+DS, there was decreased grey matter volume in the right inferior temporal gyrus, which is involved in visual processing and object recognition. This decrease in grey matter volume may therefore be relevant to the feelings of unreality and unfamiliarity that patients report during dissociative episodes.

Functional neuroimaging has also demonstrated differences in amygdalar resting state connectivity between the two subtypes, which adds to the understanding of differential fear responses in these groups. PTSD+DS is associated with greater resting functional connectivity between the amygdala and prefrontal regions involved in emotion modulation and limbic inhibition, including the ventromedial prefrontal cortex (Nicholson et al., 2015; Nicholson et al., 2017). Similarly, there has been found to be increased top down connections between the amygdala and the periaqueductal grey, a midbrain region involved in fear/defense processing, in PTSD+DS compared to PTSD, which again suggests overmodulation of arousal in PTSD+DS manifested as detachment and dissociation (Nicholson et al., 2017). The ventrolateral periaqueductal grey, which may be particularly associated with passive and parasympathetically mediated coping strategies such as dissociation, has also been shown to have increased functional connectivity at rest with areas involved in self-processing and depersonalization (e.g., left temporoparietal junction) in PTSD+DS (Harricharan et al., 2016). This accords with fMRI findings that PTSD+DS is associated with increased prefrontal activity in response to consciously perceived threat (Felmington et al., 2008).

The bed nucleus of the stria terminalis (BNST), which is considered to be part of the extended amygdala, and is involved in anticipation of threat, is also differentially affected in PTSD+DS, with differences in connectivity in multiple areas compared both to controls and to PTSD. Compared to controls, PTSD+DS has been associated with increased connectivity between the BNST and the claustrum, which may be involved in conscious awareness and sensory integration.

PTSD+DS also demonstrated increased connectivity between the BNST and the vermis, a cerebellar region that may be involved in emotion modulation and processing (Rabellino, Densmore, Harricharan, et al., 2018).

There have been multiple changes in cerebellar functional connectivity identified in PTSD+DS. Compared to PTSD, PTSD+DS is associated with decreased functional connectivity between the anterior cerebellum and vermis and areas involved in somatosensory processing, multisensory integration, and bodily self-consciousness. PTSD+DS is also associated with increased connectivity between the posterior cerebellum and cortical areas related to emotion regulation. These findings strengthen the evidence for conceptualizing PTSD+DS as a disorder of emotion overmodulation (via cortical inhibition) and impaired sensory integration (via decreased connectivity of multiple somatosensory processing and integration areas) (Rabellino, Densmore, Théberge, McKinnon, & Lanius, 2018).

PTSD+DS is also associated with greater connectivity between the amygdala and parietal, cerebellar, and limbic regions associated with consciousness, awareness, and proprioception (Nicholson et al., 2015). This suggests that fearful stimuli, identified by the amygdala, may trigger alterations in consciousness and awareness, which includes depersonalization and derealization. Relatedly, in one fMRI study by Tursich et al. (2015), dissociative symptom severity was negatively correlated with connectivity between the ventromedial prefrontal cortex and the perigenual anterior cingulate cortex. The perigenual anterior cingulate cortex is associated with self-referential processing, which is impaired during a dissociative episode.

The vestibular system, which is involved in multisensory integration, is also differentially affected in PTSD+DS. Compared to healthy controls and to non-dissociative PTSD, the dissociative subtype has been associated with decreased connectivity between the vestibular nuclei and the parietoinsular vestibular cortex and the dorsolateral prefrontal cortex. This further suggests another area of dysregulated multisensory integration, and, critically, provides another potential pathway for the sensory alterations seen during dissociative episodes (Harricharan et al., 2017).

Research has also begun to identify the differential impact of PTSD+DS on the hypothalamic-pituitary-adrenal (HPA) axis and cortisol. In one study, the presence of trauma-related dissociative symptoms was associated with a blunted cortisol response to stress (Zaba et al., 2015). This accords with older work associating a tendency towards blunted cortisol stress reactivity with PTSD and comorbid dissociative disorder (Simeon et al., 2007). Another study in pregnant women similarly found that PTSD+DS was associated with a higher and flatter gestational cortisol level curve (Seng et al., 2018). This body of work suggests another way in which the stress response in PTSD+DS differs from that seen in PTSD that may have important clinical implications.

At the molecular level, a relatively small genome-wide association study conducted on a population of trauma-exposed Veterans did not find any statistically significant associations between single nucleotide polymorphisms (SNP) and dissociative symptoms. However, some approached significance, including a SNP in one of the genes for adenylyl cyclase, which is an enzyme important in long term potentiation (and hence in learning and memory). A SNP was also identified in a gene encoding a subunit of the voltage-gated potassium channel, which has been associated with impaired

hippocampal synaptic integration in mice. Given their impact on learning and memory, these genes may be involved in dissociation proneness. Several SNPs were also found in genes involved in epigenetic processes (Wolf et al., 2014).

Treatment Implications

One area of ongoing research is differential response to trauma-focused therapies in PTSD+DS, and what modifications may be necessary to existing treatment protocols for PTSD in order to better serve patients with PTSD+DS. In particular, experts have questioned whether there is a role for stabilizing dissociation prior to initiating an exposure-based treatment such as cognitive processing therapy (CPT), prolonged exposure (PE), eye movement desensitization and reprocessing (EMDR) or narrative exposure therapy (NET). As mentioned above, patients with PTSD+DS may have a greater severity of illness, more comorbidity, and a wide range of dissociative symptoms, which suggests a potential need to stabilize symptoms prior to initiating an exposure-based treatment.

There have been minimal studies specifically examining the role of such multiple component treatment approaches and comparing them to exposure therapy alone. In one trial of a two-component treatment approach (skills training followed by exposure), while baseline dissociation did not moderate PTSD treatment outcome, at high levels of dissociation, the two component treatment approach resulted in greater improvement in dissociation. Notably, at post-treatment, those with high dissociation who received both components continued to make gains, and those who received only skills training maintained their gains. In contrast, those who only received exposure treatment lost gains (Cloitre, Petkova, Wang, & Lu Lassell, 2012). This suggests that in order to fully measure the impact of multiple component treatments, long term follow up may be necessary, and that the impact of such treatments on dissociation may be separate from their impact on other PTSD symptoms.

Critically, some literature has found an impact of certain facets of dissociation on treatment response. In one study of response to dialectical behaviour therapy (DBT) in patients with PTSD from childhood sexual abuse, while trait dissociation was not a predictor of response, low state dissociation during psychotherapy sessions increased the likelihood of substantial improvement in PTSD symptomatology compared to those with high state dissociation (Kleindienst et al., 2016). This accords with the findings of Price, Kearns, Houry, and Rothbaum (2014), who found that response to an early exposure intervention in trauma-exposed individuals was poorer in those with high state dissociation at the first treatment session. In a trial of EMDR in a group of patients from a specialized trauma clinic, non-responder status was associated with psychiatric comorbidity and with dissociative symptoms (depersonalization/derealization) (Bae, Kim, & Park, 2016). Furthermore, while Resick, Suvak, Johnides, Mitchell, and Iverson (2012) found that patients with high dissociation responded equally well to exposure based treatment, these patients (and particularly those with high levels of depersonalization) had a better overall response when treated with cognitive therapy that included exposure to the trauma narrative (rather than CPT without an exposure component), possibly because the trauma narrative assisted with narrative coherence, which may be impaired in the presence of peritraumatic dissociation.

On the other hand, some studies have found minimal effect of dissociation on magnitude of reduction in PTSD symptoms. Notably, however, a frequent finding has been that patients with PTSD+DS both begin and end treatment with more severe symptoms, which suggests that additional components of treatment could potentially further improve outcome. One trial involving patients with chronic PTSD treated with either sertraline or PE found that the group with high dissociative symptoms (as measured by the depersonalization/derealization scale of the DES) was less likely to respond overall and less likely to respond to sertraline, but were equally likely to respond to exposure-based treatment (Burton et al., 2018). Halvorsen, Stenmark, Neuner, and Nordahl (2014) similarly found that depersonalization/derealization was not a predictor of response to NET in a sample of patients with PTSD. Hagenaaers, van Minnen, and Hoogduin (2010) similarly found that patients with high dissociation (depersonalization, derealization, and/or numbing) had a similar magnitude of PTSD symptom reduction compared to those without, but had greater overall symptom severity both pre- and post-treatment. In another study by Zoet, Wagenmans, van Minnen, and de Jongh (2018), patients with PTSD+DS as diagnosed by the Clinician-Administered PTSD Scale had a greater symptom severity both pre- and post-treatment, but achieved equal symptom reduction compared to those without the dissociative subtype. Similarly, Wolf, Lunney, and Schnurr (2016) found that patients with PTSD+DS responded to PE with respect both to dissociative symptoms and overall PTSD symptoms, but with a slightly smaller effect on PTSD symptoms compared to those without the dissociative subtype. Overall, while patients with PTSD+DS appear to tolerate and improve with exposure therapy, they typically end treatment with higher levels of PTSD symptoms, suggesting that integration of additional treatment strategies may need to be explored in this population.

The current literature on treatment response in PTSD+DS is heterogeneous. There are significant differences between trials in terms of which dissociative symptoms are measured and how. There may be differential impacts of specific dissociative symptoms, particularly state versus trait dissociation. Additionally, while there is evidence that exposure-based treatments can be helpful in the presence of significant dissociation, there are few head-to-head trials that compare exposure therapy alone to multifaceted approaches incorporating skills training or dissociation-focused treatments.

Conclusion

In recent years there has been increased interest in the subpopulation of patients with PTSD and significant dissociative symptoms. Two psychometric measures have recently been developed in order to assess dissociative symptoms in patients with PTSD, specifically, two items developed for use with the PTSD Checklist and the 15-item Dissociative Subtype of PTSD Scale. Critically, there is some evidence that this subpopulation is distinct both in clinical characteristics (mixed evidence suggests that it may be associated with greater overall severity, greater comorbidity, and more protracted trauma history) and in neurobiology. This is not simply limited to fear-related pathways, but spans multiple brain areas, particularly those involved in sensory integration, which makes sense in light of the subjective experience of dissociation. There has therefore been interest in treatment response and treatment implications. While there is evidence that patients with PTSD+DS can tolerate and respond to exposure-based treatments, they typically end treatment with higher overall symptom severity and may lose gains over time. Further research examining this complex and multifaceted population is therefore warranted.

Armour, C., Contractor, A. A., Palmieri, P. A., & Elhai, J. D. (2014). **Assessing latent level associations between PTSD and dissociative factors: Is depersonalization and derealization related to PTSD factors more so than alternative dissociative factors?** *Psychological Injury and Law, 7*, 131-142. doi:10.1007/s12207-014-9196-9

Posttraumatic stress disorder (PTSD) criteria in DSM-5 included a dissociative diagnostic subtype characterized by a depersonalization item and a derealization item. Researchers have queried whether this was too restrictive, as alternative dissociative symptomatology may also be characteristic of the subtype. The current study utilized data from 318 Northern Irish students, of which 165 were trauma exposed. Participants were assessed for PTSD symptomatology based on DSM-5 criteria via a modified version of the PTSD Symptom Scale-Self-Report (PSS-5) and dissociative experiences via the Dissociative Experiences Scale (DES). Confirmatory factor analysis of PTSD and DES models revealed an optimal four-factor DSM-5 PTSD model including reexperiencing, avoidance, negative alterations in mood and cognitions, and alterations in hyperarousal and reactivity factors, and an optimal three-factor DES model including absorption, amnesia, and depersonalization/derealization factors. When comparing the correlations between depersonalization/derealization and the four PTSD factors, significant Wald tests of parameter constraints revealed that depersonalization/derealization is more related to alterations in arousal and reactivity ($r = .432$) compared to avoidance ($r = .289$), $\chi^2(1, N = 165) = 8.352, p = .004$. We discuss whether the mechanism for comorbid PTSD and dissociation may be related to PTSD's arousal factor.

Bae, H., Kim, D., & Park, Y. C. (2016). **Dissociation predicts treatment response in eye-movement desensitization and reprocessing for posttraumatic stress disorder.** *Journal of Trauma & Dissociation, 17*, 112-130. doi:10.1080/15299732.2015.1037039

Using clinical data from a specialized trauma clinic, this study investigated pretreatment clinical factors predicting response to eye-movement desensitization and reprocessing (EMDR) among adult patients diagnosed with posttraumatic stress disorder (PTSD). Participants were evaluated using the Clinician-Administered PTSD Scale (CAPS), the Symptom Checklist-90-Revised, the Beck Depression Inventory, and the Dissociative Experiences Scale before treatment and were reassessed using the CAPS after treatment and at 6-month follow-up. A total of 69 patients underwent an average of 4 sessions of EMDR, and 60 (87%) completed the posttreatment evaluation, including 8 participants who terminated treatment prematurely. Intent-to-treat analysis revealed that 39 (65%) of the 60 patients were classified as responders and 21 (35%) as nonresponders when response was defined as more than a 30% decrease in total CAPS score. The nonresponders had higher levels of dissociation (depersonalization and derealization) and numbing symptoms, but other PTSD symptoms, such as avoidance, hyperarousal, and intrusion, were not significantly different. The number of psychiatric comorbidities was also associated with treatment nonresponse. The final logistic regression model yielded 2 significant variables: dissociation ($p < .001$) and more than 2 comorbidities compared to none ($p < .05$). These results indicate that complex symptom patterns in PTSD may predict treatment response and support the inclusion of the dissociative subtype of PTSD in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*.

Blevins, C. A., Weathers, F. W., & Witte, T. K. (2014). **Dissociation and posttraumatic stress disorder: A latent profile analysis.** *Journal of Traumatic Stress, 27*, 388-396. doi:10.1002/jts.21933

The fifth edition of *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*; American Psychiatric Association, 2013) contains a dissociative subtype for posttraumatic stress disorder (PTSD) characterized by significant depersonalization and derealization. In this study the PTSD dissociative subtype was examined using latent profile analysis in a sample of 541 trauma-exposed college students. Items from the PTSD Checklist and Multiscale Dissociation Inventory were used as latent class indicators. Results supported a 3-class solution including a well-adjusted class, a PTSD class, and a PTSD/dissociative class characterized by elevated symptoms of PTSD, depersonalization, and derealization. Significant class differences were found on a number of measures of related psychopathology with Cohen's d effect size estimates ranging from 0.04 to 1.86. Diagnostic and treatment implications regarding the dissociative subtype are discussed.

Burton, M. S., Feeny, N. C., Connell, A. M., & Zoellner, L. A. (2018). **Exploring evidence of a dissociative subtype in PTSD: Baseline symptom structure, etiology, and treatment efficacy for those who dissociate.** *Journal of Consulting and Clinical Psychology, 86*, 439-451. doi:10.1037/ccp0000297

Objective: With the inclusion of a dissociative subtype, recent changes to the DSM-5 diagnosis of posttraumatic stress disorder (PTSD) have emphasized the role of dissociation in the experience and treatment of the disorder. However, there is a lack of research exploring the clinical impact for highly dissociative groups receiving treatment for PTSD. The current study examined the presence and clinical impact of a dissociative subtype in a sample of individuals receiving treatment for chronic PTSD. **Method:** This study used latent transition analyses (LTA), an expanded form of latent profile analyses (LPA), to examine latent profiles of PTSD and dissociation symptoms before and after treatment for individuals ($N = 200$) receiving prolonged exposure (PE) or sertraline treatment for chronic PTSD. **Results:** The best fitting LTA model was one with a 4-class solution at both pretreatment and posttreatment. There was a latent class at pretreatment with higher levels of dissociative symptoms. However, this class was also marked by higher reexperiencing symptoms, and membership was not predicted by chronic child abuse. Further, although those in the class were less likely to transition to the responder class overall, this was not the case for exposure-based treatment specifically. **Conclusion:** These findings are not in line with the dissociative-subtype theoretical literature that proposes those who dissociate represent a clinically distinct group that may respond worse to exposure-based treatments for PTSD.

Cloitre, M., Petkova, E., Wang, J., & Lu Lassell, F. (2012). **An examination of the influence of a sequential treatment on the course and impact of dissociation among women with PTSD related to childhood abuse.** *Depression and Anxiety, 29*, 709-717. doi:10.1002/da.21920

Background: It has been proposed that posttraumatic stress disorder (PTSD) patients who experience significant dissociation upon exposure to traumatic reminders may do less well in trauma-focused therapies. We explored whether a sequenced two-component treatment in which an emotion regulation skills training module preceding exposure would improve outcomes for those with significant dissociation.

Methods: Analyses were conducted on data from an RCT in which 104 women with PTSD related to childhood abuse were assigned to one of three treatment conditions: Skills Training in Affective and Interpersonal Regulation (STAIR) followed by Narrative Story Telling (NST; STAIR/NST), STAIR followed by supportive counseling (SC; STAIR/SC), or SC followed by NST (SC/NST). *Results:* Baseline dissociation was associated with differential outcome such that at low levels of dissociation the three treatments were equally effective but at higher levels STAIR/NST resulted in greater reductions in dissociative symptoms. Level of baseline dissociation did not moderate the effect of the treatments on PTSD outcome. At all levels of baseline dissociation, STAIR/NST produced better PTSD outcome. At posttreatment, however, participants with high dissociation treated with STAIR/NST continued to improve during follow-up, those treated with STAIR/SC maintained gains, and those treated with SC/NST experienced loss of posttreatment PTSD symptom gains. *Conclusions:* The differential results observed among the treatments depending on severity of dissociation at baseline and at posttreatment suggest the potential clinical utility of identifying a dissociative subtype of PTSD and of the benefits of sequenced, phase-oriented treatment approaches.

Felmingham, K., Kemp, A. H., Williams, L., Falconer, E., Olivieri, G., Peduto, A., & Bryant, R. (2008). **Dissociative responses to conscious and non-conscious fear impact underlying brain function in post-traumatic stress disorder.** *Psychological Medicine*, 38, 1771-1780. doi:10.1017/S0033291708002742

Background: Dissociative reactions in post-traumatic stress disorder (PTSD) have been regarded as strategic responses that limit arousal. Neuroimaging studies suggest distinct prefrontal responses in individuals displaying dissociative and hyperarousal responses to threat in PTSD. Increased prefrontal activity may reflect enhanced regulation of limbic arousal networks in dissociation. If dissociation is a higher-order regulatory response to threat, there may be differential responses to conscious and automatic processing of threat stimuli. This study addresses this question by examining the impact of dissociation on fear processing at different levels of awareness.

Method: Functional magnetic resonance imaging (fMRI) with a 1.5-T scanner was used to examine activation to fearful (*versus* neutral) facial expressions during consciously attended and non-conscious (using backward masking) conditions in 23 individuals with PTSD. Activation in 11 individuals displaying non-dissociative reactions was compared to activation in 12 displaying dissociative reactions to consciously and non-consciously perceived fear stimuli.

Results: Dissociative PTSD was associated with enhanced activation in the ventral prefrontal cortex for conscious fear, and in the bilateral amygdala, insula and left thalamus for non-conscious fear compared to non-dissociative PTSD. Comparatively reduced activation in the dissociative group was apparent in dorsomedial prefrontal regions for conscious fear faces. *Conclusions:* These findings confirm our hypotheses of enhanced prefrontal activity to conscious fear and enhanced activity in limbic networks to non-conscious fear in dissociative PTSD. This supports the theory that dissociation is a regulatory strategy invoked to cope with extreme arousal in PTSD, but this strategy appears to function only during conscious processing of threat.

Frewen, P. A., Brown, M. F. D., Steuwe, C., & Lanius, R. A. (2015). **Latent profile analysis and principal axis factoring of the DSM-5 dissociative subtype.** *European Journal of Psychotraumatology*, 6, 26406. doi:10.3402/ejpt.v6.26406 *Objective:* A dissociative subtype has been recognized based on the presence of experiences of depersonalization and derealization in relation to DSM-IV posttraumatic stress disorder (PTSD). However, the dissociative subtype has not been assessed in a community sample in relation to the revised DSM-5 PTSD criteria. Moreover, the 20-item PTSD Checklist for DSM-5 (PCL-5) currently does not assess depersonalization and derealization. *Method:* We therefore evaluated two items for assessing depersonalization and derealization in 557 participants recruited online who endorsed PTSD symptoms of at least moderate severity on the PCL-5. *Results:* A five-class solution identified two PTSD classes who endorsed dissociative experiences associated with either 1) severe or 2) moderate PTSD symptom severity (D-PTSD classes). Those in the severe dissociative class were particularly likely to endorse histories of childhood physical and sexual abuse. A principal axis factor analysis of the symptom list identified six latent variables: 1) Reexperiencing, 2) Emotional Numbing/Anhedonia, 3) Dissociation, 4) Negative Alterations in Cognition & Mood, 5) Avoidance, and 6) Hyperarousal. *Conclusions:* The present results further support the presence of a dissociative subtype within the DSM-5 criteria for PTSD.

Ginzburg, K., Koopman, C., Butler, L. D., Palesh, O., Kraemer, H. C., Classen, C. C., & Spiegel, D. (2006). **Evidence for a dissociative subtype of post-traumatic stress disorder among help-seeking childhood sexual abuse survivors.** *Journal of Trauma & Dissociation*, 7, 7-27. doi:10.1300/J229v07n02_02

This study examined evidence for a dissociative subtype of post-traumatic stress disorder (PTSD) among women seeking psychotherapy for childhood sexual abuse (CSA). One hundred and twenty-two women seeking treatment for CSA completed a battery of questionnaires assessing PTSD, dissociative symptoms, and child maltreatment. Using signal detection analysis, we identified high and low dissociation PTSD subgroups. A constellation of three PTSD symptoms—hypervigilance, sense of foreshortened future, and sleep difficulties—discriminated between these two subgroups (OR = 8.15). Further evidence was provided by the finding of a nonlinear relationship between severity of childhood maltreatment and dissociation in the women with PTSD. These results provide support for a dissociative subtype of PTSD that may stem from more severe childhood experiences of neglect and abuse.

Hagenaars, M. A., van Minnen, A., & Hoogduin, K. A. L. (2010). **The impact of dissociation and depression on the efficacy of prolonged exposure treatment for PTSD.** *Behaviour Research and Therapy*, 48, 19-27. doi:10.1016/j.brat.2009.09.001

This study investigates the impact of dissociative phenomena and depression on the efficacy of prolonged exposure treatment in 71 patients with posttraumatic stress disorder (PTSD). Diagnoses, comorbidity, pretreatment depressive symptoms, PTSD symptom severity, and dissociative phenomena (trait dissociation, numbing, and depersonalization) were assessed at pretreatment using semi-structured interviews and questionnaires. In a pretreatment behavioral exposure test, patients were imaginatively exposed to (part of) their trauma memory for 9 min, during which subjective fear was assessed.

At posttreatment and 6 months follow-up PTSD, depressive and dissociative symptoms were again assessed in the completers ($n = 60$). Pretreatment levels of dissociative and depressive symptoms were similar in dropouts and completers and none of the dissociative phenomena nor depression predicted improvement. Against expectations, dissociative phenomena and depression were associated with enhanced rather than impeded fear activation during the behavioral exposure test. However, these effects disappeared after controlling for initial PTSD severity. Hence, rather than supporting contraindication, the current results imply that patients presenting with even severe dissociative or depressive symptoms may profit similarly from exposure treatment as do patients with minimal dissociative or depressive symptoms.

Halvorsen, J. O., Stenmark, H., Neuner, F., & Nordahl, H. M. (2014). **Does dissociation moderate treatment outcomes of narrative exposure therapy for PTSD? A secondary analysis from a randomized controlled clinical trial.** *Behaviour Research and Therapy, 57*, 21-28. doi:10.1016/j.brat.2014.03.010 Dissociative symptoms, especially depersonalisation and derealisation, are often perceived as a contraindication for exposure-based treatments of posttraumatic stress disorder (PTSD) despite limited empirical evidence. The present paper examines whether derealisation and depersonalisation influence the treatment outcomes of narrative exposure therapy (NET) and treatment as usual (TaU) among severely traumatised asylum seekers and refugees. We performed a secondary analysis of a recently published randomized controlled multicentre trial comparing NET and TaU for the treatment of PTSD in asylum seekers and refugees. In order to investigate whether depersonalisation and derealisation moderate treatment outcomes, a number of moderated multiple, blockwise regression analyses were conducted. Missing data were handled with multiple imputation. The main finding from intention-to-treat analyses is that derealisation and depersonalisation overall do not moderate the treatment outcomes of either NET or TaU. The treatment condition was the most stable predictor of residual gain scores across outcome measures, with NET being associated with lower residual gain scores indicating better treatment outcomes. The present study substantiates and extends previous research indicating that dissociative symptoms such as derealisation and depersonalisation do not moderate the treatment outcome of exposure-based treatments for PTSD.

Hansen, M., Müllerová, J., Elklit, A., & Armour, C. (2016). **Can the dissociative PTSD subtype be identified across two distinct trauma samples meeting caseness for PTSD?** *Social Psychiatry and Psychiatric Epidemiology, 51*, 1159-1169. doi:10.1007/s00127-016-1235-2 *Introduction:* For over a century, the occurrence of dissociative symptoms in connection to traumatic exposure has been acknowledged in the scientific literature. Recently, the importance of dissociation has also been recognized in the long-term traumatic response within the DSM-5 nomenclature. Several studies have confirmed the existence of the dissociative posttraumatic stress disorder (PTSD) subtype. However, there is a lack of studies investigating latent profiles of PTSD solely in victims with PTSD. *Purpose and method:* This study investigates the possible presence of PTSD subtypes using latent class analysis (LCA) across two distinct trauma samples meeting caseness for DSM-5 PTSD based on self-reports ($N = 787$).

Moreover, we assessed if a number of risk factors resulted in an increased probability of membership in a dissociative compared with a non-dissociative PTSD class. *Results:* The results of LCA revealed a two-class solution with two highly symptomatic classes: a dissociative class and a non-dissociative class across both samples. Increased emotion-focused coping increased the probability of individuals being grouped into the dissociative class across both samples. Social support reduced the probability of individuals being grouped into the dissociative class but only in the victims of motor vehicle accidents (MVAs) suffering from whiplash. *Conclusions:* The results are discussed in light of their clinical implications and suggest that the dissociative subtype can be identified in victims of incest and victims of MVA suffering from whiplash meeting caseness for DSM- 5 PTSD.

Harricharan, S., Nicholson, A. A., Densmore, M., Théberge, J., McKinnon, M. C., Neufeld, R. W. J., & Lanius, R. A. (2017). **Sensory overload and imbalance: Resting-state vestibular connectivity in PTSD and its dissociative subtype.** *Neuropsychologia, 106*, 169-178. doi:10.1016/j.neuropsychologia.2017.09.010 *Background:* The vestibular system integrates multisensory information to monitor one's bodily orientation in space, and is influenced by interoceptive awareness. Post-traumatic stress disorder (PTSD) involves typically alterations in interoceptive and bodily self-awareness evidenced by symptoms of hyperarousal, as well as of emotional detachment, including emotional numbing, depersonalization, and derealization. These alterations may disrupt vestibular multisensory integration between the brainstem (vestibular nuclei) and key vestibular cortical regions (parieto-insular vestibular cortex, prefrontal cortex). Accordingly, this study examined functional connectivity of the vestibular system in PTSD and its dissociative subtype. *Methods:* Using resting-state fMRI data in SPM12 and PickAtlas, a seed-based analysis was employed to examine vestibular nuclei functional connectivity differences among PTSD ($n = 60$), PTSD dissociative subtype (PTSD + DS, $n = 41$) and healthy controls ($n = 40$). *Results:* Increased vestibular nuclei functional connectivity with the parieto-insular vestibular cortex and the dorsolateral prefrontal cortex (dlPFC) was observed in PTSD and in controls as compared to PTSD + DS, and greater connectivity with the posterior insula was observed in controls as compared to PTSD. Interestingly, whereas PTSD symptom severity correlated negatively with dlPFC connectivity, clinical measures of depersonalization/derealization correlated negatively with right supramarginal gyrus connectivity. *Discussion:* Taken together, decreased vestibular nuclei functional connectivity with key cortical vestibular regions in the PTSD + DS as compared to PTSD group, and its negative correlations with PTSD and dissociative symptoms, suggest that dysregulation of vestibular multisensory integration may contribute to the unique symptom profiles of each group. Further research examining disruption of vestibular system neural circuitry in PTSD and its dissociative subtype will be critical in capturing the neurophenomenology of PTSD symptoms and in identifying psychotherapeutic techniques that target dysfunction related to the vestibular system.

Harricharan, S., Rabellino, D., Frewen, P. A., Densmore, M., Théberge, J., McKinnon, M. C., . . . Lanius, R. A. (2016). **fMRI functional connectivity of the periaqueductal gray in PTSD and its dissociative subtype.** *Brain and Behavior, 6*, e00579. doi:10.1002/brb3.579 *Background:* Posttraumatic stress disorder (PTSD) is associated with hyperarousal and active fight or flight

defensive responses. By contrast, the dissociative subtype of PTSD, characterized by depersonalization and derealization symptoms, is frequently accompanied by additional passive or submissive defensive responses associated with autonomic blunting. Here, the periaqueductal gray (PAG) plays a central role in defensive responses, where the dorsolateral (DL-PAG) and ventrolateral PAG (VL-PAG) are thought to mediate active and passive defensive responses, respectively. *Methods:* We examined PAG subregion (dorsolateral and ventrolateral) resting-state functional connectivity in three groups: PTSD patients without the dissociative subtype ($n = 60$); PTSD patients with the dissociative subtype ($n = 37$); and healthy controls ($n = 40$) using a seed-based approach via PickAtlas and SPM12. *Results:* All PTSD patients showed extensive DL- and VL-PAG functional connectivity at rest with areas associated with emotional reactivity and defensive action as compared to controls ($n = 40$). Although all PTSD patients demonstrated DL-PAG functional connectivity with areas associated with initiation of active coping strategies and hyperarousal (e.g., dorsal anterior cingulate; anterior insula), only dissociative PTSD patients exhibited greater VL-PAG functional connectivity with brain regions linked to passive coping strategies and increased levels of depersonalization (e.g., temporoparietal junction; rolandic operculum). *Conclusions:* These findings suggest greater defensive posturing in PTSD patients even at rest and demonstrate that those with the dissociative subtype show unique patterns of PAG functional connectivity when compared to those without the subtype. Taken together, these findings represent an important first step toward identifying neural and behavioral targets for therapeutic interventions that address defensive strategies in trauma-related disorders.

Kleindienst, N., Priebe, K., Görg, N., Dyer, A., Steil, R., Lyssenko, L., . . . Bohus, M. (2016). **State dissociation moderates response to dialectical behavior therapy for posttraumatic stress disorder in women with and without borderline personality disorder.** *European Journal of Psychotraumatology*, *7*, 30375. doi:10.3402/ejpt.v7.30375 *Background:* Patients with posttraumatic stress disorder (PTSD) are prone to dissociation, which in theory should interfere with successful treatment. However, most empirical studies do not substantiate this assumption. *Objective:* The primary objective was to test whether state dissociation predicts the success of an adaptation of dialectical behavior therapy designed for the treatment of patients with PTSD after childhood sexual abuse (CSA) (DBT-PTSD). We further explored whether the operationalization of dissociation as state versus trait dissociation made a difference with respect to prediction of improvement. *Methods:* We present a hypothesis-driven *post hoc* analysis of a randomized controlled trial on the efficacy in patients with PTSD after CSA. Regression analyses relating pre-post improvements in the Clinician-Administered PTSD Scale (CAPS) and the Posttraumatic Diagnostic Scale (PDS) to dissociation were applied to the women who participated in the active treatment arm (DBT-PTSD). Multivariate models accounting for major confounders were used to relate improvements in both the CAPS and the PDS to (1) state dissociation as assessed after each treatment session and (2) trait dissociation as assessed at baseline. *Results:* State dissociation during psychotherapy sessions predicted improvement after DBT-PTSD: patients with low state dissociation during treatment had a higher chance to show substantial improvement. This relation consistently emerged across subgroups of PTSD patients with and without borderline personality disorder. The operationalization of dissociation as state versus trait

dissociation made a difference as improvement was not significantly predicted from trait dissociation. *Conclusions:* Dissociation during treatment sessions may reduce success with trauma-focused therapies such as DBT-PTSD. Accordingly, clinical studies aimed at improving ways to address dissociation are needed.

Müllerová, J., Hansen, M., Contractor, A. A., Elhai, J. D., & Armour, C. (2016). **Dissociative features in posttraumatic stress disorder: A latent profile analysis.** *Psychological Trauma: Theory, Research, Practice, and Policy*, *8*, 601-608. doi:10.1037/tra0000148 *Objective:* The fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* characterizes the dissociative subtype of posttraumatic stress disorder (PTSD) in terms of the individual meeting the criteria for PTSD and additionally reporting symptoms of depersonalization and/or derealization. The current study aimed to examine whether a dissociative PTSD profile may include alternative features of dissociation and whether it could be differentiated from a nondissociative PTSD profile on certain psychopathologies and demographics. *Method:* Data from 309 trauma-exposed participants, collected through Amazon Mechanical Turk, were subjected to latent profile analysis. Regression analyses were used to examine the predictors of latent classes. *Results:* Three discrete profiles named Baseline, PTSD, and Dissociative profile were uncovered. All examined features of dissociation were significantly elevated in the Dissociative profile. Anxiety, male sex, being employed, and having a minority racial background significantly predicted the Dissociative profile relative to the PTSD profile. *Conclusions:* The study points to the importance of alternative symptoms of dissociation in the dissociative PTSD subtype beyond the symptoms of depersonalization and derealization.

Nicholson, A. A., Densmore, M., Frewen, P. A., Théberge, J., Neufeld, R. W. J., McKinnon, M. C., & Lanius, R. A. (2015). **The dissociative subtype of posttraumatic stress disorder: Unique resting-state functional connectivity of basolateral and centromedial amygdala complexes.** *Neuropsychopharmacology*, *40*, 2317-2326. doi:10.1038/npp.2015.79 Previous studies point towards differential connectivity patterns among basolateral (BLA) and centromedial (CMA) amygdala regions in patients with posttraumatic stress disorder (PTSD) as compared with controls. Here we describe the first study to compare directly connectivity patterns of the BLA and CMA complexes between PTSD patients with and without the dissociative subtype (PTSD+DS and PTSD-DS, respectively). Amygdala connectivity to regulatory prefrontal regions and parietal regions involved in consciousness and proprioception were expected to differ between these two groups based on differential limbic regulation and behavioral symptoms. PTSD patients ($n=49$) with ($n=13$) and without ($n=36$) the dissociative subtype and age-matched healthy controls ($n=40$) underwent resting-state fMRI. Bilateral BLA and CMA connectivity patterns were compared using a seed-based approach via SPM Anatomy Toolbox. Among patients with PTSD, the PTSD+DS group exhibited greater amygdala functional connectivity to prefrontal regions involved in emotion regulation (bilateral BLA and left CMA to the middle frontal gyrus and bilateral CMA to the medial frontal gyrus) as compared with the PTSD-DS group. In addition, the PTSD+DS group showed greater amygdala connectivity to regions involved in consciousness, awareness, and proprioception—implicated in depersonalization and derealization (left BLA to superior parietal lobe and cerebellar culmen; left CMA to dorsal

posterior cingulate and precuneus). Differences in amygdala complex connectivity to specific brain regions parallel the unique symptom profiles of the PTSD subgroups and point towards unique biological markers of the dissociative subtype of PTSD.

Nicholson, A. A., Friston, K. J., Zeidman, P., Harricharan, S., McKinnon, M. C., Densmore, M., . . . Lanius, R. A. (2017). **Dynamic causal modeling in PTSD and its dissociative subtype: Bottom-up versus top-down processing within fear and emotion regulation circuitry.** *Human Brain Mapping, 38*, 5551-5561. doi:10.1002/hbm.23748 *Objective:* Posttraumatic stress disorder (PTSD) is associated with decreased top-down emotion modulation from medial prefrontal cortex (mPFC) regions, a pathophysiology accompanied by hyperarousal and hyperactivation of the amygdala. By contrast, PTSD patients with the dissociative subtype (PTSD+DS) often exhibit increased mPFC top-down modulation and decreased amygdala activation associated with emotional detachment and hypoarousal. Crucially, PTSD and PTSD+DS display distinct functional connectivity within the PFC, amygdala complexes, and the periaqueductal gray (PAG), a region related to defensive responses/emotional coping. However, differences in directed connectivity between these regions have not been established in PTSD, PTSD+DS, or controls. *Methods:* To examine directed (effective) connectivity among these nodes, as well as group differences, we conducted resting-state stochastic dynamic causal modeling (sDCM) pairwise analyses of coupling between the ventromedial (vm)PFC, the bilateral basolateral and centromedial (CMA) amygdala complexes, and the PAG, in 155 participants (PTSD [$n=62$]; PTSD+DS [$n=41$]; age-matched healthy trauma-unexposed controls [$n=52$]). *Results:* PTSD was characterized by a pattern of predominant bottom-up connectivity from the amygdala to the vmPFC and from the PAG to the vmPFC and amygdala. Conversely, PTSD+DS exhibited predominant top-down connectivity between all node pairs (from the vmPFC to the amygdala and PAG, and from the amygdala to the PAG). Interestingly, the PTSD+DS group displayed the strongest intrinsic inhibitory connections within the vmPFC. *Conclusions:* These results suggest the contrasting symptom profiles of PTSD and its dissociative subtype (hyper- vs. hypo-emotionality, respectively) may be driven by complementary changes in directed connectivity corresponding to bottom-up defensive fear processing versus enhanced top-down regulation.

Rabellino, D., Densmore, M., Harricharan, S., Jean, T., McKinnon, M. C., & Lanius, R. A. (2018). **Resting-state functional connectivity of the bed nucleus of the stria terminalis in post-traumatic stress disorder and its dissociative subtype.** *Human Brain Mapping, 39*, 1367-1379. doi:10.1002/hbm.23925 The bed nucleus of the stria terminalis (BNST) is a subcortical structure involved in anticipatory and sustained reactivity to threat and is thus essential to the understanding of anxiety and stress responses. Although chronic stress and anxiety represent a hallmark of post-traumatic stress disorder (PTSD), to date, few studies have examined the functional connectivity of the BNST in PTSD. Here, we used resting state functional Magnetic Resonance Imaging (fMRI) to investigate the functional connectivity of the BNST in PTSD ($n=70$), its dissociative subtype (PTSD+DS) ($n=41$), and healthy controls ($n=50$). In comparison to controls, PTSD showed increased functional connectivity of the BNST with regions of the reward system (ventral and dorsal striatum), possibly underlying stress-induced reward-seeking behaviors in PTSD.

By contrast, comparing PTSD+DS to controls, we observed increased functional connectivity of the BNST with the claustrum, a brain region implicated in consciousness and a primary site of kappa-opioid receptors, which are critical to the dynorphin-mediated dysphoric stress response. Moreover, PTSD+DS showed increased functional connectivity of the BNST with brain regions involved in attention and salience detection (anterior insula and caudate nucleus) as compared to PTSD and controls. Finally, BNST functional connectivity positively correlated with default-mode network regions as a function of state identity dissociation, suggesting a role of BNST networks in the disruption of self-relevant processing characterizing the dissociative subtype. These findings represent an important first step in elucidating the role of the BNST in aberrant functional networks underlying PTSD and its dissociative subtype.

Rabellino, D., Densmore, M., Théberge, J., McKinnon, M. C., & Lanius, R. A. (2018). **The cerebellum after trauma: Resting-state functional connectivity of the cerebellum in posttraumatic stress disorder and its dissociative subtype.** *Human Brain Mapping, 39*, 3354-3374. doi:10.1002/hbm.24081 The cerebellum plays a key role not only in motor function but also in affect and cognition. Although several psychopathological disorders have been associated with overall cerebellar dysfunction, it remains unclear whether different regions of the cerebellum contribute uniquely to psychopathology. Accordingly, we compared seed-based resting-state functional connectivity of the anterior cerebellum (lobule IV-V), of the posterior cerebellum (Crus I), and of the anterior vermis across posttraumatic stress disorder (PTSD; $n=65$), its dissociative subtype (PTSD+DS; $n=37$), and non-trauma-exposed healthy controls (HC; $n=47$). Here, we observed *decreased* functional connectivity of the anterior cerebellum and anterior vermis with brain regions involved in somatosensory processing, multisensory integration, and bodily self-consciousness (temporo-parietal junction, postcentral gyrus, and superior parietal lobule) in PTSD+DS as compared to PTSD and HC. Moreover, the PTSD+DS group showed *increased* functional connectivity of the posterior cerebellum with cortical areas related to emotion regulation (ventromedial prefrontal and orbito-frontal cortex, subgenual anterior cingulum) as compared to PTSD. By contrast, PTSD showed *increased* functional connectivity of the anterior cerebellum with cortical areas associated with visual processing (fusiform gyrus), interoceptive awareness (posterior insula), memory retrieval, and contextual processing (hippocampus) as compared to HC. Finally, we observed *decreased* functional connectivity between the posterior cerebellum and prefrontal regions involved in emotion regulation, in PTSD as compared to HC. These findings not only highlight the crucial role of each cerebellar region examined in the psychopathology of PTSD but also reveal unique alterations in functional connectivity distinguishing the dissociative subtype of PTSD versus PTSD.

Resick, P. A., Suvak, M. K., Johnides, B. D., Mitchell, K. S., & Iverson, K. M. (2012). **The impact of dissociation on PTSD treatment with cognitive processing therapy.** *Depression and Anxiety, 29*, 718-730. doi:10.1002/da.21938 *Background:* This secondary analysis of data from a randomized controlled trial of cognitive processing therapy (CPT) and its constituent components investigated whether dissociation decreased over the course of treatment primarily targeting symptoms of posttraumatic stress disorder (PTSD) and explored whether levels of dissociation predicted treatment outcome differentially by treatment condition.

Methods: An intention to treat sample of 150 women were randomized to CPT, cognitive therapy only (CPT-C) or written trauma accounts only (WA). Dissociation was measured by the dissociation subscale of the Traumatic Stress Inventory and the Multiscale Dissociation Inventory. *Results:* Multilevel regression analyses revealed significant decreases in dissociation that did not vary as a function of treatment condition. Growth curve modeling revealed significant treatment condition by dissociation interactions such that the impact of pretreatment levels of dissociation impacted the treatment conditions differently. *Conclusions:* Women who endorsed low pretreatment levels of dissociation responded most efficiently to CPT-C, whereas women with the highest levels of dissociation, in particular high levels of depersonalization, responded better to CPT.

Ross, J., Baník, G., Dědová, M., Mikulášková, G., & Armour, C. (2018). **Assessing the structure and meaningfulness of the dissociative subtype of PTSD.** *Social Psychiatry and Psychiatric Epidemiology*, 53, 87–97. <http://doi.org/10.1007/s00127-017-1445-2> *Purpose:* Studies conducted in the USA, Canada and Denmark have supported the existence of the dissociative PTSD subtype, characterized primarily by symptoms of depersonalization and derealization. The current study aimed to examine the dissociative PTSD subtype in an Eastern European, predominantly female (83.16%) sample, using an extended set of dissociative symptoms. *Methods:* A latent profile analysis was applied to the PTSD and dissociation data from 689 trauma-exposed university students from Slovakia. *Results:* Four latent profiles of varying PTSD and dissociation symptomatology were uncovered. They were named non-symptomatic, moderate PTSD, high PTSD and dissociative PTSD. The dissociative PTSD profile showed elevations on depersonalization and derealization, but also the alternative dissociative indicators of gaps in awareness and memory, sensory misperceptions and cognitive and behavioural re-experiencing. The core PTSD symptoms of ‘memory impairment’ and ‘reckless or self-destructive behaviour’ were also significantly elevated in the dissociative PTSD profile. Moreover, anxiety and anger predicted membership in the dissociative PTSD profile. *Conclusion:* The results provide support for the proposal that the dissociative PTSD subtype can be characterized by a variety of dissociative symptoms.

Stein, D. J., Koenen, K. C., Friedman, M. J., Hill, E., McLaughlin, K. A., Petukhova, M., . . . Kessler, R. C. (2013). **Dissociation in posttraumatic stress disorder: Evidence from the world mental health surveys.** *Biological Psychiatry*, 73, 302–312. [doi:10.1016/j.biopsych.2012.08.022](https://doi.org/10.1016/j.biopsych.2012.08.022) *Background:* Although the proposal for a dissociative subtype of posttraumatic stress disorder (PTSD) in DSM-5 is supported by considerable clinical and neurobiological evidence, this evidence comes mostly from referred samples in Western countries. Cross-national population epidemiologic surveys were analyzed to evaluate generalizability of the subtype in more diverse samples. *Methods:* Interviews were administered to 25,018 respondents in 16 countries in the World Health Organization World Mental Health Surveys. The Composite International Diagnostic Interview was used to assess 12-month DSM-IV PTSD and other common DSM-IV disorders. Items from a checklist of past-month nonspecific psychological distress were used to assess dissociative symptoms of depersonalization and derealization. Differences between PTSD with and without these dissociative symptoms were examined across a variety of domains, including index trauma characteristics, prior trauma history, childhood adversity, sociodemographic

characteristics, psychiatric comorbidity, functional impairment, and treatment seeking. *Results:* Dissociative symptoms were present in 14.4% of respondents with 12-month DSM-IV/Composite International Diagnostic Interview PTSD and did not differ between high and low/middle income countries. Symptoms of dissociation in PTSD were associated with high counts of re-experiencing symptoms and net of these symptom counts with male sex, childhood onset of PTSD, high exposure to prior (to the onset of PTSD) traumatic events and childhood adversities, prior histories of separation anxiety disorder and specific phobia, severe role impairment, and suicidality. *Conclusion:* These results provide community epidemiologic data documenting the value of the dissociative subtype in distinguishing a meaningful proportion of severe and impairing cases of PTSD that have distinct correlates across a diverse set of countries.

Steuwe, C., Lanius, R. A., & Frewen, P. A. (2012). **Evidence for a dissociative subtype of PTSD by latent profile and confirmatory factor analyses in a civilian sample.** *Depression and Anxiety*, 29, 689–700. [doi:10.1002/da.21944](https://doi.org/10.1002/da.21944) *Background:* Dissociative symptoms are increasingly recognized in individuals with posttraumatic stress disorder (PTSD). The aim of this study was to investigate the prevalence of derealization and depersonalization symptoms via latent profile analyses (LPAs) in a civilian PTSD sample and examine the relationship between PTSD and dissociative symptoms via factor analytic methods. *Methods:* A civilian sample of individuals with PTSD predominantly related to childhood abuse ($n = 134$) completed a diagnostic interview for PTSD and comorbid psychiatric disorders. LPAs and confirmatory factor analyses (CFAs) were performed on the severity scores for PTSD, derealization, and depersonalization symptoms. *Results:* LPAs extracted three groups, one of which was uniquely characterized by high derealization and depersonalization symptoms, and accounted for 25% of the sample. Individuals in the dissociative subgroup also showed a higher number of comorbid Axis I disorders and a more significant history of childhood abuse and neglect. CFAs suggested the acceptance of a five factor solution in which dissociative symptoms are distinct from but correlate significantly with the core PTSD symptom clusters. *Conclusions:* The results from LPAs and CFAs are concordant with the concept of a dissociative subtype in patients with PTSD and suggest that symptoms of derealization-depersonalization and the core symptoms of PTSD are positively correlated. Thought should be given to including a dissociative subtype of PTSD in the DSM-5.

Tursich, M., Ros, T., Frewen, P. A., Kluetsch, R. C., Calhoun, V. D., & Lanius, R. A. (2015). **Distinct intrinsic network connectivity patterns of post-traumatic stress disorder symptom clusters.** *Acta Psychiatrica Scandinavica*, 132, 29–38. [doi:10.1111/acps.12387](https://doi.org/10.1111/acps.12387) *Objective:* Post-traumatic stress disorder (PTSD) is considered a multidimensional disorder, with distinct symptom clusters including re-experiencing, avoidance/numbing, hyperarousal, and most recently depersonalization/derealization. However, the extent of differing intrinsic network connectivity underlying these symptoms has not been fully investigated. We therefore investigated the degree of association between resting connectivity of the salience (SN), default mode (DMN), and central executive (CEN) networks and PTSD symptom severity. *Method:* Using resting-state functional MRI data from PTSD participants ($n = 21$), we conducted multivariate analyses to test whether connectivity of extracted independent components varied as a function of re-experiencing, avoidance/numbing, hyperarousal, and depersonalization/derealization.

Results: Hyperarousal symptoms were associated with reduced connectivity of posterior insula/superior temporal gyrus within SN [peak Montréal Neurological Institute (MNI): -44, -8, 0, $t = -4.2512$, $k = 40$]. Depersonalization/derealization severity was associated with decreased connectivity of perigenual anterior cingulate/ventromedial prefrontal cortex within ventral anterior DMN (peak MNI: 8, 40, -4; $t = -3.8501$; $k = 15$) and altered synchrony between two DMN components and between DMN and CEN. *Conclusion:* Our results are consistent with prior research showing intrinsic network disruptions in PTSD and imply heterogeneous connectivity patterns underlying PTSD symptom dimensions. These findings suggest possible biomarkers for PTSD and its dissociative subtype.

Wolf, E. J., Lunney, C. A., Miller, M. W., Resick, P. A., Friedman, M. J., & Schnurr, P. P. (2012). **The dissociative subtype of PTSD: A replication and extension.** *Depression and Anxiety, 29*, 679-688. doi:10.1002/da.21946 *Background:* The nature of the relationship between dissociation and posttraumatic stress disorder (PTSD) has clinical and nosological importance. The aim of this study was to evaluate the evidence for a dissociative subtype of PTSD in two independent samples and to examine the pattern of personality disorder (PD) comorbidity associated with the dissociative subtype of PTSD. *Methods:* Latent profile analyses were conducted on PTSD and dissociation items reflecting derealization and depersonalization in two samples of archived data: Study 1 included 360 male Vietnam War Veterans with combat-related PTSD; Study 2 included 284 female Veterans and active duty service personnel with PTSD and a high base rate of exposure to sexual trauma. *Results:* The latent profile analysis yielded evidence for a three-class solution in both samples: the model was defined by moderate and high PTSD classes and a class marked by high PTSD severity coupled with high levels of dissociation. Approximately 15% of the male sample and 30% of the female sample were classified into the dissociative class. Women (but not men) in the dissociative group exhibited higher levels of comorbid avoidant and borderline PD diagnoses. *Conclusions:* Results provide support for a dissociative subtype of PTSD and also suggest that dissociation may play a role in the frequent co-occurrence of PTSD and borderline PD among women. These results are pertinent to the on-going revisions to the DSM and suggest that consideration should be given to incorporating a dissociative subtype into the revised PTSD criteria.

Wolf, E. J., Lunney, C. A., & Schnurr, P. P. (2016). **The influence of the dissociative subtype of posttraumatic stress disorder on treatment efficacy in female veterans and active duty service members.** *Journal of Consulting and Clinical Psychology, 84*, 95-100. doi:10.1037/ccp0000036 *Objective:* A dissociative subtype of posttraumatic stress disorder (PTSD) was recently added to the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; American Psychiatric Association, 2013) and is thought to be associated with poor PTSD treatment response. *Method:* We used latent growth curve modeling to examine data from a randomized controlled trial of prolonged exposure and present-centered therapy for PTSD in a sample of 284 female veterans and active duty service members with PTSD to test the association between the dissociative subtype and treatment response. *Results:* Individuals with the dissociative subtype (defined using latent profile analysis) had a flatter slope ($p = .008$) compared with those with high PTSD symptoms and no dissociation, such that the former group showed, on average,

a 9.75 (95% confidence interval [-16.94, -2.57]) lesser decrease in PTSD severity scores on the Clinician Administered PTSD Scale (Blake et al., 1995) over the course of the trial. However, this effect was small in magnitude. Dissociative symptoms decreased markedly among those with the subtype, though neither treatment explicitly addressed such symptoms. There were no differences as a function of treatment type. *Conclusions:* Results raise doubt about the common clinical perception that exposure therapy is not effective or appropriate for individuals who have PTSD and dissociation, and provide empirical support for the use of exposure treatment for individuals with the dissociative subtype of PTSD.

Wolf, E. J., Miller, M. W., Reardon, A. F., Ryabchenko, K. A., Castillo, D., & Freund, R. (2012). **A latent class analysis of dissociation and posttraumatic stress disorder: Evidence for a dissociative subtype.** *Archives of General Psychiatry, 69*, 698-705. doi:10.1001/archgenpsychiatry.2011.1574 *Context:* The nature of the relationship of dissociation to posttraumatic stress disorder (PTSD) is controversial and of considerable clinical and nosologic importance. *Objectives:* To examine evidence for a dissociative subtype of PTSD and to examine its association with different types of trauma. *Design:* A latent profile analysis of cross-sectional data from structured clinical interviews indexing DSM-IV symptoms of current PTSD and dissociation. *Settings:* The VA Boston Healthcare System and the New Mexico VA Health Care System. *Participants:* A total of 492 veterans and their intimate partners, all of whom had a history of trauma. Participants reported exposure to a variety of traumatic events, including combat, childhood physical and sexual abuse, partner abuse, motor vehicle accidents, and natural disasters, with most participants reporting exposure to multiple types of traumatic events. Forty-two percent of the sample met the criteria for a current diagnosis of PTSD. *Main Outcome Measures:* Item-level scores on the Clinician-Administered PTSD Scale. *Results:* A latent profile analysis suggested a 3-class solution: a low PTSD severity subgroup, a high PTSD severity subgroup characterized by elevations across the 17 core symptoms of the disorder, and a small but distinctly dissociative subgroup that composed 12% of individuals with a current diagnosis of PTSD. The latter group was characterized by severe PTSD symptoms combined with marked elevations on items assessing flashbacks, derealization, and depersonalization. Individuals in this subgroup also endorsed greater exposure to childhood and adult sexual trauma compared with the other 2 groups, suggesting a possible etiologic link with the experience of repeated sexual trauma. *Conclusions:* These results support the subtype hypothesis of the association between PTSD and dissociation and suggest that dissociation is a highly salient facet of posttraumatic psychopathology in a subset of individuals with the disorder.

Zoet, H. A., Wagenmans, A., van Minnen, A., & de Jongh, A. (2018). **Presence of the dissociative subtype of PTSD does not moderate the outcome of intensive trauma-focused treatment for PTSD.** *European Journal of Psychotraumatology, 9*, 1468707. doi:10.1080/2008198.2018.1468707 *Background:* There is a widely-held belief in the trauma field that the presence of dissociative symptoms is associated with poor treatment response. However, previous research on the effect of dissociation in treatment outcomes pertained to specific patients and trauma populations. *Objective:* To test the hypothesis that the presence of the dissociative subtype of PTSD (DS) would have a detrimental effect on the outcome of an intensive

trauma-focused treatment programme. *Methods:* PTSD symptom scores (Clinician Administered PTSD Scale [CAPS] and PTSD Symptom Scale Self-Report [PSS-SR]) were analysed using the data of 168 consecutive patients (70.6% female) who had been exposed to a wide variety of multiple traumas, including childhood sexual abuse, and of whom 98.2% were diagnosed with severe PTSD (CAPS > 65). Most of them suffered from multiple comorbidities and 38 (22.6%) met the criteria for DS. They took part in an intensive trauma-focused treatment programme for PTSD. Pre- and post-treatment differences were compared between patients with and without DS. *Results:* Large effect sizes were achieved for PTSD symptom reduction on CAPS and the PSS-SR, both for patients with DS and those without. Although patients with DS showed a significantly greater PTSD symptom severity at the beginning, and throughout, treatment, both groups showed equal reductions in PTSD symptoms. Of those who met the criteria for DS, 26 (68.4%) no longer fulfilled the criteria for this classification after treatment. *Conclusion:* The results provide no support for the notion that the presence of DS negatively impacts trauma-focused treatment outcomes. Accordingly, PTSD patients with DS should not be denied effective trauma-focused treatments.

ADDITIONAL CITATIONS

Carlson, E. B., Putnam, F. W., Ross, C. A., Torem, M., Coons, P., Dill, D. L., . . . Braun, B. G. (1993). **Validity of the Dissociative Experiences Scale in screening for multiple personality disorder: A multicenter study.** *American Journal of Psychiatry, 150*, 1030-1036. doi:10.1176/ajp.150.7.1030 In this sample, 42% of patients with PTSD scored higher than 30 on the DES. A score of 30 was also the cutoff used to identify potential cases of Multiple Personality Disorder.

Carlson, E. B., Waelde, L. C., Palmieri, P. A., Macia, K. S., Smith, S. R., & McDade-Montez, E. (2018). **Development and validation of the Dissociative Symptoms Scale.** *Assessment, 25*, 84-98. doi:10.1177/1073191116645904 The Dissociative Symptoms Scale (DSS) is a new instrument designed to assess levels of depersonalization, derealisation, gaps in awareness or memory, and dissociative re-experiencing. It may be useful in identifying PTSD+DS.

Daniels, J. K., Frewen, P., Theberge, J., & Lanius, R. A. (2016). **Structural brain aberrations associated with the dissociative subtype of post-traumatic stress disorder.** *Acta Psychiatrica Scandinavica, 133*, 232-240. doi:10.1111/acps.12464 In this voxel-based morphometry study, PTSD+DS was associated with increased grey matter volume in the right precentral gyrus, which is involved in emotion modulation. PTSD+DS was also associated with decreased grey matter volume in the right inferior temporal gyrus, which is involved in visual processing and object recognition, and therefore may be involved in producing dissociative symptoms.

Fenster, R. J., Lebois, L. A. M., Ressler, K. J., & Suh, J. (2018). **Brain circuit dysfunction in post-traumatic stress disorder: From mouse to man.** *Nature Reviews: Neuroscience, 19*, 535-551. doi:10.1038/s41583-018-0039-7 This review overviews the neurobiology of PTSD, including the dissociative subtype. In symptom provocation studies, PTSD+DS is associated with increased activity in emotion modulation areas (the ventromedial prefrontal cortex and the dorsal

anterior mid-cingulate cortex) and decreased activity in the amygdala and insula. Resting state functional connectivity analyses have shown increased connectivity between these areas in PTSD+DS.

Hagan, M. J., Gentry, M., Ippen, C. G., & Lieberman, A. F. (2018). **PTSD with and without dissociation in young children exposed to interpersonal trauma.** *Journal of Affective Disorders, 227*, 536-541. doi:10.1016/j.jad.2017.11.070 In this cross-sectional study of children with PTSD, trauma-exposed children were classified into PTSD, PTSD with dissociation, or non-clinical based on caregiver symptom report. Membership in the "PTSD with dissociation" group was associated with female sex, sexual abuse, number of traumatic events, and parental avoidance symptoms.

Hansen, M., Ross, J., & Armour, C. (2017). **Evidence of the dissociative PTSD subtype: A systematic literature review of latent class and profile analytic studies of PTSD.** *Journal of Affective Disorders, 213*, 59-69. doi:10.1016/j.jad.2017.02.004 This systematic literature review reviewed eleven studies using latent profile analysis or latent class analysis to identify correlates of the dissociative subtype. Overall, the studies were heterogeneous and had conflicting findings. Overall, however, they were supportive of the existence of PTSD+DS and there was a tendency towards an association with childhood trauma exposure and more extensive comorbidity.

Lanius, R. A., Vermetten, E., Loewenstein, R. J., Brand, B., Schmahl, C., Bremner, J. D., & Spiegel, D. (2010). **Emotion modulation in PTSD: Clinical and neurobiological evidence for a dissociative subtype.** *American Journal of Psychiatry, 167*, 640-647. doi:10.1176/appi.ajp.2009.09081168 This article overviews the evidence for a dissociative subtype of PTSD characterized by undermodulation of affect. PTSD+DS is characterized by midline prefrontal inhibition of the limbic system, leading to emotional detachment and dissociative symptoms.

Mergler, M., Driessen, M., Lüdecke, C., Ohlmeier, M., Chodzinski, C., Weirich, S., . . . Schäfer, I. (2017). **Relationships between a dissociative subtype of PTSD and clinical characteristics in patients with substance use disorders.** *Journal of Psychoactive Drugs, 49*, 225-232. doi:10.1080/02791072.2017.1296209 This study examined correlates of the dissociative subtype in patients with substance use disorders. PTSD with dissociation was associated with more current depressive symptoms, suicidal thoughts, lifetime anxiety/tension, and suicide attempts. It was also associated with higher need for substance treatment, higher current use of opiates, and higher number of drug overdoses.

Modrowski, C. A., & Kerig, P. K. (2017). **Investigating factors associated with PTSD dissociative subtype membership in a sample of traumatized justice-involved youth.** *Journal of Child & Adolescent Trauma, 10*, 343-351. doi:10.1007/s40653-017-0153-0 This study examined factors associated with the dissociative subtype in trauma-exposed detained youth. About half of the sample met criteria for the dissociative subtype. PTSD+DS was associated with peritraumatic dissociation and emotion dysregulation.

Nardo, D., Högberg, G., Lanius, R. A., Jacobsson, H., Jonsson, C., Hällström, T., & Pagani, M. (2013). **Gray matter volume alterations related to trait dissociation in PTSD and traumatized controls.** *Acta Psychiatrica Scandinavica, 128*, 222-233. doi:10.1111/acps.12026 Higher trait dissociation in patients with PTSD was associated with

increased grey matter volume in the medial and lateral prefrontal, orbitofrontal, parahippocampal, temporal polar, and inferior parietal cortices. These areas have all been implicated in pathological dissociation.

Price, M., Kearns, M., Houry, D., & Rothbaum, B. O. (2014). **Emergency department predictors of posttraumatic stress reduction for trauma-exposed individuals with and without an early intervention.** *Journal of Consulting and Clinical Psychology, 82*, 336-341. doi:10.1037/a0035537 This study randomized trauma-exposed patients from a hospital emergency department to either early intervention (an exposure-based psychotherapy) or assessment-only. For those randomized to early intervention, dissociation at the time of the first treatment session was the only factor associated with treatment response.

Seng, J. S., Li, Y., Yang, J. J., King, A. P., Kane Low, L. M., Sperlich, M., . . . Liberzon, I. (2018). **Gestational and postnatal cortisol profiles of women with posttraumatic stress disorder and the dissociative subtype.** *JOGNN, 47*, 12-22. doi:10.1016/j.jogn.2017.10.008 This was a prospective longitudinal cohort study of cortisol levels in women expecting their first child. Women with PTSD+DS had the highest and flattest cortisol level curves and the difference was largest in early pregnancy. This may have implications for intergenerational transmission of poor health outcomes.

Simeon, D., Knutelska, M., Yehuda, R., Putnam, F., Schmeidler, J., & Smith, L. M. (2007). **Hypothalamic-pituitary-adrenal axis function in dissociative disorders, post-traumatic stress disorder, and healthy volunteers.** *Biological Psychiatry, 61*, 966-973. doi:10.1016/j.biopsych.2006.07.030 This study examined HPA axis dysregulation in a group of patients with dissociative disorder and without PTSD versus those with PTSD versus healthy controls, and included a small subgroup of patients with PTSD and comorbid dissociative disorder. The subgroup of patients with PTSD and comorbid dissociative disorder demonstrated blunted stress reactivity compared to healthy controls. In both psychiatric groups, dissociation was inversely associated with cortisol reactivity.

Wolf, E. J., Mitchell, K. S., Sadeh, N., Hein, C., Fuhrman, I., Pietrzak, R. H., & Miller, M. W. (2017). **The Dissociative Subtype of PTSD Scale: Initial evaluation in a national sample of trauma-exposed veterans.** *Assessment, 24*, 503-516. doi:10.1177/1073191115615212 This article provides initial psychometric support for a 15-item self-report measure intended to measure the presence of the dissociative subtype. It consists of three factors: depersonalization/derealisation, loss of awareness, and psychogenic amnesia.

Wolf, E. J., Rasmusson, A. M., Mitchell, K. S., Logue, M. W., Baldwin, C. T., & Miller, M. W. (2014). **A genome-wide association study of clinical symptoms of dissociation in a trauma-exposed sample.** *Depression and Anxiety, 31*, 352-360. doi:10.1002/da.22260 This genome-wide association study used a sample of trauma-exposed Veterans and their intimate partners. No SNPs evidenced a statistically significant association with dissociation. However, several approached significance, and these were genes involved in learning and memory.

Zaba, M., Kirmeier, T., Ionescu, I. A., Wollweber, B., Buell, D. R., Gall-Kleeback, D. J., . . . Schmidt, U. (2015). **Identification and characterization of HPA-axis reactivity endophenotypes in a cohort of female PTSD patients.** *Psychoneuroendocrinology, 55*,

102-115. doi:10.1016/j.psyneuen.2015.02.005 HPA-axis function in female patients with PTSD was investigated using the Trier Social Stress Test. A non-responder subgroup with a blunted HPA-axis response was identified. This subgroup was associated with a higher prevalence of dissociative symptoms and with a combination of adult and early life trauma.