



The dissociative post-traumatic stress disorder (PTSD) subtype: A treatment outcome cohort study in veterans with PTSD

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Objectives. Dissociation is a prevalent phenomenon among veterans with post-traumatic stress disorder (PTSD) that may interfere with the effectiveness of treatment. This study aimed to replicate findings of a dissociative PTSD subtype, to identify corresponding patterns in coping style, symptom type, and symptom severity, and to investigate its impact on post-traumatic symptom improvement.

Methods. Latent profile analysis (LPA) was applied to baseline data from 330 predominantly (97%) male treatment-seeking veterans (mean age 39.5 years) with a probable PTSD. Multinomial logistic models were used to identify predictors of dissociative PTSD. Eighty veterans with PTSD that commenced with psychotherapy were invited for a follow-up measure after 6 months. The majority ($n = 64$, 80% response rate) completed the follow-up measure. Changes in post-traumatic stress between baseline and follow-up were explored as a continuous distal outcome.

Results. Latent profile analysis revealed four distinct patient profiles: 'low' (12.9%), 'moderate' (33.2%), 'severe' (45.1%), and 'dissociative' (8.8%) PTSD. The dissociative PTSD profile was characterized by more severe pathology levels, though not post-traumatic reactions symptom severity. Veterans with dissociative PTSD benefitted equally from PTSD treatment as veterans with non-dissociative PTSD with similar symptom severity.

Conclusions. Within a sample of veterans with PTSD, a subsample of severely dissociative veterans was identified, characterized by elevated severity levels on pathology dimensions. The dissociative PTSD subtype did not negatively impact PTSD treatment.

Practitioner points

- The present findings confirmed the existence of a distinct subgroup veterans that fit the description of dissociative PTSD.

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- Patients with dissociative PTSD subtype symptoms uniquely differed from patients with non-dissociative PTSD in the severity of several psychopathology dimensions.
- Dissociative and non-dissociative PTSD patients with similar post-traumatic severity levels showed similar levels of improvement after PTSD treatment.
- The observational design and small sample size caution interpretation of the treatment outcome data.
- The IES-R questionnaire does not assess all PTSD DSM-IV diagnostic criteria (14 of 17), although it is considered a valid measure for an indication of PTSD.

Post-traumatic stress disorder (PTSD) is a psychological disorder that may occur after experiencing a traumatic event (American Psychiatric Association [APA], 2013). Its core features are involuntary re-experiencing, persistent avoidance of traumatic content, negative alterations in cognitions, and symptoms of arousal and reactivity. The recent inclusion of a dissociative PTSD subtype in DSM-5 (APA, 2013) acknowledged the existence of a subsample of patients with PTSD that suffer from severe dissociation (Armour, Elklit, Lauterbach, & Elhai, 2014; Armour, Karstoft, & Richardson, 2014; Blevins, Weathers, & Witte, 2014; Frewen, Brown, Steuwe, & Lanius, 2015; Stein *et al.*, 2013; Steuwe, Lanius, & Frewen, 2012; Tsai, Armour, Southwick, & Pietrzak, 2015; Waelde, Silvern, & Fairbank, 2005; Wolf, Lunney, *et al.*, 2012; Wolf, Miller, *et al.*, 2012), at conceivable risk of treatment stagnation (Spiegel *et al.*, 2013). Dissociation is considered a potential indicator of poor PTSD treatment outcome (Becker, Zayfert, & Anderson, 2004; Hansen, Ross, & Armour, 2017), and treatment manuals contemplate its possible adverse treatment effects (Briere & Scott, 2015). This study presents empirical evidence of these claims in a sample of veterans with PTSD.

Conceptualization of dissociation

The concept of dissociation lacks a precise and generally accepted definition, with different conceptualizations highlighting different phenomena and processes (Giesbrecht, Lynn, Lilienfeld, & Merckelbach, 2008). Dissociation has been defined as ‘a disruption in the usually integrated function of consciousness, memory, identity, or perception of the environment’ (APA, 2000, p. 519). These disruptions are divided into psychoform and somatoform types that can be either pathological or non-pathological. Psychoform dissociation involves disruptions in the integration and perception of cognition, affect, memory, identity, and behaviour. Somatoform dissociation involves disruptions in the integration and perception of bodily functions, sensations, and movement (Pullin, Webster, & Hanstock, 2014).

Non-pathological dissociation is common in the general population (Ross, Joshi, & Currie, 1990). It relates to tendencies to become immersed in an activity and losing focus on one’s surroundings (Waller, Putman, & Carlson, 1996). Pathological dissociation is primarily split between two distinct phenomena, amnesia and depersonalization/derealization (Stockdale, Gridley, Balogh, & Holtgraves, 2002; Waller *et al.*, 1996). *Amnesia* refers to an inability to recall important autobiographic information that is inconsistent with ordinary forgetting (APA, 2013). *Derealization/depersonalization* represents a state of consciousness detached from one’s everyday experience of one’s self or the world (Holmes *et al.*, 2005). It includes out-of-body experiences, feeling unreal, and in a dreamlike state.

PTSD and dissociation

Dissociative and post-traumatic stress symptoms appear highly correlated (Murphy, Elklit, Murphy, Hyland, & Shevlin, 2017). However, the nature of their relationship remains ambiguous. Dalenberg and Carlson (2012) provided a detailed synopsis of models that explains this relationship. Their review demonstrates a lack of consensus between researchers whether PTSD and dissociation refers to a shared single construct or whether they are distinctive in origin and manifestation. Some models consider the relationship between PTSD and dissociation to be weak or non-existent. Others view dissociation and PTSD as distinct but comorbid phenomena with a shared background of trauma and vulnerabilities. Again other models posit a strong relationship between dissociation and PTSD, for example, because dissociation is seen as a vulnerability for the development of PTSD. The two models that have received the most empirical support are the component model and the subtype model (Dalenberg & Carlson, 2012). Both consider PTSD and dissociation as strongly related. The component model views the traumatic event as a cause of both PTSD and dissociation. Dissociation is viewed as a symptom of PTSD. The subtype model concurs and adds that PTSD with a high level of dissociative symptoms can differ in (comorbid) symptom patterns and severity. It views dissociative PTSD as qualitatively different from non-dissociative PTSD.

Another prominent model that describes the relationship between dissociation and PTSD is the trauma/avoidance model (Dutra & Wolf, 2017). It is mostly associated with symptoms of derealization/depersonalization, corresponding with the DSM-5 dissociative PTSD subtype. The model considers dissociation an avoidant coping strategy that shifts attention from traumatic memories to safeguard against overwhelming emotions. This view is supported by cognitive experimental research, demonstrating that dissociative persons consciously avoid traumatic memories using improved attention redirection strategies compared to non-dissociative patients (Chiu, Yeh, Huang, Wu, & Chiu, 2009; Chiu *et al.*, 2016; De Ruiter, Phaf, Veltman, Kok, & Van Dyck, 2003; DePrince & Freyd, 1999).

Dissociation and PTSD treatment

Dissociation has been identified as a problematic occurrence among veterans with PTSD (Kulkarni, Porter, & Rauch, 2012). A naturalistic UK veteran treatment study found baseline dissociation severity to predict negative PTSD treatment outcome (Murphy & Busuttill, 2015). This predictive effect, however, dissipated after controlling for baseline PTSD symptom severity. Wolf, Lunney, and Schnurr (2016) reported a small negative treatment effect for female veterans. The limited number of studies that examined treatment outcome for veterans with dissociative PTSD, paired with reports that dissociation may interfere with PTSD treatment outcome (Hansen *et al.*, 2017), warrants a further investigation into its potential negative treatment effect.

This study aimed to replicate DSM-5 dissociative PTSD subtype profile, identify non-dissociative PTSD membership predictors, and evaluate its impact on PTSD treatment. The study focused exclusively on depersonalization/derealization. Other dissociative phenomena (amnesia, absorption) were not included because they are not part of the DSM-5 dissociative PTSD subtype. We hypothesized that a dissociative PTSD profile would be characterized by distinguishable clinical features in accordance with the subtype model (Dalenberg & Carlson, 2012), and an increased use of avoidant coping strategies in accordance with the trauma/avoidance model (Dutra & Wolf, 2017). Age was examined as a predictor of profile membership because older

age was associated with dissociative PTSD in veterans (Wolf *et al.*, 2015). Finally, it was hypothesized that veterans with a dissociative PTSD profile would report less treatment improvement compared to non-dissociative profiles.

Methods

Design

This study consisted of a prospective multisite longitudinal cohort design with a pre-treatment diagnostic assessment and a routine outcome assessment after 6 months of PTSD psychotherapy. Four Dutch specialized psychotrauma centres participated.

Procedure and participants

Treatment-seeking veterans with suspected deployment-related pathology were diagnosed by a qualified psychologist or psychiatrist regarding axis I and II disorders (APA, 2000) and completed a baseline (pre-treatment) assessment. Between January 2013 and June 2015, 330 treatment-seeking veterans received the baseline assessment. Veterans with PTSD that commenced psychotherapy were invited for a follow-up assessment to reassess post-traumatic reactions symptom severity levels. The sample consisted almost exclusively of male veterans (97.0%), mean aged 39.5 years, and most (80.6%) formally diagnosed with DSM-IV-TR PTSD (APA, 2000). Eighty veterans commenced psychotherapy with 64 participating in the follow-up measure, indicating an 80.0% response rate. The majority served in Afghanistan (37%), Bosnia-Herzegovina (27%), or Lebanon (19%). Almost every veteran that commenced treatment (96.3%) experienced combat-related traumatic events, such as having killed, being shot at, sustaining injuries, losing colleagues, or witnessing extreme suffering. Figure 1 provides a study flow chart and Table 1 an overview of sample characteristics.

Treatment was provided according to standard clinical care and took place in outpatient, day treatment, and inpatient settings. Patients received either trauma-focused interventions (eye movement desensitization reprocessing, narrative exposure therapy) or non-trauma-focused PTSD interventions. The medical-ethical committee of the Utrecht University Medical Centre granted the study exemption of ethical approval (case number 12-535/C) because the assessments were part of standard procedures and did not influence treatment procedures.

Measures

Indicators of latent subtype membership

The Dutch Impact of Event Scale-Revised (IES-R; Kleber & De Jong, 1998; Weiss & Marmar, 1996) measures the psychological impact of traumatic events. Respondents reported how often they experienced symptoms of intrusions, avoidance, and hyperarousal in the past 7 days. The 22 items correspond directly with 14 of the 17 PTSD DSM-IV-TR criteria, each rated on a 5-point Likert scale ranging from 0 (*not at all*) to 4 (*extremely*). A post-traumatic symptom severity score was computed by summing the responses on the 22 items (range 0–88). Higher scores reflected more severe symptoms. The IES-R is considered a psychometrically sound measure for clinical and research purposes (Beck *et al.*, 2008). The reliability in this study was excellent (Cronbach's $\alpha = .93$).

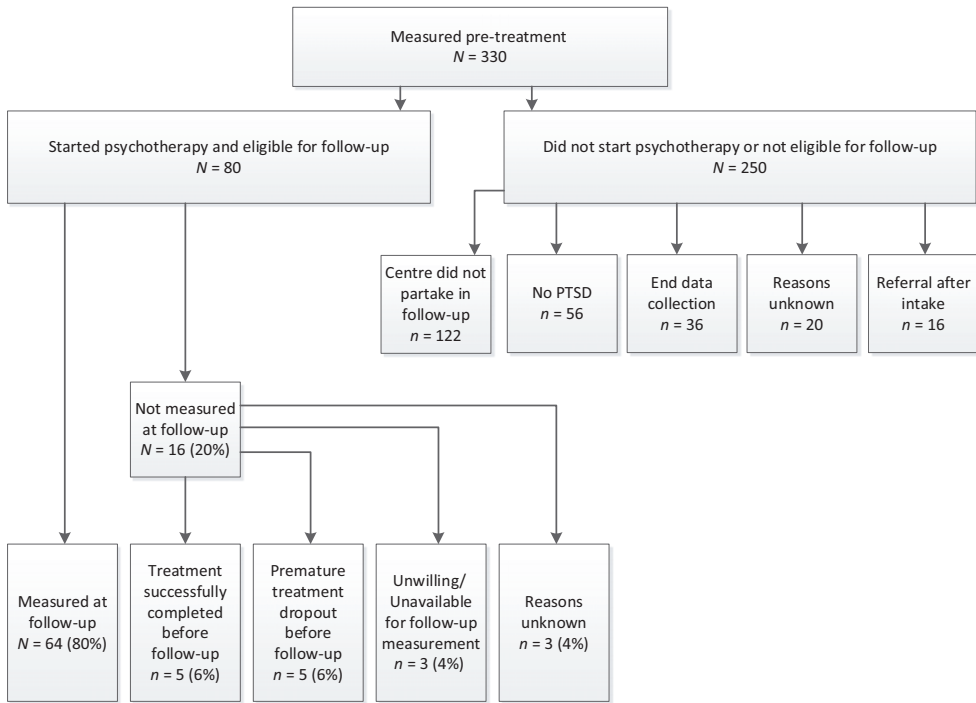


Figure 1. Flow chart.

The Dutch version of the Dissociative Experiences Scale-II (DES-II; Bernstein & Putnam, 1986; Boon & Draijer, 1995) assessed the level of psychoform dissociation. Respondents reported the frequency of experienced dissociative symptoms. Factor analytic studies indicated a three-factor structure including amnesia, absorption, and depersonalization/derealization (Stockdale *et al.*, 2002). Four pathological depersonalization/derealization items were used (DES-II 7, 12, 13, 27; ‘watching yourself’, ‘people/objects are unreal’, ‘your body is not yours’, ‘hearing voices’) that correspond with the DSM-5 definition of dissociative PTSD (Stockdale *et al.*, 2002; Waller *et al.*, 1996). Each item was rated on a 10-point scale ranging from 0% (*never*) to 100% (*always*). The questionnaire is considered reliable and valid (Van IJzendoorn & Schuengel, 1996).

Predictors (covariates) of latent subtype membership

Age, somatoform dissociation, a comorbid substance or depression diagnosis, the three PTSD DSM-IV-TR dimensions (intrusions, avoidance, and hyperarousal), and eight psychopathology severity dimensions were used to predict profile membership.

The Symptom Checklist-90-Revised (SCL-90-R; Arrindell & Ettema, 2003) self-report questionnaire was used to measure eight psychopathology dimensions (i.e., agoraphobia, anxiety, depression, somatization, cognitive performance deficits, interpersonal sensitivity-mistrust, hostility, and sleep difficulties) and provides a measure of overall psychological distress. Patients are asked to rate the severity of 90 symptoms over the past week on a 5-point scale ranging from 0 (*not at all*) to 4 (*extremely*). Sum scores were used, with higher scores indicating more distress. The SCL-90-R is well established as a

Table 1. Demographic and clinical data of the baseline ($n = 330-208$) and follow-up ($n = 64$) samples

Characteristics	Baseline measures		Baseline sample		Follow-up sample		χ^2	df	p
	n	n (%)	n (%)	n (%)					
Demographics									
Age, Mean (SD)	325	39.5 (9.2)	39.8 (10.1)						
Gender	330	320 (97.0)	62 (96.9)						
Educational level	Lower Education	276	118 (42.7)	29 (45.4)					
	Higher Education	276	126 (45.7)	26 (40.6)					
Marital status	Higher Vocational/Academic	276	32 (9.7)	8 (12.5)					
	Married/Cohabiting	301	204 (67.8)	47 (73.5)					
	Single	301	50 (16.6)	13 (20.3)					
Employment status	Divorced/Widow	301	42 (20.0)	3 (4.7)					
	Employed	265	126 (47.5)	31 (48.5)					
	Disabled	265	93 (35.1)	25 (39.1)					
	Unemployed	265	33 (12.5)	8 (12.5)					
	Other	265	13 (5.0)	0 (0.0)					
Treatment centre	Foundation Centre '45	330	82 (24.8)	42 (65.6)					
	Military Mental Health Care Utrecht	330	68 (20.6)	14 (21.9)					
	Psychotrauma Centre Zuid-Nederland	330	58 (17.6)	8 (12.5)					
	Trauma Centre Mental Health Care Drenthe	330	122 (37.0)	0 (0.0)			14.8	1	.00
Diagnosis	PTSD	325	262 (80.6)	64 (100.0)					
	Major depressive disorder	208	79 (38.0%)	26 (40.6)					
	Substance use disorder	208	54 (26.0%)	15 (23.4)					
Characteristics									
	n	M (SD)	M (SD)	t	df				
Questionnaires									
PTSD	275	52.8 (17.3)	58.8 (12.7)	3.2	337				.002
Psychoform dissociation	329	24.5 (15.0)	27.9 (17.6)						
Somatoform dissociation	327	28.9 (7.6)	29.6 (8.8)						
Avoidant coping	327	18.0 (3.9)	18.56 (3.8)						

Continued

Table 1. (Continued)

Characteristics	n	M (SD)	M (SD)	t	df	p
Agoraphobia	328	17.6 (7.2)	19.0 (7.2)			
Anxiety	328	27.8 (8.6)	29.5 (8.1)			
Depression	327	45.6 (12.5)	49.9 (12.0)	2.5	389	.02
Somatization	327	28.9 (9.7)	31.1 (9.6)			
Cognitive performance deficits	328	26.6 (7.2)	29.1 (7.7)	2.4	390	.02
Interpersonal sensitivity	327	44.0 (13.8)	45.7 (13.5)			
Hostility	328	16.0 (5.8)	17.8 (5.9)	2.2	390	.03
Sleep difficulties	327	10.9 (3.3)	11.4 (2.8)			
Total pathology score	327	236.7 (60.1)	254.9 (59.5)	2.2	389	.03

Table 2. Model fit comparisons for the one-, two-, three-, four-, five-, and six-profile solution

Profiles	Entropy	BIC	aBIC	Log-likelihood	BLRT	
					–2LL difference	p-value
2	0.83	19528.7	19278.1	–9535.3	1849.3	<.001
3	0.83	19084.1	18747.8	–9234.7	601.3	<.001
4	0.86	18723.2	18301.4	–8976.0	514.1	.02
5	0.89	18687.5	18179.9	–8976.0	191.1	.80
6	0.90	18686.7	18093.6	–8801.1	156.3	.37

Notes. Most optimal model is printed in bold. BIC = Bayesian information criterion; aBIC = sample size-adjusted Bayesian information criterion; BLRT = bootstrapped likelihood ratio test; –2LL difference = –2 times log-likelihood difference between a N profile solution and $N - 1$ profile solution.

* $p < .001$.

reliable and valid instrument (Arrindell & Ettema, 2003). The reliability ranged from good to excellent in this study (Cronbach's $\alpha = .75-.97$).

The Dutch version of the Somatoform Dissociation Questionnaire-20 (SDQ-20; Nijenhuis, Spinhoven, Van Dyck, Van Der Hart, & Vanderlinden, 1996) assessed the level of somatoform dissociation in the past year on a 20-item list. Bodily dissociative symptoms included anaesthesia, difficulty swallowing, and temporary paralysis. Each item was rated on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*extremely*). The sum score was used in the analysis (range 20–100). Higher scores indicated more severe symptoms. The SDQ-20 has good psychometric qualities (Nijenhuis *et al.*, 1996), and the reliability was considered good in this study (Cronbach's $\alpha = .82$).

The Utrecht Coping List (UCL; Schreurs, Van de Willige, Brosschot, Tellegen, & Graus, 1993) is a frequently used Dutch self-report questionnaire to measure different coping styles when confronted with stressful or unpleasant situations. The scale consists of 47-items rated on a 4-point Likert scale ranging from 1 (*rarely or never*) to 5 (*very often*). The instrument has good psychometric qualities (Schreurs *et al.*, 1993). Only the avoidance subscale (eight items) sum score (range 8–32) was used. The avoidant coping subscale measures the extent in which one uses avoidance to deal with stressful situations. Higher scores reflect an increased use of avoidant coping strategies. The reliability was considered acceptable for this study (Cronbach's $\alpha = .65$).

Analyses

Demographic and completer analyses

Cross-tabs (chi-square) and t -tests were performed in SPSS version 20 (IBM, Atlanta, GA, USA) to examine differences between the total sample and psychotherapy baseline sample, and between treatment completers and treatment dropouts.

Latent profile analysis

Latent profile analysis (LPA; Muthén & Muthén, 1998–2012) was used to assess the presence of distinct patient profiles in Mplus 7.3 (Muthén & Muthén, Los Angeles, CA, USA) based on post-traumatic stress and dissociative symptoms. LPA allows for the classification of individuals into homogenous subgroups or profiles (Geiser, 2013). The

technique is considered ideal for investigating dissociative PTSD because it can account for the heterogeneity in symptom presentations that can manifest in specific symptom constellations and severities (Hansen *et al.*, 2017). The IES-R and DES scores were transformed into a single z-scale to simplify the LPA interpretation.

Based on the number of previously identified dissociative PTSD profiles, a series of five models with two- to six-profile solutions were estimated using the robust maximum likelihood estimator with full information maximum likelihood estimation to include participants with missing data (Muthén & Muthén, 1998–2012). To avoid local likelihood maxima, 500 random sets of starting values in the first and 50 in the second step of optimization were requested and 50 initial stage iterations were used. To compare models with different profile solutions Bayesian Information Criterion (BIC), sample size-adjusted Bayesian Information Criterion (aBIC), and the bootstrapped likelihood ratio test (BLRT) were used. BIC and aBIC make a trade-off between model fit and model complexity with lower values of BIC and aBIC indicating a better fit of the model to the data (Van de Schoot, Lugtig, & Hox, 2012). BLRT compares the fit of a model with the fit of a model with one profile less. A significant BLRT demonstrates that the model fits the data better than the model with one profile less (Nylund, Asparouhov, & Muthén, 2007). The entropy index was used to evaluate the quality of patient classifications to the profiles. Values range between 0 and 1 and values above .80 indicate adequate classification quality (Celeux & Soromenho, 1996). The optimal model was chosen based on the above-mentioned statistics, clarity of interpretation, and model parsimony (Geiser, 2013).

Next, profile membership was predicted by regressing the latent profiles of the most optimal latent profile solution on the observed predictor variables using multinomial logistic regression in a three-step procedure in Mplus (Asparouhov & Muthén, 2014). The resulting odds ratios were compared between profiles with one of the profiles acting as reference.

To test whether profile membership is associated with different treatment outcomes, post-traumatic stress symptom improvement was explored as a continuous distal outcome of the latent profiles of the most optimal latent profile solution. Change scores were computed by subtracting the follow-up scores from the baseline severity scores. Change scores deliver acceptable and corresponding results to alternative regression methods in naturalistic study settings (Williams & Zimmerman, 1996). For the distal outcome analysis, again, a three-step procedure in Mplus was performed (Asparouhov & Muthén, 2014). A Wald chi-squared test for every pair of identified profiles tested whether their profile-specific probabilities differed significantly in symptom change.

Results

Baseline and completer analyses

Veterans that received psychotherapy reported somewhat elevated levels compared to the total baseline sample regarding post-traumatic stress severity, depression, cognitive performance deficits, hostility, and overall SCL-90-R pathology (Table 1). Veterans that started psychotherapy and completed the follow-up measure were considered study completers. Veterans that started psychotherapy but withdrew before follow-up without achieving therapeutic recovery according to their clinician were considered premature dropouts. Veterans that successfully completed treatment before follow-up with their diagnosis or symptoms in remission according to their clinician were considered successful treatment completers. Study completers reported lower post-traumatic stress

severity rates than dropouts, $M = 56.4, SD = 15.2$ vs. $M = 70.2, SD = 7.4; t(81) = -2.01, p = .049$, and higher severity rates than successful treatment completers, $M = 56.4, SD = 15.2$ vs. $M = 42.0, SD = 19.3; t(81) = 2.02, p = .049$. There were no significant differences in pre-treatment post-traumatic reactions severity between study completers and patients unwilling or unavailable to participate and patients who did not receive a follow-up measurement due to the end of data collection ($p > .05$).

Latent profile analysis

Table 2 provides the fit indices for each profile solution. The BIC and BLRT are considered superior to aBIC (Nylund *et al.*, 2007). The two-, three-, and four-profile solutions yielded significant BLRT tests, indicating that the four-profile solution provided the best fit. The BIC was lowest in the five-profile solution, indicating the superiority of this model. The five-profile solution closely mirrored the four-profile solution, but contained a class consisting of only 6.7% of the sample, limiting its clinical relevance. The four-profile model was consequently selected as the optimal model based on the fit statistics, profile prevalence rates, and clarity of interpretation. The entropy index was satisfactory (.86), and average profile assignment probabilities supported a high entropy precision: .98 for the first, .96 second, .85 third, and 1.0 fourth profile.

Figure 2 provides a graphic overview of the standardized profile mean scores on the indicators of the latent subtype membership. The z-scores reveal incremental post-traumatic stress severity scores per profile (profiles 1–4 $M z\text{-score} = -1.26, -.35, .46, .59$). The third and fourth profiles both reported indistinguishably severe levels of post-traumatic stress. The fourth profile was the only profile to report severe dissociative symptom levels ($M z\text{-score} = 1.82$). None of the other profiles scored high on dissociative

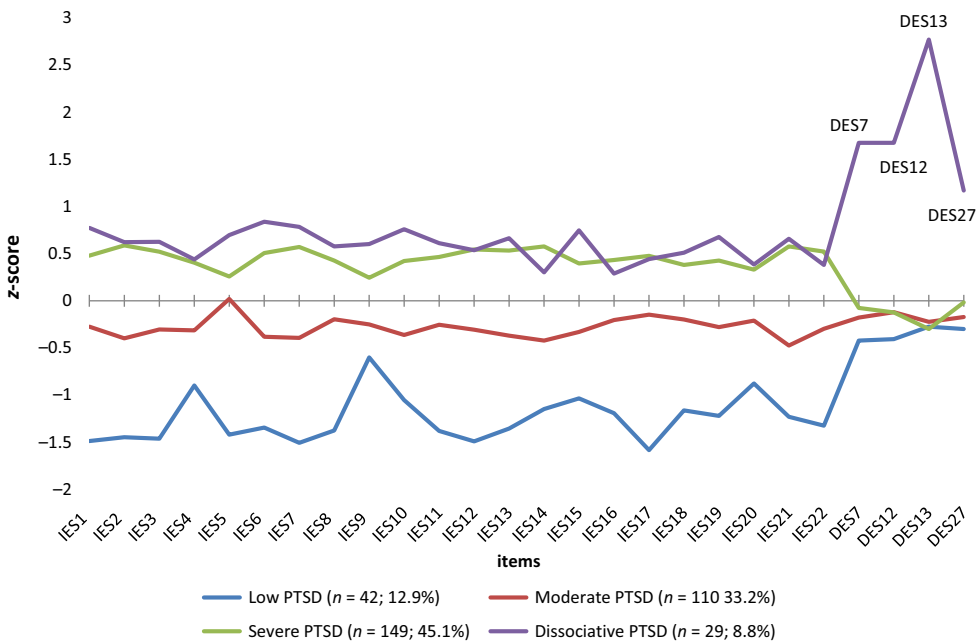


Figure 2. Standardized profile means on PTSD (IES-R) and dissociation (DES) indicators. [Colour figure can be viewed at wileyonlinelibrary.com]

symptom severity (profiles 1–3 *M z*-score = $-.35, -.17, -.13$). Consequently, the four profiles can be characterized as ‘low’ ($n = 42, 12.9\%$), ‘moderate’ ($n = 110, 33.2\%$), ‘severe’ ($n = 149, 45.1\%$), and ‘dissociative’ ($n = 29, 8.8\%$) PTSD. The unstandardized mean scores for each item are displayed in Table 3.

Predictors of profile membership

Multinomial regression analyses identifying profile membership predictors are presented in Table 4. The severe PTSD profile was selected as the reference profile because the severe and dissociative profiles did not differentiate in post-traumatic severity levels, facilitating the interpretation of the analyses between dissociative and non-dissociative PTSD patients.

Participants with low and moderate PTSD profiles reported significantly lower log odds on all PTSD and pathology dimensions, somatoform dissociation scores, and having a formal PTSD diagnosis. The low and moderate profiles only distinguished themselves from

Table 3. Differences between PTSD profiles on latent profile analysis indicators

Profile Indicators	Low PTSD <i>n</i> = 42 (12.9%)	Moderate PTSD <i>n</i> = 110 (33.2%)	Severe PTSD <i>n</i> = 149 (45.1%)	Dissociative PTSD <i>n</i> = 29 (8.8%)
<i>IES-R items (M, SE)</i>				
1 Brought back feelings	0.85 (.17)	2.2 (.10)	3.0 (.07)	3.3 (.15)
2 Difficulty staying asleep	0.52 (.17)	1.9 (.13)	3.2 (.08)	3.3 (.20)
3 Thinking of the trauma	0.77 (.20)	2.0 (.09)	2.9 (.07)	3.0 (.22)
4 Irritability and anger	1.6 (.20)	2.3 (.10)	3.0 (.09)	3.1 (.21)
5 Avoid getting upset	0.52 (.16)	2.2 (.11)	2.4 (.08)	2.9 (.27)
6 Strong feelings	0.87 (.17)	1.9 (.09)	2.9 (.08)	3.2 (.15)
7 Intrusive thoughts	0.93 (.16)	2.2 (.11)	3.3 (.06)	3.5 (.14)
8 Remove from memory	0.64 (.18)	2.2 (.16)	3.1 (.08)	3.3 (.22)
9 Surrealistic feeling	0.39 (.14)	0.85 (.12)	1.5 (.13)	2.0 (.31)
10 Easily startled	1.3 (.21)	2.1 (.11)	3.0 (.09)	3.4 (.17)
11 Avoid reminders	0.36 (.12)	1.9 (.15)	2.9 (.09)	3.1 (.28)
12 Physical reactions	0.61 (.18)	2.1 (.12)	3.2 (.09)	3.2 (.21)
13 Pictures in mind	1.0 (.19)	2.2 (.11)	3.2 (.07)	3.3 (.19)
14 Dreams	0.70 (.21)	1.7 (.13)	3.1 (.10)	2.7 (.30)
15 Trouble concentrating	1.7 (.20)	2.5 (.13)	3.3 (.08)	3.7 (.10)
16 Watchful and on-guard	2.1 (.18)	3.0 (.11)	3.6 (.06)	3.5 (.15)
17 Avoid thinking about it	0.66 (.15)	2.3 (.12)	3.0 (.07)	2.9 (.17)
18 Avoid dealing with it	0.61 (.17)	1.8 (.13)	2.5 (.10)	2.6 (.18)
19 Avoid talking about it	0.88 (.16)	2.2 (.17)	3.1 (.09)	3.5 (.20)
20 Numb feeling	0.70 (.19)	1.6 (.15)	2.4 (.12)	2.5 (.30)
21 Back at that time	0.33 (.10)	1.3 (.13)	2.7 (.09)	2.8 (.28)
22 Trouble sleeping	1.4 (.24)	2.6 (.14)	3.7 (.06)	3.5 (.21)
<i>DES-II items (M, SE)</i>				
7 Watching yourself	0.60 (.26)	1.2 (.22)	1.4 (.18)	5.7 (.53)
12 People/objects are unreal	0.27 (.16)	0.91 (.20)	0.90 (.18)	4.9 (.49)
13 Your body is not yours	0.32 (.18)	0.42 (.09)	0.27 (.07)	6.1 (.35)
27 Hearing voices	0.44 (.19)	0.73 (.17)	1.1 (.19)	3.8 (.66)

Note. IES-R = Impact of Events-Revised; DES-II = Dissociative Experiences Scale-II.

Table 4. Multinomial regression analyses of IES-R and DES profiles on age, PTSD symptom dimensions, clinical characteristics, and avoidant coping

	Low PTSD n = 42 (12.9%)				Moderate PTSD n = 110 (33.2%)				Dissociative PTSD n = 29 (8.8%)			
	B	SE	CI(B)	OR	B	SE	CI(B)	OR	B	SE	CI(B)	OR
	Demographics	.00	.02	[-.04 to .04]	1.00	-.01	.02	[-.04 to .03]	.99	-.01	.02	[-.05 to .03]
PTSD dimensions												
Intrusions	-1.60***	.28	[-2.14 to -1.05]	.20	-.82***	.18	[-1.16 to -.47]	.44	.07	.09	[-.10 to .24]	1.07
Avoidance	-.86***	.12	[-1.09 to -.63]	.42	-.36***	.07	[-.49 to -.23]	.70	.08	.07	[-.06 to .22]	1.08
Arousal	-1.33***	.17	[-1.67 to -.99]	.26	-.83***	.15	[-1.11 to -.54]	.44	.02	.12	[-.22 to .25]	1.02
Clinical characteristics												
Agoraphobia	-.45***	.08	[-.61 to -.29]	.64	-.14***	.03	[-.20 to -.08]	.87	.07*	.03	[.01 to .13]	1.07
Anxiety	-.32***	.05	[-.42 to -.23]	.72	-.18***	.03	[-.24 to -.11]	.83	.07*	.03	[.02 to .12]	1.07
Depression	-.17***	.03	[-.22 to -.11]	.84	-.07***	.02	[-.10 to -.04]	.93	.06**	.02	[.02 to .10]	1.06
Somatization	-.20***	.04	[-.28 to -.12]	.82	-.07***	.02	[-.10 to -.03]	.94	.07**	.02	[.02 to .11]	1.07
Cognitive perf. deficits	-.26***	.05	[-.36 to -.16]	.77	-.14***	.03	[-.19 to -.08]	.87	.12**	.04	[.05 to .20]	1.13
Interpersonal sensitivity	-.13***	.03	[-.18 to -.09]	.87	-.06***	.02	[-.09 to -.03]	.94	.07***	.02	[.03 to .10]	1.07
Hostility	-.25***	.07	[-.38 to -.12]	.78	-.13***	.03	[-.19 to -.07]	.87	.08*	.04	[.008 to .16]	1.09
Sleep difficulties	-.64***	.11	[-.85 to -.43]	.53	-.38***	.07	[-.52 to -.23]	.69	-.08	.10	[-.161 to 1.45]	.92
Total pathology score	-.06***	.01	[-.07 to -.04]	.94	-.02***	.01	[-.03 to -.01]	.98	.02***	.004	[.01 to .03]	1.02
Somatiform Dissociation	-.30***	.08	[-.46 to -.14]	.74	-.10***	.03	[-.15 to -.04]	.91	.10***	.02	[.05 to .14]	1.10
Avoidant coping	-.12*	.05	[-.06 to -.18]	.87	-.03	.04	[-.11 to .05]	.97	.10	.06	[-.02 to .21]	1.10
Diagnoses												
PTSD	-2.20***	.63	[-3.42 to -.97]	.11	-1.84**	.58	[-2.98 to -.71]	.16	-.56	.78	[-2.1 to .96]	.57
Substance	-1.35	.88	[-3.06 to .37]	.26	.39	.43	[-.46 to 1.24]	1.48	.06	.59	[-1.10 to 1.22]	1.06
Depression	-.17	.53	[-1.21 to .88]	.85	-.05	.40	[-.83 to .74]	.96	.15	.53	[-.89 to 1.18]	1.17

Notes. Severe PTSD acted as the reference group (n = 145). Values in bold were statistically significant.

*p < .05; **p < .01; ***p < .001.

each other in respect to the use of avoidant coping strategies. The odds of belonging to the low PTSD profile decreased by 13% for each unit of increase in avoidant coping. In contrast, there were no differences in the use of avoidant coping strategies between the moderate PTSD and reference profile.

Compared to participants from the reference profile, participants in the dissociative PTSD profile reported significantly higher log odds on somatoform dissociation and all SCL-90-R pathology dimensions with the exception of sleep difficulties. The likelihood of belonging to the dissociative PTSD profile increased with each unit of increase on these predictors (odds ratio's 1.02–1.13). Each unit of increase in somatoform dissociation increased the likelihood of belonging to the dissociative PTSD profile instead of the reference profile with 10%. There were no differences in the odds of belonging to the dissociative PTSD profile or reference profile regarding the severity of PTSD dimension scores and avoidant coping strategies. Age, comorbid depression, and substance disorder did not differentiate for any profile compared to the reference profile.

Post-traumatic reactions symptom severity change scores as distal outcome

We performed an exploratory distal outcome analysis based on the LPA four-profile model. The profile membership distribution for the total sample and the psychotherapy sample demonstrated comparable proportions for the moderate PTSD profile (33.2% vs. 34.8%) and the severe PTSD profile (45.1% vs. 46.6%). The low PTSD profile was somewhat under-represented (12.9% vs. 8.0%), and the dissociative PTSD profile slightly over-represented (8.8% vs. 10.6%).

Between baseline ($M = 58.8$, $SD = 12.7$) and follow-up ($M = 52.7$, $SD = 20.2$), post-traumatic stress reactions severity (IES-R) scores decreased on average 6.1 points, corresponding to a small to medium treatment effect ($d = .36$). The moderate ($n = 26$), severe ($n = 35$), and dissociative PTSD ($n = 8$) profiles each experienced IES-R symptom improvement. The moderate PTSD profile reported a small positive treatment effect ($d = .10$) and mean IES-R symptom reduction of 2.9 ($SD = 30.5$) points. The severe PTSD profile reported a symptom reduction of 8.6 ($SD = 26.0$) points, corresponding with a small to medium positive treatment effect ($d = .33$). The dissociative PTSD profile demonstrated a symptom reduction of 8.2 ($SD = 11.9$) points, corresponding to a medium to strong positive treatment effect ($d = .69$). The low PTSD treatment profile experienced an increase in symptom severity of 19.7 points ($SD = 18.9$) and large negative treatment effect ($d = -1.0$). The low PTSD profile performed worse compared to the moderate ($\chi^2 = 5.3$, $p = .02$), the severe ($\chi^2 = 10.8$, $p = .001$), and the dissociative PTSD profile ($\chi^2 = 10.2$, $p = .001$). The other profiles did not significantly differentiate from each in post-traumatic stress symptom improvement.

Discussion

The present study identified a subsample of predominately male veterans that corresponded robustly with the criteria of the dissociative PTSD subtype. Patients in the dissociative PTSD profile displayed severe levels of dissociative and post-traumatic symptoms. Compared to patients with non-dissociative PTSD, patients belonging to the dissociative PTSD profile reported significantly more agoraphobia, anxiety, depression, somatization, cognitive performance deficits, interpersonal sensitivity, hostility and somatoform dissociation. Patients in the dissociative PTSD profile did not differentiate

from non-dissociative patients with comparable post-traumatic stress severities in terms of age, the use of avoidant coping strategies, presence of a comorbid depression, substance disorder, and sleep difficulties. Patients with dissociative PTSD demonstrated the largest psychotherapy treatment effect size, although the effect was not statistically different from the moderate and severe PTSD profiles.

The present study replicated earlier findings of a dissociative PTSD subgroup in veterans with PTSD (Armour, Karstoft, *et al.*, 2014; Tsai *et al.*, 2015; Waelde *et al.*, 2005; Wolf, Lunney, *et al.*, 2012; Wolf, Miller, *et al.*, 2012). We identified four distinct PTSD patient profiles, specifically: 'low', 'moderate', 'severe', and 'dissociative' PTSD. The dissociative PTSD profile was characterized by severe PTSD symptoms and – unlike the other profiles – severe dissociation symptoms.

The dissociative PTSD profile prevalence rate (8.8%) was comparable to that of trauma-exposed veterans from a national U.S. survey sample (Wolf *et al.*, 2015), but lower compared to the rates in prior veteran studies (12–16%) (Armour, Karstoft, *et al.*, 2014; Tsai *et al.*, 2015; Wolf, Miller, *et al.*, 2012), in particular compared with female veterans exposed to sexual assault that had a 30% dissociative PTSD prevalence rate (Wolf *et al.*, 2016). The lower rate is likely attributable to the inclusion of veterans with subthreshold PTSD symptomatology in the LPA.

The present findings support the subtype model for dissociative PTSD as elevated psychopathology levels for veterans in the dissociative PTSD profile compared to the non-dissociative profiles were found (Dalenberg & Carlson, 2012). Our results support prior findings of elevated depression and/or anxiety scores as regular predictors of dissociative PTSD (see Hansen *et al.*, 2017). The elevations on almost all pathology dimensions, except sleep disturbances, suggest that dissociative symptoms produce additional distress and pathology over a broad pathology spectrum.

A comorbid depression or substance use disorder was not related to a higher probability of belonging to any of the PTSD profiles, regardless of dissociation. This contrasts with the depression pathology dimension that predicted the increased likelihood of belonging to the dissociative PTSD profile. Continuous scales may be more sensitive than categorical scales because they capture the extent of the severity of these disorders, and their use preferred to better understand the heterogeneity in symptom manifestations of the dissociative PTSD subtype.

We found no differences in avoidant coping strategies between patients with dissociative PTSD and patients with non-dissociative PTSD with comparable post-traumatic stress severity. These findings implicate that conscious avoidant strategies are not specifically associated with the dissociative PTSD subtype and do not support the trauma/avoidance model of dissociation (Dutra & Wolf, 2017; Holmes *et al.*, 2005). It may be possible, however, that the present questionnaires (UCL and PTSD avoidance dimension) were insufficiently specific for veterans to associate them with cognitive swift attention switching and dual tasking avoidant coping strategies.

Armour, Elklit, *et al.* (2014) reported sleep disturbances as a predictor of membership to the dissociative PTSD subtype in female sexual-assault survivors. In our predominantly male sample, we did not find indications that sleep disturbances increase the likelihood of belonging to a dissociative PTSD profile. These discrepancies may be the result of neurobiological sex differences (Steiger, Dresler, Kluge, & Schüssler, 2013). Adverse changes in sleep quality, for example, rapid-eye-movement (REM) fragmentation, appear more pronounced in women than men, and the role of sex hormones and the menstrual cycle on PTSD-related sleep disturbances remains unknown (Kobayashi, Cowdin, & Mellman, 2012).

Our findings demonstrated that patients belonging to the dissociative PTSD profile benefitted alike from psychotherapy patients belonging to non-dissociative PTSD profiles with comparable PTSD severity levels. It would also appear that patients with the most severe post-traumatic stress have greater room to improve or their baseline scores may reflected an element of over-reporting when seeking help (Forbes, Creamer, Hawthorne, Allen, & McHugh, 2003). These findings imply that dissociation does not interfere with PTSD treatment (see also Halvorsen, Stenmark, Neuner, & Nordahl, 2014; Murphy & Busuttill, 2015) or that clinicians are able to successfully mitigate its adverse effects.

Only patients from the low PTSD profile did not profit from psychotherapy. This may be the result of regression to the mean, indicating that patients with lower scores are more likely to worsen than improve. Alternatively, despite their relatively low symptom scores, these patients were identified by clinicians to be in need of PTSD treatment. It is possible that they under-reported the severity of their symptoms due to social desirability (Dobie *et al.*, 2002), or fears of displaying weakness (Greene-Shortridge, Britt, & Castro, 2007).

Strengths and limitations

The scientific identification of clinical factors associated with dissociative PTSD subtype has just begun. Only a dozen of studies investigated the dissociative PTSD subtype over a range of populations using diverse and sometimes questionable analytic methods (Hansen *et al.*, 2017). Such varied approaches may cloud the identification of membership predictors. To our knowledge, the present findings are the first to investigate the dissociative PTSD subtype for veterans using the advanced statistical three-step approach to examine both profile membership predictors and distal outcomes (Asparouhov & Muthén, 2014). Furthermore, there were no in- or exclusion criteria for patient participation in this cohort study that reflected real-world clinical practice. This increases the generalizability of our findings to clinical practice.

There are also limitations. The DES is the most prominent measure of dissociation to date, but not without criticism (Wolf *et al.*, 2015). It is unclear whether the DES measures state dissociation or trauma-specific dissociation and whether the scale has sufficient temporal stability to warrant a reliable assignment of individuals to the dissociative PTSD subtype profile, which may indicate a potential low scale sensitivity (e.g., Watson, 2003). No structured interviews were used to the dissociative PTSD subtype. It is possible that the sample used for the exploratory distal outcome analysis differed from the total sample in respects that may have influenced treatment outcome, although we found few differences (see Table 1). Also, the exploratory distal treatment outcome data does not allow for strong inferences due to sample size limitations, unbalanced profiles, and because the treatment circumstances for each profile were unknown. The profiles may lack sufficient power to detect all profile differences. The current findings are considered relevant because of the practical difficulties to study sufficient treatment-seeking veterans with dissociative PTSD in psychotherapy, considering that few veterans fit the profile (Armour, Elklit, *et al.*, 2014; Armour, Karstoft, *et al.*, 2014; Tsai *et al.*, 2015; Wolf, Miller, *et al.*, 2012). Our study assessed only two measurement moments. Therefore, the assumption of sphericity could not be tested. The present study examined the first 6 months of treatment, not the full scope of psychotherapy. The day and inpatient treatment settings provided weekly sociotherapy and creative therapy sessions that were not examined in this study because of a focus on psychotherapy treatment as the most effective method for treating PTSD (Watts *et al.*, 2013). The current observational design is limited in establishing inferences regarding causal relationships (internal validity). The

dissociative PTSD subtype is meant to be associated with the DSM-5 PTSD and results are likely more precise in relation to the DSM-5, although the DSM-IV PTSD criteria are considered suitable to identify the subtype (Hansen *et al.*, 2017). The IES-R questionnaire does not assess all PTSD DSM-IV criteria, although it is considered a valid PTSD indication measure (Beck *et al.*, 2008).

Implications

The present findings confirmed the existence of a distinct subgroup of Dutch veterans with PTSD and highly dissociative symptoms that fit the description of the dissociative PTSD subtype. The identification of diffuse elevated pathology dimensions beyond non-dissociative PTSD profiles may indicate that a sole focus on PTSD may be too narrow and warrant additional clinical attention. PTSD treatment proved beneficial to veterans belonging to the dissociative PTSD profile. They demonstrated similar – if not stronger – post-traumatic stress improvement compared to non-dissociative veterans with similar and lower severity levels. These findings implicate that severe dissociation, though distinguishable in various pathology severity dimensions from non-dissociative PTSD, does not have a negative impact on veteran PTSD treatment. Or alternatively, that clinicians in specialist settings are well versed to circumvent potential adverse effects resulting from severe dissociation during PTSD treatment. This is a significant finding because researchers and clinicians (Becker *et al.*, 2004; Hansen *et al.*, 2017) tend to consider dissociation an indicator of poor PTSD treatment outcome, and treatment manuals continue to contemplate its possible adverse treatment effects (e.g., Briere & Scott, 2015). It also questions the clinical utility of the DSM-5 Dissociative PTSD subtype.

Although our findings question the clinical utility of the dissociative PTSD subtype, the existence of this subgroup and evidence of related neurological pathways and distinct emotional responses (Lanius, Brand, Vermetten, Frewen, & Spiegel, 2012) make it worthwhile to continue the investigation of dissociative symptoms in DSM-5. The ability to distinguish between (non-)dissociative patients may prove a boon as PTSD treatments become more tailored to specific subgroups. Future developments may lead to interventions that specifically enhance the effectiveness of treatment for either dissociative or non-dissociative patients. Should this occur, the inclusion of dissociation in diagnostic criteria provides an edge in improving PTSD patients' chances of recovery. This argument also applies to the development of the International Classification of Diseases-11 (ICD-11) that is proposing to scale back on the number of symptoms to diagnose PTSD and does not include dissociative phenomena (Hansen, Hyland, Armour, Shevlin, & Elklit, 2015).

Conclusion

The present study presents evidence of the existence of a subgroup of patients with PTSD and severe dissociative symptoms of depersonalization/derealization. Patients with dissociative PTSD profiles reported uniquely elevated pathology levels compared to patients with non-dissociative PTSD and similar post-traumatic severity levels. PTSD patients with dissociative symptoms also reported a large treatment effect size, comparable to the treatment effect size of patients with non-dissociative PTSD with similar post-traumatic severity levels. Further investigations are required to determine whether the subtype and its associated elevated pathology dimensions are a major tenant in treatment recovery or rather a chord that befuddles the symphony of complexity.

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