Journal of Anxiety Disorders 63 (2019) 18–25

Contents lists available at ScienceDirect

Journal of Anxiety Disorders

journal homepage: www.elsevier.com/locate/janxdis

Examining the nonresponse phenomenon: Factors associated with treatment response in a national sample of veterans undergoing residential PTSD treatment

Rebecca K. Sripada[a,b,*], Frederic C. Blow[a,b], Sheila A.M. Rauch[c,d], Dara Ganoczy[a], Rani Hoff[e,f,g], Ilan Harpaz-Rotem[e,f,g], Kipling M. Bohnert[a,b]

[a] Veterans Affairs Center for Clinical Management Research and Veterans Affairs Ann Arbor Health Care System, Ann Arbor, MI, United States
[b] University of Michigan, Department of Psychiatry, Ann Arbor, MI, United States
[c] Department of Psychiatry and Behavioral Sciences, Emory University, Atlanta, GA, United States
[d] Atlanta VA Medical Center, Atlanta, GA, United States
[e] Veterans Affairs Northeast Program Evaluation Center, West Haven, CT, United States
[f] Veterans Affairs National Center for PTSD, Veteran Affairs Connecticut Healthcare System, West Haven, CT, United States
[g] Yale University, Department of Psychiatry, New Haven, CT, United States

ARTICLE INFO

Keywords:
Posttraumatic stress disorder
VA
Residential
Department of Veterans Affairs
Psychotherapy

ABSTRACT

Objective: Although several treatments for PTSD have demonstrated efficacy, a substantial portion of patients do not experience clinically significant improvement. Predictors of treatment response are poorly understood. The current study was designed to investigate predictors of PTSD symptom change in a large national sample of treatment-seeking Veterans with PTSD.

Method: We analyzed predictors of treatment response among Veterans engaged in residential PTSD treatment from 2012 to 2013 (N = 2715). Multilevel modeling was used to assess the association between individual-level factors and symptom improvement from treatment entry to post-discharge. Guided by the theory of Resources, Life Events and Changes in Psychological States, we hypothesized that individuals with greater psychological, social/contextual, material, and physical health resources would exhibit better treatment response.

Results: In adjusted analyses, accounting for facility, factors that predicted better treatment response included female gender, more psychological and social/contextual protective factors, and more years of education. Factors that predicted worse treatment response included Black race, comorbid personality disorder, greater pain severity, and current application for disability-related compensation.

Conclusions: These findings highlight factors that place individuals at risk of poor treatment response. Treatment modifications may be needed in order to optimize response for subgroups who are less likely to benefit from residential PTSD treatment.

1. Introduction

Posttraumatic stress disorder (PTSD) is a psychiatric condition characterized by re-experiencing of traumatic events, avoidance, negative alterations in mood and cognition, and hyperarousal, and is associated with decreased quality of life (Pacella, Hruska, & Delahanty, 2013) and increased risk for suicide (Lemaire & Graham, 2011). Although several evidence-based treatments for PTSD have demonstrated efficacy (Cusack et al., 2016), recent estimates suggest that up to 50% of individuals with PTSD who engage in treatment fail to respond adequately (Resick et al., 2017). Individuals with persistent symptoms may continue to experience high levels of distress and impairment and utilize more healthcare services than individuals without PTSD (Cohen et al., 2010).

Treatment nonresponse in PTSD remains poorly characterized. Investigations of this topic are commonly based on secondary analyses of randomized trials that have utilized stringent exclusion criteria and, consequently, their findings may not generalize to the more complicated patients with PTSD who are typically treated by the Department of Veterans Affairs (VA). It is likely that the small sample sizes and relatively homogenous composition of these studies may also contribute to their inconsistent findings. For example, controlled trials may

* Corresponding author at: Center for Clinical Management Research, 2800 Plymouth Road, Bldg. 16, Floor 2, Ann Arbor, MI, 48109, United States.
E-mail address: rekaufma@med.umich.edu (R.K. Sripada).

https://doi.org/10.1016/j.janxdis.2019.02.001
Received 29 June 2018; Received in revised form 1 February 2019; Accepted 6 February 2019
Available online 07 February 2019
0887-6185/ Published by Elsevier Ltd.

exclude individuals who are likely to be poorly responsive to treatment (Humphreys, Blodgett, & Roberts, 2015; Taylor, Abramowitz, & McKay, 2012). As opposed to controlled trials, standard clinical care is often conducted with providers who have less time to devote to patient care and must treat a broader spectrum of patient presentations. Thus, outcomes of standard clinical care may vary substantially from the outcomes of clinical trials. In order to answer the critical question of what predicts poor treatment response in standard care, additional research using naturalistic datasets that include a broader range of severity and comorbidity is needed. The current study addresses this critical area by identifying predictors of poor treatment response in a large, national sample of individuals undergoing routine care at residential PTSD programs in VA.

1.1. Theoretical model: resources, life events and changes in psychological states

Our investigation of treatment response and nonresponse is informed by the theory of Resources, Life Events and Changes in Psychological States (Murrell & Norris, 1983). In this model, psychological, social, material, and physical health resources are theorized to buffer the effects of undesirable events and boost the effects of desirable events on psychological states (Murrell & Norris, 1983). For example, personal resources may buffer the effect of spousal loss on subsequent bereavement (Norris & Murrell, 1990) and reduce the likelihood of developing depression in older adulthood (Phifer & Murrell, 1986). The model also posits that changes in mental health symptoms are a function of the strength of personal resources, along with life events and global stress (Norris & Murrell, 1990). According to the model, strengthening personal resources can help improve mental health symptoms (Phifer & Murrell, 1986). Thus, this model identifies potential pathways for improving treatment response through targeting modifiable factors. Guided by this model and by previous literature, as described below, we identified potential determinants of treatment response in each of the model's domains: a) psychological resources and risk factors, b) social/contextual resources, c) material resources, and d) physical health resources. Below, we describe the hypothesized predictors of treatment response in each domain. Treatment response was conceptualized as symptom reduction over the course of treatment.

1.1.1. Psychological resources and risk factors

Psychological resources and risk factors that may impact treatment response include pretreatment symptom severity, trauma type, psychiatric comorbidity, and personality traits. Several studies suggest that higher pre-treatment symptom severity is associated with poorer treatment outcomes in trauma-focused treatment (Galovski et al., 2016; Mills et al., 2016; van Minnen, Arntz, & Keijsers, 2002), across treatment types (Schottenbauer, Glass, Arnkoff, Tendick, & Gray, 2008; Taylor, 2004), in outpatient treatment (Sripada et al., 2017), and in residential treatment (Currier, Holland, & Drescher, 2014). Type of trauma predicts treatment response in some previous research in this area. For example, one study found that the experience of childhood trauma predicted poorer treatment response (van Minnen et al., 2002), and several others found that degree of combat exposure predicted poorer treatment response (Currier et al., 2014; Zandberg et al., 2016) or PTSD symptom worsening over time (Steenkamp et al., 2017). Psychiatric comorbidities may also reduce treatment response. These include comorbid depression (Galovski et al., 2016; Schottenbauer et al., 2008; Sripada et al., 2017; Stein, Dickstein, Schuster, Litz, & Resick, 2012), suicidal ideation (Tarrier, Sommerfield, Pilgrim, & Faragher, 2000), anxiety (Allan, Gros, Myers, Korte, & Acierno, 2017; Belleau et al., 2017; Craighead & Dunlop, 2014; Lowe, Galea, Uddin, & Koenen, 2014; Schottenbauer et al., 2008; Zandberg et al., 2016), and comorbid substance use disorder (Currier et al., 2014; Manhapra, Stefanovics, & Rosenheck, 2015; Zandberg et al., 2016). Personality traits that may also be associated with poorer treatment response include anger (Lloyd et al., 2013; Schottenbauer et al., 2008; van Minnen et al., 2002), violence perpetration (Coker, Stefanovics, & Rosenheck, 2016), and personality disorders (Feeny, Zoellner, & Foa, 2002; Galovski et al., 2016; Schottenbauer et al., 2008). Thus, there is evidence to suggest that a variety of mental health factors may relate to PTSD treatment response.

1.1.2. Social and contextual resources

Social and contextual resources may contribute to better treatment response. These factors include employment (Rossom et al., 2016; Walter, Varkovitzky, Owens, Lewis, & Chard, 2014), greater social support (Price, Gros, Strachan, Ruggiero, & Acierno, 2013; Steenkamp et al., 2017; Tarrier et al., 2000; Taylor et al., 2012), and fewer interpersonal problems (Thormahlen, Weinryb, Noren, Vinnars, & Bagedahl-Strindlund, 2003). Other social/contextual resources of import include years of education and disability compensation status. Greater educational attainment is generally associated with better treatment response (Craighead & Dunlop, 2014; Steenkamp et al., 2017) though not in all studies (Walter et al., 2014), and disability-related compensation has been associated with worse treatment response (Belsher, Tiet, Garvert, & Rosen, 2012; Crawford et al., 2017; Goodson, Helstrom, Marino, & Smith, 2017; Walter et al., 2014). Duration of treatment is another contextual factor that may be associated with better treatment response. For example, longer length of stay in VA residential programs is associated with better substance use outcomes in dually diagnosed patients (Coker et al., 2016).

1.1.3. Material resources

Material resources include systems-level factors that pertain to treatment response. In our model of residential treatment-related resources, material resources consisted of site-level characteristics such as availability of evidence-based treatments including Cognitive Processing Therapy (CPT) and Prolonged Exposure Therapy (PE), staffing ratio, and average length of stay. We did not directly test these characteristics in the current study. However, all models took into account clustering at the facility level.

1.1.4. Physical health resources

Physical health resources may also play an important role in treatment response. Preliminary evidence suggests that better overall physical health is related to greater mental health treatment response in individuals with PTSD (Currier et al., 2014; Sofko, Currier, & Drescher, 2016) and depression (Craighead & Dunlop, 2014; Iosifescu et al., 2003; Rossom et al., 2016). Furthermore, greater pain severity may predict worse mental health treatment response (Bartoszek, Hannan, Kamm, Pamp, & Maieritsch, 2017).

1.1.5. Demographic characteristics

Previous studies have identified several demographic characteristics that are potentially related to better treatment response. These include older age (Alvarez et al., 2011; Maguen et al., 2014; Sripada et al., 2017), female sex (Bekes, Beaulieu-Prevost, Guay, Belleville, & Marchand, 2016; Campbell, Loeffler, Pulos, & Campbell, 2016; Eftekhari et al., 2013; Maguen et al., 2014; Sripada et al., 2017; Wade et al., 2016; Walter et al., 2014), white race (Maguen et al., 2014; Sripada et al., 2017; Steenkamp et al., 2017), and non-Hispanic ethnicity (Sripada et al., 2017; Walter et al., 2014). These characteristics were also assessed in the current study.

1.2. Current study

To overcome the limitations of prior research, our study encompassed a large sample of patients undergoing PTSD treatment, and included PTSD outcomes measurement. To our knowledge, this is the first study of PTSD treatment response to use a national sample. In addition, the majority of previous studies have been conducted with

outpatient samples. Little research has been conducted with individuals in residential treatment, who have higher rates of psychiatric comorbidities, medical conditions, unemployment, and disability (VA, 2013). To this end, we analyzed data from all patients entering VA residential treatment for PTSD in Fiscal Years 2012-2013. The VA has approximately 40 residential rehabilitation treatment programs (RRTPs) for PTSD located throughout the country. Although VA specialized treatment for PTSD occurs primarily in outpatient programs, RRTPs are available for those needing more intense and closely monitored care (VA, 2010). The VA Northeast Program Evaluation Center (NEPEC) collects detailed information from RRTPs regarding program structure and individual patient treatment outcomes. Using this data source, the current study was designed to investigate the predictors of PTSD symptom change in Veterans undergoing PTSD treatment. We assessed the association between the factors described above and symptom improvement between treatment entry and post-discharge. Multilevel modeling was used to address factors that were hypothesized to be associated with treatment response. Guided by our theoretical model, we hypothesized that individuals with more psychological, social/contextual, and physical health resources would exhibit greater treatment response, and conversely, that individuals with fewer resources would exhibit poorer treatment response.

2. Material and methods

2.1. Participants

Between Fiscal Year (FY) 2012 and 2013, a total of 4822 RRTP participants completed a PTSD symptom checklist at treatment entry. Approximately four months following treatment discharge, Veterans were mailed follow-up measures including the PTSD symptom checklist and asked to complete them. A total of 2715 Veterans completed these follow-up measures. About 20% were under the age of 35, 93% were male, 65% were White, and 38% served in the Global War on Terror (GWOT). For patients with more than one episode of care during the two-year period, we examined the first episode of care for which the patient completed both PTSD symptom checklist assessments. Across facilities, the average length of stay in FY13 was 45 days. In regard to treatment offerings, 87% of programs offered CPT and 87% offered PE. However, across programs, only 53% of patients received CPT and 13% received PE. RRTPs offered several additional types of psychotherapy. For example, 31% of programs offered Eye Movement Desensitization and Reprocessing, 87% offered non-specific cognitive behavioral therapy, 77% offered cognitive behavioral therapy for insomnia, and 51% offered cognitive behavioral therapy for pain.

2.2. Data cleaning

In our sample, 44% of the original sample of 4822 patients did not complete the post-discharge survey. Thus, in order to reduce nonresponse bias, we weighted participants for nonresponse to the post-discharge assessment (Rubin & Little, 2002). We used logistic regression with completion of the post-discharge survey as the outcome variable and each of the individual-level independent variables included as covariates. We saved the predicted probability for each case and included it in the dataset. The weight was the inverse of this predicted probability.

2.3. Data source

NEPEC provided data from intake surveys (clinician and patient-rated) and 4-month post-discharge surveys (patient-rated). The VA Ann Arbor Healthcare System Institutional Review Board approved this study and granted a waiver of informed consent for access to protected health information.

2.4. Dependent variables

PTSD symptoms were measured using the posttraumatic stress disorder checklist (PCL), a 17-item self-report measure of PTSD symptoms based on DSM-IV criteria (Weathers, Litz, Herman, Huska, & Keane, 1993). Scores range from 17-85. A score of 50 or above has often been used to indicate a high probability of a clinical diagnosis of PTSD (Weathers et al., 1993). The PCL has excellent psychometric properties, including high internal consistency, good test–retest reliability, and strong convergent and divergent validity (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Ruggiero, Del Ben, Scotti, & Rabalais, 2003). PCLs were embedded in the intake and post-discharge surveys. The two dependent variables were PCL change score (with higher values indicating greater improvement in symptoms) and clinically significant improvement, using a dichotomous variable denoting presence or absence of a reduction of at least 10 points on the PCL (Monson et al., 2008).

2.5. Independent variables

Independent variables were derived from the literature and guided by the theory of Resources, Life Events and Changes in Psychological States (Murrell & Norris, 1983). Variables were subdivided by category: psychological, social/contextual, and physical health resources. We also included several demographic characteristics in the analyses. All independent variables were assessed at intake.

2.5.1. Demographic characteristics

Demographic characteristics included age, sex, race (White, Black, American Indian/Alaskan, Asian/Pacific Islander, or Other/Unknown), ethnicity (Hispanic or not Hispanic) and combat era. Combat era designations included Vietnam War era, Post-Vietnam/Gulf War era, and Global War on Terror (GWOT).

2.5.2. Psychological resources and risk factors

Psychological resources and risk factors included PTSD severity at intake, non-combat trauma type, psychiatric comorbidity, and personality traits. PTSD severity was assessed via the PCL. Non-combat trauma type was categorized as military sexual trauma, non-military sexual trauma, other non-combat trauma, or no non-combat trauma. Psychiatric comorbidity was categorized as the presence or absence of a clinician-rated affective disorder, anxiety disorder, alcohol or substance use disorder, serious mental illness that needed to be actively addressed during treatment, or a suicide attempt within the past four months. These variables were obtained from clinician-rated surveys. Alcohol and substance use were also measured via the Use Subscale of the Brief Addiction Monitor (Cacciola et al., 2013), which has acceptable test–retest reliability, convergent and divergent validity (Cacciola et al., 2013; Nelson, Young, & Chapman, 2014). Personality traits included clinician-rated personality disorder diagnosis and violence score, a four-item scale from the National Vietnam Veterans Readjustment Study (Kulka et al., 1988).

2.5.3. Social contextual resources

Social contextual resources were primarily assessed through the Protective Factors Subscale and Risk Factors Subscale of the Brief Addiction Monitor (Cacciola et al., 2013). These subscales tally factors that have been previously linked to PTSD treatment response. The Protective Factors Subscale consists of items assessing self-efficacy, self-help behaviors, religion/spirituality, work/school participation, adequate income, and sober support. The Risk Factors Subscale consists of items assessing physical problems, sleep, mood, cravings, proximity to risky situations, and family/social problems. We also assessed marital status (partnered or single), years of education, length of stay, and disability compensation application status. Disability compensation status was a dichotomous variable indicating whether or not the

Veteran was currently applying for a new claim for a PTSD-related service-connected disability from the Veterans Benefit Administration, as indicated on the clinician-rated NEPEC intake survey. Finally, we assessed for presence or absence of past-year admission to residential treatment.

2.5.4. Physical health resources

We assessed the presence or absence of a patient-rated pain problem or of clinician-rated traumatic brain injury. Patients also rated the severity of their pain on a 0–10 scale. These variables were assessed via standardized NEPEC intake surveys that are completed for all Veterans entering RRTPs.

2.6. Statistical analyses

Analyses were conducted using a backward selection approach. First, mixed models were used to test associations with each independent variable, adjusting for baseline PCL. Second, all independent variables were entered simultaneously in the model. Variables were then deleted from the adjusted model if they were not significant at the stay selection level of $p < .15$. PCL change score was modeled as a continuous variable and clinically significant improvement was modeled as a dichotomous variable. All analyses were conducted using PROC GLIMMIX in SAS version 9.4 (SAS Institute, Inc., 2013). The estimation technique was restricted maximum likelihood for the model of change score and residual pseudo-likelihood for the model of clinically significant improvement. For all models, facility was entered as a random effect. All analyses were conducted with weighted variables (i.e., as described above in, *Data Cleaning*).

3. Results

3.1. Descriptive characteristics

Sixty-five percent of the sample exhibited a decrease in PCL score and 36% experienced clinically significant improvement. Mean (SD) reduction in PCL was 6.9 (13.8) points. Mean PCL reduction was significantly correlated with baseline PCL score such that participants with higher initial PCL scores showed larger decreases symptom reductions over the course of treatment ($r = 0.34$, $p < .001$). Demographic characteristics of the sample (N = 2715) are presented in Table 1. These characteristics are similar to those of Veterans receiving outpatient VA treatment for PTSD.

Table 1
Descriptive Characteristics of PTSD RRTP participants (N = 2715).

Variable	N	%
Demographic Characteristics		
Age		
< 35 years	533	19.7
35-55 years	1,015	37.6
Over 55 years	1,152	42.7
Female Gender	186	6.9
Race		
White	3,187	66.1
Black	1,249	25.9
American Indian/Alaskan	99	2.1
Asian/Pacific Islander	107	2.2
Other/Unknown	180	3.7
Hispanic Ethnicity	241	8.9
Combat Era		
GWOT	1,038	38.3
Post-Vietnam/Gulf War	623	23.0
Vietnam War	1,047	38.7
Psychological Resources/Risk Factors		
Baseline PTSD Severity ($M \pm SD$)	66.5 ± 10.4	
Non-combat trauma		
Military sexual trauma	310	11.5
Non-military sexual trauma	140	5.2
Other non-combat trauma	922	34.1
No non-combat trauma	1,336	49.3
Affective Disorder	930	34.4
Anxiety Disorder	378	14.0
Alcohol/Drug Use Disorder	1,187	43.9
Serious Mental Illness	232	8.6
Recent suicide attempt	223	8.4
BAM use scale ($M \pm SD$)	4.6 ± 2.7	
Personality disorder	165	6.1
Violence score ($M \pm SD$)	1.2 ± 1.2	
Social/Contextual Resources		
BAM protective factors ($M \pm SD$)	13.0 ± 3.4	
BAM risk factors ($M \pm SD$)	19.3 ± 3.7	
Single Marital Status	1,485	54.7
Years of Education ($M \pm SD$)	13.2 ± 2.0	
Length of Stay (Days; $M \pm SD$)	44.6 ± 20.3	
Applying for Service Connection	749	28.2
Physical Health Resources		
Pain Problem	2,064	76.3
Pain severity ($M \pm SD$)	4.6 ± 2.9	
Traumatic Brain Injury	341	12.6

3.2. Single variable models

Results of single variable models are presented in Table 2. Since baseline PCL score was significantly associated with the outcome variables, we adjusted for baseline PCL in all subsequent analyses.

3.2.1. Change score

For models predicting PTSD change score, after adjusting for baseline PCL, Veterans tending to have greater symptom reduction over the course of treatment were female, had higher PCL scores at intake, had experienced non-military sexual trauma, had a recent suicide attempt, more BAM protective factors, more education, and longer stays in residential treatment. Veterans who were older, non-white, served during the Vietnam era, had a personality disorder diagnosis, were applying for service connection, had a pain problem, and had more severe pain tended to experience less symptom reduction.

3.2.2. Clinically significant improvement

After adjusting for baseline PCL, Veterans who were female, had higher PCL scores at intake, more BAM protective factors, more education, and longer stays in residential treatment had greater odds of clinically significant improvement. Those who were older, non-white, had a personality disorder diagnosis, had a pain problem, and had more severe pain all had lower odds of clinically significant improvement.

3.3. Fully adjusted models

For fully adjusted models, all independent variables were entered simultaneously in the model, then deleted from the adjusted model if they were not significant at the stay selection level of $p < .15$. Correlations between variables were all less than 0.3. Results of fully adjusted models are presented in Table 3. The intra-class correlation (ICC) for between-facility variability was .07, indicating that 7% of the total variance in PCL change was due to variation across facilities (R2-between). As compared with the unconditional model, inclusion of individual level factors in the fully adjusted model explained 15.5% of the explainable variation among Veterans within facilities (σ^2).

3.3.1. Change score

In the fully adjusted model predicting PTSD change score, Veterans who were female, had higher PCL scores at intake, had a recent suicide attempt, more BAM protective factors, more education, and longer stays in residential treatment tended to experience greater symptom reduction over the course of treatment. Black Veterans, Asian/Pacific Islander Veterans, Veterans who had a personality disorder diagnosis, and Veterans who had more severe pain tended to have less symptom

Table 2
Mixed model regression results: Factors associated with PTSD symptom change among PTSD RRTP participants, adjusted for baseline symptoms.

	PCL Change Score		Clinically Significant Improvement (≥10 points)	
Variable	β (SE)	p	OR (95% CI)	p
Demographic Characteristics				
Age	−0.05 (0.02)	.003	1.00 (0.99, 1.00)	.03
Female Gender	2.95 (1.01)	.004	1.62 (1.23, 2.13)	< .001
Race				
White	Reference			
Black	−1.92 (0.58)	< .001	0.72 (0.61, 0.85)	< .001
American Indian/Alaskan	−0.95 (1.84)	.61	1.02 (0.61, 1.69)	.94
Asian/Pacific Islander	−3.98 (1.75)	.02	0.73 (0.45, 1.19)	.21
Other/Unknown	1.02 (1.21)	.40	1.10 (0.79, 1.54)	.57
Hispanic Ethnicity	−1.22 (0.86)	.16	0.94 (0.74, 1.19)	.61
Combat Era				
GWOT	Reference			
Post-Vietnam/Gulf War	−0.46 (0.61)	.45	1.00 (0.84, 1.19)	.997
Vietnam War	−1.34 (0.55)	.01	0.89 (0.76, 1.04)	.14
Psychological Resources/Risk Factors				
Baseline PTSD Severity	0.44 (0.02)	< .001	1.04 (1.04, 1.05)	< .001
Non-combat trauma				
Military sexual trauma	1.44 (0.84)	.09	1.26 (1.00, 1.59)	.05
Non-military sexual trauma	2.14 (1.05)	.04	1.11 (0.83, 1.49)	.47
Other non-combat trauma	0.51 (0.53)	.33	1.00 (0.86, 1.16)	.99
Affective Disorder	0.78 (0.56)	.16	1.06 (0.90, 1.24)	.49
Anxiety Disorder	−0.37 (0.72)	.61	1.03 (0.84, 1.25)	.78
Alcohol/Drug Use Disorder	−0.34 (0.52)	.51	0.99 (0.85, 1.14)	.86
Serious mental illness	0.46 (0.85)	.59	1.12 (0.89, 1.41)	.34
Recent suicide attempt	1.79 (0.80)	.03	1.15 (0.92, 1.44)	.21
BAM use scale	0.03 (0.08)	.74	1.01 (0.99, 1.04)	.24
Personality disorder	−2.61 (0.97)	.004	0.68 (0.53, 0.89)	.004
Violence score	−0.06 (0.19)	.75	0.99 (0.94, 1.04)	.71
Social/Contextual Resources				
BAM protective factors	0.19 (0.07)	.007	1.04 (1.02, 1.06)	< .001
BAM risk factors	−0.14 (0.07)	.05	0.98 (0.96, 1.00)	.07
Single Marital Status	0.89 (0.48)	.06	1.15 (1.00, 1.31)	.05
Years of Education	0.30 (0.12)	.01	1.07 (1.04, 1.10)	< .001
Length of Stay (Days)	0.08 (0.01)	< .001	1.01 (1.01, 1.02)	< .001
Applying for Service Connection	−1.06 (0.52)	.04	0.89 (0.77, 1.03)	.13
Physical Health Resources				
Pain Problem	−1.82 (0.55)	.001	0.81 (0.69, 0.94)	.007
Pain severity	−0.49 (0.08)	< .001	0.94 (0.92, 0.96)	< .001
Traumatic Brain Injury	−0.23 (0.70)	.75	1.01 (0.83, 1.22)	.93

Change score was computed such that higher scores indicate greater decreases in symptoms.
Abbreviations. BAM = Brief Addiction Monitor; GWOT = Global War on Terror; PCL = Posttraumatic Stress Disorder Checklist; RRTP = Residential Rehabilitation Treatment Program.

reduction. Application for service connection was borderline significant such Veterans applying for service connection tended to have less symptom reduction. Small effect sizes were observed for BAM protective factors, length of stay, Black race, pain severity, and service connection application (Cohen's $f^2 \geq .02$).

3.3.2. Clinically significant improvement

Results were very similar to the Change Score model. Veterans who were female, had higher PCL scores at intake, had a recent suicide attempt, had more BAM protective factors, were single, had more education, and longer stays in residential treatment had greater odds of clinically significant improvement in their PTSD. Those who were Black, had a personality disorder diagnosis, were in the process of applying for service connection, and had more severe pain had lower odds of clinically significant symptom improvement.

3.3.3. Unweighted results

We conducted an additional analysis using unweighted variables. Results of the adjusted analyses were largely similar to those using weighted variables, with the following exceptions: Recent suicide attempt was no longer significantly associated with change score or clinically significant improvement, personality disorder and education were no longer associated with change score, and marital status was no longer associated with clinically significant improvement. Finally, current application for service connection was associated with less symptom reduction [β (SE) = -1.07 (0.52), $p = .04$].

4. Discussion

We analyzed predictors of treatment response among a national sample of Veterans engaged in residential treatment and found that several individual-level factors predicted treatment response. These included modifiable factors such as self-efficacy, social support, and pain, and non-modifiable factors such as sex, race, and level of education. These findings highlight factors that place individuals at risk of poor treatment response. Methods for optimizing treatment to better fit the needs of these at-risk subgroups merit future study. Future work is also needed to determine whether these factors generalize to outpatient or non-Veteran populations. Overall, 65% of Veterans experienced a decrease in PTSD symptoms and only 36% experienced clinically significant improvement, highlighting the need for continued efforts to improve treatment outcomes for this population.

Several factors from the theoretical model of Resources, Life Events and Changes in Psychological States emerged as significant predictors of treatment response. These factors spanned each domain of the model. There were very few differences between the two models (i.e., between

Table 3
Fully adjusted multivariable regression results: Factors associated with PTSD symptom change among PTSD RRTP participants.

	PCL Change Score				Clinically Significant Improvement (≥10 points)			
Variable	β (SE)	95% CI	p	Cohen's f^2	β (SE)	OR (95% CI)	OR per SD	p
Demographic Characteristics								
Female Gender	2.99 (1.02)	0.99, 4.99	.004	−.005	0.46 (0.15)	1.59 (1.19, 2.12)	–	.002
Race (Reference = White)								
Black	−1.52 (0.59)	−2.68, -0.36	.01	0.02	−0.36 (0.09)	0.70 (0.58, 0.84)	–	< .001
American Indian/Alaskan	−0.78 (1.83)	−4.37, 2.81	.67	−.002	0.12 (0.26)	1.12 (0.67, 1.88)	–	.65
Asian/Pacific Islander	−3.57 (1.76)	−7.02, -0.13	.04	−0.01	−0.17 (0.26)	0.84 (0.51, 1.40)	–	.51
Other/Unknown	1.88 (1.23)	−0.53, 4.29	.13	.006	0.15 (0.18)	1.16 (0.81, 1.66)	–	.42
Psychological Resources/Risk Factors								
Baseline PTSD Severity	0.44 (0.02)	0.40, 0.49	< .001	0.006	0.04 (0.004)	1.05 (1.04, 1.05)	1.59	< .001
Affective Disorder	0.83 (0.56)	−0.27, 1.94	.14	−.002	–	–	–	–
Recent suicide attempt	2.27 (0.81)	0.67, 3.87	.01	−0.01	0.24 (0.12)	1.27 (1.01, 1.61)	–	.04
BAM use scale	–	–	–	–	0.02 (0.01)	1.02 (0.99, 1.05)	1.06	.13
Personality disorder	−2.33 (0.94)	−4.18, -0.48	.01	.006	−0.46 (0.14)	0.63 (0.47, 0.83)	–	.001
Social/Contextual Resources								
BAM protective factors	0.21 (0.07)	0.08, 0.35	.002	0.02	0.05 (0.01)	1.05 (1.03, 1.07)	1.18	< .001
Single Marital Status	–	–	–	–	0.18 (0.07)	1.20 (1.04, 1.39)	–	.01
Years of Education	0.25 (0.12)	0.02, 0.48	.04	.003	0.07 (0.02)	1.07 (1.04, 1.11)	1.14	< .001
Length of Stay (Days)	0.08 (0.02)	0.05, 0.11	< .001	0.02	0.01 (0.002)	1.01 (1.01, 1.01)	1.23	< .001
Applying for Service Connection	−0.95 (0.52)	−1.98, 0.07	.07	0.03	−0.15 (0.08)	0.86 (0.74, 1.00)	–	.05
Physical Health Resources								
Pain severity	−0.42 (0.09)	−0.59, −0.26	< .001	−0.02	−0.05 (0.01)	0.95 (0.93, 0.98)	.87	< .001
Intercept	−30.42 (2.60)	−35.69, −25.16	< .001		−5.54 (0.43)			< .001

Change score was computed such that higher scores indicate greater decreases in symptoms.
Abbreviations. BAM = Brief Addiction Monitor; GWOT = Global War on Terror; PCL = Posttraumatic Stress Disorder Checklist; RRTP = Residential Rehabilitation Treatment Program.

PCL reduction and clinically significant change). In the psychological resources and risk factors domain, we found that personality disorders were associated with an almost 40% lower odds of clinically significant improvement. This finding is consistent with reports of previous studies that poor treatment response is associated with borderline personality disorder (Feeny et al., 2002), personality disorder features (Galovski et al., 2016), and high expressed emotion (Schottenbauer et al., 2008) in outpatients. Future work in this area might include the combination of PTSD treatment with dialectical behavioral therapy, a treatment designed for borderline personality disorder (Scheiderer, Carlile, Aosved, & Barlow, 2017).

In the domain of social contextual resources, we found that higher levels of BAM protective factors were associated with better treatment response. Previous work has identified elements from this subscale as related to symptom improvement, including employment (Rossom et al., 2016; Walter et al., 2014), social support (Price et al., 2013; Steenkamp et al., 2017; Tarrier et al., 2000; Taylor et al., 2012), and lower levels of interpersonal problems (Thormahlen et al., 2003). These factors predict better outcomes in the treatment of anxiety (Taylor et al., 2012) and depression (Rossom et al., 2016), as well as PTSD. Efforts to boost social support, interpersonal skills, and vocational training may help in this regard. For residential programs, this could include peer support interventions or greater involvement of family in treatment. We also found that years of education was associated with treatment response. Each additional year of education was associated with a 7% increase in odds of clinically significant improvement. Level of education is associated with PTSD symptom change over time (Steenkamp et al., 2017) and response to depression psychotherapy and pharmacotherapy (Craighead & Dunlop, 2014). Less education was also associated with higher treatment dropout in a randomized controlled trial of CPT (Rizvi, Vogt, & Resick, 2009). Future work is needed to clarify ways in which level of education impacts treatment response or investigate ways to make treatment (including trauma-focused treatment) more accessible to individuals with a range of educational attainment. We also found that greater length of stay was significantly associated with better treatment response. Similarly, Coker et al. found that a longer stay was associated with better substance use outcomes in dually diagnosed patients (Coker et al., 2016). This suggests that the persistence of an individual in residential treatment is associated with treatment response. However, individuals who are retained in residential treatment are a select group; those who experience significant symptom deterioration may be discharged or transferred to a higher level of care.

Another social-contextual factor that was associated with treatment response was application for service connection. Specifically, we found that applying for a new disability claim for PTSD was associated with slightly lower odds of clinically significant treatment response, which is consistent with the findings of several studies that have found service connection to be associated with poorer treatment outcome (Crawford et al., 2017; Goodson et al., 2017; Walter et al., 2014). The few studies examining this issue typically utilize a single residential treatment site, but our data encompassed a national sample of residential treatment recipients and adjusted for baseline PTSD symptom severity and other characteristics. It is possible that compensation-seeking Veterans may be concerned that they will not be awarded claims if they report significant improvement in PTSD symptoms (Walter et al., 2014). Future research should examine Veteran perspectives about the relationship between their experience in PTSD treatment and their participation and beliefs about the benefits process.

In our data, the physical health resource associated most strongly with lower treatment response was pain severity. Previous research suggests that treatment response may be related to overall physical health in individuals with PTSD (Currier et al., 2014) and depression (Iosifescu et al., 2003; Rossom et al., 2016). In two studies of residential PTSD treatment, better physical health and health-related quality of life were associated with better PTSD outcomes at follow-up (Currier et al., 2014; Sofko et al., 2016). In another study, among Veterans who engaged in outpatient prolonged exposure or cognitive processing therapy, pain intensity predicted treatment response, but only if the pain was trauma-related (Bartoszek et al., 2017). These data suggest that pain may interfere with an individual's ability to make treatment gains with regard to their PTSD. Future work in this area could include testing the addition of interventions such as cognitive-behavioral therapy for chronic medical conditions (Moore, Von Korff, Cherkin,

Saunders, & Lorig, 2000) or cognitive-behavioral therapy for chronic pain (Morley, Eccleston, & Williams, 1999). It is possible that addressing pain simultaneously with PTSD might improve both outcomes. At the time of this study, 51% of RRTPs offered cognitive behavioral therapy for pain, but only five RRTPs offered this treatment within the program. The remaining RRTPs offered it through referrals to other programs.

Several demographic characteristics were also associated with treatment response, including sex and race. Female Veterans had 60% greater odds of clinically significant improvement as compared with male Veterans. Previous evidence suggests that women improve more than men in randomized psychotherapy trials (Bekes et al., 2016), clinical effectiveness studies (Eftekhari et al., 2013), routine clinical practice (Maguen et al., 2014; Sripada et al., 2017; Walter et al., 2014) and meta-analyses (Wade et al., 2016), in both Veteran (Maguen et al., 2014; Sripada et al., 2017; Walter et al., 2014) and non-veteran samples (Bekes et al., 2016). Relevant to the current study, a meta-analysis of single-site studies from VA residential PTSD programs demonstrated that programs with greater proportions of female Veterans demonstrated greater treatment effects (Campbell et al., 2016). Some authors have suggested that this effect may be related to trauma type or trauma severity (Wade et al., 2016). However, trauma type was not a significant factor in the current study. Others have posited that women might benefit more from the secondary effects of trauma-focused psychotherapy, such as improved coping skills or improved ability to get support from one's social network (Bekes et al., 2016). Future work is needed to determine how to make treatment more effective for male Veterans.

Non-white race was also associated with poorer treatment response. Notably, Black Veterans had 30% lower odds of clinically significant improvement as compared with white Veterans. This finding is consistent with several previous studies. Black GWOT patients were less likely to lose their PTSD diagnoses over the course of one year of care in VA (Maguen et al., 2014). A latent trajectory analysis of PCL scores demonstrated that non-white patients were more likely to be in a severe symptom class and also more likely to be on a stable, as compared to an improving, trajectory (Sripada et al., 2017). However, one study reported that Black Veterans undergoing PE demonstrated greater improvement in PTSD symptoms than Veterans of other races (Jeffreys et al., 2014), and two studies in non-veteran samples did not find racial differences in treatment response (Lester, Artz, Resick, & Young-Xu, 2010; Zoellner, Feeny, Fitzgibbons, & Foa, 1999). The sample characteristics and treatment modalities of these studies vary. Nevertheless, potential disparities in the way care is delivered to minority Veterans within residential programs merits further study.

Our study has several limitations. In some programs, diagnoses may have been based on clinician judgment, which is not as reliable as structured clinical interviews. Our data did not include detailed information about treatment type, so we were unable to assess whether or not evidence-based psychotherapy or medication receipt improved treatment outcome. More detailed information, such as individual-level data on receipt of evidence-based versus non-evidence-based treatment, would allow further exploration of this association. Much of the literature on predictors of PTSD treatment response comes from studies of PE and CPT. However, the predictors identified in this study are also consistent with studies of treatment other than PE and CPT (Belsher et al., 2012; Campbell et al., 2016; Coker et al., 2016; Currier et al., 2014; Feeny et al., 2002; Manhapra et al., 2015; Sofko et al., 2016; Sripada et al., 2017; Taylor et al., 2012). The generalizability of our findings to other populations should be considered. Of note, RRTP patients have higher rates of substance use disorders, personality disorders, and psychosis, as well as higher rates of aggression and of non-military sexual trauma, as compared to outpatients (VA, 2013). In addition, preliminary data suggest that compared to outpatients, RRTP patients report greater disability and higher rates of unemployment (VA, 2013). Thus, it is unclear if findings generalize to VA outpatients. Furthermore, the extent to which findings generalize to non-veteran populations with PTSD is unknown. Finally, our analysis was limited by the fact that PTSD symptoms were only assessed at two time points, the second of which was at four months post-discharge. Future work would benefit from additional assessment time points over a greater time period.

In conclusion, we investigated predictors of treatment response among a large national sample of Veterans undergoing residential PTSD treatment, and found that minority Veterans, Veterans with pain, and Veterans with fewer protective factors were at risk for poor treatment response. Recommendations for future research might include augmenting evidence-based treatment with interventions to address these risk factors. Further research is needed on potential treatment disparities between subgroups within programs and on methods for modifying treatment to better fit the needs of such at-risk subgroups. Improving access to and delivery of high-quality care for individuals at risk of poor outcomes remains a priority for VA.

Declarations of interest

None.

Role of the funding source

This work was supported by CDA 15-251, IK2 HX-002095-01 from the United States (U.S.) Department of Veterans Affairs Health Services R&D (HSRD) Service. Dr. Bohnert is supported by CDA 11-245 from the HSRD Service. This funding source had no involvement in the study design, analysis, interpretation of data, or writing of this report.

References

Allan, N. P., Gros, D. F., Myers, U. S., Korte, K. J., & Acierno, R. (2017). Predictors and outcomes of growth mixture modeled trajectories across an exposure-based PTSD intervention with veterans. *Journal of Clinical Psychology, 73*(9), 1048–1063. https://doi.org/10.1002/jclp.22408.

Alvarez, J., McLean, C., Harris, A. H., Rosen, C. S., Ruzek, J. I., & Kimerling, R. (2011). The comparative effectiveness of cognitive processing therapy for male veterans treated in a VHA posttraumatic stress disorder residential rehabilitation program. *Journal of Consulting and Clinical Psychology, 79*(5), 590–599. https://doi.org/10.1037/a0024466.

Bartoszek, G., Hannan, S. M., Kamm, J., Pamp, B., & Maieritsch, K. P. (2017). Trauma-related pain, reexperiencing symptoms, and treatment of posttraumatic stress disorder: A longitudinal study of veterans. *Journal of Traumatic Stress, 30*(3), 288–295. https://doi.org/10.1002/jts.22183.

Bekes, V., Beaulieu-Prevost, D., Guay, S., Belleville, G., & Marchand, A. (2016). Women with PTSD benefit more from psychotherapy than men. *Psychological Trauma Theory Research Practice and Policy, 8*(6), 720–727. https://doi.org/10.1037/tra0000122.

Belleau, E. L., Chin, E. G., Wanklyn, S. G., Zambrano-Vazquez, L., Schumacher, J. A., & Coffey, S. F. (2017). Pre-treatment predictors of dropout from prolonged exposure therapy in patients with chronic posttraumatic stress disorder and comorbid substance use disorders. *Behaviour Research and Therapy, 91*, 43–50. https://doi.org/10.1016/j.brat.2017.01.011.

Belsher, B. E., Tiet, Q. Q., Garvert, D. W., & Rosen, C. S. (2012). Compensation and treatment: Disability benefits and outcomes of U.S. Veterans receiving residential PTSD treatment. *Journal of Traumatic Stress, 25*(5), 494–502. https://doi.org/10.1002/jts.21747.

Blanchard, E. B., Jones-Alexander, J., Buckley, T. C., & Forneris, C. A. (1996). Psychometric properties of the PTSD Checklist (PCL). *Behaviour Research and Therapy, 34*(8), 669–673. https://doi.org/10.1016/0005-7967(96)00033-2.

Cacciola, J. S., Alterman, A. I., DePhilippis, D., Drapkin, M. L., Valadez, C., Fala, N. C., ... McKay, J. R. (2013). Development and initial evaluation of the Brief Addiction Monitor (BAM). *Journal of Substance Abuse Treatment, 44*(3), 256–263.

Campbell, J. S., Loeffler, G. H., Pulos, S., & Campbell, A. W. (2016). Meta-analysis of average symptom change in inpatient treatment for posttraumatic stress disorder in veteran and active duty U.S. Military samples. *Psychological Services, 13*(4), 389–400. https://doi.org/10.1037/ser0000104.

Cohen, B. E., Gima, K., Bertenthal, D., Kim, S., Marmar, C. R., & Seal, K. H. (2010). Mental health diagnoses and utilization of VA non-mental health medical services among returning Iraq and Afghanistan veterans. *Journal of General Internal Medicine, 25*(1), 18–24. https://doi.org/10.1007/s11606-009-1117-3.

Coker, K. L., Stefanovics, E., & Rosenheck, R. (2016). Correlates of improvement in substance abuse among dually diagnosed veterans with post-traumatic stress disorder in specialized intensive VA treatment. *Psychological Trauma Theory Research Practice and Policy, 8*(1), 41–48. https://doi.org/10.1037/tra0000061.

Craighead, W. E., & Dunlop, B. W. (2014). Combination psychotherapy and antidepressant medication treatment for depression: For whom, when, and how. *Annual Review of Psychology, 65*, 267–300. https://doi.org/10.1146/annurev.psych.121208.

131653.
Crawford, E. F., Wolf, G. K., Kretzmer, T., Dillon, K. H., Thors, C., & Vanderploeg, R. D. (2017). Patient, therapist, and system factors influencing the effectiveness of prolonged exposure for veterans with comorbid posttraumatic stress disorder and traumatic brain injury. *The Journal of Nervous and Mental Disease, 205*(2), 140–146.
Currier, J. M., Holland, J. M., & Drescher, K. D. (2014). Residential treatment for combat-related posttraumatic stress disorder: Identifying trajectories of change and predictors of treatment response. *PloS One, 9*(7), e101741. https://doi.org/10.1371/journal.pone.0101741.
Cusack, K., Jonas, D. E., Forneris, C. A., Wines, C., Sonis, J., Middleton, J. C., ... Gaynes, B. N. (2016). Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis. *Clinical Psychology Reviews, 43*, 128–141. https://doi.org/10.1016/j.cpr.2015.10.003.
Eftekhari, A., Ruzek, J. I., Crowley, J. J., Rosen, C. S., Greenbaum, M. A., & Karlin, B. E. (2013). Effectiveness of national implementation of prolonged exposure therapy in Veterans Affairs care. *JAMA Psychiatry, 70*(9), 949–955. https://doi.org/10.1001/jamapsychiatry.2013.36.
Feeny, N. C., Zoellner, L. A., & Foa, E. B. (2002). Treatment outcome for chronic PTSD among female assault victims with borderline personality characteristics: A preliminary examination. *Journal of Personality Disorders, 16*(1), 30–40. https://doi.org/10.1521/pedi.16.1.30.22555.
Galovski, T. E., Harik, J. M., Blain, L. M., Elwood, L., Gloth, C., & Fletcher, T. D. (2016). Augmenting cognitive processing therapy to improve sleep impairment in PTSD: A randomized controlled trial. *Journal of Consulting and Clinical Psychology, 84*(2), 167–177. https://doi.org/10.1037/ccp0000059.
Goodson, J. T., Helstrom, A. W., Marino, E. J., & Smith, R. V. (2017). The impact of service-connected disability and therapist experience on outcomes from prolonged exposure therapy with veterans. *Psychological Trauma Theory Research Practice and Policy*. https://doi.org/10.1037/tra0000260.
Humphreys, K., Blodgett, J. C., & Roberts, L. W. (2015). The exclusion of people with psychiatric disorders from medical research. *Journal of Psychiatric Research, 70*, 28–32. https://doi.org/10.1016/j.jpsychires.2015.08.005.
Iosifescu, D. V., Nierenberg, A. A., Alpert, J. E., Smith, M., Bitran, S., Dording, C., ... Fava, M. (2003). The impact of medical comorbidity on acute treatment in major depressive disorder. *The American Journal of Psychiatry, 160*(12), 2122–2127. https://doi.org/10.1176/appi.ajp.160.12.2122.
Jeffreys, M. D., Reinfeld, C., Nair, P. V., Garcia, H. A., Mata-Galan, E., & Rentz, T. O. (2014). Evaluating treatment of posttraumatic stress disorder with cognitive processing therapy and prolonged exposure therapy in a VHA specialty clinic. *Journal of Anxiety Disorders, 28*, 108–114. https://doi.org/10.1016/j.janxdis.2013.04.010.
Kulka, R. A., Schlenger, W. E., Fairbank, J. A., Hough, R. L., Jordan, B. K., Marmar, C. R., ... Weiss, D. S. (1988). *Contractual report of findings from the National Vietnam veterans readjustment study*Research Triangle Park, NC: Research Triangle Institute.
Lemaire, C. M., & Graham, D. P. (2011). Factors associated with suicidal ideation in OEF/OIF veterans. *Journal of Affective Disorders, 130*(1-2), 231–238. https://doi.org/10.1016/j.jad.2010.10.021.
Lester, K., Artz, C., Resick, P. A., & Young-Xu, Y. (2010). Impact of race on early treatment termination and outcomes in posttraumatic stress disorder treatment. *Journal of Consulting and Clinical Psychology, 78*(4), 480.
Lloyd, D., Nixon, R. D., Varker, T., Elliott, P., Perry, D., Bryant, R. A., & Forbes, D. (2013). Comorbidity in the prediction of Cognitive Processing Therapy treatment outcomes for combat-related posttraumatic stress disorder. *Journal of Anxiety Disorders*. https://doi.org/10.1016/j.janxdis.2013.12.002.
Lowe, S. R., Galea, S., Uddin, M., & Koenen, K. C. (2014). Trajectories of posttraumatic stress among urban residents. *American Journal of Community Psychology, 53*(1-2), 159–172. https://doi.org/10.1007/s10464-014-9634-6.
Maguen, S., Madden, E., Neylan, T. C., Cohen, B. E., Bertenthal, D., & Seal, K. H. (2014). Timing of mental health treatment and PTSD Symptom improvement among Iraq and Afghanistan veterans. *Psychiatric Services, 65*(12), 1414–1419. https://doi.org/10.1176/appi.ps.201300453.
Manhapra, A., Stefanovics, E., & Rosenheck, R. (2015). Treatment outcomes for veterans with PTSD and substance use: Impact of specific substances and achievement of abstinence. *Drug and Alcohol Dependence, 156*, 70–77. https://doi.org/10.1016/j.drugalcdep.2015.08.036.
Mills, K. L., Barrett, E. L., Merz, S., Rosenfeld, J., Ewer, P. L., Sannibale, C., ... Teesson, M. (2016). Integrated exposure-based therapy for Co-occurring post traumatic stress disorder (PTSD) and substance dependence: Predictors of change in PTSD symptom severity. *Journal of Clinical Medicine, 5*(11), https://doi.org/10.3390/jcm5110101.
Monson, C. M., Gradus, J. L., Young-Xu, Y., Schnurr, P. P., Price, J. L., & Schumm, J. A. (2008). Change in posttraumatic stress disorder symptoms: Do clinicians and patients agree? *Psychological Assessment, 20*(2), 131–138. https://doi.org/10.1037/1040-3590.20.2.131.
Moore, J. E., Von Korff, M., Cherkin, D., Saunders, K., & Lorig, K. (2000). A randomized trial of a cognitive-behavioral program for enhancing back pain self care in a primary care setting. *Pain, 88*(2), 145–153.
Morley, S., Eccleston, C., & Williams, A. (1999). Systematic review and meta-analysis of randomized controlled trials of cognitive behaviour therapy and behaviour therapy for chronic pain in adults, excluding headache. *Pain, 80*(1), 1–13.
Murrell, S. A., & Norris, F. H. (1983). Resources, life events, and changes in psychological states: A prospective framework. *American Journal of Community Psychology, 11*(5), 473–491.
Nelson, K. G., Young, K., & Chapman, H. (2014). Examining the performance of the brief addiction monitor. *Journal of Substance Abuse Treatment, 46*(4), 472–481. https://doi.org/10.1016/j.jsat.2013.07.002.
Norris, F. H., & Murrell, S. A. (1990). Social support, life events, and stress as modifiers of adjustment to bereavement by older adults. *Psychology and Aging, 5*(3), 429.
Pacella, M. L., Hruska, B., & Delahanty, D. L. (2013). The physical health consequences of PTSD and PTSD symptoms: A meta-analytic review. *Journal of Anxiety Disorders, 27*(1), 33–46. https://doi.org/10.1016/j.janxdis.2012.08.004.
Phifer, J. F., & Murrell, S. A. (1986). Etiologic factors in the onset of depressive symptoms in older adults. *Journal of Abnormal Psychology, 95*(3), 282.
Price, M., Gros, D. F., Strachan, M., Ruggiero, K. J., & Acierno, R. (2013). The role of social support in exposure therapy for operation Iraqi Freedom/Operation enduring freedom veterans: A preliminary investigation. *Psychological Trauma Theory Research Practice and Policy, 5*(1), 93–100. https://doi.org/10.1037/a0026244.
Resick, P. A., Wachen, J. S., Dondanville, K. A., Pruiksma, K. E., Yarvis, J. S., Peterson, A. L., ... Young-McCaughan, S. (2017). Effect of group vs individual cognitive processing therapy in active-duty military seeking treatment for posttraumatic stress disorder: A randomized clinical trial. *JAMA Psychiatry, 74*(1), 28–36. https://doi.org/10.1001/jamapsychiatry.2016.2729.
Rizvi, S. L., Vogt, D. S., & Resick, P. A. (2009). Cognitive and affective predictors of treatment outcome in Cognitive Processing Therapy and Prolonged Exposure for posttraumatic stress disorder. *Behaviour Research and Therapy, 47*(9), 737–743. https://doi.org/10.1016/j.brat.2009.06.003.
Rossom, R. C., Solberg, L. I., Vazquez-Benitez, G., Whitebird, R. R., Crain, A. L., Beck, A., ... Unutzer, J. (2016). Predictors of poor response to depression treatment in primary care. *Psychiatric Services, 67*(12), 1362–1367. https://doi.org/10.1176/appi.ps.201400285.
Rubin, D. B., & Little, R. J. (2002). *Statistical analysis with missing data.* Hoboken, NJ: J Wiley & Sons.
Ruggiero, K. J., Del Ben, K., Scotti, J. R., & Rabalais, A. E. (2003). Psychometric properties of the PTSD checklist-civilian version. *Journal of Traumatic Stress, 16*(5), 495–502. https://doi.org/10.1023/A:1025714729117.
Scheiderer, E., Carlile, J. A., Aosved, A. C., & Barlow, A. (2017). Concurrent dialectical behavior therapy and prolonged exposure reduces symptoms and improves overall quality of life for a veteran with posttraumatic stress disorder and borderline personality disorder. *Clinical Case Studies, 16*(3), 216–233.
Schottenbauer, M. A., Glass, C. R., Arnkoff, D. B., Tendick, V., & Gray, S. H. (2008). Nonresponse and dropout rates in outcome studies on PTSD: Review and methodological considerations. *Psychiatry, 71*(2), 134–168. https://doi.org/10.1521/psyc.2008.71.2.134.
Sofko, C. A., Currier, J. M., & Drescher, K. D. (2016). Prospective associations between changes in mental health symptoms and health-related quality of life in veterans seeking posttraumatic stress disorder residential treatment. *Anxiety, Stress, and Coping, 29*(6), 630–643. https://doi.org/10.1080/10615806.2016.1157171.
Sripada, R. K., Pfeiffer, P. N., Rampton, J., Ganoczy, D., Rauch, S. A., Polusny, M. A., ... Bohnert, K. M. (2017). Predictors of PTSD symptom change among outpatients in the U.S. Department of veterans affairs health care system. *Journal of Traumatic Stress, 30*(1), 45–53. https://doi.org/10.1002/jts.22156.
Steenkamp, M. M., Schlenger, W. E., Corry, N., Henn-Haase, C., Qian, M., Li, M., & Marmar, C. (2017). Predictors of PTSD 40 years after combat: Findings from the National Vietnam Veterans longitudinal study. *Depression and Anxiety, 34*(8), 711–722. https://doi.org/10.1002/da.22628.
Stein, N. R., Dickstein, B. D., Schuster, J., Litz, B. T., & Resick, P. A. (2012). Trajectories of response to treatment for posttraumatic stress disorder. *Behavior Therapy, 43*(4), 790–800. https://doi.org/10.1016/j.beth.2012.04.003.
Tarrier, N., Sommerfield, C., Pilgrim, H., & Faragher, B. (2000). Factors associated with outcome of cognitive-behavioural treatment of chronic post-traumatic stress disorder. *Behaviour Research and Therapy, 38*(2), 191–202. https://doi.org/10.1016/S0005-7967(99)00030-3.
Taylor, S. (2004). Outcome predictors for three PTSD treatments: Exposure therapy, EMDR, and relaxation training. In S. Taylor (Ed.). *Advances in the treatment of posttraumatic stress disorder: Cognitive behavioral perspectives* (pp. 13–37). New York: Springer.
Taylor, S., Abramowitz, J. S., & McKay, D. (2012). Non-adherence and non-response in the treatment of anxiety disorders. *Journal of Anxiety Disorders, 26*(5), 583–589. https://doi.org/10.1016/j.janxdis.2012.02.010.
Thormahlen, B., Weinryb, R. M., Noren, K., Vinnars, B., & Bagedahl-Strindlund, M. (2003). Patient factors predicting dropout from supportive-expressive psychotherapy for patients with personality disorders. *Psychotherapy Research, 13*(4), 493–509. https://doi.org/10.1093/ptr/kpg039.
VA (2010). *Mental health residential rehabilitation treatment program. VHA handbook, 1162.02*.
VA (2013). *The long journey home XXII: Treatment of posttraumatic stress disorder (PTSD).* West Haven, CT: Northeast Program Evaluation Center.
van Minnen, A., Arntz, A., & Keijsers, G. P. (2002). Prolonged exposure in patients with chronic PTSD: Predictors of treatment outcome and dropout. *Behaviour Research and Therapy, 40*(4), 439–457. https://doi.org/10.1016/S0005-7967(01)00024-9.
Wade, D., Varker, T., Kartal, D., Hetrick, S., O'Donnell, M., & Forbes, D. (2016). Gender difference in outcomes following trauma-focused interventions for posttraumatic stress disorder: Systematic review and meta-analysis. *Psychological Trauma Theory Research Practice and Policy, 8*(3), 356–364. https://doi.org/10.1037/tra0000110.
Walter, K. H., Varkovitzky, R. L., Owens, G. P., Lewis, J., & Chard, K. M. (2014). Cognitive processing therapy for veterans with posttraumatic stress disorder: A comparison between outpatient and residential treatment. *Journal of Consulting and Clinical Psychology, 82*(4), 551–561. https://doi.org/10.1037/a0037075.
Weathers, F. W., Litz, B. T., Herman, D. S., Huska, J. A., & Keane, T. M. (1993). *The PTSD checklist (PCL): Reliablity, validity, and diagnostic utility. Paper Presented at the 9th Annual Conference of the ISTSS, San Antonio, TX*.
Zandberg, L. J., Rosenfield, D., McLean, C. P., Powers, M. B., Asnaani, A., & Foa, E. B. (2016). Concurrent treatment of posttraumatic stress disorder and alcohol dependence: Predictors and moderators of outcome. *Journal of Consulting and Clinical Psychology, 84*(1), 43–56. https://doi.org/10.1037/ccp0000052.
Zoellner, L. A., Feeny, N. C., Fitzgibbons, L. A., & Foa, E. B. (1999). Response of African American and Caucasian women to cognitive behavioral therapy for PTSD. *Behavior Therapy, 30*(4), 581–595.