Journal of Consulting and Clinical Psychology
2015, Vol. 83, No. 6, 1154–1160

http://dx.doi.org/10.1037/ccp0000031

BRIEF REPORT

Differential Effects of Prolonged Exposure on Posttraumatic Stress Disorder Symptoms in Female Veterans

Paula P. Schnurr
National Center for PTSD, White River Junction, Vermont, and Geisel School of Medicine at Dartmouth

Carole A. Lunney
National Center for PTSD, White River Junction, Vermont

Objective: We compared the effect of Prolonged Exposure (PE) on posttraumatic stress disorder (PTSD) symptom clusters and individual symptoms relative to a nonspecific comparison therapy (present-centered therapy; PCT) to identify the unique benefits of PE. We used data from a 12-site randomized clinical trial that found PE to be more effective than PCT for reducing PTSD symptom severity. ***Method:*** Participants were 284 female veterans and active duty soldiers with PTSD (*M* age = 44.8 years, range = 22–78; 45.4% non-White). Participants were randomized to 10 weekly sessions of PE or PCT and assessed before and after treatment and at 3- and 6-month follow-ups. The primary measure of PTSD symptoms and symptom clusters (reexperiencing, avoidance, numbing, and hyperarousal) was the Clinician-Administered PTSD Scale (CAPS; Weathers et al., 2001) but we also assessed self-reported PTSD using the PTSD Checklist-Specific Version (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993). ***Results:*** Almost all clinician-rated and self-reported symptoms improved from pre- to posttreatment in both conditions. In the analyses of clinician-rated PTSD, PE had greater benefit than PCT on avoidance and numbing clusters. PE also had greater benefit on most individual symptoms in these clusters as well as on distress related to reminders. In the analyses of self-reported PTSD, PE had greater benefit than PCT on all clusters and on most individual symptoms. ***Conclusion:*** PE may be especially helpful for individuals with significant avoidance and numbing. Giving patients information about how a treatment can help with the symptoms that create the greatest burden can facilitate choosing the treatment that is best for them.

What is the public health significance of this article?
Prolonged Exposure is an effective treatment for posttraumatic stress disorder. However, this study suggests that Prolonged Exposure may be especially helpful for individuals who struggle with avoidance and numbing.

Keywords: PTSD, cognitive–behavioral therapy, veterans, women

Total posttraumatic stress disorder (PTSD) symptom severity is the typical primary outcome in clinical trials of treatments for PTSD. Yet knowing whether a given treatment affects specific symptoms is important from both scientific and practical perspectives. Differential effects across symptoms can provide important information about mechanisms of change. Information about symptom-level effectiveness can offer valuable information for patients and clinicians when deciding among treatments and can help ensure that patients receive treatments that are most effective for the symptoms that cause them the greatest concern.

We examined the effect of Prolonged Exposure (PE; Foa, Hembree, & Rothbaum, 2007) on PTSD clusters and individual symptoms relative to present-centered therapy (PCT; Schnurr et al., 2005; Schnurr, Shea, Friedman, & Engel, 2007), using data

This article was published Online First July 6, 2015.

Paula P. Schnurr, National Center for PTSD, White River Junction, Vermont, and Department of Psychiatry, Geisel School of Medicine at Dartmouth; Carole A. Lunney, National Center for PTSD, White River Junction, Vermont.

This study was conducted with Grant CSP #494 from the VA Cooperative Studies Program and support from the Department of Defense for CSP #494. However, the views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs, the Department of Defense, or any U.S. government agency. Trial registration information for CSP #494: clinicaltrials.gov Identifier NCT00032617.

Correspondence concerning this article should be addressed to Paula P. Schnurr, VA National Center for PTSD, VA Medical Center (116D), 215 North Main Street, White River Junction, VT 05009. E-mail: paula.schnurr@dartmouth.edu

from a randomized clinical trial that found PE to be more effective than PCT for reducing PTSD severity in women veterans and soldiers (Schnurr, Friedman et al., 2007). The trial focused on female veterans and service members because they have a high prevalence of trauma and PTSD, yet had been excluded from or underrepresented in earlier trials (Schnurr, Friedman et al., 2007). It is particularly important to know the unique effects of evidence-based treatments like PE and cognitive processing therapy, which the U.S. Department of Veterans Affairs is disseminating in national therapist training programs (Karlin & Cross, 2014) to help patients choose among effective options.

Given the focus in PE on imaginal and in vivo (direct) exposure, it is logical to expect that PE would have unique effects on avoidance. It is plausible that PE might have unique effects on reexperiencing and hyperarousal too, through the fear reduction associated with emotional processing. It is also plausible that PE would have unique effects on numbing, if examined separately from avoidance, through the focus on approaching emotions in exposure. Findings are partially consistent with these expectations. Taylor et al. (2003) compared PE and eye movement desensitization and reprocessing (EMDR) with relaxation; outcomes were clinician-rated PTSD reexperiencing, avoidance, numbing, and hyperarousal. They found unique effects of exposure on avoidance and reexperiencing relative to both EMDR and relaxation. Bryant, Molds, Guthrie, Dang, and Nixon (2003) compared imaginal exposure with and without cognitive restructuring to supportive counseling, a nonspecific treatment that is less active than PCT, and examined self-reported reexperiencing and avoidance or numbing. They found unique effects of exposure relative to supportive counseling on both reexperiencing and avoidance/numbing. Foa, Rothbaum, Riggs, and Murdock (1991) compared PE and stress inoculation therapy with supportive counseling; outcomes were clinician-rated reexperiencing, avoidance, numbing, and hyperarousal. Foa et al. found that PE had statistically significant pre–post change in avoidance and numbing, but did not differ from supportive counseling. No study found unique effects of PE on hyperarousal, or on numbing when measured distinct from avoidance (Taylor et al., 2003). Foa et al.'s sample was comprised of women, whereas the other studies included men, and all samples were nonveteran.

The comparison treatment we used, PCT, is an active, nonspecific treatment that includes various supportive and insight-oriented techniques used across a range of treatments to control for the nonspecific effects of therapy, such as decreased isolation, mobilization of hope, and increased sense of mastery. Trauma focus is avoided, but therapists acknowledge and validate patients' trauma history and the consequences of exposure. The Society of Clinical Psychology (2012) has classified PCT as an evidence-based treatment for PTSD. Because a nonspecific comparison treatment such as PCT controls for the effects of psychotherapy in general (Schnurr, 2007), we were able to determine the unique benefits of PE on different symptoms.

It was difficult to make predictions based on prior findings. With so few studies and variability in how symptom clusters were defined, the evidence does not permit definitive conclusions. Only Taylor et al. (2003) tested avoidance separately from numbing and no study examined specific symptoms. Therefore, we examined symptom- and cluster-level outcomes, separating avoidance and numbing in cluster-level analyses. We expected that PE would have better outcomes than PCT on avoidance and reexperiencing clusters. It also was difficult to make predictions for specific symptoms, although we expected that PE would have better outcomes on the two avoidance symptoms. As in the original study, clinician-rated PTSD was the primary outcome and self-reported PTSD was secondary.

Method

Details about the original study have been published elsewhere (Schnurr et al., 2005; Schnurr, Friedman et al., 2007). An institutional review board at each site approved the research protocol. Participants provided written informed consent after they had been given a complete description of the study. Data were collected between August 2002 and October 2005.

Participants and Procedure

Participants were 284 women (277 veterans and seven Army soldiers) recruited from 12 sites. Inclusion criteria were current *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM–IV*; APA, 1994) PTSD symptoms according to the "1/2" rule (frequency $\geq$ weekly and intensity $\geq$ moderate) and minimum severity $\geq$ 45 on the Clinician-Administered PTSD Scale (CAPS; Weathers, Keane, & Davidson, 2001); $\geq$3 months since experiencing trauma; a clear memory of the trauma that caused PTSD; agreement to not receive other psychotherapy for PTSD during study treatment; and, for those on psychoactive medication, a stable regimen for the previous 2 months. Exclusion criteria were current psychotic symptoms, mania, bipolar disorder, substance dependence, prominent suicidal or homicidal ideation, involvement in a violent relationship, self-harm within the past 6 months, and cognitive impairment.

Referring clinicians provided information about potential participants to study staff, who then met with potential participants to explain the study and obtain consent. A master's- or doctoral-level clinician who was blind to participants' treatment assignment performed assessments at study entry, posttreatment, and 3- and 6-month follow-ups. Eligible women were randomized to receive 10 weekly sessions of PE (Foa et al., 2007) or PCT (Schnurr et al., 2005; Schnurr, Shea et al., 2007). PE included psychoeducation, breathing retraining, prolonged (repeated) recounting (imaginal exposure) of trauma memories during sessions, homework (listening to a recording of the recounting made during the therapy session), repeated in vivo (direct) exposure to safe situations the patient avoids because of trauma-related fear, and discussion of thoughts and feelings related to exposure exercises. Instead of focusing on trauma, PCT focuses on current life problems as manifestations of PTSD. Participants were provided with a rationale for the present focus that was equivalent to the trauma-focused rationale in PE. PCT included psychoeducation, normalizing responses to trauma, and increasing insight into how responses influence current problems. Therapists could use a range of supportive and insight-oriented interventions that did not focus on participants' traumatic experiences. Participant satisfaction was high and did not differ between treatments (Schnurr, Friedman et al., 2007).

Therapists were 52 female master's- or doctoral-level clinicians who were randomized to deliver one of the two treatments. All received specialized training in their assigned treatment. Ses-

sions were videotaped and reviewed by an expert supervisor, who provided telephone supervision. Therapist adherence and competence, rated by an independent fidelity monitor, were excellent and equivalent across treatments (Schnurr, Friedman et al., 2007).

Measures

The primary outcome was clinician-rated PTSD symptom severity on the CAPS (Weathers et al., 2001), a structured interview in which the frequency and intensity of the 17 *DSM–IV* PTSD symptoms (APA, 1994) are rated on a 5-point scale. Summing the scores yields a measure of severity (range = 0–136), for example, scores of 60–80 are considered severe (Weathers et al., 2001). Reexperiencing (B) and hyperarousal (D) clusters were defined according to the *DSM–IV*. We separated the two avoidance items (C1–C2) and the five numbing items (C3–C7), based on evidence that avoidance and numbing form separate clusters (e.g., King, Leskin, King, & Weathers, 1998). Other psychiatric diagnoses were assessed using the *Structured Clinical Interview for* DSM–IV (First, Spitzer, Gibbon, & Williams, 1995). Interrater reliability was high for both measures (Schnurr, Friedman et al., 2007). The secondary outcome was self-reported PTSD symptom severity on the PTSD Checklist (PCL; Weathers, Litz, Herman, Huska, & Keane, 1993). The PCL consists of the 17 *DSM–IV* symptoms rated on a 5-point scale of how much that symptom bothered the individual in the prior month (1 = *not at all*, 5 = *extremely*).

Table 1
Sample Description

Variable	Prolonged Exposure (n = 141)	Present-centered therapy (n = 143)
Age	44.64 (9.52)	44.93 (9.39)
Age at index trauma	21.18 (10.89)	21.69 (9.24)
Non-White race	44.0% (62)	46.9% (67)
Post high school education	91.5% (129)	86.7% (124)
Married/living as married	31.9% (45)	31.5% (45)
Unemployed	37.6% (53)	39.2% (56)
Approved VA PTSD disability	20.3% (28)	25.2% (35)
Lifetime trauma exposure		
Number of traumatic event types	9.83 (3.09)	9.42 (3.19)
Sexual trauma	93.6% (132)	93.0% (133)
Physical assault	90.8% (128)	84.6% (121)
Combat exposure	31.2% (44)	30.1% (43)
Index trauma		
Sexual trauma	66.6% (94)	69.9% (100)
Physical assault	15.6% (22)	11.9% (17)
Combat exposure	6.4% (9)	4.9% (7)
Clinician-Administered PTSD Scale	77.60 (17.04)	77.88 (16.63)
Any current comorbid Axis I disorder	75.2% (106)	80.4% (115)
Any lifetime comorbid Axis I disorder	96.5% (136)	98.6% (141)
Receiving psychotherapy	67.4% (95)	57.3% (82)
Taking psychotropic medication	76.6% (108)	73.4% (105)

Note. VA = Department of Veterans Affairs; PTSD = posttraumatic stress disorder. Data are reported as means (*SD*) or percentages (*N*). The index trauma was the focus of Prolonged Exposure treatment and the basis for assessment on the Clinician-Administered PTSD Scale.

Data Analysis

Analyses replicated those used in the original study (Schnurr, Friedman et al., 2007) to maintain consistency and facilitate comparisons with the original analyses. Analyses were performed on the intention-to-treat sample, using data from all randomized participants, with multiple imputation (Rubin, 1976) using the Markov chain Monte Carlo method (Schafer, 1997). The analysis for each outcome consisted of a longitudinal model that included therapist as a random cluster effect and baseline severity, treatment group, and site as fixed effects, with the Treatment × Time interaction to test the consistency of the treatment effect over time. Analyses were performed using SAS software, Version 9.3 (SAS Institute, Cary, NC).

Results

Table 1 presents descriptive information about the sample. The PE and PCT groups did not differ at baseline in demographic, exposure, or clinical characteristics (Schnurr, Friedman, et al., 2007). Treatment dropout was higher in PE (n = 53; 38%) than in PCT (n = 30; 21%), and the PE group attended an average of 8 sessions, compared with 9.3 in PCT (Schnurr, Friedman, et al., 2007).

Figure 1 presents between-groups effect sizes for the overall difference between PE and PCT on symptom clusters and individual symptoms. PE had greater benefit on the clinician-rated and self-reported avoidance and numbing clusters and also on the self-reported reexperiencing and hyperarousal clusters. Analyses of individual symptoms showed that PE had greater benefit on clinician-rated and self-reported avoidance of thoughts and feelings (C1), avoidance of people and places (C2), distress caused by reminders (B4), and restricted range of affect (C6). PE also had greater benefit on clinician-rated psychogenic amnesia (C3) and on self-reported dissociation (B3), detachment (C5), difficulty concentrating (D3), hypervigilance (D4), and startle (D5).

Tables 2 and 3 present pre- to posttreatment effect sizes to facilitate an understanding of the comparisons between treatments. Almost all clinician-rated and self-reported symptoms and symptom clusters improved in both conditions. Most effect sizes were medium (according to Cohen's, 1988, definition of d = .50). Effects were largest for the clinician-rated avoidance cluster (d = .77) and self-reported reexperiencing symptoms (d = .77) in PE. Effects were smallest for clinician-rated (d = .03) and self-reported psychogenic amnesia (d = .06) in PCT.

Discussion

We used clinician-rated and self-reported measures to examine the unique benefits of PE on symptom clusters and individual symptoms of PTSD. Findings differed somewhat between the clinician-rated (primary) and self-reported (secondary) measures, with effects appearing on more clusters and symptoms according to self-reports. In terms of interpreting the differences between clinician-rated and self-reported measures, we believe that the primary outcome in the original trial, the clinician-rated CAPS (Weathers et al., 2001), should be given more weight than the self-reported PCL (Weathers et al., 1993) because the CAPS is considered to be the gold standard for assessing PTSD (Weathers et al., 2001).

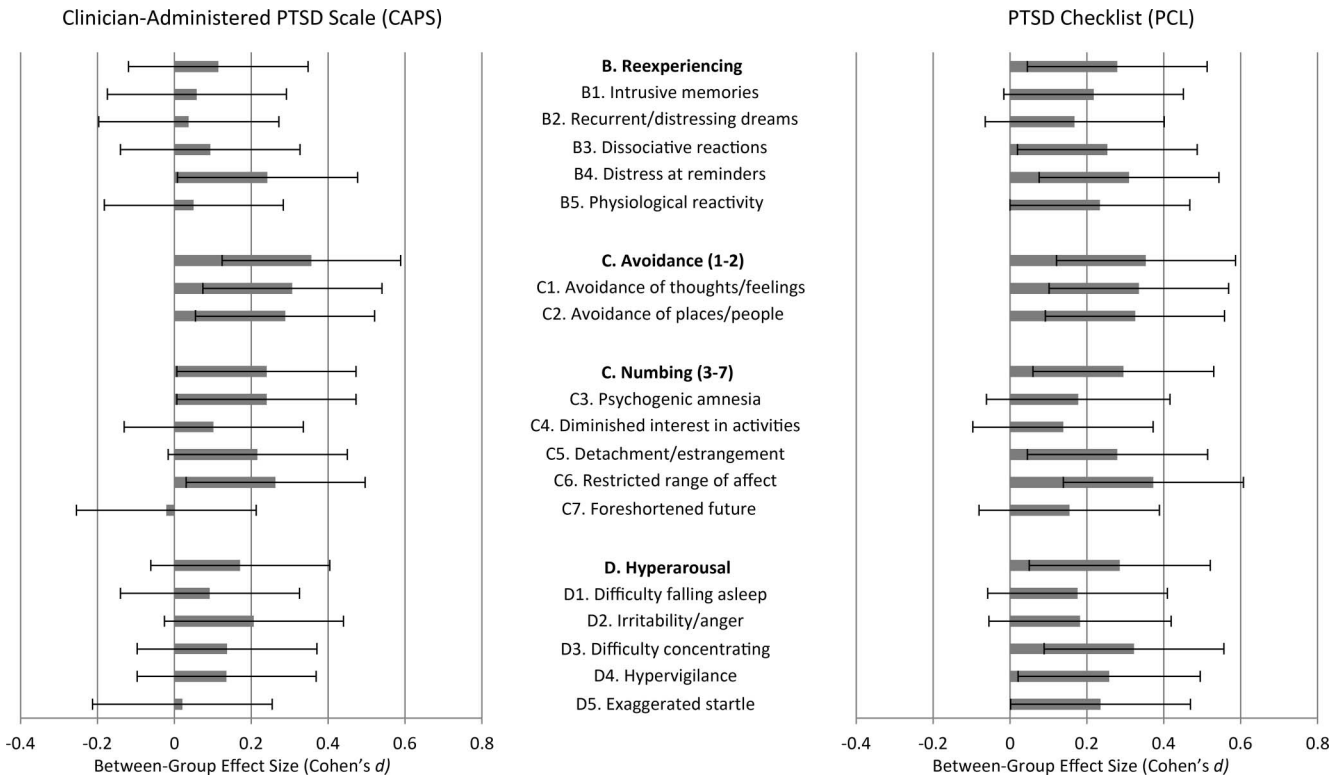

Figure 1. Between-treatment effect sizes comparing Prolonged Exposure (PE) and present-centered therapy (PCT). Between-group effects indicate the overall difference between PE and PCT in longitudinal models, including therapist as a random cluster effect and baseline severity, site, treatment group, time, and Treatment × Time as fixed effects. Error bars indicate the 95% confidence interval for each effect size.

According to both measures, a unique effect of PE was the reduction of avoidance, which makes sense given the focus on reducing avoidance in exposure therapy. Reducing avoidance is theorized to play a key role in recovery from PTSD (Foa et al., 2007). Recent evidence suggests that reducing avoidance is fundamental to improvement in PTSD treatment (Suvak et al., 2012). It is difficult to directly compare our findings with results of prior studies because of differences in measurement and comparison groups. Nevertheless, the effect of PE on avoidance is consistent with findings showing unique effects of PE versus supportive counseling on clinician-rated avoidance (Taylor et al., 2003) and self-reported avoidance and numbing (Bryant et al., 2003).

PE also had a unique effect on the numbing cluster according to both measures, although the symptom-level findings differed in terms of the locus of effects. PE was better than PCT for both measures of restricted range of affect and clinician-rated psychogenic amnesia, and for self-reported detachment. It is plausible that PE would improve numbing given the emphasis in PE on approaching avoided stimuli, including emotions. Our findings showing a unique effect of PE on clinician-rated and self-reported numbing-cluster symptoms differ from those of Taylor et al. (2003), the only previous study to examine numbing separately from avoidance. PCT is more active than Taylor et al.'s relaxation group and less active than EMDR, but type of comparison group is an unlikely explanation because Taylor et al. found no difference between PE and either group.

PE did not have a unique effect on either the clinician-rated reexperiencing or hyperarousal clusters; the only effect was on distress about reminders in the reexperiencing cluster. In contrast, PE had a unique effect on the self-reported reexperiencing and hyperarousal clusters and on individual symptoms in those clusters. Although Foa et al. (1991) did not find that PE was better than supportive counseling for reexperiencing, our findings on self-reported reexperiencing symptoms are consistent with findings from Bryant et al. (2003) and Taylor et al. (2003). No earlier study has found unique effects of PE on hyperarousal. We did, but only in terms of self-reported symptoms, so replication of our finding is important.

Like other studies of psychotherapy for PTSD (Belleville, Guay, & Marchand, 2011), we failed to find a unique effect of PE on sleep difficulties (B2 or D1). Pre–post change on these items was statistically significant, but effect sizes were small to medium in PE. It is possible that sleep habits are hard to change without intervention targeting sleep, which may be necessary for some patients even after a successful course of PE or other effective treatment. A recent randomized trial of cognitive–behavioral therapy for insomnia in PTSD patients showed larger effects than we did across a range of sleep outcomes (Talbot et al., 2014).

One strength of our study is that we used an active comparison treatment. Even with this rigorous control, we found that PE had advantages beyond the benefits of good therapy. Other strengths include use of clinician-rated and self-reported symptoms and

Table 2
Clinician-Rated PTSD Symptoms and Symptom Clusters as a Function of Treatment Group (N = 284)

Symptom	Pre–post effect size (*d*)		Pretreatment		Immediate posttreatment		3-Month follow-up		6-Month follow-up	
	PE	PCT	PE	PCT	PE	PCT	PE	PCT	PE	PCT
B. Reexperiencing	0.59*** [0.42, 0.75]	0.51*** [0.34, 0.67]	20.57 (8.04)	21.13 (7.02)	14.54 (0.86)	15.98 (0.80)	13.07 (0.84)	14.27 (0.81)	13.25 (0.92)	13.32 (0.83)
B1. Intrusive memories	0.37*** [0.20, 0.53]	0.36*** [0.20, 0.52]	4.68 (2.30)	4.87 (2.44)	3.38 (0.28)	3.69 (0.26)	2.87 (0.27)	3.12 (0.26)	2.77 (0.28)	2.63 (0.27)
B2. Recurrent/distressing dreams	0.32*** [0.15, 0.48]	0.32*** [0.16, 0.49]	3.60 (2.72)	4.02 (2.56)	2.68 (0.24)	2.95 (0.23)	2.76 (0.25)	2.75 (0.23)	2.69 (0.25)	2.66 (0.24)
B3. Dissociative reactions	0.27** [0.10, 0.43]	0.19* [0.02, 0.35]	2.44 (2.63)	2.14 (2.44)	1.51 (0.23)	1.57 (0.21)	1.15 (0.22)	1.38 (0.21)	1.35 (0.23)	1.62 (0.22)
B4. Distress about reminders	0.49*** [0.32, 0.66]	0.32*** [0.16, 0.49]	5.05 (1.75)	5.12 (1.62)	3.42 (0.23)	4.05 (0.22)	3.32 (0.22)	3.95 (0.23)	3.36 (0.25)	3.63 (0.25)
B5. Physiological reactivity	0.34*** [0.18, 0.51]	0.30*** [0.14, 0.47]	4.80 (2.24)	4.97 (1.89)	3.54 (0.28)	3.82 (0.28)	2.98 (0.27)	3.19 (0.27)	3.06 (0.27)	2.92 (0.28)
C. Avoidance (C1–2)	0.77*** [0.60, 0.93]	0.49*** [0.33, 0.65]	11.03 (3.40)	10.55 (3.37)	6.01 (0.49)	7.70 (0.48)	5.61 (0.51)	7.41 (0.49)	6.10 (0.50)	7.14 (0.49)
C1. Avoidance of thoughts/feelings	0.70*** [0.53, 0.87]	0.41*** [0.24, 0.57]	5.99 (1.73)	5.70 (1.77)	3.27 (0.28)	4.22 (0.27)	3.03 (0.30)	3.87 (0.28)	3.37 (0.27)	3.74 (0.28)
C2. Avoidance of people/places	0.52*** [0.36, 0.69]	0.38*** [0.21, 0.54]	5.04 (2.63)	4.85 (2.47)	2.79 (0.32)	3.46 (0.29)	2.63 (0.29)	3.53 (0.29)	2.77 (0.31)	3.38 (0.29)
C. Numbing (C3–7)	0.70*** [0.54, 0.87]	0.49*** [0.32, 0.65]	20.79 (6.25)	21.08 (6.86)	12.90 (0.92)	15.61 (0.92)	12.97 (0.96)	14.48 (0.91)	13.31 (1.04)	15.10 (0.96)
C3. Psychogenic amnesia	0.18* [0.02, 0.35]	0.03 [−0.14, 0.19]	2.49 (2.81)	2.58 (2.69)	1.80 (0.27)	2.44 (0.27)	1.67 (0.25)	2.14 (0.25)	1.70 (0.25)	2.19 (0.26)
C4. Diminished interest in activities	0.53*** [0.37, 0.70]	0.44*** [0.27, 0.60]	4.79 (2.20)	4.95 (2.44)	2.64 (0.32)	3.22 (0.30)	2.97 (0.32)	3.06 (0.32)	2.97 (0.37)	3.18 (0.34)
C5. Detachment/estrangement	0.63*** [0.47, 0.80]	0.35*** [0.19, 0.52]	6.01 (1.84)	5.80 (2.04)	3.57 (0.32)	4.57 (0.30)	3.91 (0.33)	4.15 (0.30)	3.89 (0.35)	4.44 (0.32)
C6. Restricted range of affect	0.59*** [0.43, 0.76]	0.41*** [0.24, 0.57]	5.40 (2.19)	5.38 (2.12)	3.15 (0.29)	3.99 (0.29)	3.13 (0.33)	3.75 (0.29)	3.34 (0.32)	3.87 (0.28)
C7. Foreshortened future	0.13 [−0.04, 0.30]	0.27** [0.10, 0.43]	2.11 (2.73)	2.37 (2.81)	1.78 (0.26)	1.47 (0.23)	1.32 (0.24)	1.46 (0.23)	1.47 (0.25)	1.52 (0.25)
D. Hyperarousal	0.62*** [0.46, 0.80]	0.43*** [0.26, 0.59]	25.21 (6.35)	25.12 (5.87)	19.08 (0.85)	20.91 (0.88)	18.65 (0.89)	19.79 (0.88)	18.26 (0.94)	19.48 (0.91)
D1. Difficulty falling asleep	0.30*** [0.13, 0.46]	0.23** [0.07, 0.40]	6.06 (2.27)	6.29 (1.88)	4.91 (0.28)	5.27 (0.28)	5.00 (0.28)	5.12 (0.27)	4.76 (0.29)	4.96 (0.28)
D2. Irritability/anger	0.30*** [0.13, 0.46]	0.12 [−0.04, 0.29]	4.77 (1.86)	4.64 (2.07)	3.79 (0.25)	4.36 (0.26)	3.65 (0.29)	4.11 (0.25)	3.57 (0.28)	3.97 (0.26)
D3. Difficulty concentrating	0.34*** [0.17, 0.50]	0.20* [0.04, 0.37]	4.96 (2.12)	4.84 (2.26)	3.77 (0.24)	4.13 (0.25)	3.58 (0.27)	3.94 (0.27)	3.63 (0.27)	3.80 (0.26)
D4. Hypervigilance	0.52*** [0.36, 0.69]	0.33*** [0.17, 0.50]	5.82 (2.09)	5.52 (2.25)	3.94 (0.28)	4.41 (0.28)	3.83 (0.27)	4.00 (0.29)	3.62 (0.30)	4.04 (0.29)
D5. Exaggerated startle	0.31*** [0.15, 0.48]	0.34*** [0.18, 0.50]	3.61 (2.30)	3.83 (2.31)	2.73 (0.24)	2.80 (0.23)	2.66 (0.25)	2.65 (0.24)	2.70 (0.25)	2.76 (0.24)

Note. PE = Prolonged Exposure; PCT = present-centered therapy; PTSD = posttraumatic stress disorder. Clinician-rated PTSD was measured using the Clinician-Administered PTSD Scale. Pre–post effect sizes (*d*) and 95% confidence intervals were calculated from the cross-sectional model that included therapist as a random cluster effect and treatment group, and site as fixed effects. Table entries for pretreatment are observed means and standard deviations. Table entries for immediate posttreatment, and 3- and 6-month follow-up are least squares means and standard errors from the longitudinal model including therapist as a random cluster effect and baseline severity, site, treatment group, time, and treatment by time as fixed effects.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3
Self-Reported PTSD Symptoms and Symptom Clusters as a Function of Treatment Group (N = 284)

Symptom	Pre–post effect size (*d*)		Pretreatment		Immediate posttreatment		3-Month follow-up		6-Month follow-up	
	PE	PCT	PE	PCT	PE	PCT	PE	PCT	PE	PCT
B. Reexperiencing	0.72*** [0.55, 0.89]	0.52*** [0.36, 0.69]	16.37 (4.79)	16.36 (4.51)	11.13 (0.61)	13.29 (0.51)	11.89 (0.57)	13.08 (0.51)	11.84 (0.57)	12.87 (0.51)
B1. Intrusive memories	0.77*** [0.60, 0.94]	0.59*** [0.43, 0.76]	3.62 (1.00)	3.60 (0.99)	2.29 (0.15)	2.73 (0.13)	2.43 (0.14)	2.67 (0.13)	2.41 (0.14)	2.57 (0.13)
B2. Recurrent/distressing dreams	0.48*** [0.31, 0.64]	0.34*** [0.17, 0.50]	2.92 (1.33)	2.93 (1.32)	2.03 (0.14)	2.35 (0.12)	2.20 (0.15)	2.38 (0.13)	2.20 (0.13)	2.25 (0.13)
B3. Dissociative reactions	0.49*** [0.33, 0.66]	0.22** [0.06, 0.39]	2.74 (1.27)	2.64 (1.29)	1.80 (0.13)	2.27 (0.12)	1.94 (0.12)	2.20 (0.11)	1.94 (0.13)	2.11 (0.12)
B4. Distress about reminders	0.56*** [0.39, 0.73]	0.37*** [0.20, 0.53]	3.70 (1.11)	3.72 (1.06)	2.60 (0.15)	3.09 (0.13)	2.69 (0.13)	3.07 (0.13)	2.78 (0.13)	3.02 (0.13)
B5. Physiological reactivity	0.51*** [0.34, 0.68]	0.39*** [0.22, 0.55]	3.38 (1.28)	3.47 (1.16)	2.43 (0.16)	2.84 (0.13)	2.64 (0.14)	2.75 (0.13)	2.53 (0.14)	2.90 (0.13)
C. Avoidance (C1–2)	0.66*** [0.50, 0.83]	0.40*** [0.23, 0.56]	7.55 (2.00)	7.39 (2.16)	4.99 (0.29)	6.01 (0.26)	5.02 (0.30)	6.19 (0.26)	5.45 (0.28)	5.94 (0.27)
C1. Avoidance of thoughts/feelings	0.71*** [0.55, 0.88]	0.44*** [0.28, 0.61]	3.89 (1.01)	3.75 (1.14)	2.50 (0.15)	2.99 (0.14)	2.58 (0.16)	3.14 (0.13)	2.81 (0.15)	3.02 (0.14)
C2. Avoidance of people/places	0.52*** [0.36, 0.69]	0.30*** [0.13, 0.46]	3.67 (1.27)	3.64 (1.30)	2.50 (0.16)	3.01 (0.15)	2.45 (0.17)	3.05 (0.15)	2.65 (0.16)	2.92 (0.15)
C. Numbing (C3–7)	0.56*** [0.39, 0.73]	0.36*** [0.20, 0.53]	15.86 (4.58)	15.75 (4.36)	11.55 (0.59)	13.47 (0.48)	12.12 (0.63)	13.60 (0.52)	12.32 (0.57)	13.48 (0.49)
C3. Psychogenic amnesia	0.23** [0.06, 0.40]	0.06 [−0.10, 0.23]	2.52 (1.43)	2.52 (1.36)	1.97 (0.14)	2.35 (0.13)	2.11 (0.14)	2.15 (0.13)	1.91 (0.15)	2.20 (0.12)
C4. Diminished interest in activities	0.41*** [0.24, 0.57]	0.31*** [0.15, 0.48]	3.52 (1.27)	3.47 (1.26)	2.66 (0.16)	2.91 (0.14)	2.73 (0.16)	2.91 (0.14)	2.73 (0.16)	2.90 (0.15)
C5. Detachment/estrangement	0.55*** [0.38, 0.72]	0.37*** [0.21, 0.53]	3.77 (1.12)	3.77 (1.09)	2.64 (0.16)	3.12 (0.13)	2.87 (0.14)	3.19 (0.15)	2.91 (0.15)	3.25 (0.14)
C6. Restricted range of affect	0.59*** [0.42, 0.75]	0.24** [0.07, 0.40]	3.41 (1.25)	3.22 (1.41)	2.29 (0.14)	2.86 (0.13)	2.39 (0.17)	2.99 (0.15)	2.62 (0.14)	2.93 (0.13)
C7. Foreshortened future	0.35*** [0.18, 0.51]	0.28*** [0.12, 0.45]	2.64 (1.49)	2.78 (1.42)	2.00 (0.14)	2.21 (0.14)	2.02 (0.15)	2.35 (0.15)	2.14 (0.15)	2.17 (0.13)
D. Hyperarousal	0.67*** [0.50, 0.83]	0.35*** [0.18, 0.51]	18.38 (3.88)	17.59 (4.20)	13.53 (0.55)	15.63 (0.52)	14.27 (0.61)	15.84 (0.52)	14.53 (0.57)	15.49 (0.52)
D1. Difficulty falling asleep	0.51*** [0.34, 0.67]	0.36*** [0.20, 0.53]	4.04 (1.10)	4.01 (1.11)	3.11 (0.14)	3.36 (0.14)	3.22 (0.14)	3.50 (0.13)	3.28 (0.15)	3.43 (0.14)
D2. Irritability/anger	0.36*** [0.19, 0.52]	0.14 [−0.03, 0.30]	3.20 (1.18)	3.10 (1.23)	2.59 (0.14)	2.95 (0.13)	2.71 (0.14)	2.95 (0.13)	2.74 (0.14)	2.89 (0.14)
D3. Difficulty concentrating	0.55*** [0.39, 0.72]	0.23** [0.07, 0.40]	3.69 (1.07)	3.62 (1.09)	2.65 (0.13)	3.20 (0.13)	2.96 (0.14)	3.34 (0.13)	2.96 (0.14)	3.16 (0.13)
D4. Hypervigilance	0.59*** [0.43, 0.76]	0.27** [0.10, 0.43]	3.91 (1.13)	3.58 (1.24)	2.71 (0.15)	3.21 (0.14)	2.81 (0.15)	3.14 (0.14)	2.94 (0.14)	3.23 (0.14)
D5. Exaggerated startle	0.62*** [0.45, 0.78]	0.29*** [0.13, 0.46]	3.55 (1.23)	3.28 (1.22)	2.50 (0.13)	2.91 (0.13)	2.60 (0.15)	2.92 (0.13)	2.65 (0.14)	2.78 (0.12)

Note. PE = Prolonged Exposure; PCT = present-centered therapy; PTSD = posttraumatic stress disorder. Self-reported PTSD was measured using the PTSD Checklist. Pre–post effect sizes (*d*) and 95% confidence intervals were calculated from the cross-sectional model that included therapist as a random cluster effect and treatment group, and site as fixed effects. Table entries for pretreatment are observed means and standard deviations. Table entries for immediate posttreatment, and 3- and 6-month follow-up are least squares means and standard errors from the longitudinal model including therapist as a random cluster effect and baseline severity, site, treatment group, time, and treatment by time as fixed effects.
* $p < .05$. ** $p < .01$. *** $p < .001$.

clusters, defining avoidance separately from numbing, and a large sample size. Nevertheless, there are limitations. Most participants were female veterans and only a few were on active duty. They had experienced multiple traumatic events. The majority had been sexually traumatized and had comorbid psychiatric problems. These factors may limit generalizing findings to men, military personnel, and nonveterans. We do not believe that there is any reason the unique effects of PE would differ between men and women or between veterans and nonveterans, but we cannot say this conclusively. Another limitation is that we did not assess all *DSM–5* symptoms (APA, 2013), although the findings on avoidance and numbing should reasonably generalize to future findings based on *DSM–5* because we assessed avoidance separately from numbing.

Our study was not intended to definitively answer the question of the unique effects of PE on specific PTSD symptoms. To do so, a study would need a much broader sample to test whether effects differ between populations, for example, men and women, and veterans and nonveterans. Even then, it is unlikely that a single study could settle the question. Instead, we offer the study as an example to encourage future research on how PE and other treatments specifically affect all of the symptoms of PTSD. With more research, meta-analysis would be possible. Symptom-level analyses would be especially helpful in studies that compare active treatments. Analyses examining patterns of change over time and relationships among symptoms in change could further greater understanding of treatment mechanisms.

Individuals with PTSD differ in terms of the burden their symptoms place on their lives. Our study suggests that PE may be especially helpful for individuals affected by avoidance and numbing. Giving patients information about how a treatment can improve the symptoms that create the greatest burden can facilitate choosing the treatment that is best for them.

References

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

American Psychiatric Association, DSM-5 Task Force. (2013). *DSM-5: Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Belleville, G., Guay, S., & Marchand, A. (2011). Persistence of sleep disturbances following cognitive-behavior therapy for posttraumatic stress disorder. *Journal of Psychosomatic Research, 70,* 318–327. http://dx.doi.org/10.1016/j.jpsychores.2010.09.022

Bryant, R. A., Moulds, M. L., Guthrie, R. M., Dang, S. T., & Nixon, R. D. V. (2003). Imaginal exposure alone and imaginal exposure with cognitive restructuring in treatment of posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology, 71,* 706–712. http://dx.doi.org/10.1037/0022-006X.71.4.706

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (1995). *Structured Clinical Interview for DSM–IV* (patient ed; SCID-I/P; Version 2.0). New York, NY: Biometrics Research.

Foa, E. B., Hembree, E. A., & Rothbaum, B. O. (2007). *Prolonged exposure therapy for PTSD: Emotional processing of traumatic experiences therapist guide*. New York, NY: Oxford University Press.

Foa, E. B., Rothbaum, B. O., Riggs, D. S., & Murdock, T. B. (1991). Treatment of posttraumatic stress disorder in rape victims: A comparison between cognitive–behavioral procedures and counseling. *Journal of Consulting and Clinical Psychology, 59,* 715–723. http://dx.doi.org/10.1037/0022-006X.59.5.715

Karlin, B. E., & Cross, G. (2014). From the laboratory to the therapy room: National dissemination and implementation of evidence-based psychotherapies in the U.S. Department of Veterans Affairs Health Care System. *American Psychologist, 69,* 19–33. http://dx.doi.org/10.1037/a0033888

King, D. W., Leskin, G. A., King, L. A., & Weathers, F. W. (1998). Confirmatory factor analysis of the Clinician-Administered PTSD Scale: Evidence for the dimensionality of posttraumatic stress disorder. *Psychological Assessment, 10,* 90–96. http://dx.doi.org/10.1037/1040-3590.10.2.90

Rubin, D. B. (1976). Inference and missing data. *Biometrika, 63,* 581–592. http://dx.doi.org/10.1093/biomet/63.3.581

Schafer, J. L. (1997). *Analysis of incomplete multivariate data*. New York, NY: Chapman & Hall. http://dx.doi.org/10.1201/9781439821862

Schnurr, P. P. (2007). The rocks and hard places in psychotherapy outcome research. *Journal of Traumatic Stress, 20,* 779–792. http://dx.doi.org/10.1002/jts.20292

Schnurr, P. P., Friedman, M. J., Engel, C. C., Foa, E. B., Shea, M. T., Chow, B. K., . . . Bernardy, N. (2007). Cognitive behavioral therapy for posttraumatic stress disorder in women: A randomized controlled trial. *JAMA: Journal of the American Medical Association, 297,* 820–830. http://dx.doi.org/10.1001/jama.297.8.820

Schnurr, P. P., Friedman, M. J., Engel, C. C., Foa, E. B., Shea, M. T., Resick, P. M., . . . Chow, B. K. (2005). Issues in the design of multisite clinical trials of psychotherapy: VA Cooperative Study No. 494 as an example. *Contemporary Clinical Trials, 26,* 626–636. http://dx.doi.org/10.1016/j.cct.2005.09.001

Schnurr, P. P., Shea, M. T., Friedman, M. J., & Engel, C. C. (2007). Posttraumatic stress disorder and cognitive behavioral therapy-Reply. [Letter]. *JAMA: Journal of the American Medical Association, 297,* 2694–2695. http://dx.doi.org/10.1001/jama.297.24.2695

Society of Clinical Psychology. (2012). *Present-centered therapy for posttraumatic stress disorder*. Retrieved from http://www.div12.org/PsychologicalTreatments/treatments/ptsd_present.html

Suvak, M. K., Treanor, M., Mitchell, K. S., Sloan, D. M., & Resick, P. A. (2012, November). Latent difference score modeling to examine relationships among PTSD symptom clusters during Cognitive Processing Therapy. In M. K. Suvak (Chair), *Understanding processes and mechanisms of change of PTSD treatment*. Symposium presented at the 28th Annual Meeting of The International Society for Traumatic Stress, Los Angeles, CA.

Talbot, L. S., Maguen, S., Metzler, T. J., Schmitz, M., McCaslin, S. E., Richards, A., . . . Neylan, T. C. (2014). Cognitive behavioral therapy for insomnia in posttraumatic stress disorder: A randomized controlled trial. *Sleep: Journal of Sleep and Sleep Disorders Research, 37,* 327–341.

Taylor, S., Thordarson, D. S., Maxfield, L., Fedoroff, I. C., Lovell, K., & Ogrodniczuk, J. (2003). Comparative efficacy, speed, and adverse effects of three PTSD treatments: Exposure therapy, EMDR, and relaxation training. *Journal of Consulting and Clinical Psychology, 71,* 330–338. http://dx.doi.org/10.1037/0022-006X.71.2.330

Weathers, F. W., Keane, T. M., & Davidson, J. R. T. (2001). Clinician-Administered PTSD Scale: A review of the first ten years of research. *Depression and Anxiety, 13,* 132–156. http://dx.doi.org/10.1002/da.1029

Weathers, F. W., Litz, B. T., Herman, J. A., Huska, J. A., & Keane, T. M. (1993, November). *The PTSD Checklist (PCL): Reliability, validity, and diagnostic utility*. Paper presented at the International Society for Traumatic Stress Studies Annual Conference, San Antonio, TX.

Received July 28, 2014
Revision received April 25, 2015
Accepted May 4, 2015 ■