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Efficacy of a Brief Treatment for Nightmares and Sleep Disturbances for Veterans

Noelle E. Balliett
VA Puget Sound Health Care System, American Lake Division, Tacoma, Washington

Joanne L. Davis and Katherine E. Miller
University of Tulsa

Nightmares and sleep disturbances are common complaints among military Veterans (Plumb & Zelman, 2009) and may be difficult to eradicate (Forbes, Phelps, & McHugh, 2001). A treatment protocol (Exposure, Relaxation, and Rescription Therapy [ERRT]) targeting nightmares and sleep disturbances, which has been used effectively in civilian populations, was adapted for the military (ERRT-M). A pilot study evaluated the efficacy of ERRT-M in improving sleep quality and quantity and reducing nightmares, symptoms of posttraumatic stress disorder, and depression in a trauma-exposed, Veteran sample (N = 19). At 1 week after treatment, analyses revealed improvements in nightmare frequency and severity, depression, sleep quality, and insomnia severity. Treatment gains were maintained at a 2-month follow-up. Fifty percent of the sample was considered treatment responders (i.e., no nightmares in the previous week). Results of this pilot study suggest that directly targeting sleep and nightmares is successful in alleviating sleep disturbances and related psychopathology in some Veterans.

Keywords: insomnia, posttraumatic stress, parasomnia, therapy, military

Distressing dreams and sleep disturbances have been described as the "hallmarks" of posttraumatic stress disorder (PTSD; Ross, Ball, Sullivan, & Caroff, 1989). Spoormaker and Montgomery (2008) reviewed evidence suggesting that nightmares and insomnia may serve as risk factors for the development of PTSD and should be considered more than secondary symptoms of PTSD. In the past 2 decades, increased attention has been paid to the development and evaluation of targeted treatments for nightmares and insomnia in trauma-exposed populations (e.g., Lancee, Spoormaker, Krakow, & van den Bout, 2008). Evaluations of these approaches suggest they are largely promising (Augedal, Hansen, Kronhaug, Harvey, & Pallesen, 2013), although the literature on military populations is equivocal. The current study evaluated a treatment modified for Veterans to reduce nightmares and improve sleep quality and related symptoms.

Research conducted with military personnel demonstrates the prevalence and persistence of nightmares and sleep problems. Veterans with PTSD reported more nonrestorative sleep, insomnia, disturbed dreams with and without combat-related content, thrashing during sleep, panicked awakenings, sleep talking, night terrors, and sleep paralysis than their Veteran counterparts without PTSD (Mellman, Kulick-Bell, Ashlock, & Nolan, 1995). More recent studies have found high rates of sleep disturbances among Operation Enduring Freedom (OEF)/Operation Iraqi Freedom (OIF)Veteran cohorts. Plumb and Zelman (2009) found that 54.6% of OEF/OIF participants considered their sleep to be "bad" or "very bad," with the presence of depression, anxiety, or PTSD symptoms increasing the likelihood of reported sleep complaints. Nearly all (90.5%) participants reported that their sleep was not problematic before joining the military. Likewise, Pietrzak and colleagues (2010) reported that in a sample of 167 OIF/OEF Veterans seeking treatment, average sleep was reported to be severely impaired on a self-report measure of sleep quality and that Veterans with PTSD reported worse sleep than Veterans without PTSD.

Because of the high prevalence and persistence of sleep disturbances, even after treatment for PTSD, treatments directly targeting sleep problems in trauma-exposed samples have been developed. Numerous approaches have been utilized, including several variations of Imagery Rehearsal Therapy (IRT; Krakow et al., 2001) and Exposure, Relaxation, and Rescripting Therapy (ERRT; Davis & Wright, 2007). In general, IRT includes practicing positive imagery, rescripting a nightmare, and rehearsing the rescripted dream. ERRT includes psychoeducation on trauma and nightmares, sleep hygiene education and modification (including stimulus control and modification of three additional sleep habits), relaxation techniques, exposure to the content of the worst nightmare, identification of nightmare themes, rescripting of the nightmare on the basis of the themes identified, and rehearsing the rescripted version.

Several meta-analytic studies find support for these approaches. For example, Augedal and colleagues (2013) found the highest effect sizes for desensitization (Cohen's d = .97), lucid dreaming (d = .96), ERRT (d = .68), and IRT (d = .58). Overall, the authors

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Noelle E. Balliett, VA Puget Sound Health Care System, American Lake Division, Tacoma, Washington; Joanne L. Davis and Katherine E. Miller, Department of Psychology, University of Tulsa.

Dr. Davis authored "Treating Posttraumatic Nightmares: A Cognitive Behavioral Approach"; which discussing Exposure, Relaxation, and Rescription Therapy (ERRT).

Correspondence concerning this article should be addressed to Joanne L. Davis, Department of Psychology, University of Tulsa, 800 South Tucker Drive, Tulsa, OK 74104. E-mail: joanne-davis@utulsa.edu

report that the effects of these psychological approaches appear to be long lasting, yield higher effect sizes than pharmacological approaches, individual formats outperform self-help approaches, and complex interventions are more promising than minimal approaches. In another review, Hansen, Höfling, Kröner-Borowik, Stangier, & Steil (2013) examined studies utilizing psychological treatments that included imaginal confrontation with nightmare content and those that included imagery rescripting and rehearsal. The authors found that overall, improvements after these approaches were maintained over time and even continued to improve through the follow-up for some factors. Furthermore, approaches utilizing imaginal confrontation yielded higher effect sizes, although no conclusions were drawn regarding which approach was more effective.

To date, meta-analytic studies of nightmare and sleep treatments have not explored the efficacy of psychological approaches by sample. Because of multiple deployments and exposure to numerous potentially traumatic events, Veterans may be more resistant to treatment approaches targeting posttraumatic stress symptoms (Creamer & Forbes, 2004). Although it is not clear that this resistance might apply to nightmare-specific treatments, studies evaluating nightmare treatments in Veterans are mixed. Utilizing IRT, several uncontrolled studies find some positive findings. Forbes and colleagues (2003) reported reductions in nightmare frequency and intensity, depression, anxiety, and global psychological symptoms immediately after treatment in a sample of 12 Veterans. Treatment gains were maintained at a 3-month and 12-month follow-up. In an uncontrolled study of 17 adult male Veterans, Lu, Wagner, Van Male, Whitehead, and Boehnlein (2009) reported that immediately after treatment, no symptom reductions were observed. Nightmare frequency and PTSD symptoms improved at 3 months, but the change in nightmare frequency was no longer significant at 6 months. No change was found for sleep quality, depression, and the effect of nightmares. An archival data analysis study (Nappi, Drummond, Thorp, & McQuaid, 2010) of IRT with 49 male and 9 female Veterans revealed significant improvements in nightmare frequency, nightmare intensity, insomnia symptoms, and PTSD symptoms from the first to the final session, with effect sizes in the moderate to large range, but no change was found for sleep quality. The authors classified 23% of participants as "complete treatment responders," defined as those reporting one or fewer nightmares in the past week. In a controlled trial of IRT versus a comparison condition (psychoeducation and components of cognitive–behavioral therapy [CBT] for insomnia [CBT-I]) with 124 Veterans, Cook and colleagues (2010) found that both groups reported some improvement in sleep quality and PTSD symptoms but no changes were found for nightmare frequency.

ERRT also shows promise within military samples. Swanson, Favorite, Horin, and Arnedt (2009) combined the three-session ERRT protocol with seven sessions of CBT-I and found improvements in sleep efficiency, sleep latency, total sleep, weekly nightmare frequency, nightmare distress, global sleep quality, and insomnia, but no improvements in self-reported PTSD symptoms. Long and colleagues (2011) extended ERRT to 6 weeks to allow more time to practice imagery skills and increase exposure to the original distressing nightmare content. Participants were 37 adult male Veterans reporting at least one trauma-related nightmare per week. Results revealed improvements in nightmare frequency, PTSD symptoms, and sleep quantity. This modified protocol was also utilized in two case studies of Vietnam Veterans over four treatment sessions and results indicated improvements in PTSD, nightmare frequency, depression, and sleep (Wanner, Long, & Teng, 2010). It remains an empirical question at this point, but it appears that extending the original three-session protocol may be helpful for Veterans with long-standing nightmares.

Although promising findings are reported for psychological approaches to nightmares, Augedal and colleagues (2013) note that the effects sizes are small compared with psychological approaches to other mental health conditions and suggest that there is a need for continued development and refinement of these approaches. Thus, ERRT was modified in several ways for the present study, including extending the protocol to five sessions and including mindfulness exercises (ERRT-Military [EERT-M], described below). In light of the findings reviewed above, we hypothesized that ERRT-M would improve nightmare frequency and severity, posttraumatic stress, depression, seven dimensions of sleep quality, fear of sleep, and insomnia severity at 1-week posttreatment and that treatment gains would be maintained at the 2-month follow-up.

Method

Participants

Participants were adult Veterans, aged 18 years or older, who experienced any traumatic event meeting Criterion A for PTSD (*Diagnostic and Statistical Manual of Mental Disorders* [4th edition, text revision; *DSM-IV-TR*]; American Psychiatric Association, 2000) at least 3 months before treatment and who reported at least one nightmare per week for the past month. Nightmares were defined as dreams that involve negative emotion of sufficient intensity to cause awakening. Participants were not required to have a PTSD diagnosis because they may experience trauma-related nightmares in the absence of PTSD. Exclusion criteria included severe cognitive impairment sufficient to interfere with treatment, psychotic spectrum disorders, current or past mania, and current substance dependence. There were no other exclusion criteria.

A total of 44 individuals contacted the investigators and expressed interest in the study. Thirty-nine individuals met Veteran status criteria and completed phone screen procedures. Of these 39 Veterans, 10 were excluded based on the above criteria, 6 individuals did not complete the initial assessment, and 2 individuals were no longer interested in participating after the initial assessment and did not start treatment. During the course of treatment, no participants dropped out, and all participants completed all follow-up assessments. One outlier was removed because of follow-up scores being $\geq$2 *SD* above the mean on total Clinician-Administered PTSD Scale (CAPS) scores and nightmare frequency. Of the remaining 18 Veterans who completed treatment, the average age was 56.6 years (*SD* = 12.5; range 30–79) and the average annual household income was $29,249 (*SD* = $19,708). Additional demographic information is presented in Table 1.

Most participants (77.8%) met criteria for PTSD, according to *DSM–IV–TR*, during the past month. Most participants (94.4%) were in a concurrent mental health treatment for PTSD, depression, and/or anxiety. Average CAPS scores (Weathers et al., 2001)

Table 1
Demographic Information for Study Sample

Demographics	*n*	%
Gender		
Men	13	72.2
Women	5	27.8
Racial and ethnic background		
Caucasian	12	66.7
Multiracial	5	27.8
Native American	1	5.6
Highest education level		
Less than high school	2	11.1
High school graduate	3	16.7
Some college	8	44.4
College graduate	4	22.2
Graduate school	1	5.6
Marital status		
Married	8	44.4
Divorced/separated	5	27.8
Single	5	27.8
Vocational status		
Retired	10	55.6
Unemployed	4	22.2
Employed full time	2	11.1
Employed part time	1	5.6
Student	1	5.6
Branch of military		
Army	7	38.9
Marines	4	22.2
Navy	4	22.2
National Guard	1	5.6
Air Force	1	5.6
Navy/Army	1	5.6

Note. $N = 18$.

and depression scores were in the moderate range (Beck, Steer, & Brown, 1996). Participants reported experiencing nightmares for an average of 40.27 years ($SD = 6.26$), with all participants indicating that their nightmares began after a traumatic event. On average, participants reported falling asleep 2.27 h after going to bed ($SD = .89$) and 2.97 nightmares per week ($SD = 1.78$). Participants reported experiencing an average of six traumatic events ($SD = 3.64$, range = 1−14). Combat was the most frequently occurring traumatic event (65.2%), followed by witnessing someone being killed or seriously injured (56.5%), being in a serious accident (39.1%), and being in another situation that was deemed likely to cause death or serious injury (39.1%). Twenty-two percent reported adult sexual assault and 8% reported child sexual assault.

Procedure

All procedures and measures were approved by a university institutional review board. Participants were recruited via clinician referrals, flyers posted in the community, and presentations for interested Veterans groups. Participants completed an initial phone screen; those who were eligible to participate were scheduled for an initial in-person evaluation. Informed consent was obtained, and participants were asked to stabilize the use of all psychoactive medications throughout treatment and follow-up. Participants attended once-per-week sessions for 4 weeks either individually ($n = 4$), in pairs ($n = 10$), or both individually and in pairs ($n = 4$) conducted by the principal investigator (N.E.B.). All assessment and treatment sessions were conducted in a university research center. A trained graduate student (K.E.M.), who was not part of the treatment procedure, conducted posttreatment assessments at 1 week and 2 months after the end of treatment. Participants were compensated with a $10 gift card at each of the follow-up assessments to decrease attrition, and they received gas cards to assist in the cost of transportation.

Measures

CAPS. The CAPS (Blake et al., 1990) is a semistructured clinical interview that assesses each of 17 *DSM–IV–TR* criteria for PTSD utilizing separate queries for frequency and severity on a 5-point scale (*0–4*). This study utilized the "FI/I2" rule, in which frequency ratings of ≥1 and intensity ratings of ≥2 must be present for a symptom to count toward diagnosis. This method is reported to yield a sensitivity estimate of .91 and a specificity estimate of .71 (Weathers, Ruscio, & Keane, 1999) with adequate reliability. The Cronbach's α for the current study ranged from .92 to .94 across the time points.

Structured Clinical Interview for DSM Disorders. The Structured Clinical Interview for DSM Disorders (SCID; First, Spitzer, Gibbon, & Williams, 1996) was used to assess for selected *DSM–IV–TR* diagnoses. Divided into modules by major pathology, items are rated by the administering clinician on a 3-point scale (1 = *absent or false*, 2 = *subthreshold*, 3 = *threshold or true*). In this study, the SCID helped to determine the presence of bipolar disorder (Mood Episodes Module), psychosis (Psychotic and Associated Symptoms Module), or current substance use disorder (Substance Use Module). Interrater reliability estimates range from .80 to 1.0 (Zanarini et al., 2000) with acceptable test-retest reliabilities of .61 to .76 over short time intervals. The primary investigator (N.E.B.) conducted both the CAPS and the SCIDs at the initial assessment and the trained graduate student, who was not part of treatment, conducted the follow-up assessments.

Trauma Assessment for Adults, Modified. The Trauma Assessment for Adults, Modified (TAA-Self Report Version; Resnick, Best, Kilpatrick, Freedy, & Falsetti, 1993) instrument was used to determine lifetime history of exposure to various traumatic events. It includes 18 items with follow-up questions assessing perceived threat for each specific event reported by participants, including combat exposure. Acceptable test–retest reliability has been observed using this measure (e.g., Gray, Elhai, Owen, & Monroe, 2009), and convergent validity with other measures of trauma exposure have been reported elsewhere.

Beck Depression Inventory-II. The Beck Depression Inventory-II (BDI-II; Beck et al., 1996) is a 21-item self-report measure that was designed to assess the severity of depression among adults. Responses on a Likert-type scale range from 0 to 3, and scores may be summed to derive a total score, with higher scores indicating more depressive symptoms. Scores of 18 and above have been suggested to reliably identify depressed patients (correct classification rate = 92%; Arnau, Meagher, Norris, & Bramson, 2001). For the current study, internal consistency ranged from .83 to .91 across the three time points.

Pittsburgh Sleep Quality Index. The Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) is a self-report instrument measuring sleep behavior and

difficulties during the past month. A global score ranging from 0 to 21 includes seven component scores; higher scores reflect poorer sleep quality. Total scores above 5 have been demonstrated to distinguish "good" from "poor" sleepers (Buysse et al., 1989). Internal consistency estimates (r = .83) and test–retest reliability (r = .85) are good. Buysse and colleagues reported an instrument sensitivity of 89.6% and specificity of 86.5%. In the present study, acceptable internal consistency was found with a Cronbach's α ranging from .53 to .64 among component scores across time points.

Pittsburgh Sleep Quality Index—Addendum for PTSD. The Pittsburgh Sleep Quality Index—Addendum for PTSD (PSQI-A; Germain, Hall, Krakow, Shear, & Buysse, 2005) is a seven-item self-report instrument used in conjunction with the PSQI for use with trauma-exposed participants and assesses the presence of seven trauma-related sleep behaviors. Analyses revealed good internal consistency (r = .85) and a moderate item-total correlation (r = .47). Internal consistency of this measure was poor at the initial assessment (α = .39) but was acceptable at the posttreatment assessment (α = .72).

Trauma-Related Nightmare Survey. The Trauma-Related Nightmare Survey (TRNS; Davis, Wright, & Borntrager, 2001) instrument was developed to measure specific characteristics of trauma-related nightmares such as frequency, severity, duration, and a range of reactions to nightmares. The TRNS utilizes several types of question formats including Likert-type, fill in the blank, and checklists. On the Likert-format questions, split-half reliabilities were found ranging from .63 (*severity*) to .77 (*fear of going to sleep*; Davis & Wright. 2007). Test–retest reliabilities for the past week range from .63 (*severity of nightmares*) to .77 (*fear of going to sleep*). Outcome variables from this measure include nightmare frequency, nightmare distress, depression upon waking, fear of sleep, and distress upon awakening.

Insomnia Severity Index. The Insomnia Severity Index (ISI; Morin, 1993) is a seven-item self-report measure designed to assess insomnia symptoms and is frequently used in research. A 4-point Likert-type scale is used to assess perceived severity, sleep satisfaction, impairment in daily functioning, visibility of impairment, and concern over impairment. Total scores from 0 to 28 can be derived. Prior studies (Bastien, Vallières, & Morin, 2001) have demonstrated an internal consistency estimate of .74 among individuals seeking sleep treatment. Utilizing a cutpoint of 14 yields a sensitivity of .94 and a specificity of .94 in a sample including individuals with and without sleep problems (Smith & Trinder, 2001). Cronbach's α in this study ranged from .84 to .86 across the three time points, indicating good internal consistency.

Treatment

ERRT (Davis, 2009; Davis & Wright, 2006) is conducted for 90 min once a week for 3 consecutive weeks and may be used in an individual or group format. Homework is assigned between all sessions, which include practicing relaxation techniques; modifying sleep habits; and daily monitoring of nightmares, sleep quality and quantity, and PTSD symptoms. The first session consists of psychoeducation about trauma, PTSD, and sleep hygiene, including the modification of sleep habits. In addition, progressive muscle relaxation (PMR) is taught. The second session consists of the exposure and rescripting elements. The rationale for exposure is provided and clients select their most distressing nightmare, write it out as if it was happening in the present time, and read it aloud. Trauma themes, including power, safety, trust, esteem, and intimacy (McCann, Sakheim, & Abrahamson, 1988), are identified within the nightmare. The rational and instruction for rescripting (i.e., changing) the nightmare is provided, and participants change their nightmare based on the identified theme(s). The client then reads the new, less-disturbing dream aloud and is tasked to imaginally rehearse the new dream each night before bed. This session ends with instruction and practice in diaphragmatic breathing. During the third session, the process of changing the nightmare is discussed and solutions for any difficulties over the past week are developed. Participants are encouraged to continue practicing the skills they learned for treatment maintenance.

The ERRT protocol was modified in several ways for this study. The treatment was extended to accommodate additional time for exposure and rescripting by adding one additional session and lengthening session time by 30 min because previous investigators noted that a Veteran population may struggle with modification of long-standing nightmares (Long et al., 2011). The patient manual was modified to improve readability and include military language and examples, and several mindfulness exercises were added. Mindfulness exercises were included because they have been found to be promising in the treatment of depression (Segal, Williams, & Teasdale, 2002), insomnia (Ong, Ulmer, & Manber, 2012), and PTSD (King et al., 2013).

Data Analysis

Repeated-measures multivariate analysis of variance was utilized to assess change in all continuous dependent variables across three time points: pretreatment, 1-week follow-up, and 2-month follow-up. Time was established as the within-subjects factor. Except for determining diagnosis, analyses using the CAPS were conducted with the removal of two items that inquired about sleep difficulties in an effort to reduce possible overlap. To assess interrater reliability for the SCID and CAPS, a random number generator was used to select 25% of the initial assessment cases. Another trained assessor not affiliated with the current study rated all selected cases. The κ coefficient calculated for the CAPS symptom scores was .87, with 97% agreement observed. CAPS diagnostic status agreement was 100% in the current study, demonstrating that the discrepancy in CAPS symptom ratings was not problematic. Likewise, 100% diagnostic status agreement was observed for depressive disorders using the SCID. The data were inspected for multivariate normality and homogeneity of variance. All variables met assumptions for normality except nightmare frequency and number of nights with nightmares. Attempts to transform these variables using logarithmic functions did not result in normally distributed variables; thus, the original data were used in subsequent analyses.

Results

Overall Findings

Results for the nightmare variables indicated a statistically significant change from pre- to posttreatment with gains maintained at follow-up in nightmares per week, number of nights with

nightmares in the past week, and nightmare distress (see Table 2). Half of the sample reported a cessation of nightmares. Total past week CAPS scores and cluster scores did not significantly change after ERRT-M. As measured using the TRNS, Veterans also reported less depression upon waking. In terms of sleep quality, results indicated a significant improvement in global sleep quality, sleep latency, sleep duration, sleep efficiency, and daytime dysfunction. Insomnia severity and fear of sleep significantly decreased after treatment (see Table 2). The above findings were statistically significant from pre- to posttreatment with gains maintained at follow-up. Depression as measured by the BDI-II demonstrated a statistically significant decrease from pre- to posttreatment; scores significantly increased from posttreatment to the 2-month follow-up, although depression remained significantly lower from pretreatment scores.

Treatment Responders Versus Nonresponders

Using Nappi and colleagues' (2010) definition of a complete treatment response, ≤1 nightmare per week in the past week, yielded 72% (n = 13) responders at 2 months posttreatment. However, because the inclusion criteria for the current study required at least one nightmare per week, we considered treatment responders as individuals with no nightmares in the past week at the 2-month follow-up, yielding a 50% response rate. In an effort to better understand the impact of ERRT-M, we evaluated differences between treatment responders and nonresponders (see Table 3) in terms of pretreatment and demographic variables and change over time.

Analyses revealed no significant difference between groups at baseline on outcome variables of interest and demographic variables, with one exception. An independent sample t test revealed a significant group difference on pretreatment insomnia severity. Individuals in the nonresponder group reported significantly more sleep problems at the pretreatment assessment (M = 20.67; SD = 4.03) than the treatment responder group (M = 15.56, SD = 5.22; $t(16) = 2.32$, $p = .03$, $\eta^2 = .25$).

In terms of change from pretreatment to follow-up, both groups reported statistically significant improvement in nightmares per week, nights with nightmares, nightmare distress, depression, global sleep quality, fear of sleep, and insomnia severity. For nonresponders, several scores decreased significantly from pre- to posttreatment but were not significantly different from pretreatment scores at follow-up (see Table 3). Only the treatment responders reported improvements in depression upon waking, sleep latency, sleep duration, and sleep efficiency. All seven individuals in the treatment responder group who originally met criteria for PTSD no longer did so at the 2-month follow-up. Two individuals of the seven who originally met criteria for PTSD no longer did so at the 2-month follow-up in the nonresponder group.

Discussion

This study examined the impact of a four-session, manualized protocol of ERRT adapted specifically for Veterans. Results indicate that ERRT-M is promising for reducing the frequency of nightmares and improving several sleep indicators, overall quality of sleep, and depression. Fifty percent of the sample was considered treatment responders because they reported no nightmares in the week before the final assessment. Although the nonresponder group continued to report nightmares, improvements were reported for nightmare frequency and insomnia severity at the 2-month

Table 2
Overall Sample Repeated-Measures Analyses of Change From Baseline to Follow-Up Assessments

Variable	Baseline		1 week follow-up		2 month follow-up				
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*	η_p^2	PW
NM past week (0–x)	2.97[a]	1.78	1.17[b]	1.48	1.03[b]	1.30	11.32**	0.40	0.99
Nights with NM (0–7)	2.61[a]	1.79	0.83[b]	1.20	0.97[b]	1.23	10.38**	0.38	0.98
NM distress (1–5)	3.94[a]	0.94	1.61[b]	2.09	1.94[b]	2.26	12.94**	0.43	0.99
Depression upon waking	3.17[a]	0.99	2.22[b]	0.94	2.39[b]	1.04	6.81*	0.29	0.9
BDI-II depression (0–60)	27.61[a]	11.72	18.94[b]	8.90	22.11[c]	11.11	9.25**	0.35	0.97
PTSD diagnosis	Y = 14	N = 4	Y = 7	N = 11	Y = 5	N = 13			
Total CAPS	50.72	24.60	46.44	27.62	43.00	23.10	0.88	0.05	0.19
CAPS Reexperiencing	11.78	5.81	11.00	9.80	7.94	8.51	1.93	0.10	0.37
CAPS Avoidance/Numbing	23.17	14.45	19.44	15.16	20.33	13.36	0.85	0.05	0.18
CAPS Hyperarousal	15.78	7.05	16.00	5.94	14.72	5.96	0.34	0.02	0.10
PSQI Sleep Quality (0–21)	15.39[a]	3.47	11.22[b]	3.98	11.83[b]	4.12	11.08**	0.4	0.99
PSQI Sleep Latency	2.11[a]	1.02	1.33[b]	0.97	1.22[b]	1.11	7.60*	0.31	0.93
PSQI Sleep Duration	2.06[a]	0.94	1.28[b]	1.13	1.33[b]	1.03	10.27**	0.37	0.98
PSQI Sleep Efficiency	63.71[a]	16.42	79.70[b]	17.28	82.18[b]	17.49	7.82*	0.32	0.93
PSQI Sleep Disturbance	2.00	0.69	1.83	0.51	1.94	0.73	0.40	0.02	0.11
PSQI Sleep Medication	2.35	1.17	2.12	1.41	2.00	1.41	0.45	0.03	0.12
PSQI Daytime Dysfunction	2.00[a]	0.49	1.61[b]	0.70	2.17[a]	0.80	4.49*	0.21	0.73
PSQI-A	10.11	3.41	8.78	4.67	7.72	4.01	2.86	0.14	0.52
TRNS Fear of Sleep (1–5)	2.39[a]	1.09	1.56[b]	0.86	1.83[b]	0.99	8.57**	0.34	0.95
Insomnia severity (0–28)	18.11[a]	5.23	9.00[b]	4.65	10.06[b]	6.39	21.17**	0.55	1.00

Note. Effect sizes were interpreted as η_p^2 = .01 small effect size, .06 medium effect size, .14 large effect size. CAPS = Clinician Administered PTSD Scale with sleep-related variables removed; NM = nightmare; PW = observed power; Y = yes; N = no. Means in the same row that do not share superscripts differ at $p < .05$ in the significant difference comparison.
* $p < .01$. ** $p < .001$.

Table 3
Treatment Responders Versus Nonresponders Repeated-Measures Analyses of Change From Baseline to Follow-Up Assessments

Variable	Baseline		1 week follow-up		2 month follow-up				
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*	η_p^2	PW
Treatment responders (n = 9)									
NM past week (0–x)	2.39[a]	1.87	0.83[ab]	1.46	0.00[b]	0.00	5.85*	0.42	0.80
Nights with NM (0–7)	2.33[a]	1.94	0.44[ab]	1.01	0.00[b]	0.00	7.61**	0.49	0.90
NM distress (1–5)	3.78[a]	1.09	0.78[b]	1.72	0.00[b]	0.00	30.10**	0.79	1.00
Depression on waking	3.00[a]	1.12	1.89[b]	0.78	2.00[ab]	1.00	5.43*	0.40	0.77
BDI-II depression (0–60)	25.00[a]	11.77	16.22[b]	9.44	19.56[ab]	13.24	3.88*	0.33	0.62
PTSD diagnosis	Y = 7	N = 2	Y = 2	N = 7	Y = 0	N = 9			
Total CAPS	43.22	21.22	35.89	25.31	32.78	13.03	0.77	0.09	0.16
CAPS Reexperiencing	10.67	6.80	7.33	7.48	4.67	3.97	2.22	0.22	0.39
CAPS Avoidance/Numbing	19.11	11.17	14.44	15.45	16.11	11.85	0.61	0.07	0.13
CAPS Hyperarousal	13.44	7.00	14.11	5.09	12.00	3.74	0.40	0.05	0.10
PSQI Sleep Quality (0–21)	14.78[a]	4.38	10.33[b]	3.61	10.56[b]	4.33	6.89**	0.46	0.86
PSQI Sleep Latency	2.33[a]	1.12	1.44[ab]	0.88	1.33[b]	1.12	3.84*	0.32	0.61
PSQI Sleep Duration	1.78[a]	0.97	0.89[b]	1.05	1.00[b]	1.12	8.94**	0.53	0.94
PSQI Sleep Efficiency	65.50[a]	13.77	81.02[b]	16.12	85.11[b]	22.71	4.92*	0.38	0.72
PSQI Sleep Disturbance	2.00	0.71	1.78	0.44	1.78	0.67	0.47	0.06	0.11
PSQI Sleep Medication	2.25	1.39	2.25	1.39	2.00	1.41	0.13	0.02	0.07
PSQI Daytime Dysfunction	1.89	0.33	1.33	0.71	1.89	0.78	2.41	0.23	0.42
PSQI-A	9.00	4.30	6.78	4.29	5.56	3.74	2.82	0.26	0.48
TRNS Fear of Sleep (1–5)	2.22[a]	1.09	1.44[b]	0.73	1.44[b]	0.53	6.64**	0.45	0.85
Insomnia severity (0–28)	15.56[a]	5.22	6.89[b]	4.86	8.89[b]	6.37	8.86**	0.53	0.94
Treatment nonresponders (n = 9)									
NM past week (0–x)	3.56[a]	1.57	1.50[b]	1.50	2.06[b]	1.10	7.09**	0.47	0.87
Nights with NM (0–7)	2.89[a]	1.69	1.22[b]	1.30	1.94[ab]	1.04	4.26*	0.35	0.66
NM distress (1–5)	4.11[a]	0.78	2.44[b]	2.19	3.89[ab]	1.54	4.33*	0.29	0.47
Depression on waking	3.33	0.87	2.56	1.01	2.78	0.97	1.86	0.19	0.33
BDI-II depression (0–60)	30.22[a]	11.76	21.67[b]	7.92	24.67[ab]	8.51	4.98*	0.38	0.73
PTSD diagnosis	Y = 7	N = 2	Y = 5	N = 4	Y = 5	N = 4			
Total CAPS	58.22	26.63	57.00	27.00	53.22	27.01	0.20	0.02	0.08
CAPS Reexperiencing	12.89	4.76	14.67	10.85	11.22	10.67	0.66	0.08	0.14
CAPS Avoidance/Numbing	27.22	16.79	24.44	13.91	24.56	14.10	0.26	0.03	0.08
CAPS Hyperarousal	18.11	6.66	17.89	6.41	17.44	6.69	0.04	0.96	0.06
PSQI Sleep Quality (0–21)	16.00[a]	2.34	12.11[b]	4.34	13.11[ab]	3.69	4.06*	0.34	0.64
PSQI Sleep Latency	1.89	0.93	1.22	1.09	1.11	1.17	3.41	0.30	0.56
PSQI Sleep Duration	2.33	0.87	1.67	1.12	1.67	0.87	2.91	0.27	0.49
PSQI Sleep Efficiency	61.91	19.39	78.38	19.26	79.25	10.73	2.91	0.27	0.49
PSQI Sleep Disturbance	2.00	0.71	1.89	0.60	2.11	0.78	0.31	0.04	0.09
PSQI Sleep Medication	2.44	1.01	2.00	1.50	2.00	1.50	0.47	0.06	0.11
PSQI Daytime Dysfunction	2.11	0.60	1.89	0.60	2.44	0.73	2.45	0.24	0.42
PSQI-A	11.22	1.86	10.78	4.35	9.89	3.10	0.48	0.06	0.12
TRNS Fear of Sleep (1–5)	2.56[a]	1.13	1.67[b]	1.00	2.22[ab]	1.20	3.77*	0.32	0.60
Insomnia severity (0–28)	20.67[a]	4.03	11.11[b]	3.52	11.22[b]	6.57	11.87**	0.60	0.98

Note. Effect sizes were interpreted as η_p^2 = .01 small effect size, .06 medium effect size, .14 large effect size. CAPS = Clinician Administered PTSD Scale with sleep-related variables removed; NM = nightmare; PW = observed power; Y = yes; N = no. Means in the same row that do not share superscripts differ at $p < .05$ in the significant difference comparison.
* $p < .05$. ** $p < .01$.

follow-up. Analyses of pretreatment variables revealed a difference only in insomnia severity between the groups, with the nonresponders indicating higher severity.

Similar to previous studies of ERRT utilizing primarily noncombat traumas (Davis, Pruiksma, Rhudy, & Byrd, 2011; Davis & Wright, 2007), nightmare frequency decreased in terms of both nightmares in the last week and number of nights with nightmares, with large observed effect sizes. Previous research utilizing ERRT with Veteran participants also found significant reductions in nightmare frequency, although not as large as in the current study. The present study found a 65% reduction and 50% cessation of past week nightmares, whereas Long and colleagues (2011) found a 49% reduction and 15% cessation of past week nightmares. Swanson and colleagues (2009) found a 50% reduction in past week nightmares, but they did not report the number of participants without nightmares. One possible explanation for the greater percentage reduction in the current study is that the participants in the current study reported a lower number of nightmares per week at pretreatment than did the other Veteran studies (2.97 current study; 4.61 Long et al., 2011; and 15.40 Swanson et al., 2009). Similar to findings in other studies, participants with greater distress at pretreatment tend to respond less favorably to interventions than those with less distress (e.g., van Minnen, Arntz, & Keijsers, 2002). Despite their chronic nature, the lower number of nightmares per week in the current study may relate to lower overall distress and a greater chance for recovery.

Nightmare severity decreased significantly in the overall sample, consistent with previous studies (e.g., Davis & Wright, 2007; Swanson et al., 2009). The nonresponder group demonstrated a decrease in frequency, but not cessation of nightmares, and although severity decreased significantly from pre- to posttreatment, there was not a significant difference from baseline at the follow-up assessment. What leads to the reduction of nightmare severity remains to be determined. Among possible mechanisms of action are neurocognitive changes through increased rapid eye movement (REM) and improved extinction learning because recent research has highlighted that impairments in extinction learning may result from deficits or fragments in REM sleep (e.g., Pace-Schott, Verga, Bennett, & Spencer, 2012). Changes in locus of control, self-efficacy, and emotion regulation may also be contributing to results because the use of exposure and subsequent rescripting of a nightmare, imagery rehearsal, and active modification of sleep habits were specifically framed as opportunities for Veterans to exercise control. In addition, exposure may allow habituation to the feared stimuli. Compared with other nightmare treatments, such as IRT, ERRT-M focuses on the most disturbing or vivid nightmare. As outlined by Foa and Kozak (1986), this exposure is an essential component for generating corrective experiences in a supportive environment. It may be that exposure as utilized in the current study was not sufficient for all participants. Future research should evaluate the dose-response impact of exposure techniques.

No statistically significant change was observed in PTSD symptoms on either total CAPS scores or CAPS symptom cluster scores. These findings concur with findings reported by Swanson and colleagues (2009) in their test of a combined ERRT and CBT-I protocol, but they differ from findings reported by Long and colleagues (2011) and Wanner and colleagues (2010). Although the treatment did not target PTSD symptoms, other than nightmares and sleep problems, or trauma directly, findings from nightmare treatment studies with civilians typically report moderate to large effect sizes for change in PTSD symptoms (e.g., Davis et al., 2011; Davis & Wright, 2007; Krakow et al., 2001; Krakow, Johnston, et al., 2001). It is unclear how the treatment affects PTSD symptoms, although we might speculate that improving sleep quality and quantity and reducing nighttime reminders of the traumatic event may increase emotion regulation, self-efficacy, and a sense of mastery, resulting in increased coping skills that may then be utilized to cope with daytime distress. Because the overall sample reported a moderate level of PTSD symptoms at pretreatment, we would have anticipated greater reduction, particularly for the treatment responders who had lower scores, albeit not statistical significantly lower, than the nonresponders. However, as noted by Swanson and colleagues, it may require additional time for Veterans to achieve positive results for daytime distress. Because research finds that treating PTSD may not alleviate sleep problems and nightmares (e.g., Zayfert & DeViva, 2004) and treating sleep and nightmares may not alleviate PTSD symptoms in Veterans (e.g., Swanson et al., 2009), future research should investigate the integration of these two approaches. Utilizing both approaches may be needed to better target mechanisms that may underlie both PTSD and sleep and nightmare problems, such as emotion regulation.

In the current study, analyses demonstrated significant improvement in depressive symptoms from pretreatment to follow-up assessment, with a large effect size. Overall, Veterans reported moderate depression before treatment and mild depression after treatment. Nonresponders reported a significant decrease in depression from pre- to posttreatment, but follow-up scores did not differ from pretreatment. Although not all treatments directly targeting nightmares find improvements in depression (e.g., Germain, Shear, Hall, & Buysse, 2007; Lu et al., 2009), previous studies using ERRT have consistently found statistically significant reductions in symptoms of depression (e.g., Davis & Wright, 2007). ERRT directly targets sleep by use of different treatment techniques that also have been shown to improve depression (e.g., Hofmann, Sawyer, Witt, & Oh, 2010), including cognitive strategies and mindfulness. Addressing sleep problems, in addition to nightmares, may be necessary to affect depression (Doghramji, 2003).

The current study found similar results to previous work in improved sleep (e.g., Davis & Wright, 2007) in that participants reported improvements in overall sleep quality, sleep latency, sleep duration, sleep efficiency, fear of sleep, and insomnia, with effect sizes ranging from moderate to large. Although many sleep-related outcome measures evidenced statistically significant improvements after ERRT-M, none of the Veterans fell below the cutoff delineating "good sleepers." Previous research has demonstrated the challenges in effecting change in sleep outcomes among Veterans (e.g., Pigeon, Campbell, Possemato, & Ouimette, 2013), suggesting that treatment approaches may require additional attention to sleep problems to aid full recovery.

This study was conceptualized as a small open-label pilot to establish preliminary efficacy of ERRT-M, and as such, it is subject to several notable limitations. These findings are limited by a small sample, and although selection of sample size was based on a power analysis using previous research, observed power in the present study varied dramatically (.11 to .98; see Table 2). The conclusions are also limited by the uncontrolled design of the study. Because promising results were found, future research needs to assess effects of ERRT-M compared with a viable alternative.

Despite these limitations, the present study supports the efficacy of ERRT-M in facilitating improvement in nightmares, sleep, and related psychopathology in Veterans. Future research should focus on the additive effect of sleep and nightmare treatments with PTSD treatments and determine the appropriate ordering of treatments. Furthermore, possible underlying mechanisms explaining the associations between sleep problems and PTSD need to be evaluated.

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