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Cognitive Behavioral Therapy for Insomnia and Imagery Rehearsal in Combat Veterans with Comorbid Posttraumatic Stress: A Case Series

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Abstract

Disrupted sleep is common among combat veterans and can negatively impact response to mental health treatments. A trial of cognitive behavioral therapy for insomnia (CBT-I) and imagery rehearsal therapy (IRT) for nightmares was conducted with 14 combat veterans diagnosed with insomnia, and who were experiencing posttraumatic stress and/or depression. In the case-series that follows veterans experienced clinically significant changes in sleep, and statistically significant reductions in insomnia, nightmare, depression and posttraumatic stress severity following treatment. Combined CBT-I and IRT is a promising treatment for patients with combat-related trauma and psychiatric morbidity.

Keywords

Sleep; Insomnia; Nightmares; Veterans; Combat Veterans; Behavioral Treatment

Sleep disturbances, especially insomnia and nightmares, are common among combat veterans (Neylan et al., 1998; Plumb, Peachey, & Zelman, 2014) and insomnia is associated with increased risk for medical and psychiatric illness (Pigeon, Pinquart, & Conner, 2012; Roth, 2004). Nightmares can lead to sleep avoidance, anticipatory anxiety that interferes with sleep initiation, or awakenings that reinforce negative associations with sleep. In addition, sleep disturbances often persist following treatment of posttraumatic stress disorder (PTSD; Belleville, Guay, & Marchand, 2011) and mediate the relationship between combat stress and other mental health symptoms (Picchioni et al., 2010). When compounded by stressors faced by returning service members and by the normal travails of aging, insomnia and nightmares are a substantial burden for combat veterans of all eras and represent important intervention targets.

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Prior samples used to study cognitive behavioral therapy for insomnia (CBT-I) and imagery rehearsal therapy (IRT) have varied in terms of their baseline severity of sleep disturbance, posttraumatic stress symptomatology, exposure to combat, and era of service. Exposure to combat may be particularly relevant, as symptom profiles can differ for those who have experienced direct combat or treated the casualties of combat. For example, previous research has suggested that combat traumas are associated with more hyperarousal symptoms (Laufer, Brett, & Gallops, 1985; Henigsberg, Folnegovic-Smalc, & Moro, 2001) and that victims of assault are more likely to report emotional numbing (Chung et al., 2009) than individuals who experienced non-combat or non-assaultive traumas. Therefore it cannot necessarily be assumed that those with posttraumatic stress as the result combat trauma will have the same treatment response as individuals with posttraumatic stress who have experienced service-related traumas unrelated to combat.

Recent meta-analyses have demonstrated that IRT, both combined with CBT-I and as a standalone therapy, is effective in reducing the frequency of nightmares (Augedal, Hansen, Kronhaug, Harvey, & Pallesen, 2013; Seda, Sanchez-Ortuno, Welsh, Halbower, & Edinger, 2015). In addition, the literature has suggested that when combined with CBT-I, IRT may provide additional utility in the reduction of other sleep quality variables as well as posttraumatic stress (Seda et al., 2015). However, the literature on the effects of combined CBT-I and IRT on depressive symptomatology and suicidal ideation (SI) is less developed. Thus, the extent to which gains in sleep attenuates mental health symptoms remains a question for further study.

While findings from existing randomized controlled trials predominate the CBT-I/IRT literature and provide a strong, initial foundation for justifying the use of the protocol, case series data can add a level of individual richness, the possibility of observing intra-individual change across multiple symptoms concurrently, and aid in considerations regarding tailoring for individual clients. As the symptom profile of combat veterans may differ from those who have not experienced direct combat or the direct treatment of casualties (Laufer et al., 1985; Henigsberg et al., 2001; Chung et al., 2009), the study of treatment effects among this sample is warranted. In addition, the presence of any level of SI is often an exclusionary criteria in treatment trials, limiting the ability to assess whether interventions have any effect on participants who endorse SI, but are at lower risk because they do not endorse a plan or intent to self-harm. Accordingly, the primary objective of the current study was to determine whether a combined intervention of CBT-I and IRT would be associated with improvements in sleep, symptoms of posttraumatic stress, depression severity and SI among Vietnam War and Operation Enduring Freedom, Operation Iraqi Freedom and Operation New Dawn (OEF/OIF/OND) combat veterans while providing individual level data and analysis.

Method

Participants and Procedures

Participants were recruited from two sites in Western New York served by the Department of Veterans Affairs (VA) and compensated \$100 for completing the study, which was approved by the local VA institutional review board.

Eligibility criteria included: 1) combat veterans from the Vietnam era to present day (including OEF/OIF/OND veterans); 2) presence of either: (a) posttraumatic stress symptoms (as evidenced by meeting full or subthreshold diagnostic criteria for PTSD with the latter operationalized as: at least one traumatic event, one re-experiencing symptom, and either three avoidance symptoms or two hyperarousal symptoms, and functional impairment) or (b) depression as evidenced by a diagnosed depressive disorder or a self-report score indicating the presence of depression; 3) the presence of trauma-related nightmares or distressing dreams in the past month at the time of screening; 4) an insomnia complaint with greater than 30 minutes sleep latency (SL) or time awake after sleep onset (WASO), averaging 3 days or more days each week for at least the past 6 months; 5) on stable medical regimens; 6) either no SI or if SI was present, no suicide plan nor stated intent; 7) no active substance dependence or in full remission for more than 3 months; and 8) no symptoms suggestive of narcolepsy, circadian rhythm disorders, or untreated sleep apnea. A review of participants' electronic medical record was conducted to identify documented cases of sleep disorders (e.g., obstructive sleep apnea) that would preclude study participation. If such a disorder was identified, further review was conducted to ensure an appropriate treatment regimen was in place (e.g., continual positive airway pressure for obstructive sleep apnea). This review was supplemented by participant self-report via an unvalidated sleep symptom questionnaire that included questions assessing symptoms such as snoring, choking or gasping for breath, or observed pauses in breathing. In regards to the stable medical regimen criteria, participants were allowed to continue pharmacological interventions so long as the intervention had not undergone significant changes within the two weeks prior to study initiation. If participants had experienced a change in their prescription or intended use of medications within this time period, an appropriate stabilization or wash-out period was implemented.

Following the informed consent process, the baseline assessment included structured interviews and a battery of self-report instruments. Eligible participants were then scheduled for their first therapy session. The post-treatment assessment was conducted one week following the last treatment session and a follow-up assessment conducted one month following the conclusion of treatment.

Treatment consisted of standard CBT-I along with IRT delivered by one of three experienced cognitive-behavioral psychologists over eight weekly individual sessions. CBT-I included sleep education, sleep restriction, stimulus control, sleep hygiene, cognitive therapy and relaxation training. IRT included nightmare education, nightmare rehearsal, and nightmare rescripting both in session and imaginal rehearsal between sessions. Fidelity was monitored from review of session audiotapes. Both interventions are described in more detail elsewhere (Lancee, Spoomaker, Krakow, & van den Bout, 2008; Pigeon, 2010); the content of the sessions in the current study are presented in Table 1.

A total of 22 veterans were enrolled in the study, subsequently, 3 were deemed ineligible, 2 declined to participate, and 3 withdrew prior to treatment due to moving or scheduling problems. Thus, the final sample consisted of 14 combat veterans. The sample was predominantly male (93%) with a mean age of 49.1 (SD =14.3). Participants reported having experienced combat in Vietnam, ($n = 7$), the Gulf War ($n = 1$), and the OEF/OIF/OND ($n =$

6) service eras. Of the 14 individuals that had agreed to participate at baseline, 11 completed treatment and three dropped out after sessions 1, 3 and 4, (due to work schedule, advice from a therapist, and enrollment in another treatment program, respectively).

Measures

At the baseline assessment, demographic and medical information was gathered with unpublished instruments created for this study. The MINI International Neuropsychiatric Interview (Sheehan et al., 1997), the Clinician-Administered PTSD Scale (CAPS; Blake et al., 1995), and the Center for Epidemiologic Studies-Depression Scale-Revised (CESD-R; Eaton, Smith, Ybarra, Muntaner, & Tien, 2004) were administered to both determine eligibility and provide baseline data.

Sleep outcomes were assessed at each of the three time points with two primary outcomes: the 7-item Insomnia Severity Index (ISI; Morin, Belleville, Belanger, & Ivers, 2011) and the 2-item Nightmare Frequency Questionnaire (NFQ; Krakow et al., 2002a). Secondary sleep outcomes were derived from a one week average of daily sleep diary values and included: SL, WASO, number of awakenings (NOA), total sleep time (TST), and sleep efficiency percent (SE).

Mental health outcomes were assessed with the past month version of the CAPS (Blake et al., 1995) used as the outcome measure for posttraumatic stress, the 20-item CESD-R (Eaton et al., 2004) as the depression outcome measure, and the clinician-administered 19-item Scale for Suicide Ideation (SSI; Beck, Kovacs, & Weissman, 1979).

Analyses

Analyses were conducted using an intent-to-treat (ITT) approach. Item level data were complete for the CAPS and sleep diaries and missing at < 0.05% for all other instruments; post-treatment and follow-up data were missing for the 4 drop-outs. The baseline observation carried forward strategy was used here because it is conservative, assuming no improvement after baseline, and the sample was too small for multiple imputation. Analyses were also conducted for completers to estimate the effect of the intervention for individuals who received it. Pre- to post-treatment and pre-treatment to follow-up scores on outcome measures were tested using paired t-tests for variables that were normally distributed and Wilcoxon signed-rank test for non-parametric data. Effect sizes were calculated using the formula for Cohen's *d* (Cohen, 1988). To assess clinical significance the percentage of participants whose scores remained above the cutoff point for each measure was calculated. All analyses were conducted with STATA 10.0 (StataCorp, 2007). To further protect confidentiality, age was rounded to the nearest decade for the case-level descriptions.

Results

In both ITT and completer analyses, the intervention was associated with significant improvements in insomnia severity, nightmare frequency, and all sleep diary variables at both post-treatment and the one month follow-up (see Table 2). For the ITT sample, effect sizes ranged from moderate (TST and NOA) to large (NFQ, SL, WASO, SE) and very large

with respect to insomnia severity ($d = 1.53$ at post-treatment and $d = 2.00$ at follow-up). As would be expected effect sizes from the completer sample were slightly larger.

The intervention was associated with statistically significant reductions in both depression and PTSD symptom severity for both the intent to treat sample, and those that completed the intervention. For the ITT sample, post treatment effect sizes were moderate for depression ($d = 0.72$) and PTSD symptom severity ($d = .48$). Effect sizes remained moderate in strength at follow up for both depression ($d = .67$) and PTSD symptom severity ($d = .58$). Among completers, effect sizes for depression and PTSD symptom severity were moderate to large (see Table 2). Participant level data is also provided for PTSD symptom severity (Figure 1) and depressive symptomology (Figure 2).

In terms of clinically significant improvements in the completer sample, 45% dropped below the ISI cutoff by one month follow-up (see Figure 3). The percentage of participants remaining above sleep diary variable cutoffs was more pronounced with only 9% meeting clinical benchmarks for SL, WASO and SE at follow-up (see Table 3). Those falling below PTSD and depression cutoffs were slightly reduced compared to baseline rates. Notably, 4 of 8 completers (50%) who had elevated CAPS scores at baseline fell below the CAPS cutoff at post-treatment. Finally, 3 subjects endorsed SI at baseline, but none reported SI at the final assessment.

Discussion

A combined intervention utilizing CBT-I and IRT for nightmares was associated with significant and sizable reductions in insomnia severity and nightmare frequency in combat veterans. The overall findings are in keeping with recent studies testing similar combined interventions (e.g., Swanson, Favorite, Horin, Arnedt, 2009; Ulmer et al., 2011; Germain et al., 2012) with some exceptions. We found significant improvements in both PTSD and depression symptom severity, which has not been a consistent finding in prior work, though this may be attributable to comparably less severe sleep and mental health issues in at least one study (Germain et al, 2012) and less severe depression in another (Ulmer, Edinger, & Calhoun, 2011).

In addition, statistically significant and somewhat clinically significant reductions in both PTSD and depression severity were observed, along with decreases in SI in three participants who had endorsed baseline SI. We are unaware of any reports of behavioral sleep interventions effect on SI in PTSD samples, though this has been observed in other uncontrolled studies including among outpatients with depression (Trochel, Karlin, Taylor, Brown, & Manber, 2015). Nonetheless, the small number of participants enrolled in this protocol that endorsed SI at baseline precludes making inferences about how the intervention may have affected SI.

Limitations of this study include its small sample size and single-arm design, opening the possibility that treatment gains may be attributable to nonspecific or uncontrolled factors. In the absence of objective sleep measurements participants with occult sleep disorders may have been included, though this would have likely diluted, rather than inflated, findings. The

use of the NFQ as our nightmare measure is somewhat antiquated as a revised version of this instrument, the Disturbing Dream and Nightmare Severity Index (Krakow, et al., 2002b), has been published. Additionally, as this study consisted of combat veterans, findings may not generalize to civilian PTSD populations.

Participant adherence to the prescribed sleep schedule is another potential limitation and consideration for future research protocols utilizing CBT-I. While all participants saw at least some gains on subjective measures of sleep quality, adherence to the prescribed sleep schedule proved difficult for some participants. Work schedules (e.g., variable shift work), ambivalence to change behaviors associated with insomnia, and bed partners that do not support the desired changes can all contribute to how well a patient adheres to their CBT-I treatment goals. Additionally, as traumatic content is addressed as part of combined CBT-I and IRT protocols (as part of IRT and potentially in the course of addressing maladaptive cognitions during cognitive therapy), patients may encounter unique barriers to adherence as compared to those engaged in CBT-I alone. Fear of sleep, perceived stigma surrounding treatment of posttraumatic stress, posttraumatic stress symptomatology including hypervigilance (e.g., maladaptive cognitions regarding sleep and nighttime), hyperarousal, and nightmares can all serve as barriers to the successful implementation of sleep restriction and stimulus control and are worthy of clinician consideration during implementation of CBT-I protocols that include IRT.

The present study adds to the growing literature that suggests behavioral sleep interventions have utility in reducing psychopathology in populations suffering from insomnia with comorbid mental health conditions. The results presented here extend that literature by providing a more individualized and in-depth look at how patients may respond to such interventions. Further adding to its relevance, this study was conducted with a sample of combat veterans from both the Vietnam era and current OEF/OIF/OND conflicts who were recruited from VA primary care, many of which had comorbid medical conditions. While women were underrepresented, the characteristics of the sample suggest that findings should be generalizable to combat veterans, though they should be replicated in a larger randomized clinical trial. The intervention holds some promise as a useful augmentation to standard care for trauma-related PTSD and/or depression. Clinicians may also consider treating insomnia and/or nightmares before PTSD, providing symptom reduction and a positive treatment experience that may increase willingness to engage in PTSD treatments.

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Figure 1. Clinician Administered PTSD Scale Total Scores by Participant

Figure 2. The Center for Epidemiologic Studies Depression Scale Total Scores by Participant

Figure 3. Insomnia Severity Index Total Scores by Participant

Table 1
Intervention Schedule

Session	Content
1	Insomnia evaluation; introduction to intervention; sleep education
2	Stimulus control; sleep restriction
3	Sleep hygiene
4	Cognitive therapy
5	Image rehearsal therapy; Diaphragmatic breathing
6	Image rehearsal therapy continued; Body scan exercise
7	Image rehearsal therapy continued
8	Review of progress; Maintenance strategies

Note. Once a therapeutic technique was introduced in session therapist and participant continued to utilize it, and address any issues applying the technique, in subsequent sessions. For example, sleep restriction and calculating sleep efficiency was addressed in sessions 2-8.

Table 2
Intent to Treat and Completer Analyses of Sleep and Mental Health Outcomes

Measure	Pre Mean(SD)	Post Mean(SD)	Follow-up Mean(SD)	Pre-Post t^a or z^b	d	Pre-FU t^a or z^b	d
Intent to Treat Sample (n=14)							
ISI ^a	21.3 (4.3)	14.7 (6.5)	12.7 (7.5)	5.35 ***	1.53	4.71 ***	2.00
NFQ ^b	3.1 (1.6)	1.4 (1.9)	1.7 (2.2)	2.60 **	1.01	2.26 *	0.83
SL ^b	51.4 (39.7)	21.2 (23.1)	21.3 (21.4)	3.16 **	0.76	3.16 **	0.76
WASO ^b	66.5 (31.5)	31.0 (33.4)	32.3 (37.1)	2.93 **	0.89	2.93 **	0.86
SE ^b	72.2 (10.4)	87.4 (10.0)	87.4 (10.1)	-3.26 **	-1.37	-3.33 ***	-1.46
TST ^a	308.9 (107.1)	354.4 (101.0)	355.4 (96.4)	-2.53 *	-0.42	-2.77 *	-0.43
NOA ^a	2.8 (1.1)	2.2 (1.1)	2.2 (1.3)	2.69 *	0.56	2.71 *	0.61
CESD ^a	27.7 (12.6)	18.5 (10.7)	19.2 (11.4)	3.64 **	0.72	3.92 **	0.67
CAPS ^a	60.3 (19.1)	51.1 (22.1)	49.3 (26.3)	3.20 **	0.48	2.88 *	0.58
SSI	1.0 (2.1)	0.9 (2.8)	0.1 (0.3)	0.04	0.03	1.73	0.45
Completer Sample (n=11)							
ISI ^a	21.3 (3.6)	13.9 (5.7)	11.2 (6.6)	4.96 ***	2.04	4.49 **	2.80
NFQ ^b	2.9 (1.6)	0.8 (0.9)	1.2 (1.7)	2.91 **	1.35	2.55 *	1.09
SL ^b	53.9 (42.5)	16.0 (15.4)	16.1 (11.7)	2.94 **	0.89	2.93 **	0.89
WASO ^b	66.4 (32.1)	19.5 (22.9)	21.2 (30.7)	2.85 **	1.46	2.85 **	1.41
SE ^b	72.6 (10.7)	91.8 (5.2)	91.7 (5.6)	-2.89 **	-1.79	-2.94 **	1.79
TST ^a	316.5 (108.4)	378.1 (93.9)	379.5 (86.5)	-2.72 *	-0.57	-3.04 *	-0.58
NOA ^a	2.6 (1.0)	1.8 (0.8)	1.7 (1.0)	4.94 ***	0.84	4.50 **	0.91
CESD ^a	29.2 (12.8)	18.7 (10.5)	19.6 (11.4)	3.14 ^a *	0.82	3.32 ^a **	0.75
CAPS ^a	58.5 (16.6)	46.1 (18.9)	43.5 (24.7)	3.68 ^a **	0.75	3.21 ^a **	0.75
SSI	1.3 (2.4)	1.2 (3.3)	0.0 (0.0)	0.05	0.04	1.73	0.54

^a t-test;

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Wilcoxon signed-rank test;
 q
 $p < .05$,
**
 $p < .01$,

 $p < .001$;

CAPS = Clinician Administered PTSD Scale; CESD-R = Center for Epidemiologic Studies Depression Scale-revised; ISI = Insomnia Severity Index; NFQ = Nightmare Frequency Questionnaire; NOA = Number of Awakenings; SL = Sleep latency; SE = Sleep Efficiency; SSI = Scale for Suicidal Ideation; TST = Total Sleep Time; WASO = Wake after Sleep Onset

Table 3
Percent of completers (n = 11) meeting clinical cutoffs

Clinical Cutoff	Pre	Post	FU
Insomnia Severity Index 10	100%	72%	55%
Sleep Latency 30 minutes	73%	0%	9%
Wake after Sleep Onset 30 minutes	91%	9%	9%
Sleep Efficiency < 85%	91%	9%	9%
CESD-R 16	82%	64%	64%
Clinician-Administered PTSD Scale 56	73%	36%	36%
Scale for Suicidal Ideation > 2	27%	9%	0%

CESD-R = Center for Epidemiologic Studies Depression Scale-revised

Table 4**Sleep Diary Measures by Participant**

ID	Gender	Age	SL			WASO			TST			SE	
			Pre	Post	FU	Pre	Post	FU	Pre	Post	FU	Pre	FU
1	M	70	71	17	--	79	21	--	280	342	--	73	90
2	M	60	50	33	25	120	85	111	450	562	498	71	80
3	M	60	20	11	10	4	16	5	201	283	290	89	95
4	M	60	60	9	12	69	17	23	114	260	228	47	91
5	M	60	42	6	6	65	10	7	331	385	375	76	96
6	M	40	45	10	21	62	7	13	296	283	345	73	94
7	M	30	44	14	11	50	26	11	387	396	449	80	91
8	F	50	171	56	46	40	15	18	489	476	482	70	87
9	M	30	19	6	8	61	1	2	381	316	301	82	97
10	M	40	53	9	15	65	6	4	302	462	442	72	98
11	M	60	18	5	6	115	10	19	251	394	422	65	94

Note. Values for SL, WASO, and TST were rounded to the nearest minute. SE values were rounded to the nearest percent. SL = sleep latency; WASO = time awake after sleep onset; TST = total sleep time; SE = sleep efficiency.