Research Article

Follow-Up Analyses From a Wait-List Controlled Trial of Occupational Therapist–Delivered Cognitive–Behavioral Therapy for Insomnia Among Veterans With Chronic Insomnia

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Importance: Veterans often experience chronic insomnia, and professionals capable of delivering effective interventions to address this problem are lacking.

Objective: To evaluate the efficacy of the Restoring Effective Sleep Tranquility (REST) program, an occupational therapist–led cognitive–behavioral therapy for insomnia (CBT–I) intervention to treat sleep problems among post-9/11 veterans.

Design: Wait-list controlled trial with 3-mo follow-up.

Setting: Community-based veteran support program in a Mountain West university.

Participants: Fifteen post-9/11 veterans with sleep disturbances who were assigned to either the REST intervention or a wait-list control group.

Outcomes and Measures: Sleep-related, health-related, and participation-related patient-reported outcomes (PROs) and daily sleep diary variables.

Results: Wait-list controlled trial benefits included improved sleep-related (e.g., sleep disturbance), health-related (e.g., depression), and participation-related (e.g., meaningful activity) PROs. Findings were confirmed after participants in both the intervention and the control groups ($n = 13$) received the REST intervention, including improved daily sleep diary outcomes (e.g., sleep efficiency). All gains were maintained at 3 mo.

Conclusions and Relevance: Occupational therapy practitioners with advanced training in CBT–I have the potential to safely deliver an effective CBT–I intervention to veterans with sleep disturbances in a community-based setting.

What This Article Adds: Occupational therapy practitioners with sleep-related education and training can positively affect the well-being of their clients through improving sleep participation.

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Sleep disturbances are a common sequela of stressors associated with training, deployment, and combat among U.S. military personnel. Many post-9/11 veterans have returned to their communities with mild traumatic brain injury, posttraumatic stress disorder (PTSD), depression, pain, and anxiety, which commonly co-occur with insomnia (Pietrzak et al., 2010; Troxel et al., 2015). Sleep disturbance occurs in as many as 90% of veterans with PTSD, involving nightmares, which can in turn exacerbate PTSD symptoms (Harvey et al., 2003). Conservative insomnia prevalence rates among veterans range from 20% to 53% (Jenkins et al., 2015; McLay et al., 2010; Mustafa et al., 2005), with insomnia limiting the efficacy of

mental health treatments and contributing to poor daytime functioning (Manber & Carney, 2015).

Multicomponent cognitive–behavioral therapy for insomnia (CBT–I) is indicated for the treatment of chronic insomnia and refers to a combination of strategies including sleep restriction therapy, stimulus control therapy, cognitive therapy, psychoeducation, and sleep hygiene (Bootzin & Manber, 2013). Sleep restriction therapy, for example, involves reducing time in bed to the time a person can sleep until sleep efficiency improves. Next, time in bed is gradually increased week by week until the client can fill their desired time in bed with consolidated sleep. The intent of stimulus control therapy is to reassociate the bed and bedtime with sleep. This goal is accomplished by the occupational therapy practitioner requesting, for example, that the client only go to bed when sleepy, engage only in sleep or sex when in bed, and leave the bedroom when they cannot sleep (Manber & Carney, 2015).

Empirical support for multicomponent CBT–I is well established, indicating its effectiveness as a treatment for chronic insomnia (Geiger-Brown et al., 2015; Trockel et al., 2014). CBT–I is strongly recommended as the first-line treatment for insomnia disorder among adults by the American College of Physicians (Qaseem et al., 2016) and the American Academy of Sleep Medicine (Edinger et al., 2021). Treatment effects from CBT–I, such as reduced insomnia symptom severity and improved sleep quality, persist for 3 mo, if not up to 1 yr, after the end of treatment (van der Zweerde et al., 2019). CBT–I is also effective in reducing insomnia in the presence of comorbid conditions such as PTSD, depression, pain, and anxiety (Manber & Carney, 2015; Manber et al., 2008).

Yet, there exists a shortage of professionals capable of delivering CBT–I, which limits veterans' access to this effective treatment for insomnia (Manber et al., 2012; Troxel et al., 2015). Occupational therapy practitioners have identified sleep as a cornerstone of health and well-being, and CBT–I is within the profession's scope of practice given the nonpharmacological and behavioral nature of this approach for treating chronic insomnia (American Occupational Therapy Association, 2020; Leland et al., 2014). Thus, the aim of this study was to test the efficacy of Restoring Effective Sleep Tranquility (REST), an occupational therapist–led CBT–I intervention for veterans in college with service-connected injuries who experience chronic insomnia (Eakman, Schmid, et al., 2017). We hypothesized that REST delivered to veterans with sleep disturbances would result in improved sleep-, health-, and participation-related outcomes compared with veterans with sleep disturbances who did not receive the REST intervention. We further hypothesized that improved sleep-, health-, and participation-related outcomes after completion of the REST intervention would persist for up to 3 mo.

Method

In this study, we used a wait-list controlled trial with 3-mo follow-up of the REST intervention, an occupational therapist–delivered multicomponent CBT–I program initially reported by Eakman, Schmid, et al. (2017).

Participants and Procedures

Inclusion criteria were as follows: post-9/11 U.S. veteran attending college; service-connected injury; self-reported difficulties with sleep quality (i.e., Insomnia Severity Index score $\geq$ 10); and commitment to completion of daily sleep diaries and group and 1:1 sessions. Exclusion criteria were epilepsy or bipolar disorder (I or II). Participants were recruited via the ongoing veteran research programs and services on the Colorado State University campus. Human subjects approval was granted by the university (15-5974H in 2015), and the study was registered with ClinicalTrials.gov (NCT02871414). All participants provided written informed consent. Data were collected between January 2016 and September 2016.

Restoring Effective Sleep Tranquility Intervention

REST (Eakman, Schmid, et al., 2017) is a 7-wk multicomponent CBT–I intervention that uses concurrent weekly 1:1 and group formats with an emphasis on sleep restriction, stimulus control, and sleep hygiene treatments on the basis of best practice in CBT–I (Carney & Manber, 2009; Manber & Carney, 2015; Perlis et al., 2008). In weekly 1:1 sessions, an occupational therapist (Natalie R. Rolle) monitored sleep diary data, set sleep-related goals, and supported adherence to sleep prescriptions (e.g., prescribed time to bed, prescribed time out of bed). In weekly group sessions, an occupational therapist (Aaron M. Eakman) led discussions on REST treatment approaches and chronic insomnia (e.g., circadian rhythm and homeostatic sleep-driver systems); a brief mindfulness practice occurred in each group session. Daily activity routines in support of adherence to sleep prescriptions were addressed in 1:1 and group sessions.

The occupational therapists completed advanced training in CBT–I before treatment, met weekly to discuss participants, and obtained consultation from a psychologist with expertise in CBT–I. Weekly occupational therapist discussions included a review of each case, including likely biological, psychological, and social–environmental factors precipitating and perpetuating insomnia as recommended by Manber and Carney (2015). Weekly meetings were also used to ensure treatment fidelity in CBT–I delivery by reviewing participants' sleep diary data and achieving therapist consensus on modifications to sleep prescriptions.

Sleep Diary Outcomes

Participants recorded their sleep on a daily basis in line with best practice for CBT–I (Edinger et al., 2001;

Perlis et al., 2008). We collected daily sleep diary data using a web-based format, and these data were used to determine sleep onset latency, nighttime awakenings, wake after sleep onset, total time in bed, total sleep time, and sleep efficiency, which the occupational therapist (Rolle) used to adjust sleep prescriptions.

Patient-Reported Outcomes

We assessed patient-reported outcomes (PROs) at baseline, posttreatment, and 3 mo after completion of REST using a web-based format. All PROs were well-validated indicators of their respective constructs and were presented in random order during each assessment period. *Sleep-related outcomes* included the Patient-Reported Outcomes Measurement Information System (PROMIS)–Sleep Disturbance scale (Yu et al., 2011), which assessed sleep disturbances; the Dysfunctional Beliefs About Sleep–10 scale (Espie et al., 2000), which assessed inaccurate beliefs regarding sleep that may contribute to cognitive arousal and perpetuation of maladaptive sleep behaviors; and the Pittsburgh Sleep Quality Index Addendum for PTSD (Germain et al., 2005), which assessed sleep-disturbing factors such as nightmares and sleep-related anxiety.

Health-related outcomes included levels of stress, depression, and anxiety, which were assessed with the Perceived Stress Scale (Cohen et al., 1983), Patient Health Questionnaire–Depression scale (Kroenke et al., 2001), and the Generalized Anxiety Disorder Screener (Löwe et al., 2008). We assessed symptoms of posttraumatic stress using the six-item PTSD Checklist (Lang & Stein, 2005). In addition, we assessed participants' perception of how pain interfered with daily life using the PROMIS–Pain Interference scale (Cella et al., 2010).

Participation-related outcomes were included to determine whether improved sleep was associated with a broad range of participation factors. The Engagement in Meaningful Activities Survey (Eakman, 2012) was used to assess perceptions of positive meanings associated with engagement in activities as part of day-to-day life (Goldberg et al., 2002). The Mindfulness Attention Awareness Scale (Brown & Ryan, 2003) was used to assess mindfulness; in addition, social role satisfaction and perceived ability to participation in social roles were assessed, respectively, with the PROMIS–Satisfaction with Social Roles scale (Hahn et al., 2010) and the PROMIS–Ability to Participate in Social Roles scale (Hahn et al., 2010).

Study Design

We used a wait-list controlled trial with a 3-mo follow-up. Our study design is presented in Figure 1 and represents eligibility determination, testing of the REST intervention via wait-list controlled trial, and subsequent 3-mo follow-up within-person assessments for both conditions after completion of the intervention. Participants were assigned to condition by convenience to accommodate participants' busy class schedules and to ensure an even number of group participants during the delivery of the REST intervention. Baseline PROs were completed during Week 1, and participants assigned to the intervention group immediately received the REST intervention, whereas wait-list control participants did not receive the intervention. After completion of the REST intervention in Week 8, the intervention group and wait-list control group completed posttest PROs. We refer to Week 1 through Week 8 as the primary phase of the study.

The wait-list control participants then received the REST intervention beginning Week 9 and completed posttest PROs immediately after completion of the intervention during Week 16. The intervention group again completed PROs at 3-mo follow-up during Week 20 of the study, whereas the wait-list control group completed their 3-mo follow-up PROs during Week 28.

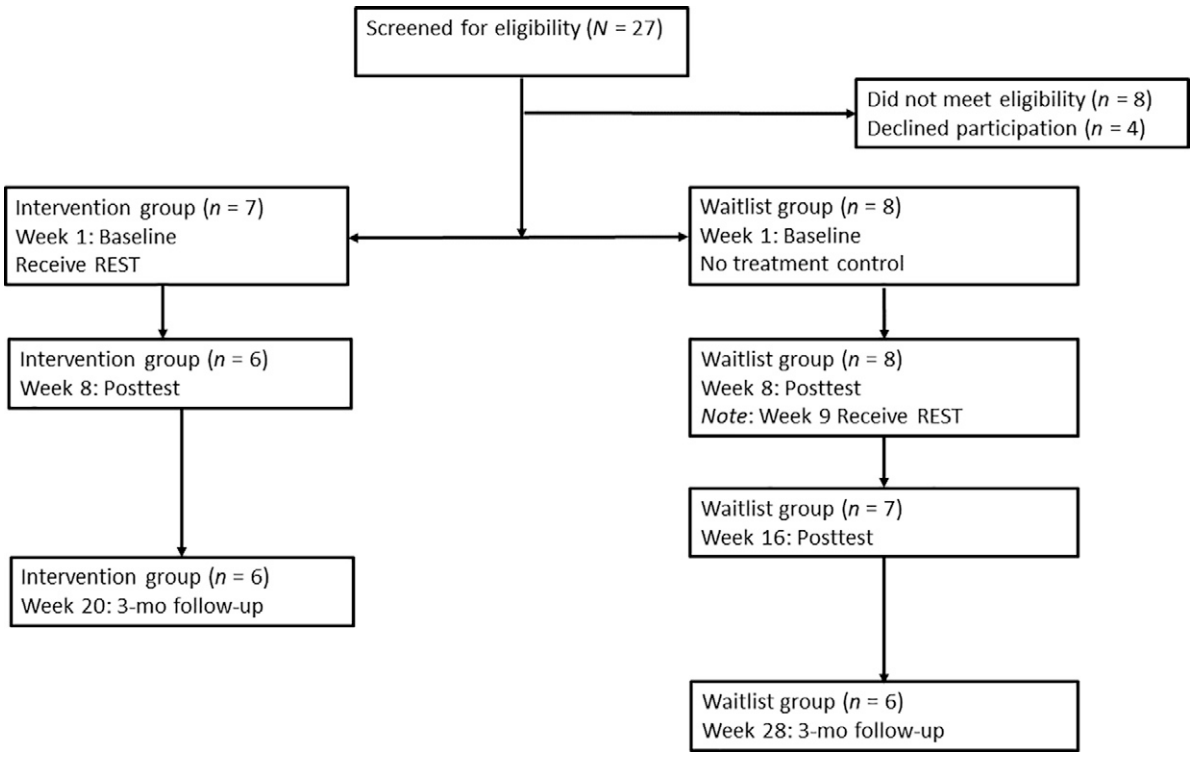
Data Analyses

Data analysis unfolded in two stages. First, we compared the intervention group with the wait-list control group at baseline and immediately after treatment using data from the primary phase of the study (Week 1–Week 8; see Figure 1). All PROs were assessed. We conducted 2 × 2 (Condition × Time) repeated-measures analyses of variance (ANOVAs) to compare the treated and wait-list control groups with respect to change in PROs ($n = 14$). Sleep diary data were available only for the treated group and were not part of these analyses. Second, we evaluated pre- to posttest changes in sleep-, health-, and participation-related outcomes as well as sleep diary outcomes using data from the intervention phase for both the treated group (Weeks 1–8) and wait-list control group (Weeks 9–16), given that each group had then completed the REST intervention ($n = 13$). We used dependent t tests to assess whether significant change occurred between the pre- and postintervention assessment and whether significant change occurred between the postintervention assessment and 3-mo follow-up assessment ($n = 12$).

Results

All aspects of the group and 1:1 sessions were delivered as planned (for more details regarding the REST intervention, see Eakman, Schmid, et al., 2017). Two participants did not complete REST because of personal issues; no adverse events occurred. Participants who completed REST ($n = 13$) attended on average 6.3 of the seven group sessions and 6.9 of the seven 1:1 sessions. Participants were on average age 29.5 yr; 2 were women, 8 were not married, all were undergraduate students, the majority were White ($n = 9$) and Army veterans ($n = 7$), 12 reported having a disability rating with the Veterans Health Administration, and only 3 reported prior insomnia treatment.

Figure 1. Study design.



Note. REST = Restoring Effective Sleep Tranquility.

Analyses of data from the primary phase of the study, which compared the treatment group with the wait-list control group during Weeks 1 through 8, indicated significant beneficial treatment effects for all PROs. Sleep-related treatment effects included a large decrease in sleep disturbances (partial $\eta^2 = .59$, $p = .002$) and a very large decrease in dysfunctional sleep beliefs (partial $\eta^2 = .78$, $p < .001$), whereas nightmare-related symptoms displayed a moderate decline (partial $\eta^2 = .30$, $p = .054$). Moderate health-related treatment effects were found for reduced stress (partial $\eta^2 = .35$, $p = .033$), depression (partial $\eta^2 = .34$, $p = .036$), and anxiety (partial $\eta^2 = .41$, $p = .019$). Participation-related treatment effects were observed only for meaningful activity (partial $\eta^2 = .35$, $p = .032$; Table 1.

When comparing within-person change in sleep outcomes for all participants when they had completed the REST intervention, we found very large improvements in sleep efficiency ($d = 1.33$, $p \leq .001$), although an average loss of about 15 min in total sleep time was found ($d = 0.67$, $p \leq .05$). All other sleep diary variables improved, including very large reductions in sleep onset latency ($d = 1.67$, $p \leq .001$) and nighttime awakenings ($d = 1.29$, $p \leq .001$), whereas wake after sleep onset demonstrated a modest improvement ($d = 0.67$, $p \leq .05$; Table 2. Large to very large improvements were found in each sleep-related PRO, including sleep disturbance ($d = 1.39$, $p \leq .001$), dysfunctional sleep beliefs ($d = 2.37$, $p \leq .001$), and nightmares ($d = 0.92$, $p \leq .01$). Stress ($d = 0.96$, $p \leq .01$), depression ($d = 0.83$, $p \leq .05$), and anxiety ($d = 1.00$, $p \leq .01$) symptoms lessened. In terms of participation-related PROs, meaningful activity ($d = 0.77$, $p \leq .05$) and mindfulness ($d = 0.64$, $p \leq .05$) demonstrated moderate improvements. Lastly, all PRO gains were maintained at 3-mo follow-up (Table 3).

Discussion

The REST intervention was safely delivered in a community-based setting, and it was beneficial for post-9/11 veterans in college with sleep disturbances. Group-based sessions offered education regarding the mechanisms of the human sleep–wake cycle, such as the circadian system and the homeostatic sleep-driver system, which, when in synchrony, promote sleep quality and regularity (Harvey & Buysse, 2018). Building participant knowledge about how "sleep works" was essential to the REST intervention. This education contributed to participants' understanding of, and likely their adherence to, sleep restriction and stimulus control goals needed to develop sleep-promoting routines in day-to-day activities (e.g., stay awake until your prescribed time to bed, leave the bed and bedroom when you have difficulty sleeping, get up at the same time every day; Maurer et al., 2018).

Sleep restriction and stimulus control goals were prescribed during 1:1 sessions with the occupational therapist and reinforced as part of weekly group

Table 1. Results of Repeated-Measures ANOVA Comparing Treatment and Control Groups

Variable	*M* (*SD*)				Repeated-Measures ANOVA		
	Control Group (*n* = 7)		Treatment Group (*n* = 6)				
	Baseline	Posttest	Baseline	Posttest	*F* (1, 11)	*p*	Partial η^2
Sleep-related outcomes							
Sleep disturbances	59.47 (4.54)	60.44 (4.58)	61.33 (6.31)	46.67 (7.76)	15.70	.002	.59
Dysfunctional sleep beliefs	4.41 (0.78)	4.24 (0.46)	4.82 (1.01)	2.03 (0.83)	38.11	<.001	.78
Nightmares	7.71 (5.35)	8.86 (4.67)	4.33 (4.55)	2.67 (3.08)	4.66	.054	.30
Health conditions							
Stress	19.29 (4.03)	19.00 (5.23)	16.83 (5.04)	10.17 (6.24)	5.91	.033	.35
Depression	10.00 (5.03)	11.57 (6.55)	8.17 (6.18)	4.33 (3.98)	5.69	.036	.34
Anxiety	8.71 (7.27)	9.14 (5.64)	8.00 (4.47)	3.50 (3.15)	7.63	.019	.41
PTSD	18.00 (6.83)	18.29 (6.55)	14.83 (6.91)	13.00 (6.51)	1.69	.220	.13
Pain	57.30 (7.55)	58.04 (5.81)	52.72 (6.22)	49.38 (6.70)	1.00	.340	.08
Participation-related outcomes							
Meaningful activity	31.29 (3.64)	28.86 (4.06)	28.50 (6.53)	33.33 (6.98)	6.00	.032	.35
Satisfaction	48.39 (5.16)	42.01 (9.52)	46.83 (4.00)	50.00 (4.78)	3.24	.099	.23
Performance	45.50 (7.48)	46.67 (7.33)	46.48 (3.31)	51.42 (6.77)	1.09	.319	.09
Mindfulness	3.79 (0.76)	3.71 (0.86)	3.92 (0.71)	4.41 (0.84)	1.29	.280	.11

Note. ANOVA = analysis of variance; PTSD = posttraumatic stress disorder.

sessions. Group sessions also provided education on behavioral (e.g., napping) and cognitive (e.g., worry and rumination) factors that can perpetuate chronic insomnia. We believe that the group sessions, in which participants could share experiences in a safe environment and develop a sense of camaraderie, combined with 1:1 treatment sessions, contributed to low program attrition (just 13%); this result is excellent compared with other studies of veterans that had double the attrition rate (Dopke et al., 2004; Trockel et al., 2014).

REST outcome indicators were not only compelling when comparing the intervention group with the control group in the primary phase of the study but also when assessing within-person change when treatment was received. For the primary phase of the study, we found robust and large treatment effects for the sleep-related PROs, indicating that REST reduced sleep disturbances, dysfunctional sleep beliefs, and nightmares. These findings are consistent with a growing evidence base highlighting the effectiveness and relative safety of multicomponent CBT–I for the treatment of chronic insomnia (Miller et al., 2014; van der Zweerde et al., 2019; van Straten et al., 2018). Although a future randomized controlled trial of the REST intervention is needed, present results indicate that REST causes better sleep outcomes because it incorporates CBT–I components such as sleep restriction, stimulus control, education regarding sleep-related beliefs, and embedding sleep-promoting activities into daily life (Eakman, Schmid, et al., 2017).

Using within-person analyses of individual change, we found that sleep disturbances, a hallmark indicator of chronic insomnia, improved nearly 1 *SD* after

Table 2. Dependent *t* Tests Investigating Change in Sleep Diary Indicators From Baseline to Posttest (*n* = 13)

Variable	*M* (*SD*)		Change From Baseline to Posttest			
	Baseline	Posttest	*M* (*SD*)	*SE*	*t* (12)	*d*
Sleep onset latency	35.46 (12.94)	13.00 (6.31)	22.46 (13.43)	3.73	6.03**	1.67
Nighttime awakenings	1.85 (0.80)	1.08 (0.86)	0.77 (0.60)	0.17	4.63**	1.29
Wake after sleep onset	21.46 (12.93)	11.38 (9.08)	10.08 (15.08)	4.18	2.41*	0.67
Total time in bed	485.38 (56.33)	428.00 (47.96)	57.39 (34.06)	9.45	6.08**	1.68
Total sleep time	413.08 (57.50)	396.46 (44.80)	16.62 (24.72)	6.86	2.42*	0.67
Sleep efficiency	85.15 (4.28)	93.23 (3.30)	−8.08 (6.09)	1.69	−4.78**	1.33

*$p \leq .05$. **$p \leq .001$.

Table 3. Dependent *t* Tests Investigating Change in Outcomes From Baseline to Posttest and From Posttest to 3-Mo Follow-Up

	Observed Values, *M* (*SD*)			Change in Outcomes							
				Baseline to Posttest ($n = 13$)				Posttest to 3-Mo Follow-Up ($n = 12$)			
Variable	Baseline[a]	Posttest[a]	Follow-Up[b]	*M* (*SD*)	*SE*	*t* (12)	*d*	*M* (*SD*)	*SE*	*t* (11)	*d*
Sleep-related outcomes											
Sleep disturbances	59.52 (5.34)	48.19 (7.02)	50.54 (6.21)	11.33 (8.13)	2.26	5.02***	1.39	−2.13 (7.61)	2.20	−0.97	0.28
Dysfunctional beliefs	4.51 (0.84)	2.15 (0.65)	2.40 (1.04)	2.35 (0.99)	0.28	8.55***	2.37	−0.23 (0.74)	0.21	−1.10	0.32
Nightmares	6.69 (4.55)	3.38 (2.84)	4.00 (3.25)	3.31 (3.61)	1.00	3.30**	0.92	−0.33 (1.88)	0.54	−0.62	0.18
Health conditions											
Stress	18.23 (5.15)	13.31 (7.42)	15.50 (5.84)	4.92 (5.12)	1.42	3.47**	0.96	−1.92 (5.57)	1.61	−1.19	0.35
Depression	9.69 (6.14)	5.69 (4.68)	5.58 (3.87)	4.00 (4.81)	1.34	3.00*	0.83	0.58 (1.93)	0.56	1.05	0.31
Anxiety	8.77 (5.23)	5.08 (3.86)	5.92 (4.12)	3.69 (3.71)	1.03	3.59**	1.00	−0.42 (2.71)	0.78	−0.53	0.16
PTSD	16.23 (6.31)	13.69 (6.07)	12.25 (3.47)	2.54 (4.58)	1.27	2.00	0.56	1.92 (3.15)	0.91	2.11	0.61
Pain	55.62 (6.48)	53.83 (7.39)	51.98 (7.31)	1.79 (7.86)	2.18	0.82	0.23	2.12 (3.54)	1.02	2.07	0.60
Participation-related outcomes											
Meaningful activity	28.92 (4.91)	32.85 (5.21)	30.17 (8.02)	−3.92 (5.14)	1.43	−2.75*	0.77	2.75 (6.43)	1.86	1.48	0.43
Satisfaction	43.94 (7.24)	47.98 (5.52)	47.05 (6.22)	−4.05 (7.62)	2.11	−1.92	0.53	1.20 (5.68)	1.64	0.73	0.21
Performance	48.26 (7.31)	50.12 (7.62)	49.09 (5.33)	−1.86 (6.74)	1.87	−1.00	0.28	0.88 (5.36)	1.55	0.57	0.17
Mindfulness	3.82 (0.67)	4.27 (0.87)	4.22 (0.92)	−0.45 (0.70)	0.19	−0.87*	0.64	0.09 (0.81)	0.23	0.38	0.11

Note. PTSD = posttraumatic stress disorder.
[a]Indicates value for the 14 participants who took the baseline and posttest assessments. [b]Indicates value for the 12 participants who took the 3-mo follow-up.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

REST. PROMIS sleep disturbance scores fell to the normal range immediately after intervention, and these benefits were maintained at 3-mo follow-up. Dysfunctional sleep beliefs (e.g., "If I am having difficulty falling asleep, I must try harder") demonstrated the largest reductions, reflecting the relevance of behavioral and cognitive factors to primary insomnia. That is, inaccurate beliefs about sleep may lead to insomnia-perpetuating behaviors, such as napping, or to a sense of worry regarding difficulties with sleeping or concerns about impaired daytime functioning, which can increase cognitive arousal and thereby make falling asleep more difficult. Nightmares, which are commonly associated with chronic insomnia among veterans (Harvey et al., 2003), also decreased substantially. We found a medium effect size for the reduction of PTSD-related sleep disturbances, indicating that the REST intervention may improve nightmares, nighttime terrors, anxiety, and panic among veterans with PTSD.

Sleep diary parameters demonstrated large to very large improvements pre- to posttest, although they were only available for the all-treated analysis (i.e., assessment of within-person change). Sleep efficiency, an indicator of sleep quality, was substantially improved, from 85% to 93% on average. Reductions in sleep onset latency, nighttime awakenings, and wake after sleep onset indicate the efficacy of the REST intervention.

Chronic insomnia among post-9/11 veterans is commonly accompanied by mental health challenges (Jenkins et al., 2015). In this study, stress, depression, and anxiety symptoms demonstrated moderate to large improvements that were associated with significantly better sleep. This finding is consistent with growing evidence that multicomponent CBT–I interventions improve sleep and likely contribute to improvements in mental health (Karlin et al., 2013). Notably, the mental health gains achieved at the end of REST were maintained at 3-mo follow-up, indicating the impact and durability of the intervention (van der Zweerde et al., 2019). Symptoms of PTSD and pain interference decreased pre- to posttest but were not significantly different. It is interesting to note that in Table 3, a clear trend of improvement occurs in PTSD and pain interference at 3-mo follow-up. This finding may indicate a positive, although delayed, effect of REST via improved sleep quality for these two health conditions.

Participation-related outcomes are typically not addressed in studies of CBT–I; therefore, the present findings are important to advancing understanding of sleep and participation. Meaningful activity was the only participation-related PRO demonstrating a treatment effect in response to the REST intervention in both the primary phase of the study and the assessment of within-person change. Meaningful activity, as assessed by the Engagement in Meaningful Activities Survey (Eakman, 2012), taps into positive experiences of meaning and value such as belonging, helping, competence, autonomy, pleasure, and satisfaction associated with day-to-day activities. A likely effect of REST on participation involved adopting changes to evening and morning sleep preparation routines (Eakman, Rolle, & Henry, 2017; Eakman, Schmid, et al., 2017; Manber & Carney, 2015).

Participants were encouraged to adopt evening routines that helped them to wind down; for example, morning routines served as cues or zeitgebers, such as eating, showering, dressing, and socializing, to promote entrainment of the circadian system (Monk, 2010). Group occupational therapy sessions addressed incorporating meaningful activities within participants' daily routines. One-on-one occupational therapy sessions included time management support to ensure that sleep-promoting activities fit within participants' daily lives. We surmise that improved activity routines led to healthy sleep and that healthy sleep enabled improved occupational performance, thereby resulting in greater meaningful activity experiences.

Mindfulness was the only remaining participation-related PRO demonstrating an effect from REST. Participants engaged in approximately 5 min of a mindfulness practice, including seated yoga, in the seven weekly REST group sessions. We did not assess daily mindfulness practice, so we are uncertain whether these practices were embedded in participants' daily practices. Indicators of social role satisfaction and performance showed improvement in response to REST, although these changes were not statistically significant.

Limitations and Directions for Research

We did not use random assignment to condition, and findings from the primary phase of the study should be evaluated in that light. The occupational therapy interveners (Aaron M. Eakman and Natalie R. Rolle) were authors of this study and were aware of the study hypotheses. In addition, although sample size was enough to detect clinically significant effects from the REST intervention, participant characteristics were rather homogeneous (e.g., post-9/11 veterans who were undergraduate college students); therefore, our results may not generalize well to populations with more diverse characteristics. Nonetheless, a strong evidence base supports the effectiveness of multicomponent CBT–I for the treatment of chronic insomnia. Future study is needed in occupational therapy to test sleep-promoting interventions and to promote the use of effective treatments in clinical practice.

Occupational therapy practitioners address occupational performance challenges of diverse populations, and future research should seek to capture the role that sleep and sleep promotion serve in maximizing participation, health, and well-being. Research is also

needed to explore the personal and cultural significance of sleep-related practices and beliefs so that inclusive and culturally sensitive interventions can be created (Leive & Morrison, 2020).

Implications for Occupational Therapy Practice

The results of this study have the following implications for occupational therapy practice:

- Occupational therapy practitioners with advanced training in multicomponent CBT–I are needed to fill a service provision gap and to assist people with chronic insomnia.
- CBT–I and its components, such as sleep restriction, stimulus control, and mindfulness practices, should be adopted as aspects of occupational therapy education and practice to augment sleep preparation and to promote sleep participation.

Conclusion

The REST intervention was safe and effective in reducing sleep disturbances and improving mental health and participation outcomes among post-9/11 veterans attending college. Occupational therapy practitioners with advanced training in CBT–I can fill a substantial service-provision gap and reduce sleep disturbances in this population. Notably, REST participants demonstrated reduced sleep- and health-related problems, and these benefits were sustained 3 mo posttreatment. Meaningful activity and mindfulness were positively affected through the REST intervention, highlighting the interrelated nature of sleep quality and meaningful participation in daily activities.

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