Brief Behavioral Treatment of Insomnia

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KEYWORDS

• Insomnia • Behavioral treatment • Brief treatment • BBTI

KEY POINTS

- Cognitive behavioral treatment for insomnia (CBTI) is an effective treatment of insomnia; however, there are insufficient CBTI providers for the 10% to 25% of the population who have insomnia.
- Brief behavioral treatment for insomnia (BBTI) is a 4-session manualized treatment paradigm administrable in medical settings by nonpsychologist health professionals.
- BBTI is effective in reducing symptoms of insomnia, such as sleep onset latency, wake after sleep onset, and sleep efficiency. In some cases, BBTI resulted in full remission from insomnia.
- Ongoing clinical trials are further testing the efficacy of BBTI in alternative treatment deliveries (video conference) and in primary medical care settings.

INTRODUCTION

Insomnia is defined by difficulty with sleep initiation, sleep maintenance, and daytime impairment in social, educational, or other areas of functioning.[1] It is the most common sleep disorder, with prevalence in the general population ranging from 10% to 25%.[2] Individuals with insomnia symptoms have high health care utilization and costs and increased workplace absenteeism and reduced productivity.[3] Insomnia is often managed with hypnotics, which are efficacious, but also pose risks for side effects, dependence, and withdrawal symptoms.[4] Cognitive behavioral treatment of insomnia (CBTI) is an effective treatment of insomnia and is recommended as the initial treatment by the American College of Physicians.[5,6]

Despite favorable results, CBTI can be impractical as a first line of treatment. Specialists in behavioral sleep medicine often administer CBTI over a relatively long duration (6–8 sessions). As such, there is a significant discrepancy between the number of people who would benefit from CBTI treatment and the number of CBTI providers. Moreover, individuals with insomnia have psychiatric and medical comorbidities and are more likely to present with their sleep complaints to a general practitioner.[7] To extend the reach of behavioral treatments for insomnia to those with comorbidities and to other medical settings, Buysse and colleagues[8,9] developed a brief, manualized protocol administrable in medical settings, *brief behavioral treatment for insomnia* (BBTI). In a 2011 initial efficacy study, individuals who completed BBTI demonstrated improvement in sleep over 6 months.[9] The authors provide a brief overview of BBTI, review its efficacy in varied populations, discuss limitations, and make suggestions for future research using BBTI.

BRIEF BEHAVIORAL TREATMENT FOR INSOMNIA OVERVIEW

BBTI was developed to be brief, acceptable to patients taking medications and with other

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comorbidities, and efficacious in a short time period. It is deliverable by professionals with minimal specialty training (the initial efficacy trial was delivered by a nurse practitioner with no prior sleep medicine or behavioral interventions). The design targets 2 physiologic processes that regulate sleep: Homeostatic drive that increases sleep propensity as duration of wakefulness increases, and circadian drive that governs 24-hour rhythms in sleep-wake propensity. Treatment focuses on modifying sleep behaviors that influence homeostatic and circadian sleep regulation. In particular, the duration of daytime wakefulness is increased to optimize sleep drive, and sleep timing is regulated to establish consistent cues for circadian entrainment.[5,6]

Table 1 presents a brief summary and rationale of the protocol, which is described in more detail in later discussion. For a more detailed overview, see Troxel and colleagues.[8] The primary components of BBTI are stimulus control[10] and sleep restriction,[11] which are behaviorally focused modifications with strong empirical support for improving insomnia symptoms. These techniques minimize "psychological" concepts that can be challenging to address in medical environments. Before treatment, patients complete a clinical interview, standardized questionnaires for sleep and daytime symptoms, and 1 to 2 weeks of sleep diaries, which facilitate individualized treatment recommendations. The original protocol consists of 2 in-person meetings (sessions 1 and 3) and 2 telephone check-ins (sessions 2 and 4).

Session 1 (45–75 minutes) introduces most of the intervention components, including health sleep practices, the 2-process model of sleep regulation, and treatment recommendations. An interactive workbook guides session 1, beginning with a review of behaviors that help or hinder sleep and an overview of the interplay between the homeostatic and circadian drives in regulating sleep. This education informs the rationale for specific behavioral recommendations to limit time in bed and maintain a consistent wake time (**Fig. 1** represents one workbook page). The therapist and patient then use the workbook to calculate and record average sleep parameters from sleep diaries to facilitate insight into day-to-day sleep-impairing practices. Finally, the therapist introduces the patient to the "Four Rules" to improve sleep, relating these rules to the physiologic sleep-regulatory mechanisms, basic behavioral conditioning principles, and the patient's individual sleep characteristics on diaries (see **Table 1**).

The patient and therapist brainstorm distracting, low-stimulation activities that can be pursued in dim lighting while the patient is outside of the bedroom and unable to sleep. With guidance from the therapist, a new sleep schedule is established in which the patient selects a consistent wakeup time and works backward to determine bedtime. Session 1 concludes with a customized "sleep prescription" that includes the target daily bed and wake time, nighttime out-of-bed activities, recommendations for medication timing and dosage, if applicable, and scheduling of follow-up sessions. Troxel and collegues[5] note that acknowledging the anticipated difficulty of adhering to the prescription during this time is useful for setting realistic expectations for patients and enhancing their compliance to treatment.

Session 2 is a follow-up phone call (<20 minutes) regarding the patient's current sleep and daytime functioning status as well as any noticed changes. The therapist confirms adherence to sleep recommendations, provides support, and engages the patient in problem solving. The patient has their sleep diary on hand to facilitate review of the week's data; however, a night-by-night review of the week's sleep is not required.

Session 3 (30 minutes) is an in-person meeting to review progress and address difficulties with recommendations, monitor and reinforce adherence, and provide instructions for titrating sleep schedule. The patient is instructed to maintain changes to the sleep schedule for the next week. Patients are instructed to follow the algorithm of sleep extension or restriction (see **Table 1**) on a weekly basis throughout treatment, and beyond treatment discontinuation if sleep problems persist.

Session 4 (<20 minutes) is a final phone call to discuss progress and treatment challenges, increase time in bed as needed, and review relapse prevention. The 4 rules for better sleep and the instructions for increasing or decreasing time in bed are also readdressed. It is also useful to discuss scenarios or periods during which patients will likely encounter increased sleep disturbance, which may aid in developing preemptive strategies to prevent relapse during challenging periods.

UPDATE ON BRIEF BEHAVIORAL TREATMENT FOR INSOMNIA EFFICACY

The goals of BBTI are similar to other insomnia treatment modalities: (1) improve sleep quality and quantity and (2) reduce daytime impairment.[1] Improvements in these domains are generally assessed using questionnaires addressing sleep quality (eg, Pittsburgh sleep quality index; PSQI),[12] insomnia severity (eg, insomnia severity index; ISI),[13] and daily sleep diaries in which patients estimate and record their bedtime, sleep

Table 1
Brief behavioral treatment for insomnia session-by-session methods and rationale

Session	Method	Rationale
Pretreatment		
Sleep evaluation	Clinical interview with provider	Sleep diagnosis and rule out other sleep disorders
Questionnaires	Baseline measures of sleep quality (eg, PSQI) and insomnia severity (eg, ISI), sleepiness (eg, ESS)	Determines nature and severity of patient impairment in sleep and daytime functioning[31]
Sleep diaries	Two weeks daily sleep diaries (eg, bedtime, wake time, etc.)	Accurately estimate sleep pattern[32]; facilitate personalized sleep schedule[11]
Session 1 (45–75 min)		
Healthy sleep practices	Patient is educated on practices that facilitate sleep (eg, dim evening light), or hinder sleep (eg, computer in bed)	Distinguish healthy sleep practices from active components of treatment[8,33]
Two-process model of sleep regulation[34]	1. Homeostatic sleep drive (sleep propensity increases with the duration of wakefulness) 2. Circadian sleep drive (sleep propensity governed by 24-h biological pacemaker)	Behavioral recommendations for sleep harness and strengthen components of 2-process model[8]
Four sleep rules:	1. Reduce time in bed (usual TST + 30 min, never reduce TIB below 6 h) 2. Establish consistent wake time 3. Go to bed when sleepy 4. Get out of bed when not sleeping in 30 min	1. ↑ Homeostatic sleep drive; ↓ sleep latency[11] 2. Strengthen circadian signaling[10]; ↓ chance of phase delay[35]; ↑ homeostatic sleep drive[11] 3. ↑ Homeostatic sleep drive[11]; ↑ awareness of internal cues of sleepiness[10] 4. Facilitates reconditioning to associate bed with sleep[36]
Session 2 (<20 min)		
Phone follow-up	Review patient's sleep quality, diaries, daytime functioning, and adherence to recommendations and schedule prescribed at session 1	Provide interim support, identify specific challenges to adherence, and problem solve for solutions[8]
Session 3 (30 min)		
In-person follow-up	Therapist and patient review progress, address challenges, and reinforce adherence	
Sleep schedule titration	Adjust sleep schedule as needed: • If SOL and WASO <30 min on most nights, add 15 min to time in bed (advance bedtime or delay wake time). • If SOL or WASO >30 min on most nights, decrease time in bed by 15 min	Sleep schedule should facilitate patient's core sleep requirement and maximize SE and homeostatic drive[11]

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Table 1
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Session	Method	Rationale
Session 4 (<20 min)		
Phone follow-up	Review progress, address challenges, monitor and reinforce adherence to recommendations Titrate as needed; TIB is *decreased* when sleep is poor and *increased* when sleep is good	
Relapse prevention	Therapist and patient anticipate insomnia recurrence (eg, stressful events at work or home). Review recommendations for sleep titration	Minimize perpetuating factors in insomnia[37]; develop proactive strategies to mitigate relapse[8]

onset latency (SOL), wake after sleep onset (WASO), wake time, and out-of-bed time. Daily diary estimates can then be used to estimate total in bed (TIB), total sleep time (TST), and sleep efficiency (SE), which is expressed as the percent of time the patient was in bed asleep (ie, SE = TST/TIB * 100). SOL, WASO, and SE can also be derived from actigraphy and polysomnography (PSG). Insomnia treatments, including BBTI, are evaluated by their ability to decrease scores on one or more of these global rating scales or specific sleep parameters. Although PSG is the "gold standard" for sleep assessment, it is not indicated in the evaluation of insomnia.[1] Use of PSG to evaluate insomnia is also less common than daily diaries or actigraphy due to participant burden and cost. Finally, the efficacy of BBTI (and other treatments for insomnia) can be described by a priori operationalized definitions of response to treatment and remittance of symptoms.

Results from 6 studies using BBTI to treat insomnia are outlined in **Table 2**. Study designs were either randomized controlled trials (RCTs; 4) or one-group quasiexperimental designs (2). Sample sizes ranged from 10 to 79 individuals. Study samples were diverse in terms of age, comorbidities (eg, human immunodeficiency virus),[14] medical history (eg, cancer survivors),[15] and insomnia

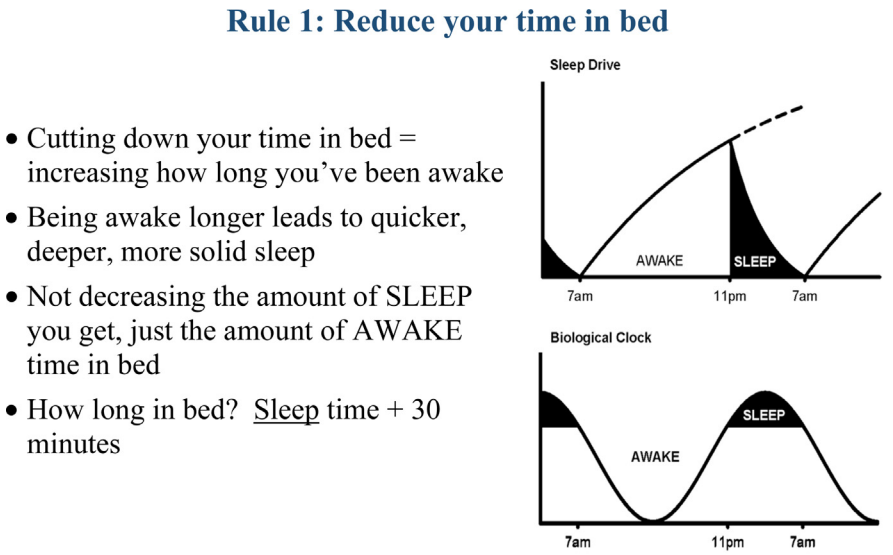

Fig. 1. BBTI workbook page with description of first "rule" of treatment on the left and a depiction of the 2-process model of sleep on the right. The therapist and the patient review the rules and the rationale together.

Table 2
Results from studies using brief behavioral treatment for insomnia for treatment of insomnia

First Author, y	Sample	Study Design	Sleep Measures	Efficacy Criteria	Efficacy and Other Sleep Outcomes
Germain et al,[16] 2006	N = 35, 71% women, *M* age = 70.2 ± 6.4 y	RCT BBTI vs information control	PSQI, diary SOL, TST, WASO, SE	Response = 3 pt decrease on PSQI or 10% increase in SE; Remission = response + PSQI <5 or SE >85%	BBTI group: 71% response and 53% remission; control group: 39% response and 17% remission Other sleep outcomes: BBTI improvements in diary and PSQI > than control
Buysse et al,[9] 2011	N = 79, 70% women, *M* age = 71.7	RCT BBTI vs information control	PSQI, ESS, diary, actigraphy, & PSG SOL, TST, WASO, SE	Response = 3 pt decrease on PSQI or 10% increase in diary SE; remission = response + PSQI <5 or SE >85%; no insomnia diagnosis based on structured clinical interview	BBTI group: 55% no longer met insomnia criteria, 40% response, and 25% remission; control group: 13% no longer met insomnia criteria, 20% response, and <5% remission Other sleep outcomes: BBTI improvements in PSQI, diary SOL, WASO, & SE > than control; BBTI improvements in actigraphy SOL, WASO, & SE > control; BBTI actigraphy TST < control; no PSG group differences
Wang et al,[38] 2016	N = 79 adults with treatment resistant insomnia, 54% women, *M* age = 41.6 ± 8.42	RCT BBTI vs sleep hygiene	PSQI, ESS, DBAS, ISI, diary SOL, TIB, SE, WASO	Not specified	BBTI improvements in PSQI, ESS, DBAS, ISI, diary SOL, TIB, SE, WASO > control group

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Table 2
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First Author, y	Sample	Study Design	Sleep Measures	Efficacy Criteria	Efficacy and Other Sleep Outcomes
Buchanan et al,[14] 2018	N = 12 adults with HIV, 77.3% men, *M* age = 46 (range 30–59)	One-group quasi-experimental pilot	PSQI, ISI, diary SOL, WASO, SQ, PROMIS-sleep impairment	Not specified	↓ PSQI, ISI, PROMIS diary SOL, WASO, & SQ (lower score = better sleep quality), ↑ SE Other sleep outcomes: ISI scores decreased to no "clinically important insomnia," ↑ TST
Zhou et al,[15] 2017	N = 10 adolescent and young adult cancer survivors, 60% women, *M* age = 28.1 ± 7.2	Modified BBTI, one-group quasiexperimental	PSQI, ISI, diary TST, & SE	Not specified	↓ PSQI, ISI, diary SOL & WASO ↑ diary SE
McCrae et al,[17] 2018	N = 62, 42% women, *M* age = 69.4 ± 7.7	RCT BBTI vs self-monitoring control	Diary SQ, diary & actigraphy SOL, TST, WASO, SE	Response = ≥10% in SE, remit = response criteria, + SE ≥85% + SQ ≥2.5	BBTI group: 53% response and 28% remit; control group: 13% response and 7% response Other sleep outcomes: BBTI improvements in diary SOL, WASO, SE, & SQ > than control group; no differences between BBTI and control group on actigraphy outcomes

Abbreviations: DBAS, dysfunctional beliefs about sleep; ESS, Epworth sleepiness scale; M, Mean; PROMIS, patient-reported outcomes measurement information system; pt, patient; SQ, sleep quality.

medication use. Three studies found better response and remissions rates in BBTI groups compared with information or self-monitoring control groups.[9,16,17] Results from 4 studies indicated that improvements in diary-assessed sleep quality, SOL, WASO, and SE were greater in BBTI groups than in a control condition. Buysse and colleagues[9] found that improvements in actigraphy-assessed SOL, WASO, and SE were greater in the BBTI group compared with the control condition. In contrast, McCrae and colleagues[17] found no group differences in actigraphy-assessed sleep outcomes. Only one study reported on pre-post PSG assessments and found no pre-post or group differences in PSG-assessed sleep.[9] All studies reported postintervention improvements in sleep diary measures. Two studies demonstrated sustained improvements. McCrae and colleagues[17] found that improvements in diary-assessed SOL, WASO, and SE were sustained at 3 months. Among 25 BBTI recipients at 6 months after treatment, 40% met criteria for remission, 44% met criteria for response, and 64% no longer met diagnostic criteria for insomnia.[9] BBTI also appears to be acceptable in terms of treatment adherence outcomes, in keeping with protocol aims. Participants in a BBTI treatment group restricted their time in bed as instructed and were 80% to 90% adherent to sleep hygiene and stimulus control recommendations.[17]

Thus, results from existing studies on BBTI demonstrate that it is acceptable and efficacious in improving both global and specific symptoms of insomnia assessed via daily diary (ie, SOL, WASO, SE). In some studies, patients no longer met criteria for insomnia. However, response to treatment may vary depending on individual differences in sleep, mental health, and other comorbidities. For example, Troxel and colleagues[18] found that patients with *more* anxious and depressive symptoms at baseline were more likely to demonstrate an a priori–defined treatment response to BBTI ($\geq$3-point change in PSQI score or $\geq$10% change in SE). Longer sleep durations at baseline were also associated with more likelihood of a treatment response, whereas individuals with short sleep durations at baseline were less likely to respond to BBTI treatment.[18]

Treatment response may also vary depending on medical comorbidities, especially those that influence nighttime sleep behavior. Older adults with nocturia had reduced BBTI treatment effects compared with older adults without nocturia.[19] To the authors' knowledge, no other studies have examined predictors of treatment response. Based on the existing literature, BBTI appears to be efficacious in older adults with diverse medical histories, but treatment response may be attenuated based on individual differences in medical comorbidities, sleep duration, and distress at baseline.

OTHER IMPLICATIONS OF BRIEF BEHAVIORAL TREATMENT FOR INSOMNIA

Improving or resolving insomnia has a positive impact on other medical and psychological domains. For example, individuals who underwent CBTI had reduced pain ratings after treatment even though pain management was not a part of the treatment protocol.[20] Similarly, Manber and colleagues[21] found that individuals with major depression and insomnia had better depression remission rates when they were offered CBTI in addition to pharmaceutical treatment of depression. Buysse and colleagues[9] found that individuals in the BBTI group had improved scores on measures of depression and general health, but not anxiety, compared with the control group. However, McCrae and colleagues[17] found no differences in mood and anxiety in response to BBTI. Although BBTI was not associated with improved cognitive performance at 4 or 12 weeks after treatment compared with the control condition, improved sleep (across groups) was associated with small performance improvements.[17,22] However, BBTI is associated with improvements in medical outcomes. In a secondary analysis of a BBTI trial,[9] Tyagi and colleagues[23] examined whether BBTI was associated with changes in self-reported nocturia (excessive nighttime voids). Nocturnal voids decreased in the BBTI and *increased* in the control group.

The brevity and flexibility of BBTI facilitates dissemination via varied treatment deliveries and to populations with comorbidities. For example, in an RCT, BBTI was adapted to include a focus on military factors that contribute to symptoms of insomnia in military veterans (BBTI-MV).[24] The BBTI-MV group had a greater response to treatment compared with the control group (76% vs 50%, respectively), although this difference was not statistically significant. In a small sample of cancer survivors, Zhou and colleagues[15] piloted the efficacy of a BBTI protocol that was modified to include components of CBTI. As presented in **Table 2**, they found that their protocol (delivered in person or via video conference) was associated with improvements in sleep quality, insomnia severity, and SOL. The efficacy of BBTI among individuals with hypertension and insomnia is currently being evaluated in an ongoing RCT, hypertension with unsatisfactory sleep health (HUSH).[25] In this large trial (the enrollment target

is 625 adults), BBTI is delivered in person via Web-interface/telehealth and is compared with a self-guided Internet protocol condition (SHUTi [Sleep Healthy Using the Internet]) and an enhanced usual care condition. Results from this trial will demonstrate the effectiveness of low-cost insomnia interventions with potential for dissemination to medical settings.[25]

LIMITATIONS AND FUTURE DIRECTIONS OF BRIEF BEHAVIORAL TREATMENT FOR INSOMNIA

Much of what is known about BBTI's efficacy has been observed in older adult populations. Insomnia with comorbidities is common in older adults,[26] who are also at increased risk for side effects from medications.[27] Thus, results of BBTI trials demonstrate positive outcomes for a population most likely to benefit from a brief behavioral intervention for insomnia that is deliverable by health practitioners in a medical setting. However, evaluation on generalizability of BBTI efficacy is currently limited to 4 RCTs (in older adults) and 2 quasiexperimental designs. Results from studies on BBTI in other age ranges and comorbidities, and in other settings, are necessary.

To the authors' knowledge, there are 2 ongoing BBTI trials. In addition to the HUSH trial described above, Bramoweth and colleagues[28] are comparing the efficacy of BBTI to CBTI in Veterans Affairs primary care settings. The aims of this study are to directly compare BBTI to the "gold standard," CBTI, and to identify provider level barriers to implementation of behavioral treatment of insomnia in a primary care setting. Findings from these BBTI trials[25,28] will determine the extent to which BBTI is effective when delivered via other modalities (video/telehealth) and across medical settings (eg, primary care). Positive outcomes have the potential to reduce health care costs due to insomnia. For example, brief CBTI (a treatment paradigm similar to BBTI) was associated with reduced health care usage and a significant reduction in office visit–related costs.[29] Insomnia treatment delivered in a group format is successful[30] and may facilitate cost reduction. To the authors' knowledge, BBTI has not yet been tested in a group treatment paradigm; however, BBTI is being delivered via video/telephone conference in the HUSH trial. Treatments with few or no office visits may also facilitate cost reduction. Current and future studies will help determine whether BBTI is as effective at a reduced cost to the patient.

In addition to exploring reductions in health care usage and costs, it will be useful to determine whether BBTI is associated with other downstream psychological and health benefits. Thus far, BBTI is not directly related to cognitive improvement in one study where it was examined; however, it will be important to consider other types of cognitive assessment (eg, computerized testing paradigms) and that improvements in cognition may not be immediately apparent.[22,29] Likewise, it will be useful to continue to explore whether BBTI contributes to improved symptoms of mood and anxiety disorders. Thus far, the data are mixed; however, extended follow-up may be useful in assessing psychological outcomes.

In sum, BBTI is effective in reducing symptoms of insomnia, and in many cases, predicts insomnia remission. Treatment is successful when administered by a nonpsychologist,[9] which suggests that with some sleep education, health practitioners could effectively increase treatment availability. Individuals with varied medical histories show improvement after BBTI treatment. Ongoing and future studies will test alternate treatment deliveries (eg, video conference) and efficacy in primary care settings, which will provide further evidence of BBTI's ability to reduce insomnia across medical settings.

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