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Assessment and Treatment of Sleep Disturbances in Posttraumatic Stress Disorder

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Definition of Trauma and Posttraumatic Stress Disorder (PTSD)

Traumas are defined as events that are directly experienced or witnessed, that threaten one's integrity, and are accompanied by intense feelings of fear, horror, and/or hopelessness during or immediately after the event.[1] Combat exposure and other war-related experiences are typical representations of traumas. Other events, such as sexual and physical violence, motor vehicle accidents, terrorist attacks, and natural disasters also can be traumatic. Of note, traumas can refer to a single event (e.g., a car accident), or to a series or indirect or diffuse threats occurring over a long period of time (e.g., domestic violence, or deployment in a combat zone). Exposure to trauma is common in the general population. Epidemiological studies have shown that more than 60% of individuals surveyed endorse exposure to at least one traumatic event in their lifetime.[2-4] Although trauma exposure and acute stress reactions are common experiences, a significant minority of trauma-exposed individuals will experience prolonged symptoms, and will develop PTSD.

As summarized in Table 1 *(see page 2)*, PTSD is characterized by three clusters of symptoms that persist for more than one month after exposure to a traumatic event.[1] Re-experiencing symptoms refers to intrusive images, thoughts, feelings, or somatic sensations that are related to the trauma. Flashbacks are rare symptoms, but also are part of the re-experiencing symptom cluster. Finally, nightmares are frequent, and may be replays of the actual traumatic event(s), or morphed depictions of the physical, emotional, or cognitive aspects of the trauma. Avoidance refers to effortful

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TABLE 1:

Summary of PTSD Diagnostic Symptoms

Symptom Cluster	Re-experiencing	Avoidance	Hyperarousal
Number of symptoms required	1	3	2
	Intrusive memories	Avoidance of thoughts and feelings about the trauma	Insomnia
	Nightmares	Avoidance of trauma reminders	Irritability
	Flashbacks	Loss of interest in activities	Poor concentration
	Distress with exposure to reminders of the trauma	Amnesia	Hypervigilance
	Physiological reactivity to cues related to the trauma	Estrangement from others	Exaggerated startle response
		Emotional numbing	
		Sense of foreshortened future	

attempts to encounter any people, places, or other reminders of the trauma. Social isolation, feeling alienated, and emotional numbing also are symptoms of this second cluster. Finally, symptoms of hyperarousal include insomnia, hypervigilance, exaggerated startle response, outbursts of irritability or anger, or violent behaviors.

In the general civilian population, PTSD estimates range between 1% and 10%, depending on the survey methods and populations sampled, with consensus figure estimates between 5% and 10%. In the military population, estimates range between 6% and 30%, with higher prevalence estimates in combat-exposed military personnel, including veterans of the ongoing Operations Enduring/Iraqi Freedom (OEF/OIF) in Afghanistan and Iraq, respectively.[5] In civilians, prevalence estimates vary between 5% to 10%,[6] with higher prevalence estimates observed in victims of interpersonal violence and in civilians exposed to war conflicts.[7-12]

The risk factors for PTSD following trauma exposure include being a woman, childhood history of trauma or abuse, family history of PTSD or other mental disorders, and greater intensity of duration of traumatic events, and peritraumatic dissociation and distress.[13, 14] Alternatively, protective factors that enhance resilience to trauma and have protective effects against PTSD include secure attachment, social support, and the persistence or rapid restoration of consolidated sleep following trauma exposure.[15-17]

Of note, the adverse consequences of trauma exposure are not limited to PTSD. A wide variety of psychiatric disorders have been associated with, or precipitated by, traumatic events, including mood disorders, other anxiety disorders, addictive disorders, eating disorders, and possibly psychotic disorders.[e.g., 18, 19-21] Alternatively, all these conditions also may result from or be comorbid with chronic, severe PTSD symptoms. Comorbidity between PTSD and mood disorders or addictive disorders is often the norm rather than the exception. High comorbidity rates may reflect the overlap in symptoms between PTSD and other psychiatric conditions (e.g., anhedonia, sleep disturbances, or cognitive impairments), an overlap in the neural circuits underlying symptoms of PTSD and other disorders, and/or consequences of attempts to cope with PTSD symptoms (e.g., social isolation, sense of foreshortened future leading to an episode of major depression). Of course, these possibilities are not mutually exclusive.

PTSD is associated with astronomical health care costs, both related to direct psychiatric costs, and indirect costs related to nonpsychiatric health care utilization, comorbidities, loss of productivity, absenteeism, and legal costs.[e.g., 22, 23-27]

Nature and Correlates of Sleep Disturbances in PTSD

Both daytime and nighttime symptoms characterize PTSD. However, sleep disturbances such as nightmares and insomnia are among the most frequent and debilitating symptoms of PTSD. Between 52% and 90% of adults with PTSD endorse nightmares,[28, 29] and as many as 90% of patients with PTSD endorse difficulty falling or staying asleep, despite adequate opportunity for sleep, or nonrestorative sleep. Although only nightmares and insomnia are part of the diagnostic symptoms of PTSD, other sleep disturbances also are frequently reported by patients with PTSD. Nightmares or bad dreams that do not share specific aspects of traumatic events, nocturnal panic attacks, sleep terrors, and a variety of motor and vocal behaviors during sleep are prevalent in adult patients with PTSD.[e.g., 30, 31, 32] Higher prevalence estimates of sleep breathing disorders[33-35] and of sleep-related movement disorder[33, 36-38] also have been reported in adults with PTSD.

Among civilians exposed to traumatic events, pre-existing sleep disturbances are associated with higher incidence of poor psychological outcomes to trauma exposure, such as posttraumatic stress disorder (PTSD), major depressive disorder (MDD), and addictive disorders that include alcohol and substance abuse and dependence,[17, 39] beyond the effects of other risk factors. Subjective sleep complaints and objective disruption of sleep occurring early after trauma exposure predict the development of PTSD.[40-43] Nightmares that occur early after traumatic events also predict subsequent sleep disruption and daytime PTSD symptoms.[44]

In patients with PTSD, the severity of sleep disturbances independently contributes to the severity of daytime PTSD symptoms, symptoms of depression, anxiety, suicidality, alcohol misuse, and perceived physical health and quality of life.[45-49] Sleep disturbances also have been found to reduce the likelihood of treatment response and remission in adults with PTSD.[50]

Several polysomnographic (PSG) studies have been conducted in adults with PTSD to objectively corroborate subjective complaints of sleep disturbances.[e.g., 51, 52] PSG refers to the collection of objective, physiological signals to detect and identify sleep stages. PSG studies in PTSD samples typically have been conducted in the laboratory, but some ambulatory devices have been used to conduct in-home sleep studies.[e.g., 53] In general, PSG studies in PTSD samples generally have reported nonspecific sleep anomalies during rapid-eye movement (REM) sleep[39, 41, 54-58] and/or non-REM (NREM) sleep. A meta-analysis reported that PTSD is associated with increased density of REMs, decreased slow-wave sleep, and increased stage 1 (light) sleep compared to healthy samples.[59]

The lack of specific and consistent objective anomalies detected in PSG-based sleep profiles of patients with PTSD has yielded the suggestion that sleep disturbances may reflect cases of sleep misperception, or that sleep complaints are not rooted in actual sleep events.[e.g., 60] However, it is crucial to note that PSG anomalies are not required diagnostically to determine the clinical significance of these sleep complaints. Insomnia, nightmares, sleep terrors, and nocturnal panic attacks are all clinically identified based on patients' reports and related daytime impairments and distress. In addition, PSG may not provide sufficient sensitivity and specificity to capture underlying physiological correlates of sleep complaints in PTSD. For instance, sleep neuroimaging studies have shown clear differences between patients with primary insomnia or major depression compared to healthy sleepers, despite a lack of group differences on PSG measures.[61-64] Our own preliminary data suggest that combat-exposed veterans with PTSD show marked

increase in relative regional cerebral glucose metabolism compared to combat-exposed veterans without PTSD during both wakefulness and REM sleep in brain regions involved in threat responses. Although these findings need to be replicated in a larger sample, and supplemented by the study of NREM sleep, they nevertheless suggest that the lack of consistent and specific PSG findings in PTSD should not bear weight on the decision to assess and treat sleep complaints in PTSD, and provide limited information of the cerebral activity during sleep in PTSD. As is the case for other anxiety and mood disorders, the nature, frequency, and consequences of subjective sleep complaints and in-depth clinical assessments can provide sufficient information to guide clinical management of sleep disturbances in patients suffering from PTSD.

Reconceptualizing PTSD as Disorder of Both Wake and Sleep

The prevalence, diversity, and impacts of sleep disturbances on daytime functioning suggest that the pathophysiology of PTSD involves profound alterations in sleep regulation, and that the underpinnings of PTSD persist across the sleep-wake cycle. However, in the current clinical paradigm, sleep disturbances are conceptualized as symptoms of PTSD, or secondary manifestations of a unique underlying psychophysiological dysfunction. In this paradigm, treating PTSD with evidence-based approaches should alleviate both daytime and sleep symptoms of PTSD, by normalizing the common and unique underlying pathophysiological anomaly. Unfortunately, sleep disturbances are often resistant to PTSD treatments. Selective serotonergic reuptake inhibitors (SSRIs) have limited benefits on insomnia and nightmares, and may exacerbate insomnia in some cases. Clinical trials for pharmacological treatments of PTSD commonly allow enrolled patients to remain on hypnotics during the trial,[65, 66] making it difficult to evaluate the effects of these treatments on sleep complaints. Similarly, a study by Zayfert and colleagues showed that as many as 48% of PTSD successfully treated with prolonged exposure (an evidence-based psychological treatment for PTSD) continued to endorse significant complaints of insomnia post-treatment.[67]

Several lines of evidence support the notion that sleep disturbances reflect, at least partially, a distinct aspect of the pathophysiology of PTSD that can develop into independently comorbid conditions, which in turn, maintain daytime symptoms and require targeted treatments. As previously indicated, a growing number of prospective studies have shown that the occurrence of sleep disturbances early after exposure to a traumatic event is a strong risk factor for the development and persistence of PTSD,[40-43, 68] whereas the preservation of consolidated sleep posttrauma may serve as a protective factor to enhance resilience to trauma or accelerate recovery from trauma exposure. The considerable frequency of use of hypnotics or pharmacological agents with hypnotic properties for the management of PTSD patients suggests that monotherapy for PTSD sleep symptoms is rarely sufficient to treat sleep complaints.[69, 70] Alternatively, sleep-focused pharmacological or psychological treatments, administered as monotherapy or adjuncts to first-line treatments, are consistently associated with improvements in daytime symptom domains, despite the fact that these approaches do not target daytime symptomatology.[71-79]

Together, these observations suggest that the reconceptualization of PTSD as a disorder that affects both waking function and sleep, and that types of symptoms need to be addressed directly clinically, may best serve patients. Evaluating the possibility that sleep disturbances can develop into independent, comorbid conditions to daytime symptoms of PTSD may provide a more comprehensive

understanding of this pervasive disorder, and most importantly, may enhance treatment outcomes in patients with PTSD. Longitudinal and prospective empirical studies are required to ascertain the strength and directionality of the relationship between sleep disturbances and daytime symptoms of PTSD in order to guide development of effective PTSD treatment that alleviates symptoms across the sleep-wake cycle. Nevertheless, there is no evidence that conceptualizing sleep disturbances as independent, comorbid conditions that require targeted treatments can be detrimental for patients. Rather, the available empirical and clinical data suggest that such a comprehensive approach may yield greater benefit for a significant portion of patients who complain primarily of clinically meaningful sleep disturbances.

Another significant benefit for the evaluation and treatment of sleep disturbances in PTSD relates to the fact that patients are often less reluctant to discuss and address sleep problems than they are to discuss traumatic events and adhere to effective, but emotionally demanding, cognitive-behavioral treatments for PTSD. For instance, military personnel returning from combat deployment or other operations where they are confronted with potentially traumatic events are notoriously reluctant to seek care for mental health issues.[7, 80] However, and because of the high prevalence of sleep disturbances endorsed by active and separated military personnel, targeting sleep complaints can provide a nonstigmatizing, culturally acceptable entry into care, allowing for experiences that may encourage the pursuit of psychiatric care by destigmatizing the mental health care-seeking process. For clinicians who do not feel comfortable tackling trauma-related issues, or for those who do not have the expertise and resources to integrate trauma-focused interventions in the treatment plan, a sleep evaluation can provide a focused approach to gather preliminary information about trauma history and PTSD.

Assessing Sleep Disturbances in Adults with PTSD

On the sleep diary he had received following his first visit, the mean sleep latency was 90 minutes (range: 40-180 minutes), the mean wake time after sleep onset was 105 minutes (range: 15-167 minutes), and mean total sleep time per night varied between four hours and 5.25 hours, with a mean of four hours and 32 minutes per night. He reported an average of one nightmare per night.

Table 2 *(see page 6)* summarizes the diagnostic criteria for insomnia and nightmare, as defined by the International Classification of Sleep Disorders, Second Edition.[81] Features of these sleep disorders that are often found in adults suffering from PTSD also are included in Table 2.

For sleep disturbances comorbid with PTSD, a thorough review of key components of the clinical sleep evaluation is often sufficient for diagnostic and differential purposes, and for the development of treatment plans. In addition to evaluating the presence and severity of diagnostic features listed in Table 2, the clinical interview focuses on specific questions to assess antecedents of the sleep disturbances (e.g., onset following trauma exposure or pre-existing sleep complaints), the daytime consequences associated with these sleep disturbances (e.g., cognitive impairments or mood dysregulation), coping strategies used to manage the sleep disturbances (e.g., prior medication trial, use of alcohol as a sleep aid, or use of stimulants to enhance daytime alertness), and to rule out other possible sleep disorders. Specific inquiries about other stressful events that may exacerbate sleep disturbances also are important. Some patients may recall stressful events that are not traumatic per se (e.g., birth of a child, retirement, divorce, job loss, or promotion) that preceded the onset of disruptive nocturnal episodes.

TABLE 2:

Diagnostic and Related Features of Nightmares and Insomnia

	Nightmare Disorder	Insomnia Disorder
Sleep features	Recurrent episodes of awakenings from sleep with vivid recall of intense disturbing dreams. Dreams can involve feelings of fear or anxiety, anger, sadness, guilt, and other unpleasant emotions. Can be accompanied by difficulty returning to sleep following the episode. The episodes typically occur in the second half of the habitual sleep period, when rapid-eye movement sleep is more prominent.	Difficulty falling asleep, as defined by a sleep latency > 30 minutes, or Difficulty staying asleep, as defined by a duration of wakefulness after initial sleep onset > 30 minutes, or Early morning awakenings with inability to return to sleep, or Complaint of nonrestorative sleep.
Differential sleep features	The person is fully oriented and alert upon awakening.	Sleep complaint(s) described above occurs despite regular, adequate opportunity for sleep. Insomnia is not sleep deprivation, where the opportunity for sleep is inadequate and/or curtailed to allow for restorative sleep.
Daytime consequences	May be accompanied by: • insomnia • dysphoric mood upon awakening that may persist during the day • avoidance of reminders of dream content • occupational, social, and/or interpersonal impairments	At least one of the following daytime impairments accompany the sleep complaint: • cognitive difficulty (poor memory, difficulties with concentration or attention, worries about the impact of sleep loss) • changes in affect (sadness, irritability, anxiety) • impairments in occupational performance • interpersonal difficulties • somatic complaints
Possible clinical presentations in adults with PTSD	May occur in the first half of the night, or during naps. Disturbing dreams may not be exact replays of traumatic events. Awakenings may not immediately follow the nightmares.	Fear of darkness, or of sleep. Shifted sleep-wake schedule with sleep onset late at night or mainly during the day, when the feeling of safety may be increased.
Useful and brief self-report evaluation tools	Nightmare Frequency Questionnaire[127] Nightmare Distress Questionnaire[128] Pittsburgh Sleep Quality Index Addendum for PTSD[30] Sleep and Nightmare Log (Figure 1)	Insomnia Severity Index[129] Pittsburgh Sleep Quality Index[130] Sleep and Nightmare Log (Figure 1)

The clinical review can be supplemented by validated self-report measures to establish baseline severity of sleep complaints and their daytime consequences, and to monitor progress over the course of treatment. Self-report tools available to assess insomnia and nightmares in individuals with and without PTSD also are listed in Table 2. To date, only the Pittsburgh Sleep Quality Index Addendum for PTSD[30] has been specifically developed and validated in adults with PTSD to assess the severity of disruptive nocturnal behaviors, or behaviors that may be described as nightmares (e.g., screaming, acting dreams, or unpleasant dreams unrelated to the trauma). However, other

FIGURE 1: **Example of a Sleep and Dream Log**

SLEEP AND DREAM LOG Name:

	Noon	p.m.											Midnight	a.m.											Sleep Quality	# Dreams Recalled	# Nightmares	Nightmare Distress
		Afternoon						Evening						Morning														
Date	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11				
M																												
T																												
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Use the symbols below to indicate your sleep times in the grid.
↓ = Go to bed
↑ = Get out of bed
↔ = Actual sleep
* = Nightmare occurrence

- Rate your sleep quality each night from 0 (poor) to 10 (excellent).
- Record your number of dreams.
- Record your number of nightmares.
- Rate your nightmare distress from 0 (no distress) to 10 (extreme distress).

well-validated instruments that more generally target insomnia, nightmares, and sleep quality can be helpful to quantify the severity and frequency of sleep disturbances to complement diagnostic evaluations, as well as to monitor progress over the course of treatment.

Sleep and dream logs are the most helpful tools to supplement clinical interviews with a prospective assessment of the pattern of occurrences of the sleep disturbances, as well as of other behaviors that may contribute to poor sleep and dreaming disturbances (e.g., naps or irregular sleep-wake schedules). An example of a sleep and dream log is provided in Figure 1 *(above)*.

PSG, or sleep studies conducted in the laboratory, are not recommended for the evaluation of sleep disturbances that are commonly reported by adults with PTSD.[82] However, suspicion of sleep breathing disorders, such as obstructive sleep apnea, sleep-related movement disorders, such as periodic leg movement disorder, or REM sleep behavior disorder warrants referral for a polysomnographic evaluation. A daytime, multiple sleep latency test also may be considered when narcolepsy is suspected.

Pharmacological and Psychological Treatments of Sleep Disturbances in PTSD

As previously mentioned, insomnia and nightmares are often resistant to first-line PTSD treatments, including sertraline, paroxetine, and exposure-based therapy.[83-85] Fortunately, a growing number of clinical trials have shown that sleep-focused treatments not only can effectively treat insomnia and nightmares, but also can yield clinically meaningful improvements in daytime symptoms of PTSD, anxiety, depression, and irritability.[e.g., 51, 86, 87]

Pharmacotherapy is the most widely used approach for the treatment of nightmares and insomnia in PTSD. Prazosin (an alpha-1 antagonist) has been shown to effectively alleviate trauma-related nightmares in military and civilian samples.[71-74, 88, 89] Effective doses range between 4 mg and 10 mg for a majority of patients. Tolerance and dependence do not develop, but nightmares may recur upon discontinuation. Possible side effects include dizziness, orthostatic hypotension, congestion, and headaches. Prazosin is not a hypnotic medication; it does not accelerate sleep onset. Rather, improvements in sleep maintenance and reductions in difficulty falling asleep appear to be a consequence of nightmare reduction.

Less consistent benefits have been reported with other pharmacological agents. In the past few years, several studies have explored the benefits of atypical antipsychotic drugs for the treatment of PTSD-related sleep disturbances. Studies conducted with risperidone, olanzapine, and quetiapine have all yielded mixed results.[90-92] Other agents, such as zolpidem (nonbenzodiazepine imidazopyridine[93]), gabapentin,[94] and mirtazapine[95] show some promise, but await more rigorous evaluation. Both nefazodone and trazodone have been associated with moderate-to-large beneficial effects on nightmares in open-label and controlled trials.[96-99] Similarly, monoamine oxidase inhibitors and tricyclic antidepressants, as well as cyproheptadine and guanfacine, have shown limited benefits on sleep disturbances in PTSD. Cyproheptadine (an antihistamine with serotonin receptor antagonist properties)[100, 101] and guanfacine (an alpha-2 adrenergic receptor agonist)[102, 103] have not been found effective for reducing sleep disturbances in patients with PTSD in two randomized controlled trials. Finally, studies of benzodiazepines did not find detection benefits for sleep complaints among patients with PTSD,[104, 105] despite observations that they are widely prescribed in adults with PTSD.[69, 70]

A number of cognitive-behavioral treatments targeting nightmares and insomnia also have been found effective for adults with PTSD. The literature on the cognitive-behavioral treatments of sleep disturbances in PTSD has focused primarily on nightmares and insomnia. Imagery rehearsal therapy (IRT) has been shown effective for PTSD-related nightmares in both civilian and military PTSD samples.[76, 79, e.g., 106, but not 107] The rationale underlying IRT is that nightmares are learned cognitive behaviors that can be altered by repeatedly mentally rehearsing new, nondistressing dream scenarios during the daytime. Exposure to the nightmare content is usually discouraged,[30, 76, 78] although some investigators have encouraged explicit discussions of disturbing dream content in group or individual session format prior to altering nightmares.[79, 106, 107] It is hypothesized that repeated mental rehearsal of new dreams provides an alternative behavior (new dream) that can be activated during sleep. As such, patients are first instructed to select a nightmare and modify it "in any way they want,"[76] in order to create a new dream scenario. While some authors have targeted the most distressing dreams in the first acquisition of the IRT technique,[e.g., 79, 107] others encourage the selection of nightmares or bad dreams that are less distressing at the beginning of IRT. The latter approach is akin to creating a hierarchy of feared stimuli for exposure therapy, for example, so that the patient can learn and master the technique with a nightmare that triggers a manageable level of distress. Patients are then instructed to rehearse the new dream at home, several times per day, for up to 20 minutes in a given practice session if they can sustain mental imagery for this length of time. Of note, there are no data suggesting that lengthier mental rehearsal sessions are more effective. Rather, tailoring the home practice sessions to the patient's ability to maintain focus on mental imagery is recommended. Significant reductions in the frequency and

intensity of nightmares are observed within six to 12 weeks after the technique is introduced to patients,[76, 78] and are maintained for at least 30 months.[108] Improvements in nightmare following IRT also are associated with improvements in overall sleep quality and reduced insomnia complaints, and decreases in daytime PTSD symptoms, and depression. The latter observation suggests that nightmares may indeed independently contribute to the maintenance of insomnia and daytime symptoms. The mechanisms underlying the efficacy of IRT, however, remain unknown.

Other techniques that have been anecdotally reported to alleviate nightmares comorbid with PTSD include exposure and desensitization,[109-111] hypnosis,[112, 113] eye movement desensitization and reprocessing,[114] and lucid dreaming.[115] While promising, controlled trials are necessary to determine the efficacy of these methods to reduce nightmares.

For insomnia, effective cognitive-behavioral treatments (CBT) have been developed, tested, and repeatedly shown to be associated with decreased sleep latency, decreased duration of nocturnal awakenings, and increased total sleep time in patients with primary insomnia,[116, 117] or insomnia comorbid with other psychiatric conditions.[118, 119] CBT for insomnia consists of a collection of behavioral techniques aimed at reducing sleep latency, the number and duration of nocturnal awakenings, improving overall sleep quality, and reducing daytime consequences associated with insomnia, such as difficulty concentrating, irritability, somatic complaints, or worries about the impact of sleep loss.[120]

Effective techniques combined under the umbrella of CBT for insomnia include sleep restriction and stimulus control. Sleep restriction refers to limiting the total time allowed in bed to the total numbers of hours of sleep reported by the patient, plus 30 minutes to allow for normal wakefulness during sleep.[121] Sleep restriction is typically associated with a mild level of sleep deprivation, which increases daytime sleepiness and one's propensity to fall asleep rapidly. In turn, this increased propensity to sleep favors short sleep latency. Stimulus control aims at increasing the conditioned pairing between sleep and the sleep environment.[122] Instructions for stimulus control consist of limiting the use of the bed and bedroom for sleep (and sexual activity) only. Patients are instructed to go to bed only when they feel sleepy, and to remain in bed when they are asleep. If awake for more than 20 minutes (the equivalent in time of repositioning oneself twice to fall asleep), or upon awakening in the morning, the patient must leave the bed and the bedroom to go perform some nonstimulating activity in another room. Adhering closely to a set rise time is crucial – both to reinforce the paired associations between the sleep environment and sleep, and to favor accumulation of wakefulness necessary to build up one's propensity to sleep. Setting a bedtime to limit entry into the bed or bedroom is important, but less so than adhering to a set rise time, every day of the week and weekend, regardless of the total amount of sleep obtained on the previous night. Cognitive restructuring also is included in CBT for insomnia to address erroneous beliefs about sleep and unrealistic expectations about sleep and the impact of sleep loss, which can contribute to increased arousal and delayed sleep onset or return to sleep following a nocturnal awakening.[123]

CBT for insomnia is generally administered weekly, over six to eight sessions, and clinically meaningful improvements in sleep latency, wake time after sleep onset, total sleep time, sleep efficiency, sleep quality, and daytime functioning have been consistently reported,[e.g., 116, 117] and improvements are maintained over time. Recent studies by Edinger and colleagues suggest that four sessions is the optimal delivery

format.[124] Briefer formats of delivery also have been used,[e.g., 75, 124, 125, 126] and were associated with comparable improvements in sleep latency, wake time after sleep onset, total sleep time, sleep efficiency, sleep quality, and daytime functioning. Both CBT and brief behavioral treatments (BBT) for insomnia have been used in adults with psychiatric disorders, including PTSD,[75, 118, 119] and have been associated with clinically meaningful improvements in sleep. However, only a handful of controlled trials have investigated the efficacy of CBT or BBT for adults with PTSD.[118, 125, 126] Further research is needed to fully establish the efficacy of CBT or BBT for insomnia in PTSD, and to identify baseline characteristics that moderate treatment response.

With regard to other sleep disturbances common in PTSD, the use of continuous-position air pressure therapy is associated with improvements in nightmares and insomnia in patients suffering from PTSD and sleep-disordered breathing.[77] There is a paucity of studies targeting the treatment of other sleep disturbances common in PTSD, such as nocturnal panic attacks, sleepwalking, night terrors, and other complex motor behaviors. Nevertheless, there is little ground to suspect that evidence-based treatments targeting these episodes would be differently effective in patients suffering from PTSD.

Conclusion

Exposure to traumatic events is prevalent in the general population. Although PTSD is a prevalent, debilitating, and well-recognized psychiatric outcome following trauma exposure, it is important to remember that other psychiatric disorders also may be precipitated by trauma exposure, such as mood and addictive disorders, all of which also are associated with clinically significant sleep disturbances.

Sleep disturbances are a core feature of acute and chronic stress reactions, including PTSD. While insomnia and nightmares are nighttime symptoms of PTSD, several lines of evidence coalesce to support the suggestion that sleep disturbances may be comorbid with, rather than secondary to, PTSD. As such, evaluation and treatment approaches that specifically target sleep disturbances may be necessary to optimize clinical outcomes and accelerate recovery from trauma reactions.

A number of evaluation tools are available to supplement clinicians' assessment of sleep complaints, and a number of pharmacological and psychological treatments have been shown to be effective to improve sleep quality, and reduce or eliminate insomnia and nightmares.

Reconceptualizing PTSD as a sleep-wake disorder may not only provide novel avenues to improving and developing effective treatments, but also is a framework that may be more easily acceptable to trauma patients, and more accessible to clinicians who do not specialize in the assessment and treatment of the aftermath of trauma.

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