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Invited review

Treating nightmares and insomnia in posttraumatic stress disorder: A review of current evidence

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ABSTRACT

Emerging evidence supports the notion of disrupted sleep as a core component of Posttraumatic Stress Disorder (PTSD). Effective treatments for nighttime PTSD symptoms are critical because sleep disruption may be mechanistically linked to development and maintenance of PTSD and is associated with significant distress, functional impairment, and poor health. This review aimed to describe the state of science with respect to the impact of the latest behavioral and pharmacological interventions on posttraumatic nightmares and insomnia. Published studies that examined evidence for therapeutic effects upon sleep were included. Some behavioral and pharmacological interventions show promise, especially for nightmares, but there is a need for controlled trials that include valid sleep measures and are designed to identify treatment mechanisms. Our ability to treat PTSD-related sleep disturbances may be improved by moving away from considering sleep symptoms in isolation and instead conducting integrative studies that examine sequential or combined behavioral and/or pharmacological treatments targeting both the daytime and nighttime aspects of PTSD.

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1. Introduction

Nightmares and insomnia are some of the most ubiquitous, distressing, and chronic symptoms of Posttraumatic Stress Disorder (PTSD). Subjective reports of these symptoms are well documented (Spoormaker and Montgomery, 2008) and recent studies substantiate their impact upon objectively assessed sleep quality and continuity (Calhoun et al., 2007; Kobayashi et al., 2007; Westermeyer et al., 2007; Woodward et al., 2000).

Effective treatment of posttraumatic sleep symptoms is important for several reasons. Although temporal relationships between trauma exposure, PTSD, and sleep disruption are complex (Babson and Feldner, 2010), emerging evidence lends support to the notion of disrupted sleep as a core component of PTSD (Spoormaker and Montgomery, 2008), linked mechanistically to its development and maintenance (Germain et al., 2008; Ross et al., 1989). Multiple processes may explain the role of disturbed sleep in the developmental pathology of PTSD. Some of these include underlying neurobiological alterations (Germain et al., 2008), compromised generalization of fear extinction secondary to sleep deprivation (Pace-Schott et al., 2009), disruption of sleep-dependent processing of emotional experiences (Walker and van Der Helm, 2009), and repeated resensitization to trauma cues during nightmares (Rothbaum and Mellman, 2001). These plausible mechanistic processes explain the ways in which nightmares and insomnia can interfere with natural recovery from trauma exposure (Babson and Feldner, 2010), contribute to the development of PTSD, and compromise response to evidence-based treatments.

More simply, treating sleep disruption in PTSD is important because nightmares and insomnia are associated with significant distress and daytime impairment (Clum et al., 2001; Kramer et al., 2003; Neylan et al., 1998; Wittmann et al., 2000; Zammit et al., 1999). For example, to the extent trauma-related nightmares or a lack of sleep increase reactivity to emotional cues (Franzen et al., 2009; Yoo et al., 2007), one's ability to function in social and occupational roles may be compromised (Zohar et al., 2005). Furthermore, sleep impairment in general is associated with negative psychiatric outcomes across a range of populations, including increased suicidal ideation(Liu, 2003; Nishith et al., 2001), while sleep fragmentation and deprivation are correlated with neurocognitive deficits (Drummond et al., 2006) and neuroendocrine abnormalities (Knutson and Van Cauter, 2008). Thus, effectively addressing the nighttime PTSD symptom profile may contribute to improved functional outcomes and overall well-being.

Finally, to the extent sleep impairment in PTSD is experienced as distressing, it may serve as a motivation for treatment engagement

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in a disorder otherwise characterized by avoidance behavior. The absence of relief for that which motivated treatment may promote hopelessness and diminish willingness to participate in future treatment. By contrast, effective treatment of sleep disturbance in this context may lead to subsequent engagement in evidence-based trauma-focused treatments.

In light of the critical need for effective treatments, the primary goal of this paper is to describe the state of science with respect to the impact of the latest behavioral and pharmacological interventions on sleep symptoms in PTSD. Our focus is on the two most common forms of sleep disturbances in PTSD: nightmares and insomnia. It should be noted that the term "nightmare" in this review refers to the PTSD re-experiencing symptom of recurring distressing dreams. Similarly, our use of the term "insomnia" here does not refer to the formal diagnosis of insomnia as specified in the Diagnostic and Statistical Manual of Mental Disorders-IV-TR (DSM-IV-TR) or the International Classification of Sleep Disorders (ICSD). Rather, we use the term "insomnia" to refer to the hyperarousal-related sleep difficulties experienced in PTSD. While in many cases these would meet criteria for insomnia, many of the studies reviewed focused on enrolling patients with PTSD, without utilizing sleep-specific criteria beyond those required for the diagnosis of PTSD and thus likely include sub-threshold insomnia, as well. We will discuss interventions designed to treat PTSD more generally, recognizing such reports are often based upon secondary analysis of single-items extracted from PTSD measures, as well as studies with sleep as a primary outcome. This overview of the evidence will identify promising interventions and suggest avenues for future investigation leading to more refined and effective treatments for disrupted sleep in PTSD.

2. Effects of behavioral PTSD treatments upon posttraumatic nightmares and insomnia

Evidence-based, trauma-focused behavioral treatments for PTSD are validated for overall PTSD symptomatology (Foa et al., 2007; Resick and Schnicke, 1993). The extent to which they ameliorate posttraumatic sleep disturbances is less clear because sleep outcomes are rarely examined. The studies reviewed here are the only ones that we know of to report treatment effects upon sleep, though only a small fraction employed current, standardized treatment protocols (e.g., Galovski et al., 2009) and only two reported validated measures of sleep.

A retrospective review of data from 27 patients no longer meeting criteria for PTSD following trauma-focused cognitive behavioral therapy (Zayfert and DeViva, 2004) is often cited to substantiate the refractory nature of sleep difficulties following PTSD treatment. In this study, sleep disturbances were assessed using single-items (difficulty sleeping and distressing dreams) from the Clinician Administered PTSD Scale (CAPS). Approximately half of the sample endorsed difficulty sleeping following treatment, the majority of which reported clinically significant insomnia. Only one PTSD symptom (anger) was reported with greater frequency than insomnia following treatment. At post-treatment, nightmares were among the least frequently endorsed symptom indicating a significant decrease in this sleep disturbance even among those participants that continued to endorse insomnia. Findings from this study are limited because validated sleep measures were not used. Nevertheless, this is the only study to examine relative frequency of symptoms post-treatment.

Cooper and Clum (1989) examined effectiveness of imaginal exposure ("flooding") therapy as an adjunct to treatment as usual for PTSD among Veterans ($N = 14$). This study used a new and admittedly unvalidated subscale of sleep disturbance. The treatment group demonstrated significant improvements in difficulty sleeping and hours of sleep per week relative to the control group. Nevertheless, the treatment group, per self-report, was only sleeping a mean of 6.1 and 5.7 h per week at post-treatment and follow-up, respectively. Of note, all participants in the treatment group reported elimination of or greater than 50% reduction in nightmares, a significant decrease relative to the control group. By contrast, in a slightly larger study ($N = 24$; Keane et al., 1989) of the same therapy, there was no detected treatment effect for sleep disturbance (assessed by one item on a PTSD symptom checklist). Re-experiencing symptoms significantly improved; however, effects upon nightmares specifically were not reported. Two wait-list control studies examined effects of distinct treatments (both of which included exposure-based components) upon sleep difficulties (Gersons et al., 2000; Lange et al., 2003) and findings were similarly discrepant (see Spoormaker and Montgomery, 2008).

The effects of Eye Movement Desensitization and Reprocessing (EMDR) therapy (Shapiro, 2001) upon sleep outcomes were reported in two studies. While validity of the theoretical underpinning of EMDR has been questioned (McNally, 1999), some theorize (Stickgold, 2002) this standardized behavioral treatment reduces PTSD to the extent it induces a neurobiological state similar to REM sleep, a period during which emotional-memory processing is theorized to occur (Walker and van Der Helm, 2009). Based upon this rationale, Raboni et al. examined effects of EMDR upon sleep quality using polysomnography (Raboni et al., 2006). This is the only study of behavioral PTSD treatment to include an objective measure of sleep as a primary outcome. Participants ($N = 7$) demonstrated significant decreases from pre-treatment to one-week post-treatment on PSG sleep onset latency and wake after sleep onset. Unfortunately, as highlighted by Spoormaker and Montgomery (2008), findings may be largely attributed to habituation because PSG results from the first night were used as a baseline (there is a well known disruption in sleep during the first night in a lab known as "the first night effect"). Subjective sleep measures that may have corroborated objective findings were not included and nightmares were not assessed. The second study of EMDR (Vaughan et al., 1994) demonstrated significant decreases on a 1-item assessment of nightmares relative to control groups, although effects on sleep quality or quantity were not reported.

In the largest study to date ($N = 108$) to examine effects of evidence-based behavioral treatment for PTSD upon a validated sleep measure, significant improvements on all scales of the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989) were reported 2-weeks and 9-months following treatment with either Cognitive Processing Therapy (CPT) or Prolonged Exposure (PE) (Galovski et al., 2009). Nevertheless, PSQI scores remained in the clinically significant range for all participants, despite both treatments reducing overall PTSD symptoms and related mental health problems. Effects upon nightmares were not reported. Findings from this study are noteworthy because it is the only study to report changes in sleep in response to the most current and validated behavioral treatment protocols for PTSD.

Taken together, findings are inconsistent with regard to effectiveness of empirically supported behavioral PTSD treatments for reducing insomnia. When detected, improvements in difficulty sleeping appear small relative to improvements in other PTSD symptoms (Spoormaker and Montgomery, 2008) and nonclinical levels of sleep quality or quantity are not achieved. Although rarely reported, effects of these treatments upon nightmares appear promising for treatment responders. It should be noted that only one of the reviewed studies used a validated subjective measure of sleep quality (Galovski et al., 2009) and only one employed an objective measure (Raboni et al., 2006). These measurement issues compromise the validity of conclusions regarding the extent to which posttraumatic sleep disturbances remit following standard