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Sleep Disturbances Associated with Posttraumatic Stress Disorder and Alcohol Dependence

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Abstract

Sleep disturbances commonly appear in the context of both posttraumatic stress disorder (PTSD) and alcohol use disorders. Sleep symptoms typically reported among clinical populations include delayed sleep onset, poor sleep continuity, early morning awakening, and disturbed sleep architecture. The aim of the present study was to examine multiple forms of sleep disturbances among individuals with comorbid PTSD and alcohol dependence, PTSD only, alcohol dependence only, and a control group. Both PTSD and alcohol dependence diagnoses were associated with multiple forms of sleep disturbance, but comorbidity of the two disorders did not appear to increase the risk over and above either single disorder for reporting any of the sleep difficulties examined. As PTSD symptom severity increased, so did sleep latency, mid-sleep waking, and early morning waking. However, contrary to our hypothesis, no significant direct relationship between severity of alcohol use and sleep disturbances was revealed. These findings suggest a need for thorough assessment of sleep symptoms in patients presenting with PTSD or alcohol dependence.

Keywords

posttraumatic stress disorder; alcoholism; sleep; insomnia

Sleep disturbances frequently co-occur with psychiatric disorders, including substance use disorders (SUDs) and posttraumatic stress disorder (PTSD) (Foster & Peters, 1999). Sleep symptoms typically reported among clinical populations include delayed sleep onset, poor sleep continuity, early morning awakening, and disturbed sleep architecture (Pressman & Orr, 1997). Sleep disruption can occur with acute or chronic alcohol consumption, but the pattern and severity of symptoms depends on the amount and timing of alcohol use (Vitiello, 1997). As a central nervous system depressant, alcohol can reduce sleep latency through its sedative effects. However, alcohol consumption tends to disrupt the first half of the sleep period with increases in slow wave sleep and decreases in rapid eye movement (REM) sleep. In the second half of the sleep period, even relatively low alcohol doses tend to result in increased REM sleep, more frequent episodes of wakefulness, and more frequent shifts between sleep stages (Stone, 1980). Over a number of days of consistent alcohol use near bedtime, the initial sleep

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onset effects tend to diminish, but the later sleep disruption persists (Roehrs & Roth, 1997). A cycle of alcohol use and sleep disruption can develop when individuals increase their alcohol use with the intention of relieving the insomnia symptoms (Roehrs & Roth, 1997). In patients with alcohol use disorders, insomnia is often part of the withdrawal syndrome and increases risk for relapse (Crum, Ford, Storr, & Chan, 2004; Vitiello, 1997).

The self-medication hypothesis suggests that the high comorbidity between PTSD and SUDs is due, in part, to the maladaptive use of substances to manage PTSD symptoms (McFarlane, 1998). Sleep disruption is one of the more debilitating symptoms in the clinical presentation of PTSD. Sleep deprivation interferes with most domains of functioning, including work performance, personal relationships, and mental and physical health. In tests of the self-medication hypothesis, PTSD patients have reported the intentional use of alcohol as a coping strategy associated with sleep disturbance (Nishith, Resick, & Mueser, 2001). A recent epidemiological study found that, in the general population, 11% of respondents reported using alcohol specifically to help them sleep (National Sleep Foundation, 2005). Alcohol consumption may initially lead to improved sleep latency, but it is ultimately associated with poorer sleep quality, early wakening, and insomnia (Crum et al., 2004; Foster & Peters, 1999). It remains unclear at this time whether chronic use of alcohol to induce sleep may result in the development of clinically significant abuse or dependence.

A number of studies have examined sleep disturbances in the presence of either PTSD or alcohol use disorders as independent diagnoses, but few have investigated sleep disturbances associated with comorbid PTSD and alcohol abuse or dependence. Also, existing studies have limited their assessments to sleep items drawn directly from the PTSD diagnostic criteria. One report assessed sleep disturbances as part of the PTSD diagnosis among individuals with comorbid PTSD and alcohol or other drug use disorders (Saladin, Brady, Dansky, & Kilpatrick, 1995). In Study 1, a comparison of PTSD+SUD and PTSD only groups of women revealed that a significantly larger proportion of the comorbid group had sleep problems (86.2% vs. 46.4%). In Study 2, which included men and women, a significantly larger proportion of patients with comorbid PTSD and alcohol dependence reported sleep problems when compared to patients with comorbid PTSD and cocaine dependence (100.0% vs. 70.6%).

In a secondary analysis of the National Comorbidity Survey, patients with PTSD and comorbid panic, major depressive disorder, generalized anxiety disorder, or alcohol dependence were compared on their reports of the three symptoms from the DSM-IV diagnosis of PTSD: nightmares, insomnia, and exaggerated startle (Leskin, Woodward, Young, & Sheikh, 2002). The PTSD/panic disorder group reported significantly more nightmares, insomnia, and exaggerated startle responses than all other groups. The authors noted that reports of each of the three symptoms were high in all groups, ranging from 61 to 100% of cases, however there were significant limitations associated with the study. One was that alcohol dependence and PTSD were assessed as lifetime diagnoses, but the other diagnoses were current (past month) diagnoses. The sample included adolescents and adults (age range 15–54 years), but did not account for possible age effects. Finally, the assessment of sleep-related disturbances was limited to those symptoms associated with the PTSD diagnosis.

The intent of the present study was to examine multiple forms of sleep disturbances among individuals with comorbid PTSD and alcohol dependence, PTSD only, alcohol dependence only, and a control group. The presence of PTSD and/or alcohol dependence was expected to be associated with more severe sleep disturbance as compared to the control group. Greater severity of either disorder was expected to be associated with more severe sleep problems.

Methods

Participants

The participants ($N = 131$) were recruited from the community and local treatment centers through flyers and advertisements in local newspapers. They were enrolled in a larger study examining the relationship between stress, alcohol dependence, and hypothalamic pituitary adrenal axis (HPA) function. The sample was 51.9% women with an average age of 31.0 years ($SD=10.1$). The diagnostic groups were alcohol dependence with PTSD (ETOH/PTSD; $n=29$), alcohol dependence only (ETOH; $n=40$), PTSD only (PTSD; $n=31$), and neither alcohol dependence nor PTSD (Controls; $n=31$). Exclusion criteria included major depressive disorder, bipolar disorder, psychotic disorders, eating disorders, and any medical condition that could affect HPA axis function (e.g., endocrine or neurological disorders).

Measures

Structured Clinical Interview for DSM-IV (SCID: First, Spitzer, Gibbon, & Williams, 2002)—The SCID is a structured diagnostic interview that assesses each of the criteria for DSM-IV diagnoses. It has adequate inter-rater and test-retest reliability. In the present study, participants were assessed for current psychiatric diagnoses, including alcohol dependence.

Clinician Administered PTSD Scale (CAPS: Blake et al., 1995; Weathers, Keane, & Davidson, 2001)—The CAPS is reliable structured interview designed to assess symptoms of posttraumatic stress disorder for frequency and intensity. The CAPS is considered the “gold standard” for assessing the PTSD diagnosis. It has excellent psychometric properties and utility as a diagnostic instrument (see review Weathers, Keane, & Davidson, 2001). PTSD severity was computed as the sum of the frequency and intensity scores. When determining whether participants met the DSM-IV (APA, 1994) PTSD diagnosis, a frequency score of “1” and intensity score of at least “2” were sufficient for a symptom to be counted.

Time-Line Follow-Back (TLFB: Sobell & Sobell, 1992)—The TLFB is a calendar-based assessment of alcohol use that is administered by an interviewer. It consists of a detailed review of the respondent’s use of alcohol during the 90 days prior to study entry. Variables that can be generated from the TLFB data include, for example, percent drinking days, and average number of drinks per drinking day.

Sleep History Questionnaire (SHQ)—The SHQ has five items scored on a 0–4 Likert scale (0 = *None* to 4 = *Very Severe/Everyday*) that assess the severity/frequency of daytime sleepiness, daytime napping, delayed sleep onset, mid-sleep waking, and early morning waking in the past week. There was an additional item on which participants were asked to rate their overall sleep quality on a 0 to 100 scale (0 = *Sleep is completely rested and refreshed* to 100 = *Sleep is completely unrested and unrefreshed*). Internal reliability of the measure was good (Cronbach’s $\alpha = .72$).

Procedures

Participants were first screened over the phone. Eligible participants then came into the laboratory and read and signed an IRB-approved consent form. A trained master’s or doctorate level clinician administered the SCID to assess for Axis I diagnoses. A trained research assistant with at least a bachelor’s degree administered the TLFB, and participants completed the SHQ self-report form.

Results

Preliminary Analyses

Demographics—Table 1 contains descriptive data about the samples. A two-way analysis of variance (ANOVA) revealed a significant ETOH by PTSD interaction on age, $F(1, 120) = 6.97, p = .009$. Posthoc tests indicated that the ETOH/PTSD group was significantly older than the two single-diagnosis groups, but not the control group, $ps < .05$. The race distributions were similar across groups, $\chi^2(6) = 7.24, p = .30$. However, the percentage of smokers was higher in the ETOH/PTSD group compared to other groups, $\chi^2(3) = 19.4, p < .001$.

PTSD symptoms—The ETOH/PTSD and PTSD groups did not differ on the severity of their PTSD symptoms, $F(1, 57) = .01, p = .91$.

Alcohol use—As suggested by the diagnostic grouping, significant group effects for percent days drinking (PDD), $F(3, 127) = 23.37, p < .001$ and mean number of drinks per drinking day (DDD), $F(3, 101) = 23.07, p < .001$ were found. Posthoc tests for drinking frequency (PDD) and severity (DDD) revealed that the ETOH and ETOH/PTSD groups were similar ($p > .05$). Both reported significantly more frequent and heavier drinking when compared to the PTSD and Control groups ($p < .05$), which did not differ from each other ($p > .05$).

Age and smoking status were examined as potential confounds with sleep disturbance. Bivariate correlations were examined between age and each item on the SHQ. Two-tailed tests indicated that only early morning waking had a statistically significant association with age ($p < .001$). One-way ANOVA tests were conducted for each sleep variable, with smoking status as the independent variable; none were statistically significant. Based on these preliminary analyses, age was used as a covariate in the analysis of early morning waking.

Primary Analyses

Means and standard deviations for the SHQ items are shown in Table 2. A series of analysis of variance (ANOVA) tests were conducted with alcohol dependence and PTSD status as the independent variables for each sleep problem, except in the case of early morning waking, which was tested with an analysis of covariance (ANCOVA). Overall sleep quality showed a PTSD effect, $F(1, 116) = 28.03, p < .001$, with lower sleep quality reported in the PTSD– (M=32.81, SD=22.85) versus PTSD+ (M=55.16, SD=24.16) participants. There was a trend for an alcohol effect, $F(1, 116) = 3.46, p = .07$, with the ETOH+ (M=46.76, SD=26.57) versus ETOH– (M=39.48, SD=24.88) participants reporting better overall sleep quality.

For daytime sleepiness, there was also a PTSD effect, with more frequent sleepiness among the PTSD+ (M=1.46, SD=1.11) as compared to the PTSD– (M=.75, SD=.78) participants, $F(1, 116) = 16.53, p < .001$. There was no effect of alcohol dependence status. For daytime naps, there was an effect of ETOH; the ETOH+ groups (M=1.18, SD=1.15) reported more frequent daytime napping than did the ETOH– groups (M=.79, SD=.93), $F(1, 116) = 3.98, p = .048$. There was no effect of PTSD status, $p = .12$.

A significant ETOH effect was observed for sleep onset, $F(1, 116) = 4.52, p = .04$, with ETOH+ participants (M=1.95, SD=1.29) reporting longer sleep latency compared to ETOH– participants (M=1.53, SD=1.38). There was also a PTSD effect for sleep onset, $F(1, 116) = 41.49, p < .001$, with the PTSD+ participants (M=2.46, SD=1.29) reporting longer sleep latency when compared to the PTSD– participants (M=1.13, SD=1.05). For early morning waking there was a significant effect of PTSD, with PTSD+ respondents (M=2.00, SD=1.45) reporting more severe early morning waking disturbance as compared to PTSD– respondents (M=.86, SD=.91), $F(1, 116) = 26.91, p < .001$. No alcohol effect or interaction was observed.

As noted above in the *Preliminary Analyses* section, age was covaried in the test for repeated waking, with older age associated with more frequent waking, $F(1,115) = 3.97, p = .049$. Repeated waking also was significantly higher in the PTSD+ groups ($M=2.55, SD=1.17$) as compared to PTSD- groups ($M=1.72, SD=1.12$), $F(1,115) = 16.64, p < .001$. There was no significant main effect of ETOH, $p = .41$. There was, however, a significant PTSD $\times$ ETOH interaction observed for repeated waking, $F(1,115) = 5.41, p = .02$. Post hoc tests were conducted with and without age as a covariate, yielding the same pattern of results. The following group means are adjusted for age. Least significant difference tests indicated that the PTSD-only ($M=2.70, SD=1.13$), ETOH-only ($M=2.04, SD=1.13$), and ETOH/PTSD ($M=2.38, SD=1.14$) groups reported more severe repeated waking disturbance than did the control group ($M=1.38, SD=1.12$), $ps < .05$. Also, the PTSD-only group reported more repeated waking than did the ETOH-only group, $p = .02$. The mean for the ETOH/PTSD group fell between those of the single-diagnosis groups and did not differ significantly from either of them, $ps > .05$.

To test the hypothesis that PTSD symptoms (i.e., sum of CAPS frequency and intensity scores) and alcohol use (i.e., percent days drinking, and drinks per drinking day) would be positively associated with sleep difficulties, correlations were used to examine the relationships among these variables (see Table 3). As can be seen, PTSD severity was positively associated with increased sleep latency, mid-sleep waking, and early morning waking ($p < .05$). Contrary to predictions, alcohol use frequency and severity were not significantly related to any of the sleep disturbance items assessed, $p > .05$.

Exploratory analyses were conducted to evaluate potential for group differences on the relationships among alcohol use patterns and sleep disturbances. These were composed of bivariate correlations among the variables of interest calculated for each diagnostic group. Among the ETOH-only group, more drinks per drinking day was associated with shorter sleep latency and less trouble with daytime sleepiness ($ps < .05$). In the comorbid group, a higher percent of drinking days was associated with fewer problems falling asleep, staying asleep, and waking up too early ($ps < .05$). A higher average number of drinks per drinking day was also associated with fewer problems with sleep onset ($p < .05$) and a trend for fewer problems with nighttime waking ($p = .056$). In the PTSD-only group, a higher percent of drinking days was associated with more nighttime waking, and more daytime napping ($p < .05$). In the control group, there was a trend for problems with sleep onset to be related to percent of drinking days ($p = .078$).

Discussion

In the present study, both PTSD and alcohol dependence diagnoses were associated with multiple forms of sleep disturbance. Comorbidity of the two disorders did not appear to increase the risk over and above either single disorder for reporting any of the sleep difficulties examined. These results partially supported the hypotheses that PTSD and alcohol dependence would be associated with more severe sleep disruption.

As expected, the presence of a PTSD diagnosis was associated with more severe daytime sleepiness, daytime napping, longer sleep latency, and early awakening. The presence of an alcohol dependence diagnosis was associated with longer sleep latency. Repeated nighttime waking was most severe in the PTSD-only group and least severe in the control group, with the alcohol dependence and comorbid groups also reporting more nighttime waking compared to controls. An examination of the roles of PTSD and alcohol use severity and frequency suggested that, as PTSD symptom severity increased, so did sleep latency, mid-sleep waking, and early morning waking. However, contrary to our hypothesis, no significant direct relationship between severity of alcohol use and sleep disturbances was revealed across

groups. Although unexpected, this finding is not entirely inconsistent with the literature. In a recent study on alcoholics with insomnia, researchers found that some measures of drinking were related to insomnia symptoms, while others were not (Conroy et al., 2006). This relationship also seemed to depend on the measurement time frame.

One unexpected finding was the report of better overall sleep quality among participants with as compared to without PTSD. It is interesting to note, however, that when each symptom was assessed individually, patients with PTSD reported more problems, but when assessed globally, they reported less severe problems. It may be that, as is the case with most assessment instruments, greater specificity yields more accurate responses.

The unexpected result that alcohol use severity was not significantly associated with sleep disruption deserves further investigation. The severity of alcohol use and physical tolerance that is required to meet criteria for alcohol dependence suggests that participants in the present study may have become tolerant to the effects of alcohol on their sleep quality. Also, researchers have noted that hypersomnia is sometimes associated with chronic, heavy alcohol use (e.g., Vitiello, 1997). However, severe and long-lasting insomnia-related sleep disruption reliably appears during acute alcohol withdrawal (Vitiello, 1997). Perhaps in a sample with a greater range of alcohol use severity and chronicity and repeated measures over time, a different pattern would emerge (Rundell, Williams, & Lester, 1977; Stein & Friedmann, 2006).

These results highlight the need for more thorough assessment of sleep disruption in patients who present with PTSD. Although the PTSD diagnosis includes items related to sleep disturbance, they are quite limited. The importance of sleep to overall functioning supports the use of a more thorough assessment of sleep disruption among those patients who present with PTSD symptoms, whether or not they meet full criteria for the syndrome. This assessment could then be used to direct interventions that target improved sleep quality, which would likely benefit other areas of functioning, including PTSD symptoms, other mental health issues, and physical and interpersonal functioning.

This study has several limitations. The sleep problems were assessed by a brief self-report measure and were not confirmed via observation in a sleep laboratory. It may be that patients with alcohol dependence and/or PTSD perceive their sleep difficulties differently. Because sleep impairment is such a ubiquitous component of the PTSD diagnosis, those particular symptoms may have been more salient to PTSD patients than to alcohol dependent patients, and this may have influenced the findings. The assessment for PTSD prior to the completion of the sleep questionnaire may have affected their responses. Also, major depressive disorder was an exclusion criterion for the present study. Future studies are needed to examine the role of depression in sleep problems among patients with PTSD and alcohol dependence because these disorders co-occur at high rates and have all been implicated in sleep disruption.

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Table 1

Descriptive data by group.

	ETOH/PTSD (<i>n</i> = 29)	ETOH only (<i>n</i> = 40)	PTSD only (<i>n</i> = 31)	Controls (<i>n</i> = 31)
Age (mean (sd))	35.00 (11.91)	29.21 (9.57)	28.39 (9.55)	32.03 (8.67)
Race (%)				
African American	13.8	10.0	29.0	29.0
Caucasian	79.3	75.0	71.0	67.7
Other	3.4	0	0	0
Missing	3.4	15.0	0	0
Smoker (%)	74.1%	55.9%	19.4%	38.7%
CAPS Score (mean (sd))	59.75 (13.44)	--	60.10 (10.20)	--
Percent days drinking (mean (sd))	63.30 (33.25)	56.56 (34.68)	16.02 (23.30)	16.20 (24.52)
Average drinks per day (mean (sd))	8.60 (5.19)	7.88 (5.47)	.75 (1.47)	.55 (.73)
Drinks per drinking day (mean (sd))	11.85 (5.85)	11.73 (6.96)	2.44 (2.60)	3.19 (2.06)

Table 2
Means and standard deviations of the Sleep History Questionnaire (SHQ) items.

SHQ Items	Diagnostic Groups				ANOVA results
	ETOH/PTSD (<i>n</i> = 29)	ETOH only (<i>n</i> = 40)	PTSD only (<i>n</i> = 31)	Controls (<i>n</i> = 31)	
Sleep quality	58.89 (25.38)	36.76 (23.45)	51.43 (22.72)	28.33 (21.67)	ETOH, <i>p</i> = .07 PTSD, <i>p</i> < .001
Daytime sleepiness	1.54 (1.20)	.68 (.81)	1.39 (1.03)	.83 (.75)	PTSD, <i>p</i> < .001
Daytime naps	1.25 (1.38)	1.12 (.95)	1.04 (1.07)	.57 (.73)	PTSD, <i>p</i> = .04
Falling asleep	2.61 (1.23)	1.41 (1.08)	2.32 (1.36)	.80 (.93)	ETOH, <i>p</i> = .04 PTSD, <i>p</i> < .001
Repeated awakening	2.46 ^a (1.23)	2.00 ^{a,c} (1.13)	2.64 ^{a,d} (1.13)	1.4 b (1.04)	PTSD, <i>p</i> < .001 PTSD × ETOH, <i>p</i> = .02
Early morning awakening	1.96 (1.43)	.88 (.81)	2.04 (1.50)	.83 (1.02)	PTSD, <i>p</i> < .001

Note: Means with different superscripts are significantly different from one another.

Table 3
Correlations among PTSD severity, alcohol use severity, and SHQ sleep items.

	1	2	3	4	5	6	7	8	9
1. PTSD Severity	—	-.01	-.04	.14	.13	.19	.24*	.30*	.31*
2. Alcohol Use Frequency (PDD)		—	.52**	.10	-.07	.12	.01	.04	-.06
3. Alcohol Use Severity (DDD)			—	.07	-.04	.10	-.04	-.03	-.10
4. Overall Sleep Quality				—	.34**	.16*	.50**	.40**	.42**
5. Daytime Sleepiness					—	.34**	.19*	.16*	.18*
6. Daytime Napping						—	.17*	.04	.06
7. Sleep Latency							—	.54**	.46**
8. Mid-Sleep Awakening								—	.52**
9. Early Morning Awakening									—

* Note: $p < .05$
** $p < .01$, one-tailed tests.