

Sleep Events Among Veterans With Combat-Related Posttraumatic Stress Disorder

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Objective: Sleep disturbances are important features of posttraumatic stress disorder (PTSD); however, the published data characterizing PTSD sleep phenomena are limited. The authors report on the phenomenology and physiological correlates of symptomatic sleep events in PTSD. **Method:** The study data included survey results that addressed sleep symptoms during the past month in combat veterans with and without PTSD (N=58), sleep diary records of awakenings from combat veterans with PTSD hospitalized on an inpatient rehabilitation unit (N=52), and overnight polysomnography recordings obtained from 21 medication-free combat veterans with PTSD and eight healthy comparison subjects not exposed to combat. **Results:** Recurrent awakenings, threatening dreams, thrashing movements during sleep, and awakenings with startle or panic features represented the most prevalently reported sleep-related symptoms. Laboratory findings of longer time awake, micro-awakenings, and a trend for patients to exhibit body and limb movements during sleep are consistent with the subjectively reported symptom profile. Prospectively assessed symptomatic awakenings featured startle or panic symptoms or anxiety related to threatening dreams. Laboratory findings revealed a trend for the symptomatic awakenings (with and without dream recall) to be disproportionately preceded by REM sleep, and the two recorded awakenings with objective physiological arousal were preceded by REM. **Conclusions:** PTSD features intrusions into sleep of more highly aroused behaviors and states, which appear partially conditioned to REM sleep. (Am J Psychiatry 1995; 152:110–115)

Posttraumatic stress disorder (PTSD) is increasingly recognized to be a prevalent condition that is associated with substantial psychosocial morbidity and risk for chronicity (1–4). Sleep disturbances have been characterized as a hallmark of PTSD (5) and are components of the reexperiencing and heightened arousal symptom clusters in DSM-III-R. Nightmares are referred to frequently in the PTSD literature and are considered to be an integral feature of the disorder (5–7). In a study by Kramer et al. (6), Vietnam veterans with prominent dream disturbances were characterized as more “troubled,” on the basis of personality inventories, than a comparison veteran group without dream

disturbances. Posttraumatic dreams have been described as initially recapitulating traumatic events and maintaining threatening themes over time (7).

Heightened arousal symptoms related to sleep, which are referred to in DSM-III-R in terms of difficulties initiating and maintaining sleep, have received less specific elaboration in the PTSD literature. Several preliminary sleep EEG studies of PTSD patients reported decreased sleep efficiency (8–10). In an investigation that used survey methods, there was a greater association of anxiety, agitation, and body movement found with sleep disturbance in combat-related PTSD than in primary insomnia (11). A survey of Nazi holocaust survivors revealed that they had awakenings related to nervousness and various somatic, autonomic symptoms, in addition to nightmares (12). An additional report in the literature described three cases in which night terrors were highlighted as a feature of the posttraumatic syndrome (13). Collectively, these descriptive reports and preliminary laboratory observations suggest that various sleep events that involve heightened arousal, in addition to nightmare phenomena, are prominent features of PTSD.

The phenomenology and physiological correlates of such sleep events have implications for conceptualizing

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the pathophysiology of PTSD, including its relationship to other psychiatric and sleep disorders. For example, in panic disorder, which appears to overlap PTSD with respect to some clinical features and sensitivity to pharmacological probes (14–16), sleep attacks occur in association with deepening non-REM sleep (17, 18). Night terrors, which feature markedly aroused behaviors and confusion, arise out of slow-wave sleep and are most typically described in children (19). Night terrors occurring in adulthood have been nonspecifically linked to psychopathology (20, 21). REM behavior disorder is manifested by dramatic motor activity in sleep and features disturbing dreams (22). This condition appears to be mediated by a failure of the normal suppression of muscle tone during REM sleep. The question of whether PTSD is on a continuum with REM behavior disorder was addressed by an investigation of Ross and colleagues (23). These investigators found phasic increases of electromyograph (EMG) activity during REM sleep to be several times more frequent in PTSD patients than in control subjects. The specificity of this finding is challenged by there also having been more periodic movements during non-REM sleep in the PTSD patients.

The purpose of this report is to characterize phenomenological and physiological aspects of symptomatic sleep events occurring in patients with chronic, combat-related PTSD. There are limitations inherent to any method for assessing sleep phenomena. Surveying populations allows for broader sampling but provides subjective and retrospective information. Laboratory studies provide objective measurements but use more select and smaller samples, and the events in question may not occur during recording periods. Therefore, in this report we include information on sleep events from three related but independent studies that used complementary methods. To obtain a representative profile of sleep symptoms and determine associations with PTSD, combat veterans with and without the disorder were surveyed in treatment and nonclinical settings. Information more prospective in nature on frequencies and types of awakenings was obtained from sleep diary records of PTSD inpatients. Finally, objective indices of sleep disturbance and physiological correlates of symptomatic awakenings were reported from overnight polysomnography recordings of a subgroup of PTSD patients and comparison subjects that were conducted under medication- and substance-free conditions.

METHOD

Sleep Survey

Male Vietnam veterans ranging in age from 39 to 48 years were recruited from Department of Veterans Affairs (VA) medical center outpatient treatment (N=27), clients of the Miami Readjustment Counseling Center (N=17), and members of the Miami chapter of the Vietnam Veterans of America (N=14). The veterans from the two clinical settings were screened for combat exposure by review of military discharge forms and interviews with experienced clinicians regarding specific combat experiences. The Vietnam Veterans of America subjects had their military discharge forms screened for membership and

were personally recruited by one of us (L.E.A., a fellow member) because they had served in Army infantry units in Vietnam. None of this subgroup was receiving treatment at the time of the study.

The Mississippi Scale for Combat-Related Posttraumatic Stress Disorder was administered in order to categorize subjects as having versus not having current PTSD. The cutoff score of 107 previously established for clinical veteran populations (24) was used in the treatment-seeking subjects. The more conservative cutoff score of 89 that was applied in a community-based epidemiological study of Vietnam veterans (1) was used for the Vietnam Veterans of America subjects. Among the 58 respondents, 37 had PTSD by these criteria. We developed a survey to assess factors pertaining to sleep disruption and adaptation during combat tours as well as current sleep habits and symptoms. Specific items addressed the occurrence and frequency of symptoms during the past month, including patterns of insomnia, and events hypothesized to occur in PTSD or other disorders featuring parasomnias. Insomnia patterns were categorized positively if moderate to severe symptoms were endorsed. The events were tabulated as to whether they occurred frequently (weekly or more often), infrequently (less than weekly), or not at all. The resulting frequencies were compared, by chi-square analysis, for those who had and did not have PTSD. To adjust for low frequency rates, frequent and infrequent categories were collapsed when expected frequencies were below five and Yates's correction was applied for analyses of 2x2 frequency tables when expected frequencies were between five and 10.

Sleep Diary

Patients admitted to the specialized inpatient PTSD unit of the Miami VA Medical Center routinely provide military discharge forms to confirm service in a combat zone. Additional evaluations include inventories of specific combat experiences, the Structured Clinical Interview for DSM-III (SCID) PTSD section (1), and the Mississippi Scale for Combat-Related Posttraumatic Stress Disorder (24). The patients are also screened for abstinence from illicit drug and alcohol use before admission and during their stay by behavioral observation and urine toxicology. Fifty-two of the first 60 consecutively admitted patients who were male Vietnam veterans, aged 39–52 years, and who met SCID and Mississippi scale criteria for combat-related PTSD were appropriate for and complied with the assessment. These patients filled out sleep diary forms on three consecutive mornings regarding the previous night's sleep during the third or fourth week of a planned 3-month hospital stay. During the time they filled out sleep diaries, 40 (77%) of the 52 patients were receiving psychotropic medications, including cyclic antidepressants (N=30), benzodiazepines (N=11), and neuroleptics (N=5).

The sleep diary forms included questions regarding estimated time asleep, sleep quality, and the number of recalled awakenings during the night. Items then addressed whether each awakening was associated with dream recall or other features, including startle, fear, and physiological symptoms (rapid heart rate, dyspnea, shaking, sweating, or dizziness). On the basis of the responses, awakenings with symptoms were first categorized as to the presence of dream recall and then according to whether the dream content was related to combat or other threatening situations. In the absence of dream recall, symptomatic awakenings were categorized as featuring 1) startle or fear if these items were endorsed in the absence of physiological symptoms or 2) panic if fear or startle was accompanied by one or more physiological symptoms. The frequencies of total awakenings and types of symptomatic awakenings were averaged across nights and compared, by chi-square analysis, between patients receiving and not receiving medication. Possible relationships of PTSD severity and types of symptomatic events were probed by Pearson correlations of Mississippi scale scores with average frequencies of types of awakening.

Sleep Laboratory

Twenty-one male Vietnam combat veterans diagnosed with PTSD, recruited from inpatient and outpatient VA medical center treatment, and eight healthy male comparison subjects not exposed to combat spent two consecutive nights in the sleep laboratory. Informed consent forms were signed by all subjects participating in the laboratory

TABLE 1. Sleep Symptoms in Combat Veterans With or Without PTSD

Sleep Symptom	Veterans With PTSD (N=37)		Veterans Without PTSD (N=21)		χ^2 (df=1)
	N	%	N	%	
Nonrestorative sleep	27	73	8	38	4.0*
Insomnia					
Initial	25	68	5	24	11.6***
Middle	23	62	4	19	15.0***
Late	22	59	5	24	7.0**
Disturbing dreams—noncombat					5.9*
Frequent	25	68	6	29	
Infrequent	8	22	6	29	
Disturbing dreams—combat ^a					26.9***
Frequent	24	65	1	5	
Infrequent	10	27	6	29	
Thrashing; violent movements ^a					9.0**
Frequent	22	59	4	19	
Infrequent	6	16	8	38	
Startle-panic awakenings					4.2*
Frequent	19	51	1	5	
Infrequent	9	24	6	29	
Sleep talking					2.6
Frequent	18	49	6	29	
Infrequent	2	5	0	0	
Hallucinations					7.4**
Frequent	15	41	0	0	
Infrequent	7	19	4	19	
Night terrors (screaming or shaking while sleeping)					8.9**
Frequent	14	38	2	10	
Infrequent	6	16	0	0	
Sleep paralysis					4.2*
Frequent	9	24	0	0	
Infrequent	6	16	0	0	
Sleep walking					1.0
Frequent	1	3	0	0	
Infrequent	3	8	0	0	

^adf=2.

*p<0.05. **p<0.01. ***p<0.001.

procedure. The patients had a mean age of 42.7 years (SD=2.5, range=38–48), comparable to the healthy subjects' mean age of 42.6 (SD=6.0, range=35–51). In addition to the PTSD assessments described for the sleep diary subjects, these patients received a SCID evaluation of comorbid mood, anxiety, and substance use disorders. Two patients additionally met criteria for current major depression; 10 others had past, lifetime major depression. Seven met criteria for panic disorder. Ten had recent (in the past 6 months) and an additional six had lifetime histories of substance use disorders. These patients were evaluated and monitored to ensure that they were free of illicit drug and alcohol use for at least 1 month and were withdrawn from all medication for at least 2 weeks. The patients with known drug use histories all had a negative urine toxicology screening during the month of the study. These patients also were screened by history and physical examination to ensure that they were free of significant medical conditions, including stigmata of primary sleep pathology (i.e., morbid obesity, hypertension, loud snoring, or severe daytime somnolence). The comparison subjects were recruited from VA medical center and university employees and were screened by interview to ensure that they were free of lifetime axis I disorders, significant medical illness, and combat exposure.

The first night in the sleep laboratory was considered an adaptation night; data were obtained from the second night. Patients were monitored with electro-oculograph, EEG, EMG, and ECG leads and

oximetry and respiratory strain gauge monitors. Specific monitors that were uncomfortable to the patient (most frequently oximetry) were discontinued after apnea screening. Records were hand scored by a trained technician in 30 second epochs, according to standard criteria (25), from which sleep measures were tabulated by a computer program. The records were then further reviewed for sleep pathology by one of the authors (B.N.) who is board-certified in sleep medicine.

The sleep laboratory subjects also filled out the previously described sleep diary following sleep monitoring. Symptomatic awakenings were located on the polysomnographic records from the diary description of the time of occurrence and duration of the event and technician notes. These events were also categorized as described for sleep diary symptomatic awakenings, and they were further characterized in terms of preceding sleep stage and cardiac and respiratory rates in the epoch before and immediately following the point of awakening.

In order to assess conservatively whether sleep was objectively disturbed in the PTSD patients, measures reflecting sleep initiation and maintenance (sleep latency and efficiency, total sleep time, number of full and subthreshold awakenings, time awake during sleep) were compared across study groups by multivariate analysis of variance (MANOVA). These sleep measures and REM latency were then compared across patients and healthy subjects by independent t tests (two-tailed). The proportion of subjects in each group exhibiting body movement (full epochs obscured by artifact body movement preceded and followed by EEG sleep), limb movements, or respiratory events during sleep was compared by Fisher's exact test (two-tailed). The percent of sleep represented by specific sleep stages and the percent of awakenings preceded by sleep stages were also compared across study groups by t tests. The association of symptomatic (versus nonsymptomatic) awakenings preceded by REM versus non-REM sleep stages among PTSD patients was then analyzed by chi-square.

RESULTS

Sleep Survey

The combat veterans with PTSD reported significantly fewer hours of sleep than combat veterans without PTSD (mean=5.3, SD=1.6, versus mean=6.5, SD=1.3) ($t=2.9$, $df=56$, $p<0.05$). Table 1 contains comparisons of frequencies of sleep symptoms among the 37 surveyed combat veterans with PTSD and the 21 combat veterans without current PTSD. Insomnia and nonrestorative sleep were endorsed as significant problems by 59%–73% of the subjects with PTSD versus 19%–38% of the respondents without PTSD. Among insomnia patterns, middle insomnia (awakening in the middle of the night) was associated most specifically with having PTSD. The most commonly endorsed parasomnia-like events to occur frequently in the respondents with PTSD were noncombat nightmares, combat nightmares, thrashing movements during sleep, and startle or panic-like awakenings (waking up suddenly with fear or startle without remembering a dream). Noncombat nightmares and sleep talking were the events most commonly endorsed as occurring frequently in the respondents without PTSD. Among these items, combat nightmares were most specifically associated with PTSD, followed by thrashing movements during sleep.

Sleep Diary

The hospitalized PTSD patients documented an average of 2.5 awakenings per night in their sleep diary forms (SD=1.3, range=0–5.3). Specific symptomatic awakenings included nightmares related to combat

TABLE 2. Laboratory Assessment of Measures of Sleep Disturbance in Combat Veterans With PTSD and Comparison Subjects

Measure	Combat Veterans With PTSD (N=21)		Comparison Subjects (N=8)		t (df=27)
	Mean	SD	Mean	SD	
Sleep efficiency (%)	81.1	11.5	90.1	3.4	3.1*
Latency to sleep (min)	32.3	23.0	26.4	6.9	-1.1
Total sleep (min)	329.4	47.6	361.4	53.3	1.5
Number of awakenings	7.1	5.3	5.4	1.8	-1.3
Awake time (min)	49.9	46.8	20.3	8.0	-2.8*
Micro-awakenings	12.9	10.9	5.7	3.3	-2.6*
REM latency (min)	65.2	36.2	78.3	31.5	0.9

*p<0.01.

themes (mean=0.20 times per night, SD=0.30, range=0–1), dreams with other disturbing or threatening themes (mean=0.14, SD=0.24, range=0–1), startle or fear awakenings without dream recall (mean=0.24, SD=0.34, range=0–1), and panic awakenings (startle or fear with physiological symptoms) (mean=0.12, SD=0.22, range=0–0.66). Among the 12 patients not receiving medication, combat-related nightmares were less frequent (mean=0.06 per night, SD=0.13, versus mean=0.25, SD=0.33) ($t=3.0$, $df=50$, $p<0.01$) and sleep panic was more frequent (mean=0.27, SD=0.31, versus mean=0.08, SD=0.16) ($t=-2.1$, $df=50$, $p<0.05$) than in the 40 inpatients receiving psychotropic medication. None of the correlations between average nightly frequency of types of awakening and Mississippi scale severity scores was significant ($df=50$ for all) (total awakenings: $r=0.21$, combat dreams: $r=0.19$, other threatening dreams: $r=0.08$, startle awakenings: $r=-0.22$, panic awakenings: $r=-0.22$).

Sleep Laboratory

The MANOVA of the sleep initiation and maintenance measures showed a significant effect of study group ($F=2.6$, $df=6, 22$, $p<0.05$). Among these variables there was significantly less sleep efficiency and a significantly greater amount of time awake during sleep and number of micro-awakenings (EEG wake periods lasting 15–45 seconds) ($p<0.01$; table 2).

Six (28.6%) of the PTSD patients and none of the comparison subjects had one or more epochs scored as body movement time (mean=1.3 minutes, SD=0.7, range=0.5–2.5) ($p<0.10$, Fisher's exact test). Seven PTSD patients (33.3%) and none of the comparison subjects had periodic limb movements that ranged from two to 33 per hour (mean=17.4, SD=10.2) ($p<0.10$). Among patients with limb movements, on average 34.6% (range=0%–100%) were associated with arousals (brief increases in EEG activity).

Sleep-induced respiratory events (apneas or hypopneas) were noted in 10 (47.6%) of the PTSD patients and one (12.5%) of the comparison subjects (n.s.). These findings were in the normal to borderline range (i.e., combined apnea and hypopnea index of less than

TABLE 3. Sleep Stages and Awakenings in Combat Veterans With PTSD and Comparison Subjects

Sleep Variable	Combat Veterans With PTSD (N=21)		Comparison Subjects (N=8)		t (df=27)
	Mean	SD	Mean	SD	
Sleep stage percentage					
Stage 1	16.1	6.2	12.0	3.9	-1.7*
Stage 2	50.9	10.5	56.4	6.0	1.4
Delta sleep (stages 3 and 4)	10.7	6.6	13.2	9.2	0.9
REM sleep	21.3	7.6	28.6	23.6	1.3
Percentage of awakenings preceded by sleep stage					
Stage 1	20.9	24.8	4.1	7.8	-1.8**
Stage 2	42.7	27.5	58.1	23.4	1.4
Delta sleep	5.1	10.5	7.1	9.8	-0.5
REM sleep	35.9	26.4	30.8	25.4	-0.5

*p<0.10. **p<0.08.

10 per hour, absence of oxygen desaturations less than 90%) for the comparison subject and eight of the 10 patients. One PTSD patient's findings were in the borderline to mild range for sleep-induced respiratory abnormality (25 hypopneas per hour, no apneas, no significant desaturations), and another had findings in the moderate to severe range (combined apnea and hypopnea index of 69 per hour, desaturations to 86% oxygenation). The differences in sleep maintenance measures were of similar magnitude when this patient was excluded from the analysis.

Eight patients had a total of 18 awakenings that were reported to feature symptoms. Fifteen of the awakenings (83%) were endorsed as being associated with a feeling of startle or fear but not dream recall. Three (17%) were reported to feature recall of threatening dream content. One dream involved a threat related to the hospital environment, another involved being chased by vague assailants, and another dream of a Vietnam veteran involved a World War II scenario. Two (11%) of the recorded symptomatic awakenings, neither featuring dream recall, had physiological measures that were markedly greater immediately upon awakening (a 12-bpm increase in heart rate and an eight-breaths-per-minute increase in respiratory rate).

Table 3 lists the percentages of total sleep represented by specific sleep stages and percentages of total awakenings preceded by the sleep stages. Other than a trend for greater stage 1 sleep and a comparable trend toward an increase in stage 1 awakenings, there were no differences between patients and comparison subjects. With respect to the 18 symptomatic awakenings in the patients, nine (50%) were preceded by REM sleep including the three reported with dream recall, eight (44%) were preceded by stage 2 sleep, and one (6%) was preceded by stage 1 sleep. The awakenings from REM sleep did not feature waxing and waning EMG activity as has been characterized in REM behavior disorder. The association of symptomatic awakenings, but not nonsymptomatic awakenings, with REM sleep was sig-

nificant at a trend level (nine of 18 versus 41 of 128) ($\chi^2=2.9$, $df=1$, $p<0.10$). Both of the awakenings with physiological arousal were preceded by REM sleep. In one of these patients, two additional awakenings preceded by stage 2 sleep were similarly reported with startle and fear and did not feature an increase in cardiac or respiratory rate.

One comparison subject reported awakening with mild apprehension that he related to a dream of being in a nonserious car accident. This awakening was preceded by REM sleep and did not feature increases in cardiac or respiratory rate.

DISCUSSION

We found that patients with chronic, combat-related PTSD report recurrent awakenings—variably associated with startle, apprehension, physiological arousal, and dream recall—and excessive body movement during sleep. Laboratory documentation of impaired sleep maintenance and sleep-related movement in a subgroup of patients and none of the comparison subjects is consistent with this subjectively reported symptom profile. We also found more brief, subthreshold awakenings in PTSD patients and subclinical, sleep-induced respiratory events in almost half of the patients studied in the laboratory. Both of these last two findings are consistent with sleep being less restorative in PTSD. The finding of respiratory events with PTSD is consistent with the findings of Dagan and Lavie of sleep apnea in Israeli combat veterans, although these investigators reported more severe apnea indices (26).

The prospectively obtained data (diary reports from the inpatient unit and the sleep laboratory) suggest that startle or panic awakenings occurred as frequently as awakenings with recall of disturbing dreams and were more frequent in PTSD patients not receiving medication. Nonetheless, we found a trend for symptomatic awakenings, overall, to be associated with REM sleep, and both recorded events with physiological arousal were preceded by REM sleep.

As indicated in the introduction, we believe the three study methods to have complementary strengths and weaknesses. The survey relied on subjective and retrospective reporting. In addition, factors affecting sleep were not controlled for; these included variable sleep/wake schedules and use of prescribed and nonprescribed substances to facilitate sleep (which was acknowledged by 64% of the respondents). The sleep diary information from the inpatient unit was obtained prospectively from a more controlled setting. These inpatients represented a more severely impaired subpopulation, and the majority were receiving medication. Patients were medication and substance free for the sleep laboratory assessments, and the recordings generate objective, physiological measures. It is possible that the laboratory environment influences the experiencing or reporting of symptoms, and the laboratory subjects represent a smaller and possibly more select cohort

(e.g., patients willing and able to discontinue medication). We found, however, similar profiles of symptomatic awakenings in the medication-free subjects who filled out diaries in the inpatient and laboratory settings. In fact, among the five subjects who filled out diaries in both settings, none reported dream recall, and similar rates of startle (mean=0.46 per night, $SD=0.38$, versus mean=0.30, $SD=0.45$) and panic-like awakenings (mean=0.26, $SD=0.28$, versus mean=0.40, $SD=0.55$) were reported in the inpatient and laboratory settings, respectively. Overall, the convergence of the survey, diary, and laboratory findings supports the validity of our characterization of sleep events in chronic, combat-related PTSD.

As previously noted, our findings suggest a partial association of arousability from sleep and REM sleep. One possibility is that the REM symptomatic awakenings are triggered by dream activity in that dreaming has been linked, albeit with varying specificity, to REM sleep (27, 28). The majority of the symptomatic awakenings occurring in the laboratory, including those emerging from REM sleep, however, did not feature dreaming according to morning diary reports and follow-up interviews. It is therefore possible that nightmares are a less prominent feature of chronic PTSD but that a psychophysiological response to REM activity per se (as well as to, to a lesser degree, other sleep stages) develops that is conditioned by nightmares during a more acute phase of the illness. This type of phenomenon appears similar to Greenberg's description of "dream interruption insomnia" in which a group of patients (studied in a VA hospital) with histories of nightmares were reported to have been awakening from REM sleep without dream recall. Treatment with chlor-diazepoxide was reported to reduce awakenings and increase dream recall (29). Consistent with this observation, the inpatients in our study who received medication (most commonly antidepressants and benzodiazepines) reported dream recall more frequently than the medication-free subgroup. It is also possible that a neurobiological dysregulation underlies a heightened arousal response from REM sleep in PTSD. A recent study documented sensitivity in combat-related PTSD to provocation of panic or flashback symptoms from yohimbine, which stimulates central noradrenergic, locus ceruleus activity (16). The Hobson et al. model for sleep regulation posits the primary stimulus for terminating REM activity to be greater firing of the locus ceruleus (30). Consistent with the possibility of a relationship to a REM termination stimulus, all but one of the symptomatic awakenings from REM arose from sustained REM periods (an average of 17.4 minutes of REM sleep [$SD=8.8$] preceded the nine awakenings). Finally, there is some evidence in the literature that suggests an adaptive aspect of suppressed dream recall in PTSD. Kramer et al. (6) reported the less symptomatic subgroup in their study as having lower than normal dream recall. Kaminer and Lavie found a "well adjusted" Holocaust survivor subgroup to have limited or absent dream recall when awakened from REM sleep (31).

Our observations of the relationship of symptomatic awakenings and sleep stages contrast with panic disorder

studies in which sleep panic attacks were found to be associated with early slow-wave sleep (17, 18). A subset of the symptomatic awakenings in PTSD, however, have features similar to those of sleep panic. Awakenings with panic features were also less frequent among the PTSD inpatients in our study who were receiving medication, which in almost all cases included antipanic therapies. It is therefore possible that certain sleep events in PTSD and panic disorder involve common final pathways but are triggered by different stimuli, which in panic disorder are linked to slow-wave sleep, and in PTSD are partially associated with REM sleep.

More generally, the sleep disturbance of chronic combat-related PTSD is characterized by paroxysmal symptoms in which aroused states and behaviors intrude into states of diminished arousal (i.e., sleep states). It is reasonable to infer that these patterns were engendered by combat. While we did not obtain much systematic information on precombat sleep histories (which may not be entirely reliable), the surveyed patients reported absent or mild premilitary sleep disturbance, and none of the more extensively evaluated laboratory subjects reported childhood parasomnias. The subjects did report repetitive experiences in which sleep was disrupted during combat tours, at times by life-threatening situations. A number of PTSD investigations have documented a conditioned heightened arousal response to trauma-related stimuli during wake states (32, 33). Our findings suggest that impairment in sustaining states of diminished arousal may also be a prominent conditioned feature of PTSD. The importance of further research focusing on the nature and treatment of sleep disturbance in PTSD is underscored by the associated distress and the probable impact of persistently disrupted sleep on daytime symptoms (e.g., poor concentration, irritability) and functioning.

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