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- Have a heightened awareness that physical injuries occurring during sleep or upon awakening may be the result of a sleep pathology that may need medical treatment in order to prevent such injuries
- Distinguish the different forms of parasomnia and identify which of them are more likely to produce violent or injurious behaviors during sleep
- Recognize the symptoms accompanying violent behaviors during sleep so that the participant can identify patients who may have such sleep problems

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# Violent Behavior During Sleep

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**Background:** Although the relative incidence of violent behavior during sleep (VBS) is presumed to be low, no epidemiologic data exist to evaluate the prevalence of the phenomenon or to begin to understand its precursors or subtypes. This study examined the frequency of violent or injurious behavior during sleep and associated psychiatric risk factors.

**Method:** A representative United Kingdom sample of 2078 men and 2894 women between the ages of 15 to 100 years (representing 79.6% of those contacted) participated in a telephone interview directed by the Sleep-EVAL expert system specially designed for conducting such diagnostic telephone surveys.

**Results:** Two percent (N = 106) of respondents reported currently experiencing VBS. The VBS group experienced more night terrors and daytime sleepiness than the non-VBS group. Sleep talking, bruxism, and hypnic jerks were more frequent within the VBS than the other group, as were hypnagogic hallucinations (especially the experience of being attacked), the incidence of smoking, and caffeine and bedtime alcohol intake. The VBS group also reported current features of anxiety and mood disorders significantly more frequently and reported being hospitalized more often during the previous 12 months than the non-VBS group. Subjects with mood or anxiety disorders that co-occurred with other nocturnal symptoms had a higher risk of reporting VBS than all other subjects.

**Conclusion:** We have identified a number of sleep, mental disorder, and other general health factors that characterize those experiencing episodes of VBS. These findings suggest that specific factors, perhaps reflecting an interaction of lifestyle and hereditary contributions, may be responsible for the observed variability in this rare but potentially serious condition.

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The occurrence of violent behavior during sleep (VBS) appears to be a relatively rare medical phenomenon, although there are to date no epidemiologic data available from either the general population or sleep centers to confirm or quantify the frequency of this disorder.<sup>1,2</sup> The consequences for patients exhibiting VBS range from benign acting out during sleep to self-mutilating injuries, murder, or suicide.<sup>1,3-8</sup> Some patients with VBS remain untreated for several years before seeking medical consultation and instead pursue idiosyncratic and often ineffective remedies to attempt to suppress their acting-out behaviors.

Until recently, a common assumption was that most acts of violence perpetrated during sleep were attributable to night terrors or sleepwalking episodes.<sup>9-12</sup> In 1986, Schenck et al.<sup>1</sup> described a new syndrome, REM sleep behavior disorder, characterized as "injuries or disruptive behaviors emerging during REM sleep, which ordinarily exhibits a generalized skeletal muscle atonia." In normal REM sleep, this protective measure of atonia was said to prevent the physical acting out of the dream, but in subjects suffering from REM sleep behavior disorder, this atonia is absent, often resulting in injurious behavior to self or others.<sup>13,14</sup>

Aggression associated with sleep was also reported in other types of sleep disorders but not as an essential diagnostic feature. Such was the case of somnambulism<sup>3,5,6,15,16</sup> and night terrors,<sup>15,16</sup> both parasomnias occurring during non-REM (NREM) sleep. Violent behavioral patterns might also occur in subjects suffering from nocturnal seizures,<sup>14,16-19</sup> during the transitional period between sleep

and complete wakefulness (sleep drunkenness),<sup>10,20</sup> or with some neurologic diseases.<sup>21-23</sup>

Our current study investigated the prevalence of violent or injurious behaviors occurring in sleep and the associated psychiatric risk factors.

## METHOD

### Sample

Individuals from a representative sample of subjects consisting of the noninstitutionalized United Kingdom population aged 15 years or over were questioned by phone about their sleep habits, sleep-related symptoms, sleep quality, and psychiatric disorders. The sample was obtained using a stratified probabilistic approach. Sample selection, with respect to distribution among the 11 areas of the United Kingdom, was based on the results of the 1991 census survey and, with respect to age and gender, on the Kish selection method,<sup>24</sup> which specifies the household member to be interviewed.

Only those subjects who agreed to participate after the goals of the study were outlined, had sufficient mastery of the English language to understand the questions, and had no hearing or speech impairment nor illness preventing feasibility of the interview were included in the study. Subjects who refused to participate after two requests were classified as a "refusal."

The interviews were completed for 4972 subjects (79.6% of the potential sample). The unweighted sample included 2894 women and 2078 men, who ranged in age from 15 to 100 years of age.

### Instrument

The telephone interviews were performed by a company specializing in nationwide telephone surveys (BPS Teleperformance, Birmingham, England). These interviews were conducted by 40 individuals inexperienced in psychiatric diagnosis, who were specially trained to use the knowledge-based system "Sleep-EVAL,"<sup>25,26</sup> a computer program designed to provide homogeneous and standardized evaluations. The system is a nonmonotonic, level-2 expert causal reasoning system that uses the Adinfer inference engine.<sup>27</sup> The Sleep-EVAL system has been validated<sup>27-29</sup> and was considered to be an appropriate tool for use with the present epidemiologic study and the administration of the questionnaire.

The Sleep-EVAL system is a logical computer software program designed to formulate diagnostic hypotheses from a quantum of informational data provided by ques-

tionnaire responses and which can revise, refine, and validate the hypotheses in the course of the interview as new and relevant data are received. The dynamic capacity of the Sleep-EVAL system enables it to economize the interview by preemptively eliminating superfluous questions that might otherwise be put to a given subject.

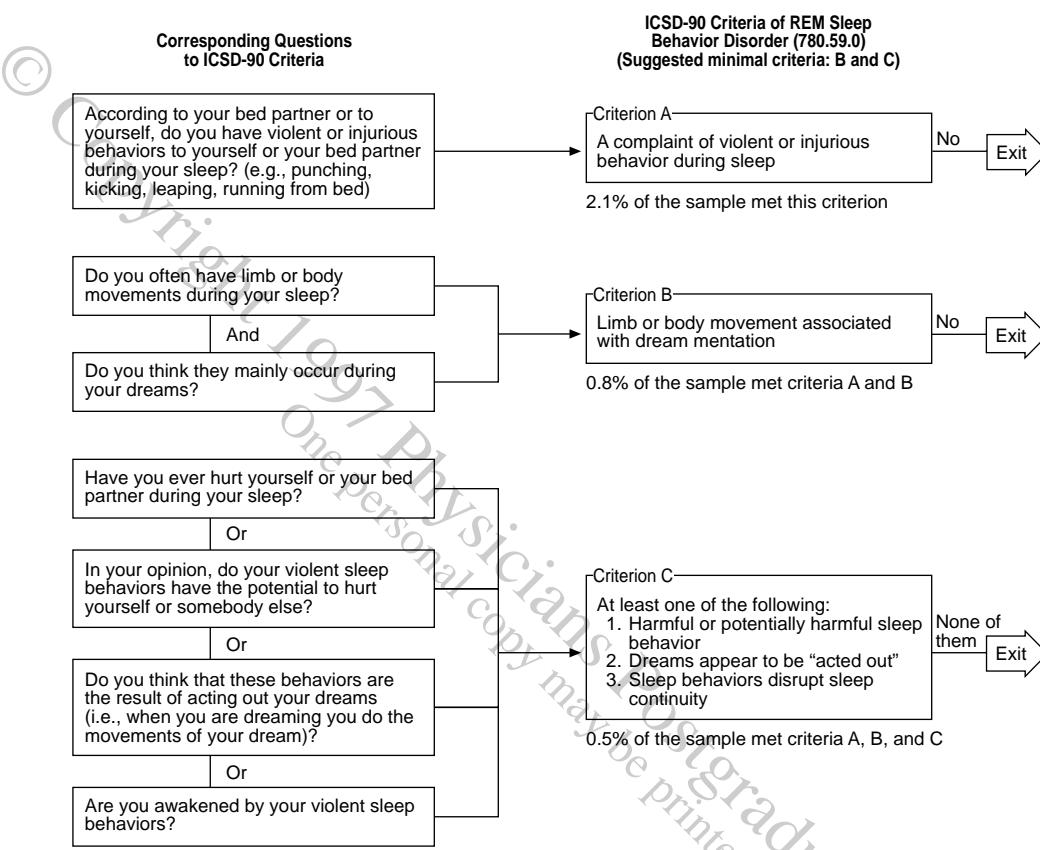
For respondents without sleep and psychiatric problems, the interview was brief (20 to 30 minutes). Conversely, for subjects with a history of sleep or mental disorder(s), the interview was designed to be far more comprehensive and lasted up to 180 minutes in some cases. The program formulated questions whereby the interviewer was required to glance at the monitor as the prompts appeared and to read them aloud to the interviewee. Additionally, samples and instructions on how to answer a question were provided. Answers were assigned on a "yes-no" or "present-absent-unknown" basis or to a 5-point scale, depending on the item. Some questions required keyboard responses, such as the name or the duration of an illness.

Responses to questions related to violent or injurious behaviors were analyzed in relation to the following major categories explored during the investigation: socio-demographic information, current medication intake, medical consultations and treatments during the past 12 months, hypnagogic and hypnopompic hallucinations, dreams and nightmares, DSM-IV mental disorders,<sup>30</sup> and International Classification of Sleep Disorders (ICSD)-90 sleep disorders.<sup>2</sup>

### Data Analyses

Data were weighted with respect to the distribution of the noninstitutionalized United Kingdom population aged 15 years and older, taking into account age, gender, and geographic distribution. These transformations were performed for all variables and the results tabulated with the weighted percentage outcome. After weighting, the sample was composed of 52.2% women and 47.8% men. Bivariate analyses were performed using chi-square statistics; when N values were smaller than five, the Fisher's exact probability test was applied.<sup>31</sup> Predictive variables for the presence of violent behaviors during sleep were determined with the help of logistic regressions.<sup>32</sup> A method of quasi-sequential selection was used with the likelihood-ratio (LR) test for determining variables to be removed from the model.<sup>33</sup> The cutoff point of entry (PIN) was fixed at  $p < .05$ , and the cutoff point of exclusion (POUT) at  $p < .10$ . The Statistical Package for the Social Sciences, release 6.1 (SPSS, Chicago, Ill.) was used.

**Figure 1. Decision Tree and Corresponding Questions of the Sleep-EVAL Questionnaire to International Classification of Sleep Disorders (ICSD)-90 Criteria**



## RESULTS

One hundred six subjects in the VBS group (2.1%, 95% confidence interval [CI] = 1.7% to 2.5%) complained of currently experiencing violent or injurious behavior during sleep (i.e., at the time of the interview). These behaviors lasted for less than 1 year in 15.1% of cases, between 1 and 5 years in 27.4%, and for more than 5 years in 18.4%. One subject reported it began in childhood, and 37.7% of subjects said they did not remember. The prevalence of these episodes was higher in male subjects (2.6%, 95% CI = 2.0% to 3.2%) than in the female group (1.7%, 95% CI = 1.2% to 2.2%;  $p < .05$ ) and more frequently observed among younger subjects: 3.0% (95% CI = 2.4% to 3.6%) of the age 15 to 44 sample; 1.6% (95% CI = 0.9% to 2.3%) of the age 45 to 64 group, and only 0.4% (95% CI = 0% to 0.8%) of the 65 years or

older sample ( $p < .0001$ ). Most VBS subjects were married (54.1%) or single (35.7%).

Only 40 subjects reported that these behaviors occurred when they dreamed. In 8 cases, subjects reported acting out their dreams. Fifteen subjects said they had already hurt themselves or their bed partners while asleep, and a further 3 subjects described their violent behaviors as potentially harmful for themselves or their bed partners.

Although no EEGs have been performed, the presence of a REM sleep behavior disorder (ICSD-90 sleep disorders classification) was suspected in 24 cases (0.5% of the total sample) (see Figure 1).

### Sleep Characteristics of VBS Subjects

Sleep latency, number of hours slept, and time spent in bed were comparable between VBS subjects and non-VBS subjects.

However, VBS subjects more often mentioned insomnia complaints than non-VBS subjects. Thus, difficulties initiating sleep were cited by 24.9% of VBS subjects and 12.7% of non-VBS subjects ( $p < .001$ ). Difficulty in maintaining sleep was found in 33% of VBS subjects and 20.5% of non-VBS subjects ( $p < .0001$ ). Early morning awakening (with inability to go back to sleep) was reported by 25% of VBS subjects and 15.7% of non-VBS subjects ( $p < .01$ ). Finally, nonrestorative sleep after an adequate period of sleep was reported by 31.7% of VBS subjects and 15.7% of non-VBS subjects ( $p < .0001$ ).

The occurrence of abrupt awakening from sleep, accompanied by a panicky scream, and nightmares (frightening dreams), occurring at least twice monthly, was observed more often in VBS subjects compared with the non-VBS group (Table 1). Periods of sleepwalking and of mental confusion on waking were also more frequently reported in the VBS group compared with the non-VBS group (Table 1).

A greater number of VBS subjects reported snoring, talking in their sleep, bruxism, breathing pauses, convulsive movements of the limbs, and hypnic jerks at sleep onset than did subjects in the non-VBS study group (see Table 1).

Hypnagogic hallucinations (vivid perceptual experiences occurring at sleep onset) were far more often reported by VBS subjects (67%) than by non-VBS subjects (36.4%;  $p < .0001$ ). Hypnagogic experiences including the vivid sensation of feeling "about to be attacked" were more often reported by VBS subjects (10.6%) than by non-VBS subjects (3.1%;  $p < .0001$ ). The realistic feeling that shadows or objects were moving was also more frequently reported by VBS (6.6%) than by non-VBS subjects (3.3%;  $p < .01$ ). Experiences of hypnopompic hallucinations (vivid perceptual experiences occurring on awakening) were reported in nearly equal proportion by both VBS (19.2%) and non-VBS subjects (12.5%) (N.S.).

VBS subjects reported more often feeling tired at waking up (43.5%) and having difficulty waking up at the desired time (12.1%) than did non-VBS subjects (21.4% and 5.3%, respectively,  $p < .005$ ). Furthermore, excessive daytime sleepiness was cited by nearly half of VBS (48.5%) subjects while only 20.4% of non-VBS subjects reported it ( $p < .0001$ ).

Use of sleep-enhancing, anxiety-reducing, and antidepressant medications did not differ significantly between VBS subjects and non-VBS subjects. There was a significant association between a high daily intake of coffee or tea ( $\geq 6$  cups per day) and the report of violent behavior

**Table 1. Distribution of Groups by Behaviors Occurring in Sleep and Parasomnia Symptoms\***

Behavior/Symptom	% of VBS (N = 106)	% of Non-VBS (N = 4866)
Behaviors occurring in sleep		
Snoring	56.8 <sup>a</sup>	40.0
Sleep talking	64.9 <sup>a</sup>	24.0
Teeth grinding	25.3 <sup>a</sup>	9.1
Breathing pauses	11.0 <sup>b</sup>	3.7
Agitation	39.3 <sup>a</sup>	14.0
Excessive limb movement	70.8 <sup>a</sup>	34.7
Hypnic jerks	62.5 <sup>a</sup>	33.8
Subjective sense of choking and blocked breathing	11.3 <sup>c</sup>	4.9
Parasomnia symptoms		
Abrupt awakenings from sleep accompanied with a panicky scream	12.0 <sup>a</sup>	1.9
Periods of sleepwalking	7.3 <sup>b</sup>	2.0
Nightmares	23.5 <sup>a</sup>	6.6
Periods of mental confusion on waking	7.4 <sup>a</sup>	1.9

\*Abbreviations: VBS = subjects with violent behaviors during sleep; Non-VBS = subjects without violent behavior manifestation during sleep.

<sup>a</sup> $p < .001$ .

<sup>b</sup> $p < .01$ .

<sup>c</sup> $p < .05$ .

(22.7%) compared with the non-VBS group (10.4%;  $p < .005$ ). VBS subjects (36.6%) more often reported smoking than did non-VBS subjects (22.4%), but the amount smoked had no effect on this correlation. The percentage of total abstainers and quantity of alcohol consumed did not differ between groups. However, VBS subjects more often reported having an alcoholic drink when they were in bed (13.7%) than non-VBS subjects (6.4%;  $p < .005$ ).

Medical consultations within the last 12-month period were more often reported by VBS (71.2%) than by non-VBS subjects (60.8%;  $p < .05$ ). VBS subjects (25.7%) reported having been hospitalized more often than non-VBS subjects over the last 12-month period (10.7%;  $p < .05$ ). A comparable number of VBS subjects (16.7%) and non-VBS subjects (15.5%) reported being currently treated for a physical illness. Kidney diseases were more often reported by VBS subjects than by the non-VBS group (6% vs. 1.6%;  $p < .01$ ). However, no epileptic disorder was reported by VBS subjects.

VBS was most often associated with ICSD-90<sup>2</sup> parasomnias: sleep talking, sleep starts, and sleep bruxism. A significantly higher percentage of VBS subjects was diagnosed as having an obstructive sleep apnea syndrome (Table 2). Moreover, a significantly greater number of VBS than non-VBS subjects were diagnosed with mood disorder associated with sleep disturbance.

**Table 2. Distribution of Groups by International Classification of Sleep Disorders Diagnoses\***

ICSD-90 Diagnoses <sup>a</sup>	VBS (N = 106)		Non-VBS (N = 4866)	
	N	%	N	%
<b>Dyssomnias</b>				
Psychophysiological insomnia	6	6.0	101	2.1
Idiopathic insomnia	1 <sup>b</sup>	...	17	0.3
Narcolepsy	0	...	7	0.1
Obstructive sleep apnea syndrome	11 <sup>c</sup>	10.1	84	1.7
Periodic limb movement disorder	0	...	3	0.1
Restless legs syndrome	0	...	5	0.1
<b>Parasomnias</b>				
Confusional arousals	1 <sup>b</sup>	...	19	0.4
Sleepwalking	0	...	3	0.1
Sleep terrors	1 <sup>b</sup>	...	0	...
Sleep starts	9 <sup>d</sup>	9.8	126	2.7
Sleep talking	48 <sup>b</sup>	49.5	939	20.2
Nocturnal leg cramps	3	3.0	39	0.8
Nightmares	1 <sup>b</sup>	...	32	0.7
Sleep paralysis	0	...	35	0.7
REM sleep behavior disorder	25	23.6	0	...
Sleep bruxism	13 <sup>d</sup>	12.7	220	4.5
Sleep enuresis	1 <sup>b</sup>	...	9	0.2
<b>Sleep disorders associated with psychiatric disorders</b>				
Mood disorder associated with sleep disturbance	15 <sup>d</sup>	14.3	221	4.5
Anxiety disorder associated with sleep disturbance	2	1.8	58	1.2
Panic disorder associated with sleep disturbance	0	...	31	0.6
Psychosis associated with sleep disturbance	1 <sup>b</sup>	...	13	0.3
No diagnosis	14 <sup>c</sup>	13.5	2207	45.3

\*N values and percentages are weighted for the VBS subjects.

<sup>a</sup>A subject may have more than one diagnosis.

<sup>b</sup>Due to small numbers of cases, percentages are omitted.

<sup>c</sup>p < .001.

<sup>d</sup>p < .05.

## Association of Violent Behaviors With Mental Disorders

Subjects with DSM-IV anxiety and mood disorders at the time of the interview reported a significantly higher percentage of VBS than did subjects without anxiety and mood disorders ( $p < .05$  and  $p < .01$ , respectively). Subjects with psychotic symptoms (visual, olfactory, gustative, or somesthetic daytime hallucinations) also had a significantly higher rate of VBS than subjects without psychotic symptoms ( $p < .001$ ) (Table 3). Finally, subjects with a history of mood disorders have more often reported VBS than subjects without history ( $p < .001$ ).

## Multivariate Models

Multivariate analyses were performed to assess the possible relationship between the presence of violent behavior

**Table 3. Prevalence of Violent Behavior During Sleep (VBS) by DSM-IV Mental Disorders Diagnoses**

Disorder	N	VBS	
		%	95% CI
<b>Current DSM-IV mental disorders</b>			
Mood disorders			
Present	347	4.8 <sup>b</sup>	2.6 to 7.0
Absent	4607	1.9	1.5 to 2.3
Anxiety disorders			
Present	292	4.3 <sup>c</sup>	2.0 to 6.6
Absent	4646	1.9	1.5 to 2.3
Adjustment disorders			
Present	91	2.1	0.0 to 5.0
Absent	4880	2.1	1.7 to 2.5
Psychotic symptoms			
Present	57	12.1 <sup>a</sup>	3.6 to 20.6
Absent	4825	1.9	1.5 to 2.3
<b>History of mental disorders</b>			
Mood disorders			
Present	241	5.2 <sup>a</sup>	2.4 to 8.0
Absent	4731	2.0	1.6 to 2.4
Anxiety disorders			
Present	233	3.7	1.3 to 6.1
Absent	4738	2.1	1.7 to 2.5
Psychotic symptoms			
Present	14	6.3	0.0 to 19.0
Absent	4958	2.1	1.7 to 2.5

<sup>a</sup>p < .001.

<sup>b</sup>p < .01.

<sup>c</sup>p < .05.

during sleep; mood and anxiety disorders; significant sleep parameters; insomnia complaints; and caffeine, tobacco, and alcohol intake. For the first model, all significant variables were entered into the model without including interaction terms. It was found that the following factors were significantly (at least  $p < .05$ ) associated with the report of VBS: being between 15 to 44 years of age (odds ratio [OR] = 3.2), being male (OR = 2.0), bruxism (OR = 1.8), having hypnic jerks (OR = 2.0), reporting hypnagogic hallucinations (OR = 1.9), having a diagnosis of obstructive sleep apnea syndrome (OR = 3.2), having been hospitalized within the past year (OR = 2.0), having abrupt awakenings from sleep accompanied with a panicky scream (OR = 2.8), reporting daytime sleepiness (OR = 2.9), and sleep talking (OR = 3.8).

Since an important number of VBS subjects displayed insomnia complaints, and/or had a mental disorder, it was important to determine whether the differences noted between VBS and non-VBS subjects were related to the presence of a mental disorder or an insomnia complaint rather than to the effects of VBS. Interaction terms were entered into the model in order to verify whether

the presence of mental disorders or insomnia complaints modified each of the odds ratios listed above.

Four variables had no significant interaction with insomnia complaints or mood or anxiety disorders: the presence of VBS was significantly associated with having abrupt awakenings from sleep accompanied with a panicky scream (OR = 4.0), bruxism (OR = 2.2), reporting hypnagogic hallucinations (OR = 1.7), and having hypnic jerks (OR = 1.8).

The variable of hospitalization within the past year was significantly related to subjects with anxiety disorders (OR = 2.5) or insomnia complaints (OR = 4.4) and to those without disorder or complaint (OR = 2.6), while mood disorders had no effect on this variable. Similarly, the variable of sleep talking was also significantly related to subjects with anxiety disorders (OR = 62.1), mood disorders (OR = 7.0), or both disorders (OR = 22.3) and to those without disorder or insomnia complaint (OR = 4.4). Daytime sleepiness was significantly related to subjects with mood disorders (OR = 15.3) and to those without disorder or insomnia complaint (OR = 3.5); anxiety disorders and insomnia complaint had no effect. Interestingly, a diagnosis of obstructive sleep apnea syndrome was significantly related to VBS only when an anxiety disorder was present; whether alone (OR = 28.9), in association with mood disorder (OR = 48.5), or in association with mood disorder and insomnia complaint (OR = 29.3). Drinking alcohol in bed was significantly related to the presence of VBS only when insomnia complaint was present, whether alone (OR = 6.3) or accompanied by mood disorder (OR = 29.6). Finally, subjects with mood disorder without nocturnal symptoms had a lower risk of reporting VBS (OR = 0.01).

## DISCUSSION

To our knowledge, this study is the first attempt to estimate the prevalence of violent or injurious behaviors occurring in sleep in the general population. The most important finding emerging from this epidemiologic study was the observed measurable correlation between sleep disorders and potentially violent behavior during the sleep period. Of the subjects in our study, 2.1% exhibited such behavior while asleep and were mostly males. It is likely that this percentage represents an underestimation of the correlation between sleep disorders and harmful behaviors, since our findings were based on self-reports and probably involved subjects who for various reasons would fail to report incidents of violence during sleep.

Furthermore, one can reasonably suppose that only a small number of these subjects will seek medical help for these behaviors during sleep since there were no serious consequences for most cases (only 15 cases reported having already hurt themselves or their bed partners). It is imperative that further studies are conducted to confirm our reported prevalence rate. These violent behaviors were minimally related to REM sleep behavior disorder, which apparently occurred in only 0.5% of the sample. Clear clinical diagnoses of REM sleep behavior disorder for subjects presenting with such behavior are, of course, difficult without accompanying polysomnographic studies.

Violent or injurious behaviors during sleep may relate to various sleep disorders such as sleepwalking, nocturnal terrors, sleep apnea, nocturnal panic attacks, or confusional arousals. Neurologic disorders, such as nocturnal seizures and Parkinson's disease, may also produce these eruptive types of harmful behavior.<sup>3,5,6,14-23</sup> The common denominator of these disorders is that the individual is lacking awareness at the time of the episode. In some cases, as in sleepwalking or nocturnal terrors, there is complete amnesia of events that have produced the behavior and of what has provoked it. In the case of REM sleep behavior disorder, the subject is unaware at the time of acting out a dream but is generally able to describe the dream on awakening. The majority of case histories described in the literature<sup>1,4-6,8,23,34</sup> report a correlation between sleepers who perform destructive acts and accounts of vivid dreams in which the sleeper defends against an assailant or protects a loved one from harm. These descriptions closely coincide with the content of hypnagogic hallucinations reported by subjects of our study who assert having had a vivid experience of being attacked.

A number of studies<sup>16,35</sup> have also reported that subjects exhibiting violent or injurious behaviors during sleep displayed various other sleep events (vocalizations, bruxism, significant limb movements); these observations matched reports from subjects in our survey. Schenck et al.<sup>36</sup> described prodromal symptoms of REM sleep behavior disorder (appearing 10 to 40 years before the full manifestation of REM sleep behavior disorder), which were characterized by sleep talking or yelling or limb jerking during sleep—symptoms presented by many VBS subjects in our study. The presence of excessive limb movement in sleep, as reported by 70.8% of our VBS patients, has been described as altered phasic motor activity.<sup>37</sup>

The association between violent behavior and sleep apnea has also been underlined in several studies.<sup>16,20,38</sup> One study found that cerebral hypoxia provoked by recurrent

breathing pauses during sleep may, in the long term, cause excessive daytime sleepiness, motor vehicle accidents, or impulsive behaviors on awakening, or even lead to cerebral damage.<sup>16</sup> Sudden awakening when the subject is in a relative state of cerebral anoxia may cause a confusional state expressed in violent behavior.<sup>10</sup> In our study, 10% of our VBS subjects suffered from obstructive sleep apnea syndrome, which is usually accompanied by excessive daytime sleepiness. However, the strong association between obstructive sleep apnea syndrome, anxiety disorder, and VBS reports suggests that a part of our obstructive sleep apnea syndrome subjects, rather, may have nocturnal panic attacks, which is another disorder where VBS is also likely to occur. Unfortunately, since our study is based only on self-report, we cannot confirm which diagnosis was the most suitable for these subjects.

Psychiatric disorders, mostly depressive disorders, are observed in 20% to 25% of patients with injurious sleep behavior.<sup>16,37,39</sup> In our study, we found that a significant number of VBS subjects had psychiatric disorders, with mood disorders accounting for 16%. In clinical studies, harmful sleep behaviors were rarely found to be the consequence of psychiatric disorders. Previous studies of REM sleep behavior disorder<sup>8,39</sup> and sleep-related injury patients<sup>16,38</sup> found neurologic diseases to be associated with the disorder in only 10% to 30% of cases and psychiatric disorders in less than 10% of cases. Thus, in more than 50% of patients complaining of violent behavior in sleep, the disorder was unrelated to a specific mental or neurologic syndrome or disease. REM sleep behavior disorder remained a sleep disorder of the elderly, with dementia and Parkinson's disease ranking first as the cause.<sup>36</sup> However, our study group was derived from the general population (rather than the sleep center-oriented studies that consisted of older subjects) and involved a wider age span than that of Schenck et al.<sup>8,16,38</sup> Furthermore, dementia and Parkinson's disease are handicapping diseases that require the institutionalization of the patients in most cases. Thus, there is little chance such subjects have been included in our study. Our finding is that VBS appears more often among young subjects, most of whom are between the ages of 30 and 35. As illustrated by the results of multivariate analyses, the presence of a mental disorder plays a significant role in the explanation of VBS only when accompanied by other nocturnal manifestations or symptoms; anxiety disorder alone is nonsignificant and mood disorder alone has a significantly lower risk for VBS. However, when

nocturnal symptoms are present, the co-occurrence of a mental disorder multiplies the effect on VBS risk.

Alcohol consumption during daytime had no influence on VBS report. However, when alcohol is taken at bedtime—which is often used as a self-remedy for insomnia—the risk of reporting VBS is considerably increased in subjects with insomnia and still higher when a mood disorder is also coexistent. In these cases, one may hypothesize that alcohol intake at bedtime plays a triggering role in VBS occurrence.

Epidemiologic studies such as ours have some limitations to keep in mind. The results are based on self-report, which means that diagnoses and importance of symptoms are quoted according to the perception of the subject rather than derived from a clinical interview. Furthermore, as we have underlined previously, polysomnographic recordings were not performed. Sleep diagnoses were based on minimal criteria as defined by the International Classification of Sleep Disorders.<sup>2</sup> Consequently, results must be interpreted given these reservations.

Research on VBS in human subjects is quite recent and has been receiving more attention in the past 10 years, but still, studies on this topic remain scanty. Our results clearly show that a constellation of symptoms accompany VBS, which could prove useful for the identification of subjects with high risk of developing VBS. However, further clinical and epidemiologic studies are critical if we are to fully understand this important sleep phenomenon.

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## Instructions

Psychiatrists may receive 1 hour of Category 1 credit toward the American Medical Association Physician's Recognition Award by reading the article starting on page 369 and correctly answering at least 70% of the questions in the quiz that follows.

1. Read each question carefully and circle the correct corresponding answer on the Registration form.
2. Type or print your full name, address, phone number, and fax number in the spaces provided.
3. Mail the Registration form along with a check, money order, or credit card payment in the amount of \$20 to: Physicians Postgraduate Press, Office of CME, P.O. Box 752870, Memphis, TN 38175-2870.

4. For credit to be received, answers must be postmarked by the deadline shown on the CME Registration form. After that date, correct answers to the quiz will be printed in the next issue of the *Journal*.

All replies and results are confidential. Answer sheets, once graded, will not be returned. Unanswered questions will be considered incorrect and so scored. Your exact score can be ascertained by comparing your answers with the correct answers to the quiz, which will be printed in the *Journal* issue after the submission deadline. The Physicians Postgraduate Press Office of Continuing Medical Education will keep only a record of participation, which indicates the completion of the activity and the designated number of Category 1 credit hours that have been awarded.

1. **Violent or injurious behaviors during sleep may occur during:**
  - a. REM sleep behavior disorder
  - b. Nocturnal seizures
  - c. Sleep drunkenness
  - d. Sleepwalking
  - e. All of the above
2. **Violent or injurious behaviors are:**
  - a. Always accompanied by a complete amnesia for events that have produced the behavior
  - b. Always accompanied by a complete recall for events that have produced the behavior
  - c. Always the result of a neurologic disorder
  - d. Characterized by a lack of awareness at the time of the episode
  - e. None of the above
3. **Which of the following behaviors is not a violent or injurious behavior that may occur during sleep?**
  - a. Self-mutilating injuries
  - b. Hypnic jerks
  - c. Benign acting out such as brushes
  - d. Murder
  - e. All of the above
4. **Which type of hallucination is most likely to be associated with violent or injurious behaviors during sleep?**
  - a. Olfactory hallucinations
  - b. Hypnopompic hallucinations
  - c. Hypnagogic hallucinations
  - d. Gustative hallucinations
  - e. All of the above

5. **Which of the following affirmations is true?**
  - a. The prevalence of violent or injurious behaviors during sleep is 5% in the general population
  - b. The prevalence of violent or injurious behaviors during sleep is lower in subjects with a mental disorder
  - c. Bedtime alcohol intake increases the risk of violent or injurious behaviors during sleep
  - d. Alcohol consumption may prevent the occurrence of violent or injurious behaviors during sleep
  - e. Answers a and c only
6. **This epidemiologic study outlined that:**
  - a. Violent behaviors during sleep most often occur in elderly subjects
  - b. Daytime alcohol intake is a risk factor of violent behaviors during sleep
  - c. Use of sleep-enhancing, anxiety reducing, or antidepressant medications increase the likelihood of violent behaviors during sleep
  - d. Violent behaviors during sleep are associated with other parasomnias such as abrupt awakening from sleep accompanied by a panicky scream, period of sleepwalking, and mental confusion on waking up
  - e. All of the above
7. **Which of the following mental disorders or neurologic diseases is associated with violent or injurious behaviors during sleep?**
  - a. Nocturnal panic attacks
  - b. Depressive disorders
  - c. Parkinson's disease
  - d. Dementia
  - e. All of the above

**Circle the one correct answer for each question.**

1.	a	b	c	d	e
2.	a	b	c	d	e
3.	a	b	c	d	e
4.	a	b	c	d	e
5.	a	b	c	d	e
6.	a	b	c	d	e
7.	a	b	c	d	e

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**Please evaluate the effectiveness of this CME activity on a scale of 1 to 5 (1 being poor, 5 being excellent).**

1. Overall quality of this CME activity \_\_\_\_\_
2. Content \_\_\_\_\_
3. Format \_\_\_\_\_
4. Faculty \_\_\_\_\_
5. Achievement of educational objectives:
  - A. Enabled the reader to heighten his/her awareness that physical injuries occurring during sleep or upon awakening may be the result of a sleep pathology that may need medical treatment in order to prevent such injuries. \_\_\_\_\_
  - B. Enabled the reader to distinguish the different forms of parasomnia and identify which of them are more likely to produce violent or injurious behaviors during sleep. \_\_\_\_\_
  - C. Enabled the reader to recognize the symptoms accompanying violent behaviors during sleep so that the participant can identify patients who may have such sleep problems. \_\_\_\_\_
6. This CME activity provided a balanced, scientifically rigorous presentation of therapeutic options related to the topic, without commercial bias. \_\_\_\_\_
7. Please comment on the impact that this CME activity might have on your management of patients.

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8. Please offer additional comments and/or suggested topics for future CME activities.

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