

# EDITORIAL

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## Violence and Sleep

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### DEFINITION OF THE CONCEPT

In the common beliefs, violence during sleep evokes images of dramatic murders or suicides. However, violent or injurious behaviors during sleep are not limited to these two types of acts. A violent behavior can be harmful (or potentially harmful). It includes a broad range of behaviors: benign dream enactment (kicking, jumping out of bed, running) self-mutilation, sexual assault, murder attempt, murder and suicide. The issue in most cases is without consequences but the behavior involves a potential danger. The violent behavior during sleep can be directed to other individuals, to objects or property, or self but is always unintentional. The common denominator is that the sleeping violent individual is unaware of the behavior she/he is committing and has a complete amnesia of its actions. Upon awakening, some individuals having a (non-rapid eye movement sleep NREM) parasomnia remember having frightening dream during the night but cannot provide a detailed account of the dream while in (rapid eye movement sleep REM) parasomnia, the subject can narrate the dreams upon awakening but there is also a complete amnesia of its dream enactment. These dreams are mainly centered on defending oneself against attacks from others or beasts, trying to escape a danger or to protect a loved one against potential danger.

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### HISTORICAL PERSPECTIVE

The world of sleep, especially that of dreams, has been studied from ancient history where it was associated with divination and prophecy. Even before that time, the potential for danger when an individual is abruptly awakened was already known by primitive tribes. Their belief was that a sleeper should not be awakened because the soul does not have time to return to the body (1). Sleep-related violence has for a long time caught the imagination because it lacks of rational explanation for the acts. The earliest detailed account of violent behavior during sleep can be found in *The Odyssey* (Homer, book 10). Elpenor, a companion of Ulysses, spent a part of the evening to drink with his companions. During the night, he was suddenly awoken by a noise. He was in a confusional state and he forgot all about coming down by the main staircase; he tumbled right off the roof and broke his neck. In the legal records, one should return in 1313 to find a report from the Council of Vienne (France) stating that a sleeper killing or wounding someone should not be yield guilty (2). Malingering was also a matter of concern: Covarrubias, a Spanish canonist from the 16th century, concluded that an individual cannot be guilty for acts he committed while asleep unless he arranges matters in such a way to make believe he was asleep when committing the acts. A similar warning was also emitted by Matthaeus, a Dutch jurist of the 17th century and Mackenzie, a Scottish jurist also from the same century. Both concluded that crime carried out by a sleeper are punishable if there is evidence of animosity toward the victim while awake (3).

Since 1900, three literature reviews (scientific papers, court reports, newspapers) of murdering while asleep has been published (see table 1). The first reviews (4,5) reflected the knowledge of sleep and its disorders: at least 8 cases cannot be considered as being in a confusional state at the moment the murder was committed. They were more likely to be sleepwalking episodes or did not contain enough information to be classified as sleep homicide. Since the review done by Bonkalo in 1974 (3), 29 other cases of homicide or assaults during sleep have been published in the scientific literature (Table 1).

jects with violent or harmful behavior during sleep than the nonviolent subjects, as were hypnagogic hallucinations (especially the experience of being attacked), the incidence of smoking, caffeine and bedtime alcohol intake.

## DISORDERS INVOLVING VIOLENT BEHAVIORS DURING SLEEP

Violent behaviors may occur in both sleep stages: In NREM sleep, the muscle tone is diminished but remains present allowing the sleeper to move and even to perform complex motor activities such as

Table 1. Literature review of cases with forensic implications

Authors	N of cases	Issue
Confusional arousals		
Gudden (1905) (4)	18	10 homicides, 8 non-fatal assaults
Schmidt (1943) (5)	35	15 homicides, 20 non-fatal assaults
Langel deke (1955)	4	3 homicides, 1 sexual assault
Bonkalo (1974) (3)	50	20 homicides, 30 non-fatal assaults
(included some of the cases quoted by Gudden and Schmidt)		
Raschka (1984) (27)	1	assault
Nofzinger & Wettstein (1995) (28)	1	homicide (offender found guilty)
Somnambulism (with or without sleep terrors)		
Hopwood & Snell (1933) (29)	1	Homicide
Podolsky (1961) (30)	6	5 homicides, 1 suicide
Brookes (1974) (31)	1	Non-fatal assault
Watkins (1976) (32)	1	Homicide
Luchins et al (1978) (33)	1	Homicide
Hartmann (1983) (34)	1	Homicide
Oswald & Evans (1985) (35)	3	3 non-fatal assaults
Tarsh (1986) (36)	1	Non-fatal assault
Howard & d Orban (1987) (37)	2	1 homicide, 1 non-fatal assault
Brahams (1991) (38)	1	Non-fatal assault
Ovuga (1992) (39)	1	Homicide
Broughton et al (1994) (40)	1	Homicide
Moldofsky et al (1995) (17)	3	1 homicide, 2 non-fatal assault
Lemoine et al (1997) (41)	3	2 homicides, 1 non-fatal assault
Schenck & Mahowald (1998) (42)	1	Sexual misconduct

## EPIDEMIOLOGY

The occurrence of violent or harmful behavior during sleep is believed to be a relatively rare phenomenon. We have addressed this question in an epidemiological study (6) performed in the general population of the United-Kingdom and involving 4,972 individuals 15 years old and over. About 2% of respondents reported currently experiencing violent or harmful behavior during sleep with a higher occurrence in men. Night terrors, daytime sleepiness, sleep talking, bruxism, and hypnic jerks were more frequent in sub-

sleepwalking. In REM sleep, there is a muscle atonia, or sleep paralysis, that prevents dream enactment. Theoretically, violent behaviors during REM sleep should never occur. However, Japanese researchers have shown this safety lock is sometimes defective in humans allowing therefore the apparition of movements during REM sleep: we then assist to dream enactment in these individuals.

Violent or injurious behaviors during sleep are not an essential feature of any sleep disorder excepted for REM sleep behavior disorder, a parasomnia labeled as such by Schenck et al. in 1986 (7). However, violent behaviors have been reported in

many parasomnias: confusional arousals, sleepwalking, sleep terrors, nocturnal seizures (seizures in the orbital, mesial or prefrontal region) and episodic nocturnal wanderings (epileptiform etiology suspected). About one third of assaultive acting out in sleepwalkers was associated with an episode of sleep terror.

## EMPIRICAL STUDIES

In the last decade, 16 polysomnographic studies involving at least five cases with violent or injurious behaviors during sleep can be found in the MEDLINE. Nine of them included exclusively (or almost) REM behavioral disorder (RBD) (7-15). Two studies were devoted to sleepwalking and/or sleep terrors patients (16,17). Only one compared different parasomnias involving violent or injurious behaviors during sleep (Table 2) (18).

violent group was composed mainly of men (22/26). Both violent and harmful behaviors were more likely to occur with drug abuse (caffeine, alcohol, drugs). The best predictors of violent group membership were being a man and having <2% stage 4 sleep.

Schenck et al. (18) studied 100 consecutive adults patients with a main complaint of nocturnal injury to themselves and/or their bedpartners. About half of them were with night terrors/ sleepwalking, 36 had RBD, seven a dissociative disorder, two nocturnal seizures and one sleep apnea and periodic limb movements disorder. Some results in the night terrors/sleepwalking group were different of the current opinion about this disorder. First, in about one third of cases, the disorder began in late adolescence or adulthood; second, all NREM sleep stages are commonly involved; third, elaborate dre-

Table 2. Summary of the samples including subjects with violent or injurious behaviors during sleep

Authors	N of cases	M/F	Age range	Sleep diagnosis
Schenck et al (1986) (7)	5	4/1	60-72	RBD*
Schenck et al (1987) (8)	5	5/0	57-75	RBD
Maselli et al (1988) (20)	12	7/5	19-29	Episodic nocturnal wandering
Shimizu et al (1990) (9)	14	10/4	48-73	RBD
Sforza et al. (1988) (10)	6	5/1	42-69	RBD
Culebras & Moore (1989) (11)	6	4/2	64-74	RBD
Schenck et al (1989) (18)	100	71/29	18-79	Sleepwalking/Night terrors (n=54) RBD (n=36) Others (n=10)
Kavey et al (1990) (16)	10	6/4	18-40	Sleepwalking
Schenck et al. (1990) (12)	70	63/7	10-77	RBD
Schenck & Mahowald (1991) (13)	20	17/3	20-81	17 RBD, 3 Sleep walking/ Night terrors
Tachibana et al (1991) (19)	7	3/4	61-81	RBD
Schenck et al. (1992) (43)	17	12/5	8-74	Narcolepsy + RBD
Lapierre & Montplaisir (1992) (14)	5	3/2	44-65	RBD
Moldofsky et al (1995) (17)	64	39/25	18-71	Sleepwalking or Night terrors
Comella et al (1998) (15)	9/61	7/2		9 RBD, 52 Parkinson disease

RBD\*: REM Behavior Disorder

Kavey et al. (16) studied 10 sleepwalkers with episodes of violent behavior or self-injury. Recorded sleepwalking episodes occurred all in the NREM sleep but were not limited to the first third of the night as suggested by the classifications; near half of recorded episodes occurred in the latter 2/3 of the night.

Moldofsky et al. (17) studied 64 consecutive patients with sleepwalking or sleep terrors. They further divided the patients within three groups: those who committed serious violence during sleep to other individuals, property or self; those with harmful but not destructive behavior and non-violent behavior during sleep. The serious

amlike mentation can be present with substantial recall of nocturnal behaviors; forth, a current mental disorder was present in only one third of this group. In the RBD group, prodromal symptoms appeared 10 to 40 years before the full manifestation of the disorder in 25% of the studied cases. This prodrome is characterized by sleep talking, yelling, or limb-jerking during sleep.

The initial sample of Schenck et al. (7) to describe RBD included four men and one woman, all aged 60 years or over. Four of them had neurological disorders. In all studies, RBD is observed almost exclusively in men and is frequently associated

with a neurological disorder. The polysomnographic results showed a higher REM density than normal in all studies on RBD. Some studies reported excessive slow-wave sleep for the age of patients (7,8,11,13,14) but this was not found in other studies (19). This could be due to the heterogeneity of neurological diseases observed in RBD patients.

A study investigated 12 nonepileptic young patients with episodic nocturnal wanderings (20), a disorder that shares

episode accompanies the sleepwalking, the risk of serious violence is increased. Kales et al (21) estimated that as many as 72% of persistent adult sleepwalkers are at risk of injury. Furthermore, many conditions increase the risk of serious violence during sleep in NREM parasomnia individuals: alcohol, medication (hypnotic, tranquilizer, neuroleptic, stimulant, antihistamines) or drug intake, sleep deprivation and emotional stress (Table 3).

Men are at greater risk to have serious

Table 3. Predisposing factors, precipitants and neurological diseases associated with violent or injurious behaviors during sleep

Predisposing factors	Precipitants	Neurological diseases
Male gender	Medication intake	Arnold-Chiari type I malformation
Older age	Alcohol intake	Brainstem astrocytoma
	Drug intake	Dementia
	Irregular sleep schedule	Guillain-Barr Syndrome
	Emotional stress	Ischemic cerebrovascular disease
	Sleep deprivation	Lewy body disease
		Machado-Joseph Disease
		Multiple sclerosis
		Narcolepsy
		Olivio-ponto-cerebellar atrophy
		Parkinsonism
		Pontine tumor
		Progressive supranuclear palsy
		Shy-Drager Syndrome
		Spinocerebellar degeneration
		Stroke
		Subarachnoid hemorrhage

REM Behavior Disorder only  
NREM parasomnias only

many similarities with sleepwalking/night terrors but thought to have an epileptiform etiology because it is responding to anti-convulsants. Nocturnal seizures are difficult to capture on EEG and may have uncertain significance since they can be also observed in many other neurological conditions and also in normal subjects. In this study, the epileptiform etiology have been confirmed only in four of the twelve patients.

### CAUSES OF VIOLENT BEHAVIORS DURING SLEEP

The etiology of violent behaviors during sleep remains largely unknown in NREM parasomnias (sleepwalking, sleep terrors and confusional arousals). In theory, episodes of sleepwalking always contain a risk of violent or harmful behaviors of any nature because the subject is moving in a surrounding with a limited perception and an unawareness of the potential dangers for self. When a night terror

violent behaviors during sleep; reported homicides during sleep are almost all perpetrated by men and the wife or roommate are the most frequent victims.

In the different studies, 40% of REM behavioral disorder patients had a neurological disorder directly related with the apparition of violent behaviors during sleep. A list of the neurological diseases cited in the literature can be found in Table 3. Using magnetic resonance imaging, Culbras and Moore (11) found abnormalities in the brainstem in 5 on 6 of the studied patients: lacunar infarcts in periventricular white matter of both hemispheres (5 patients) and in the tegmentum of the pons in 3 patients. The increased tonic and phasic EMG activity in REM sleep found in the overwhelming majority of RBD patients are suggestive of lesions or microscopic lesions in dorsal pontomesencephalic areas.

Violent or harmful behaviors during sleep have been assumed to be indicative of and underlying severe psychopathology. In clinical studies, violent or harmful sleep

behaviors have seldom been found to be the consequence of mental illness. In general, mental disorder has no etiological relationship with violent or harmful behaviors during sleep. However, a mental illness can be concomitantly present. These disorders, mostly depressive disorders, are observed in 20-25% of patients with harmful sleep behavior (10,12,18). Previous studies of REM Sleep Behavior Disorder (18) and sleep-related injured patients (12) found associated psychiatric disorders in less than 10% of cases. This is further illustrated in our epidemiological study (6) where we found that the presence of a mental disorder played a significant role in explaining violent or harmful behaviors during sleep only when accompanied by other nocturnal manifestations or symptoms (e.g., sleep-talking, alcohol consumption at bedtime). Anxiety Disorder alone was non-significant and Mood Disorder alone presented a significantly lower risk for violent or harmful behaviors during sleep.

The genetic contribution in violent or harmful behaviors during sleep is unknown. Our study in Italy involving 3970 individuals suggests that such a contribution may exist. About one tenth of those reporting violent or harmful behaviors during sleep have a family member with similar behaviors. This rate was less than 1% in subjects without these behaviors (Ohayon M.M., data on file).

## FUTURE DIRECTIONS

A growing body of literature shows that parasomnias are far more complex than what we know. Data from epidemiological studies (22,23) and from clinical observations clearly show that mixed forms of parasomnias exist. For example, Kavey &

Whyte (24) reported two cases of sleep-walkers who experienced hypnagogic or hypnopompic hallucinations during the episodes which resulted in life-threatening behaviors when trying to escape from the hallucinations. Other sleep diagnoses and neurological disorders were ruled out. These appear to be a variant of the sleep-walking / night terrors association in which some individuals keep fragmentary memory of the frightening dream. A similar case has been reported by Hurwitz et al (25). These authors suggested that overlapping of several parasomnias may in fact represent a different parasomnia in its own.

In the general population, prevalence of parasomnias as a whole are much higher than many dyssomnias for example, obstructive sleep apnea, hypersomnia, narcolepsy. Therefore, why sleep disorders centers have so few cases of parasomnias? This may be partly due to the fact that many individuals with violent or harmful behavior go untreated for many years before seeking medical help, persisting instead with idiosyncratic and often ineffective remedies to suppress their acting out behaviors. Frequently, individuals with such behaviors turn to health professionals only after a dramatic or harrowing experience. Furthermore, there is a paucity of information given to the population and to the clinicians about parasomnias, their clinical manifestations and their consequences. Further researches are needed to identify what are the best predictors of violent or harmful behaviors during sleep and how we can identify these individuals. Our works have already provided some indications but supplemental efforts are needed to refine the knowledge of these phenomena.

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