Sleep-related violence (SRV) and sexual behavior in sleep (SBS) represent a challenging medical-legal issue when such behaviors are suspected or purported to have caused a criminal offense (e.g., assault, attempted murder, murder, sexual assault). Indeed, SRV and SBS can do arise from the sleep period, without full consciousness, and therefore without responsibility for the offender.1

SRV subsumes a wide spectrum of behaviors ranging from very simple or semi-purposeful behavioral manifestations to more complex, inappropriate acts that could be directed to oneself, to the bed partner, or to objects. Ohayon and Schenck found that violent or injurious behaviors during sleep (e.g., masturbation, to fondling another person, and complex sexual acts and agitated/assaultive sexual behaviors.5,9 Sleep related abnormal sexual behaviors, also called sexsomnia or sleepsex, are primarily classified as confusional arousals but have also been less commonly associated with sleepwalking,10 although some authors suggest that they be classified as a distinct entity for its unique combination of specific motor and autonomic activation.7 Abnormal sexual behaviors during sleep are also reported in association with RBD,11,12 parasomnia overlap disorder,13 obstructive sleep apnea (OSA),6,8,12,14 and sleep-related seizures.8 Besides several scientific articles addressing forensic issues of SRV and SBS,4,8,15-25 two previous works have reviewed criminal cases implicating sleep disorders.26,27 However, both the above reviews present two limitations. First, they combined different types of reports (medical and legal) and sources (articles, books, media) without a systematic approach. Second, collecting cases available until 1979, when the first “Diagnostic classification of sleep and arousal disorders” was published.28

The present review focuses on medical-legal cases published since 1980 in which a sleep disorder was purported as defense during the criminal trial. Sleep experts’ reports and testimonies were pivotal in these cases, whether they were appointed by the prosecution, by the defense, or by the court.
The research questions were:
a) What were the legal issues of these cases?  
b) What were the defendant and the victim characteristics?  
c) What circumstantial factors were identified?  
d) What type of forensic evaluation was carried out?  
Additionally, recommendations for a sleep expert evaluation are provided.

### METHODS

**Inclusion Criteria**

We included articles written in English published from 1980 to 2012 reporting cases in which a sleep disorder was purported as the defense during a criminal trial and in which information about the forensic evaluation of the defendant was provided.

### Search Strategy and Study Selection

An electronic literature search of articles published from January 1980 through December 2012 was performed in Pubmed and PsychINFO databases. Two search strategies were used. The first included terms indexed in MeSH and Thesaurus vocabularies respectively: (crime OR criminal law OR insanity defense (defence)) AND (sleep OR parasomnia*). The second search was performed with the following free terms: “sleep violence” OR “violent behavior during sleep” OR “sleep-related violence” OR “sexsomnia” OR “sleep sex” OR “sleep-related abnormal sexual behavior” OR “sleepwalking defense (defence).”

Two of the review authors screened titles and abstracts independently to identify potentially relevant articles. The reference lists of these articles were also screened for additional relevant sources. Two reviewers obtained and scrutinized the full texts of articles of interest. Disagreements were resolved by a third reviewer.

### Data Extraction and Assessment

Three of the authors extracted from each case a set of medical-legal key elements (Table 1). A qualitative-comparative assessment of cases was performed.

### RESULTS

We found 699 references; all abstracts were screened and 62 articles with potentially relevant material were examined in detail, leading to the final identification of 27 articles (26 in Pubmed and 1 in PsychINFO), containing a total of 35 medical-legal cases.

Sixteen of the above 27 articles, reporting a total of 18 cases (9 of SRV and 9 of SBS), met the inclusion criteria (Figure 1). The selected articles were published from 1985 to 2011 and included 9 single case reports, 9 sleep-related violence cases, 9 sexual behavior in sleep cases, and 1 in a sexual medicine journal. In cases fulfilling the

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**Table 1—Medical-legal key elements**

<table>
<thead>
<tr>
<th>Legal issues</th>
<th>Charge</th>
<th>Defense</th>
<th>Verdict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defendant characteristics</td>
<td>Gender</td>
<td>Age</td>
<td>Occupation</td>
</tr>
<tr>
<td>Victim characteristics</td>
<td>Gender</td>
<td>Age</td>
<td>Relationship with defendant</td>
</tr>
<tr>
<td>Circumstantial factors</td>
<td>Proximity</td>
<td>Timing (interval between the defendant’s sleep onset and the event)</td>
<td>Current psycho-physical condition of defendant at the time of the event</td>
</tr>
<tr>
<td>Forensic evaluation</td>
<td>Clinical examination (physical, neurologic, psychiatric)</td>
<td>PSG</td>
<td>Other evaluations (EEG, brain MRI, MSLT, brain CT, blood/urine tests, neuropsychological tests, scales, etc.)</td>
</tr>
</tbody>
</table>

PSG, polysomnography; EEG, electroencephalogram; MRI, magnetic resonance imaging; MSLT, multiple sleep latency test; CT, computerized tomography.
inclusion criteria but lacking data regarding the trial outcome, we directly contacted the authors. Each case was summarized in terms of the description of the event, the legal charge(s), the defense, the forensic evaluation, and the court verdict (Table 2 and Table 3).

The remaining 11 articles, reporting a total of 18 cases, were excluded because it was not clear whether the sleep disorder was actually purported as the defense during the trial, or because information about the forensic evaluation was lacking. A description of excluded cases is reported in Table S1 (supplemental material).

**Sleep-Related Violence Cases (Table 2)**

**Legal Issues**

All 9 SRV cases reported on a single criminal episode. The legal charge was “murder” in 5 cases (including case B reported by Howard and D’Orbán), 30,32-34,36 “attempted murder” in 3 cases (with case A reported by Howard and D’Orbán), 29,30,35 and “murder and attempted murder.” 31

At trial, the defense was based on sleepwalking in 6 cases, 29,31,33-36 on night terrors in 2 cases, 30 and on a confusional state related to arousals associated with OSA in 1 case. 32

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### Table 2—Sleep-related violence cases

<table>
<thead>
<tr>
<th>Authors</th>
<th>Description</th>
<th>Charge</th>
<th>Defense</th>
<th>Forensic evaluation and expert’s conclusion</th>
<th>Verdict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oswald and Evans, 1985</td>
<td>A 14-year-old schoolboy stabbed his 5-year-old female cousin with a bread knife after checking on her during the night.</td>
<td>Attempted murder</td>
<td>SW</td>
<td>Psychiatric evaluation, including family interviews; EEGs. Conclusion: SW.</td>
<td>Case deserted</td>
</tr>
<tr>
<td>Howard and D’Orbán, 1987 (case A)</td>
<td>A 17-year-old male trainee computer operator attacked his sleeping 18-year-old friend with a club and a knife. He was sleeping on the floor nearby the victim’s bed.</td>
<td>Attempted murder with intent</td>
<td>NT</td>
<td>Psychiatric and neurological evaluation; fasting blood sugar; EEG. Conclusion: NT.</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Howard and D’Orbán, 1987 (case B)</td>
<td>A 34-year-old salesman strangled his wife while dreaming of being chased by two armed Japanese soldiers. They were sleeping together in their bed.</td>
<td>Murder</td>
<td>NT</td>
<td>Psychiatric and neurological evaluation; psychological tests; EEG. Conclusion: NT.</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Broughton et al., 1994</td>
<td>A 23-year-old recently unemployed man drove 23 km to the home of his wife’s parents, where he beat and stabbed his mother-in-law, who died, and strangled his father-in-law, who survived.</td>
<td>First degree murder, and attempted murder</td>
<td>SW</td>
<td>Clinical assessment*; EEGs; brain CT; 2 PSGs. Conclusion: SW.</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Nofzinger and Wettstein, 1995</td>
<td>A 37-year-old male laborer, possibly dreaming about deer hunting, shot and killed his wife (unclear if they were sleeping together).</td>
<td>First degree murder</td>
<td>OSA</td>
<td>Pulmonary examinations; video-PSG. Conclusion: severe OSA that could be associated with confusion and memory loss.</td>
<td>Conviction</td>
</tr>
<tr>
<td>Kayumov et al., 2000</td>
<td>A 26-year-old unemployed man was accused of first-degree murder of his girlfriend’s 2-year-old daughter after he awoke to find her covered in blood and not breathing.</td>
<td>First degree murder</td>
<td>SW</td>
<td>Mental status examination; hypnotic interview; 2 video-PSGs. Conclusion: parasomnia diagnosis not supported.</td>
<td>Conviction</td>
</tr>
<tr>
<td>Cartwright, 2004</td>
<td>A 42-year-old electrical engineer stabbed and killed his wife, leaving her body outside near the pool.</td>
<td>First degree murder</td>
<td>SW</td>
<td>Forensic workup as in the case reported by Broughton et al. plus 4 night PSGs (including a night with sound-induced arousals). Conclusion: SW followed by sleep terror.</td>
<td>Conviction</td>
</tr>
<tr>
<td>Poyares et al., 2005</td>
<td>A 26-year-old Hispanic, recently married man threw his son out of a 3rd floor window and then ran into the street.</td>
<td>Attempted murder</td>
<td>SW</td>
<td>Psychiatric evaluation; EEG; brain CT; video-PSG. Conclusion: SW.</td>
<td>Case dropped</td>
</tr>
<tr>
<td>Ebrahim and Fenwick, 2008</td>
<td>A 22-year-old man beat his father to death after going to sleep after a night of drinking.</td>
<td>Murder</td>
<td>SW</td>
<td>Mental and cognitive state assessment; neuropsychological tests; brain MRI; EEG; 5 night video-PSGs (including a night with verbal and tactile provocation, a night with alcohol challenge, and a PSG after 36h of sleep deprivation). Conclusion: confusional arousal into what was a SW episode.</td>
<td>Acquittal</td>
</tr>
</tbody>
</table>

*Clinical assessment included the following: psychiatric and neurological evaluation; sleep assessment (personal and family sleep/wake history, also from family members and from cell mates); psychological assessment and tests. SW, sleepwalking; EEG, electroencephalogram; NT, night terrors; CT, computerized tomography; PSG, polysomnography; OSA, obstructive sleep apnea; MRI, magnetic resonance imaging.
Table 3—Sexual behavior in sleep cases

<table>
<thead>
<tr>
<th>Authors, Year</th>
<th>Description</th>
<th>Charge</th>
<th>Defense</th>
<th>Forensic evaluation and expert’s conclusion</th>
<th>Verdict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thomas, 1996</td>
<td>38-year-old male mechanic with a long-term partner was found drinking a beer while naked in a major urban thoroughfare.</td>
<td>Indecent exposure</td>
<td>SW</td>
<td>Psychiatric evaluation of the defendant and telephone interview of the partner. Conclusion: SW.</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Borum and Appelbaum, 1996</td>
<td>31-year-old single man loudly knocked on door of communal bathroom while yelling; when the female occupant opened the door, he pushed and struggled with her, and his hand touched her breast.</td>
<td>Indecent assault/ battery, assault with intent to rape</td>
<td>Not explicitly stated</td>
<td>Neurological evaluation. Conclusion: nocturnal complex partial seizure.</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Ingravallo, Poli, Gilmore et al., 2002</td>
<td>26-year-old man, with partner, engaged in sexual behavior with his friend’s 4-year-old daughter, who had crawled into bed with him during the night.</td>
<td>Sexual misconduct</td>
<td>SW</td>
<td>Interviews of defendant, his mother, his sister and his current partner. Conclusion: parasomnia.</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Rosenfeld and Elhajjar, 1998</td>
<td>45-year-old married businessman fondled his 14-year-old daughter’s female friend, who was sleeping downstairs in the living room of his house.</td>
<td>Sexual battery</td>
<td>SW</td>
<td>Neurologic and psychiatric evaluation. Conclusion: SW.</td>
<td>NR</td>
</tr>
<tr>
<td>Guilleminault et al., 2002</td>
<td>18-year-old single student placed his finger into the vagina of a young woman who was sleeping in the vicinity.</td>
<td>Sexual assault</td>
<td>SW</td>
<td>Clinical assessment*; 2 urine drug tests; EEG in regular and sleep-deprived conditions; video-PSG; MSLT. Conclusion: NREM parasomnia.</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Shapiro et al., 2003 (case CJ)</td>
<td>35-year-old married man sexually touched his 9-year-old daughter, who had climbed into bed with her parents during the night.</td>
<td>Sexual touching</td>
<td>Not explicitly stated</td>
<td>Video-PSG study. Conclusion: parasomnic behavior.</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Shapiro et al., 2003 (case AF)</td>
<td>32-year-old single unemployed man inserted a finger into the vagina of a 10-year-old girl with whom he was sharing a bed.</td>
<td>Sexual assault</td>
<td>Not explicitly stated</td>
<td>Video-PSG study. Conclusion: parasomnia.</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Ebrahim, 2006</td>
<td>22-year-old single employed man rapidly penetrated a female friend orally, anally, and vaginally; they were sleeping in different rooms in the defendant’s house after a party.</td>
<td>Three counts of rape</td>
<td>SW</td>
<td>Medical, psychiatric and neurological evaluations; Epworth Sleepiness Scale; 3 night PSGs (including a night with alcohol challenge). Conclusion: SW.</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Cicolin et al., 2011</td>
<td>38-year-old divorced man repeatedly fondled the 8-year-old daughter of his current partner over a 6-month period.</td>
<td>Repeated sexual fondling</td>
<td>Sleepsex</td>
<td>Clinical assessment*; standard EEG; brain MRI; 5 night PSGs (4 under sleep restriction at 4 h/night), Conclusion: parasomnia overlap disorder (SW, sexual behavior during sleep, RBD).</td>
<td>Acquittal</td>
</tr>
</tbody>
</table>

*Clinical assessment included the following: (1) general medical evaluation with associated review of charts and test results obtained by private physicians during past years, including medication, drug, and alcohol intake; (2) sleep disorders evaluation by: scales (Sleep Disorders Questionnaire, Epworth Sleepiness Scale, Fatigue Scale); interviews of defendant, bed partners, and if possible other family members; clinical examination; (3) clinical neurological and psychiatric evaluation. *Clinical assessment included the following: general medical evaluation, sleep disorders evaluation (including interviews of defendant, bed partners, and if possible other family members), neurologic evaluation, and clinical psychiatric evaluation. SW, sleepwalking; EEG, electroencephalogram; PSG, polysomnography; MSLT, multiple sleep latency test; MRI, magnetic resonance imaging; RBD, REM behavior disorder.

The verdict was in favor of the defendant in 6 of 9 cases: 4 defendants were acquitted, while in 2 trials the charges were dropped. In 3 cases, the defendant was convicted.

**Defendant Characteristics**

All 9 defendants were male, with a mean age 26.8 ± 9.3 years (range 14-42 years). Seven reports mentioned the defendant’s occupation at the time of the event: 3 defendants were employed (including case B from Howard and D’Orbán), 2 were students (including case A from Howard and D’Orbán), and 2 were unemployed. In 6 cases, the defendants were married (including case B from Howard and D’Orbán) or had a partner. Previous criminal history was mentioned in 6 cases: although defendants did not have convictions, a history of previous shoplifting, episodes of theft at work, and abusive behaviors towards previous and current wives and children were reported.

An ongoing sleep disturbance was reported in 4 cases: sleepwalking, sleep talking, sleepwalking associated with sleep talking and enuresis, and night wandering episodes with a
long history of snoring, respectively. Prior histories of parasomnias were reported in 4 cases in 5 of 8 cases with an ongoing or past sleep disorder, sleep-related complex behaviors (including Howard and D’Orbán case B), and were reported, along with 3 cases of sleep-related violent behaviors (with Howard and D’Orbán case B). Consequences of a serious head injury three years previously (mild disability and moderate degree of residual posttraumatic personality change) were reported in 1 case (Howard and D’Orbán case B), and a history of pathological gambling in another.

Information about the defendant’s family sleep history was reported in 4 of 9 cases and included isolated sleepwalking or multiple parasomnias (sleepwalking, sleep talking, sleep terrors, bedwetting, and confusional arousals or bruxism). In 1 case, there was a negative family history for any sleep disorder.

**Victim Characteristics**

Of 10 victims, 6 were females. The victims were 7 adults and 3 minors, but their exact age was reported only in 3 cases (including Howard and D’Orbán case A). In only 1 case, the crime had 2 victims, the defendant’s parents-in-law. The other victims’ relations to the defendant included 1 son, 1 father, 3 wives (including Howard and D’Orbán case B), 1 daughter of a partner, 1 cousin, and 1 friend (Howard and D’Orbán case B).

**Circumstantial Factors**

In most of the cases, the defendant and the victim were sleeping under the same roof: in the same bed in 1 case (Howard and D’Orbán case B), in the same room in 1 case (Howard and D’Orbán case A), in different rooms in 3 cases, while in 3 other cases it was not specified whether they were sleeping in the same room or bed. In 1 case, the defendant was sleeping at home prior to the abrupt onset of sleepwalking and driving 23 kilometers to the victims’ house.

The time span between the defendant’s sleep onset and the criminal event was reported in 6 of 9 cases; in all the cases, the criminal event occurred within 1 to 2 hours after the defendant’s sleep onset.

Details about the psycho-physical condition of the defendant at the time of the alleged event included: exposure to stress, unspecified or excessive alcohol intake, fatigue along with caffeine overuse (with Howard and D’Orbán case A), either alone or variably associated.

**Forensic Evaluation**

The forensic evaluation of the defendant included routine electroencephalogram (EEG) and a psychiatric and/or neurological assessment in 3 cases, and polysomnography (PSG) in 6 cases (the number of recorded nights ranged from 1 to 6). Provocative stimuli during the PSG were administered in 2 cases: “sound induced arousals” in 1 case, and “verbal and tactile provocation,” “alcohol challenge,” and 36 hours of sleep deprivation (each provocation was administered on non-consecutive nights) in the other case. Detailed PSG findings were described in all cases who underwent sleep-lab studies. All the defendants who underwent PSG study also had additional clinical and/or instrumental evaluations (psychological/mental/cognitive assessments and tests; EEG; brain computerized tomography; brain magnetic resonance imaging, etc.). Seven of 9 defendants had a final diagnosis of parasomnia: sleepwalking in 3 cases, in 2 cases, “confusional arousal into what was a sleepwalking episode” in 1 case, and “sleepwalking followed by sleep terror” in 1 case. The expert evaluation did not support the diagnosis of parasomnia in 1 case and resulted in a diagnosis of severe OSA in another.

**Sexual Behavior in Sleep Cases (Table 3)**

**Legal Issues**

The allegation regarded a single episode in all cases but one. Charges were: “sexual battery/assault” in 3 cases (including case AF reported by Shapiro et al.), “sexual touching/fondling” in 2 cases (including Shapiro et al. case CJ), “indecent exposure” in 1 case, “indecent assault and battery with intent to rape” in 1 case, “sexual misconduct” in 1 case, and “three counts of rape” in 1 case.

At trial, the defense was based on sleepwalking in 5 cases, and on “parasomnia including sleepsex” in 1 case. In 3 cases, the legal defense was not explicitly stated, but the authors reported that evidence of a parasomnia and of epileptic postictal aggression were accepted in court.

In 7 of 9 cases, the verdict was reported and was in favor of the defendant. In 1 of the remaining 2 cases in which the trial outcome was unknown, we obtained information that the verdict was in favor of the defendant.

**Defendant Characteristics**

All 9 defendants were male, with a mean age of 31.7 ± 8.5 years (range 18-45 years). Five reports provided details on the occupations of the defendants at the time of the event: 3 were employed, and 1 was a student, and 1 was unemployed (Shapiro et al. case AF). The marital status of the defendants was reported in all cases: 5 were married (including Shapiro et al. case CJ) or had a partner, and 4 were single (including Shapiro et al. case AF). Reference to a prior criminal history was provided in 4 cases: 2 defendants had no previous charges or convictions, a 38-year-old man had been arrested for burglary at the age of 18, and had a conviction for driving while intoxicated.

In 6 of 9 cases, the defendants had a long clinical history of either isolated persistent sleepwalking, sleepwalking in association with other parasomnias, or snoring. Associated parasomnias consisted of sleep talking in 4 cases, (coupled in 1 case with sleep terrors and enuresis), and in 1 case sleep terrors and sleep behaviors. In 4 cases, parasomnias were characterized by complex behaviors, and in 2 cases included sexual elements. In 1 case the defendant had a history of nocturnal complex partial seizures, followed by periods of postictal wandering and confusion.

Clinical history was less suggestive in the remaining 2 cases, both reported by Shapiro et al.: AF had a history of sleep talking but exhibited sleepwalking on only one occasion; while in the case of CJ, the defendant’s sleep history was based upon
his wife’s recall, who reported that “there probably were times that he had spoken in his sleep (mumbling).”

Regarding past clinical features apart from sleep, a head injury at age 4 years and a gunshot wound to the head at age 22 years were reported in 1 case, and a history of previous alcohol abuse was reported in 2 cases (including the case AF by Shapiro et al.).

Information about the defendant’s family sleep history was reported in 4 of 9 cases and included sleepwalking in 2 cases, parasomnia not otherwise specified in 1 case (AF by Shapiro et al.), and sleepwalking plus sleep talking in the other one.

**Victim Characteristics**

With the exception of the indecent exposure case, in which the defendant was seen by a male driver of an automobile to be drinking a beer while naked in a major thoroughfare, in all cases the crime had a single female victim. The exact age of the victims was reported in 4 cases (7.7 ± 2.6 years, range 4-10 years), while in 2 cases the victims were only described as being “teenager.” In 1 case the victim’s relation to the defendant was reported in 5 cases: a daughter (case CJ by Shapiro et al.), a partner’s daughter, a friend of defendant’s daughter, a friend, and a housemate, respectively.

**Circumstantial Factors**

In 4 cases, the defendant and the victim were sleeping in the same bed, or in the same room, while in 4 cases they were sleeping in different rooms in the same home.

In the only 3 cases in which the interval between the time of sleep onset of the defendant and the time of the criminal event was reported, it was approximately 1-2 hours. In 1 case the authors specified that “[the events] usually [occurred] during the first third of the night.”

Details about the psycho-physical condition of the defendant at the time of the event included exposure to stress, sleep deprivation (including Shapiro et al. case CJ), limited, or excessive alcohol intake (including Shapiro et al. case AF), either alone or variably associated. In 1 case, the defendant also used marijuana (Shapiro et al. case AF).

**Forensic Evaluation**

In 4 cases, the defendant underwent only a neuropsychological or psychiatric evaluation (i.e., only half of those retrieved) were published from 1985 to 2011, mainly in journals in the psychiatric field, but also in the fields of legal medicine, sleep medicine, and sexual medicine, thus calling attention to the growing multidisciplinary interest to publish these cases. Unfortunately, the lack of completeness of the remaining published cases prevented an analysis about all the cases that came to trial.

All SRV reports encompassed major crimes (murder or attempted murder), while in SBS cases the criminal charges ranged from sexual touching to rape. In 1 case, the charge of “indecent exposure” demonstrates that sleep disorders may result in criminal behavior, even when physical contact between a defendant and the victim is lacking.

In most of the cases, the sleep disorder supporting the sleep defense was sleepwalking, which indicates that the sleep defense generally corresponds to a “sleepwalking defense.” The trial outcome was in favor of the defendant in all SBS and in two-thirds of SRV cases. However, we can not exclude a publication bias due to a possible greater interest engendered by an acquittal than by a conviction. In addition, some verdicts may be challenged on appeal, which could ultimately result in a different outcome for the defendant.

Almost all these legal cases concerned a single criminal episode, and had a single victim. In all cases, defendants were men of relatively young age; this was also found by Bonkalo in 20 cases of homicide collected from 1791 until 1969. Beyond medical-legal cases, SRV with moderate to severe injuries is known to be frequently reported in males of relatively young age.

Moreover, based on our results, in most cases defendants had no prior criminal record, were employed, had a partner, and did not demonstrate any antisocial trait. In the context
of otherwise unremarkable medical histories, the defendants’ sleep history usually disclosed past or ongoing sleepwalking, frequently associated with other parasomnias and characterized by complex sleep behaviors. A family history, when investigated, revealed parasomnia in relatives in almost all cases.

Interestingly, differences between SRV and SBS cases were found in the victims’ characteristics. Indeed, in most SRV cases the victim was an adult relative of the defendant, and of female gender in two-thirds of cases, while SBS victims were always females, and in most cases minors without a familial relationship with the defendant. Since it is known from the literature that in SBS cases, bed partners often experience physical injuries (ecchymoses, lacerations),

or excessive fatigue, and intake of alcohol and other substances should be investigated.6,35,61

A complete description of the defendant’s lifetime history of any motor behavior during sleep, preferably from both the defendant and possible witnesses (present and former bed partners/relatives/friends) should be obtained, and details about age at onset, the usual timing of the event during the sleep, the degree of amnesia, and both duration and frequency of episodes should be investigated.1,6,21,35,61

A video-PSG study to identify or rule out other sleep disorders associated with abnormal motor behaviors (RBD, nocturnal frontal lobe epilepsy) or possibly triggering sleepwalking (OSA, periodic limb movements) should be performed with standard polysomnographic monitoring61 and with an extensive scalp EEG, electromyographic monitoring also of the arms, and time-synchronized audiovisual recording.4,15,20,21 To increase the possibility to capture an event, the documentation of nocturnal episodes with home video using a camera with infrared night vision function could be useful.4,6,62,64 Combining video and PSG monitoring at home may allow for longer recording periods and minimize bias from monitoring in a sleep laboratory setting. However, home video-PSG recording prevents the possibility of technician/physician intervention during and after a parasomnia episode. For these reasons, home video-PSG should be performed, when feasible, in conjunction with a sleep laboratory study.

It should be emphasized in the forensic context that irrespective of whether an event compatible with sleepwalking is recorded during PSG, this will not conclusively indicate that the defendant was or was not sleepwalking at time of the criminal event. Indeed, the only direct evidence of whether or not a criminal act occurred during a state of parasomnia comes from any eyewitness testimony and/or evidence obtained from the scene of the crime. Nevertheless, sleep experts have the duty to pursue as much as possible objective data to support or not
promising novel approach to the forensic use of PSG in sleep-walking cases for ruling out or greatly minimizing the prevalence, comorbidity and consequences. Sleep Med 2010;11:941-6.

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Forensic sleep medicine is at an embryonic stage. Our review points out that many medical-legal cases of SRV and SBS, reported in the form of small case series and case reports, do not provide essential information about a proper forensic evaluation. Cases sufficiently informative offer the conclusion that court trials for SRV and SBS involved relatively young and healthy adult males as the defendants, while victims were usually adult relatives in SRV cases and unrelated teenagers or young girls in SBS cases. Although many sleep disorders could result in assaultive behaviors, in most cases sleepwalking was implicated, and the sleepwalking defense turned out to be generally successful. However, no common protocols for the forensic evaluation were utilized.

An international expert consensus among sleep experts, medical-legal experts, and psychiatrists for the forensic evaluation of SRV and SBS cases should be developed, which we consider to be an urgent priority. This report has provided a foundation for advocating such an international consensus. Finally, enhancing the publication of accurate and comprehensive reports of medical-legal cases involving SRV and SBS would provide essential information for sleep medicine experts who participate in forensic evaluations, and a relatively homogeneous body of data for ongoing scientific research.

REFERENCES


### Table S1—Excluded cases

<table>
<thead>
<tr>
<th>Authors</th>
<th>Description</th>
<th>Charge</th>
<th>Defense</th>
<th>Forensic evaluation</th>
<th>Verdict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buchanan, 1991</td>
<td>27-year-old single man walked up and down a communal balcony while naked, where he encountered a neighbor.</td>
<td>Indecent exposure</td>
<td>-</td>
<td>Unclear whether the relationship between crime and sleep disorder was a matter during the trial</td>
<td>Conviction</td>
</tr>
<tr>
<td>Fenwick, 1996 (case 1)</td>
<td>Young man crawling along a ledge entered the young neighbors' apartment. He crawled into bed with girl and her boyfriend and placed his hand against her genitals.</td>
<td>NR</td>
<td>SW</td>
<td>NR</td>
<td>Conviction</td>
</tr>
<tr>
<td>Fenwick, 1996 (case 2)</td>
<td>Young male airman repeatedly caressed the genitals of his male colleague with whom he was sharing a room, during the course of one night.</td>
<td>Sexual assault</td>
<td>SW</td>
<td>NR</td>
<td>Case dismissed</td>
</tr>
<tr>
<td>Fenwick, 1996 (case 3)</td>
<td>Young man entered a nearby room, which was inhabited by a young woman and her boyfriend. He reached into their bed and touched the woman's legs, genitals, and breasts.</td>
<td>NR</td>
<td>SW</td>
<td>NR</td>
<td>Case dropped</td>
</tr>
<tr>
<td>Shapiro et al., 2003 (case LD)</td>
<td>35-year-old married man sexually assaulted a 12-year-old girl.</td>
<td>Sexual assault</td>
<td>-</td>
<td>Unclear whether the relationship between crime and sleep disorder was a matter during the trial</td>
<td>Conviction</td>
</tr>
<tr>
<td>Mahowald et al., 2005</td>
<td>A 28-year-old commercial fisherman killed his 42-year-old girlfriend by stabbing and beating her while she was sleeping in their hotel room.</td>
<td>First degree murder</td>
<td>SW</td>
<td>NR</td>
<td>Conviction</td>
</tr>
<tr>
<td>Pressman, 2007 (R v. Catling)</td>
<td>Male defendant, after taking at least 6 tablets of zopiclone, stabbed his girlfriend 9 times and cut her throat after arguing with her.</td>
<td>NR</td>
<td>SW</td>
<td>NR</td>
<td>Eventually withdrew SW defense and pleaded guilty</td>
</tr>
<tr>
<td>Pressman, 2007 (Indiana v. McLain)</td>
<td>Male defendant assaulted police officers and resisted arrest. He was severely jetlagged and had consumed beer and marijuana.</td>
<td>NR</td>
<td>SW</td>
<td>NR</td>
<td>Conviction</td>
</tr>
<tr>
<td>Pressman, 2007 (US v. Clayton)</td>
<td>Male defendant hit victim in head with a hammer several times and chased victim down the street with hammer.</td>
<td>NR</td>
<td>SW</td>
<td>NR</td>
<td>Conviction</td>
</tr>
<tr>
<td>Pressman, 2007 (Ohio v. Hines)</td>
<td>Male defendant committed aggravated burglary and assault on elderly residents of home with rolling pin and knife; the defendant had fallen asleep after consuming 2-3 bottles of wine.</td>
<td>Aggravated burglary and assault</td>
<td>ST followed by SW</td>
<td>NR</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Samuels et al., 2007</td>
<td>A man attacked his female friend with a bottle and video and grasped her by the throat.</td>
<td>Wounding with intent</td>
<td>NR</td>
<td>NR</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Bornemann, 2008</td>
<td>After drinking alcohol, a 25-year-old man sexually touched a 12-year-old girl who was sleeping in the same house.</td>
<td>Sexual assault of a minor</td>
<td>Parasomnia</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Mohanty, 2008</td>
<td>15-year-old boy sexually abused (including intercourse) his 13-year-old stepsister over a period of 4 years, transmitting to her genital warts and Chlamydia.</td>
<td>NR</td>
<td>SW</td>
<td>NR</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Authors</td>
<td>Description</td>
<td>Charge</td>
<td>Defense Description</td>
<td>Forensic evaluation</td>
<td>Verdict</td>
</tr>
<tr>
<td>-------------------------------</td>
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</tr>
<tr>
<td>Bordenave and Kelly, 2009</td>
<td>A married man shot his wife in the head, killing her.</td>
<td>Murder</td>
<td>SW and confusional arousals</td>
<td>NR</td>
<td>Acquittal on appeal</td>
</tr>
<tr>
<td>Beach and Soliman, 2010</td>
<td>Married man engaged in sexual contact with his stepdaughter, a minor.</td>
<td>Sexual battery and rape</td>
<td>SW</td>
<td>NR</td>
<td>Conviction</td>
</tr>
<tr>
<td>Ingravallo et al., 2010</td>
<td>A 28-year-old male industrial worker beat his wife on more than one occasion while they were sleeping together in bed.</td>
<td>Beatings</td>
<td>RBD in narcolepsy</td>
<td>NR</td>
<td>Acquittal</td>
</tr>
<tr>
<td>Wortzel et al., 2012</td>
<td>Man in his early 40's, who was sleeping naked, got out of bed and wandered down the hall where he was seen by his girlfriend’s underage daughter.</td>
<td>Indecent exposure to a minor</td>
<td>-</td>
<td>Unclear whether the relationship between crime and sleep disorder was a matter during the trial</td>
<td>Conviction</td>
</tr>
<tr>
<td>Vlahos, 2012</td>
<td>A 26-year-old Kenyan college student attacked his wife with a hammer and then stabbed and strangled her to death.</td>
<td>Murder</td>
<td>Not possible SW defense due to the lack of expert evidence</td>
<td>NR</td>
<td>Conviction</td>
</tr>
</tbody>
</table>

NR, not reported; SW, sleepwalking; ST, sleep terrors; RBD, REM behavior disorder.