

## Parasomnias

**Zenobia Zaiwalla** FRCP FRCPC, Consultant Neurophysiologist, *Park Hospital for Children and Radcliffe Infirmary, Oxford*

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Parasomnias are disorders of experience and behaviour, sometimes with prominent autonomic features, occurring during sleep. The sleep behaviours may be mild and self-limiting, but in a few cases the potential for injury makes imperative early diagnosis and intervention. Sleep-related epileptic seizures, though facilitated by sleep, are usually not classified as parasomnias. The International Classification of Sleep Disorders (ICSD)<sup>1</sup> subdivides the parasomnias on the basis of their timing in the sleep cycle as follows (Table 1):

- sleep–wake transition disorders
- non-rapid eye movement (NREM) sleep arousal disorders
- parasomnias associated with rapid eye movement (REM) sleep
- other parasomnias.

Knowledge of the sleep stage association of the parasomnias provides a useful approach to diagnosis (Table 2).<sup>2</sup>

### Sleep–wake transition disorders

Parasomnias occurring in the sleep–wake transition state are usually benign, though they can be distressing.

Hypnic body jerks occurring towards sleep onset are a common physiological event. In the exploding head syndrome, patients report sudden sensations of flashing lights and/or loud banging noises in the transition between wakefulness and sleep. These occur especially during periods of emotional stress from exaggeration of sensory experience as wakefulness decreases. Reassurance is usually sufficient.

### Rhythmic movement disorders

Rhythmic movement disorders, including head banging and body rocking,

occurring in sleep–wake transition may persist in children with learning difficulties and occasionally into adolescence and young adult life in neurologically normal children. Though benign and never associated with significant injury, the noise disturbs the family and can be socially embarrassing to the older child. There is varying awareness of the behaviour, with some acknowledging that the movements are pleasurable and help overcome anxiety associated with sleep onset insomnia, while others appear genuinely unaware. In the younger child, reassurance may be sufficient. There are anecdotal reports of positive response to a metronome in the room set at the movement frequency, changing to a water bed, psychotherapy, hypnosis and use of benzodiazepines.

### Non-rapid eye movement arousal disorders

NREM arousal disorders occur on abrupt arousal from NREM sleep, usually deep (slow-wave) sleep, including NREM stages 3 and 4, most commonly in the first part of the night. They include confusional arousals, night terrors and sleep walking. The complexity of the behaviours varies from mild disorientation in time and space in confusional arousals to complex semidirected behaviours of sleep walking or prominent affective symp-

toms and autonomic disturbance in night terrors. Duration can be from a few minutes to an hour (sleep walking). Sleep terrors tend to appear around 18 months of age, with sleep walking a little later in the pre-school and school-age years. NREM arousal parasomnias often disappear by adolescence, but can persist or appear for the first time in adolescence or adulthood. The prevalence of sleep walking falls from 15% in childhood to less than 1% in adults.<sup>3</sup> A recent single photon emission computed tomography study performed during an episode of sleep walking<sup>4</sup> revealed activation of motor regions of the brain with deactivation of association cortices, in keeping with the apparent dissociation of motor arousal from mind sleep during this parasomnia.

### Pathophysiology

There is a multifactorial pathophysiology. Sleep walking is at least 10 times greater in first-degree relatives of those who have experienced sleep walking than in the general population, while a population-based twin study<sup>5</sup> suggests a genetic contribution in more than a third of adult sleep walkers and more than half of children. Neurophysiological studies suggest inheritance of NREM sleep instability with high level of arousal oscillations,<sup>6</sup> suggested by some to reflect instability of

## Key Points

**Parasomnias are complex experiences and behaviours occurring from sleep**

**Most parasomnias are benign though distressing, but some have potential for injury to self and others**

**The characteristics of parasomnias depend on the sleep stage from which they occur**

**Differential diagnosis includes sleep-related epileptic seizures, especially frontal/temporal lobe epilepsies**

**Chronic rapid eye movement (REM) sleep behaviour disorder in adults is often a precursor of neurodegenerative disorders including Parkinson's disease**

**Understanding the complexity and range of behaviours especially in non-REM arousal parasomnias and their genetic, psychological and environmental triggers is important for forensic medicine**

**KEY WORDS:** eating disorders, night terrors, NREM arousals, panic attacks, REM behaviour, sleep walking

**Table 1. International Classification of Sleep Disorders.**

Sleep-wake transition disorders	NREM arousal disorders	REM sleep parasomnias	Others
Restless leg syndrome	Confusional arousals	Nightmares	Sleep bruxism
Sleep starts	Night terrors	Sleep paralysis	Sleep enuresis
Exploding head syndrome	Sleep walking	Impaired/painful sleep-related erections	Sleep-related abnormal swallowing syndrome
Nocturnal leg cramps		REM sleep-related sinus arrest	Benign neonatal sleep myoclonus
Rhythmic movement disorders		REM sleep behaviour disorder	Sleep-related panic attacks
Sleep talking		Hypnagogic/hypnopompic hallucinations	Sleep-related choking episodes
			Sleep-related laryngospasm
			Nocturnal groaning
			Periodic leg movements in sleep

NREM = non-rapid eye movement; REM = rapid eye movement.

serotonin levels affecting smooth transition through various sleep stages. Environmental triggers are also important, including febrile illness, sleep deprivation, obstructive sleep apnoea, alcohol, hypnotics and psychotropic drugs, shift work, emotional stress and psychopathology.

### Diagnosis

Diagnosis of NREM arousal parasomnias is usually clinical, but in some situations video/EEG/polysomnography studies

will be indicated. There has been considerable recent interest in the forensic consequence of sleep-related behaviours, including driving, personal injury, inappropriate sexual behaviour and homicide. NREM sleep-related violent behaviours often show combined features of night terror and sleep walking. Psychiatric disorders were identified in a third of adult onset episodes of violence from sleep,<sup>7</sup> with persistence of sleep walking associated with high scores on hysteria, anxiety and externally directed hostility scales.<sup>8</sup> Following a review of

the literature on violence during sleep walking, Rosalind Cartwright<sup>9</sup> proposed a standard protocol in assessing forensic cases which, in addition to clinical/psychiatric history, should include:

- childhood/family history of NREM parasomnias
- three nights of sleep recording, with one night preceded by 36 hours of sleep deprivation to induce an episode in the sleep laboratory.

Sleep studies may also be necessary when the parasomnia behaviour is difficult to differentiate from sleep-related epileptic seizures,<sup>10</sup> especially frequent brief nocturnal frontal/ temporal lobe seizures. Table 3 outlines the electro-clinical features that can aid differential diagnosis.

### Treatment

Treatment of arousal parasomnias can be challenging. Advice on common sense measures to reduce risk of injury during sleep walking behaviours is important, for example:

- locking windows and doors
- avoiding triggers like alcohol and sleep deprivation
- treating obstructive sleep apnoea and periodic leg movements (essential where present).

Psychopathology is present in about half the adults with persistent arousal parasomnias, and insight-oriented psychotherapy is advocated. There is no obvious psychopathology in the others

**Table 2. Sleep time and sleep stage linkage to parasomnias (modified from Ref 2).**

Time and sleep stage	Sleep stage	Parasomnia
Pre-sleep Sleep onset	NREM stages 1–2	Restless leg syndrome Hypnic jerks Hypnagogic hallucinations Head banging (rhythmic movement disorders) Bruxism Exploding head syndrome Night groaning Panic attacks/choking episodes from sleep Sleep talking
First third of sleep	NREM stages 3–4	Nocturnal enuresis (all sleep stages) Confusional arousals Sleep walking Night terrors
Middle and late sleep	REM sleep	Nightmares Cluster headaches Painful nocturnal erections REM behaviour disorder
Late sleep, early morning	NREM or REM sleep Arousal	Hypnopompic hallucinations (REM sleep) Sleep drunkenness Sleep paralysis (REM sleep; can also occur at sleep onset)

NREM = non-rapid eye movement; REM = rapid eye movement.

but they are often people who control their emotions during the day; obtaining a handle on unresolved issues maintaining their sleep behaviour can be challenging for the therapist. Hypnosis has been tried with varying success.<sup>11</sup> The anticipatory waking technique described by Lask<sup>12</sup> can be valuable in children in whom the parasomnias usually occur before parental bedtime. Patients at risk of injury or harm may need long-term treatment with a low dose of clonazepam at night.<sup>7,9</sup>

### Sleep-related eating disorders

Eating disorders related to sleep deserve a special mention. Early literature differentiated:

- nocturnal eating syndrome, when there is full awareness of eating on waking and
- sleep-related eating disorder, when night eating occurs in a state of sleep automatism with only partial or no awareness.

These patients typically wake 2–3 hours after sleep onset, with 'out of control' food ingestion, becoming agitated and angry if resisted. Both types occur on arousal from NREM sleep, with compulsive food-seeking; they are probably manifestations of a single disorder<sup>13</sup> and are associated with a high incidence of psychiatric disorders and psychotropic drug use. A quarter of cases develop this parasomnia for the first time in adult life, with no history of childhood sleep walking<sup>7</sup> and often associated with daytime dieting because of obesity.

### Treatment

Treatment of sleep-related eating disorders overlaps with management of sleep walking behaviour. Triggers for confusional arousals from NREM sleep such as periodic leg movements in sleep and obstructive sleep apnoea as well as hypnotic/ psychotropic drugs (zolpidem, risperidone, olanzapine) have been incriminated in sleep-related eating

disorders. In addition to psychotherapy for anxiety/stress and daytime eating patterns, patients may respond to clonazepam, alone or combined with dopaminergic agents, and selective serotonin re-uptake inhibitors.

### Parasomnias associated with rapid eye movement sleep

REM sleep parasomnias such as sleep paralysis and hypnogogic hallucinations are classically seen in narcolepsy but may occur in isolation, as in familial sleep paralysis or when there is rebound increase in REM sleep, for example following abrupt withdrawal of alcohol or of abuse or psychotropic drugs, with mental stress or sleep deprivation.

### Rapid eye movement sleep behaviour disorder

The condition of REM sleep behaviour disorder (RSBD)<sup>14</sup> is characterised by violent/injurious behaviours from attempted

**Table 3. Characteristics of frontal/temporal epileptic seizures versus parasomnias.**

	Epilepsies		Parasomnias	
	Frontal lobe	Temporal lobe	NREM arousal disorder	REM behaviour disorder
Time of night	Any time	Any time	1st third	Mid-third or later
Duration	<1 min	Minutes	Minutes to 1 hour	Minutes
Frequency	Very frequent (20–30 per night)	Few	More than 1 uncommon	Recur through REM sleep blocks
Semiology	Stereotype complex motor movements and vocalisation	Confused stereotype automatisms	Confused, semipurposful varying automatisms	Complex dream enactment behaviours
Directed behaviour/ violence	No	No	Can occur	Can occur
Resistive aggression	Too brief to cause significant injury to others	Yes, especially postictal	Yes	Yes
Memory of event	Absent	Absent	Absent	Can relate to dream content
Family history	Sometimes	Rarely	Common	Rarely
Polysomnography: sleep stage occurrence	NREM stage 2 Arousal immediately leads to seizure	NREM or REM Usually an interval between arousal and seizure	NREM stages 3–4 Episode immediately on abrupt arousal	REM sleep Intermittent during REM sleep with loss of REM atonia
EEG	Interictal/ictal EEG may be abnormal but can be normal	Interictal/ictal epileptiform change usually present	No epileptiform activity	No epileptiform activity
Video	Usually diagnostic	Usually helpful	Helpful	May be helpful

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dream enactment during REM sleep, secondary to loss of the normal REM sleep atonia. The disorder shows a male preponderance with a mean age of onset in various series of 52–62 years, patients reporting a change in dream character to more vivid, violent dreams out of character with their daytime personality. Acute transient RSD can occur with stress or rapid withdrawal of alcohol, drugs like selective serotonin reuptake inhibitors, tricyclics and amphetamine. A proportion of older chronic RSD patients were thought to be idiopathic, but increasingly the view is that RSD is almost always a precursor of a neurodegenerative disorder such as Parkinson's disease and multisystem atrophy. Rarely, RSD may occur in children with disorders involving brainstem structures. RSD in the neurologically normal young patient should point to idiopathic overlap disorder with co-occurrence of NREM arousal parasomnia and RSD.<sup>15</sup>

## Diagnosis and treatment

Polysomnography studies with multiple EMG channels are essential for diagnosis to demonstrate the loss of muscle atonia and other features, including increase both in slow-wave sleep and in periodic leg movements. Most patients respond to clonazepam.

## Other parasomnias

A number of parasomnias are classified under 'Other parasomnias' in the current ICSD diagnostic and coding manual. This allows some leeway to include newly recognised parasomnias such as *catathrenia* (nocturnal expiratory groaning) occurring in NREM stage 2 and REM sleep in the second part of the night.<sup>16</sup>

*Panic attacks occurring only from sleep* are an under-recognised form of parasomnia. These patients have recurrent awakening with panic or fear, often a feeling of impending death or of choking. This is neither preceded by remembered dreams nor associated with confused behaviour, as occurs in night terrors, the patient becoming fully awake immediately on waking. There is no accompanying stereotype motor activity

as in frontal lobe epilepsy. The episodes occur from NREM stages 2 and 3. Differential diagnosis includes night terrors and arousals from obstructive sleep apnoea.

The *sleep choking syndrome* – repeated episodes of waking through the night with choking sensation, often in those with anxious personality – has overlapping symptoms with panic attacks and may be the same disorder.

In *sleep-related laryngospasm*, on waking there is inability to breathe and stridor, the episodes occurring infrequently (ca 2–3 times a year). A 24-hour ECG recording may be necessary to exclude REM sleep-related sinus arrest when patients can wake abruptly with vague light headedness or faintness.

## Conclusions

Parasomnias are a fascinating group of disorders of varying clinical significance which can challenge clinical skills. They open a window to the understanding of the process of both normal and abnormal sleep and overlap a number of medical specialties. Awareness of the range of behaviours that occur in sleep is essential to target investigations and to consider treatment or reassurance, as appropriate.

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