

Parasomnias

Thomas F. Morley, D.O., FACOI, FCCP, FAASM

Chairman of the Department of Medicine

Director of the Division of Pulmonary, Critical Care and Sleep Medicine

Rowan SOM

Stratford, New Jersey



ROWAN UNIVERSITY

School of
Osteopathic Medicine

No Disclosures



ROWAN UNIVERSITY

School of
Osteopathic Medicine

The third edition of the ICSD (ICSD-3) includes seven major categories of sleep disorders:

- Insomnia
- Sleep-related breathing disorders
- Central disorders of hypersomnolence
- Circadian rhythm sleep-wake disorders
- Parasomnias
- Sleep-related movement disorders
- Other sleep disorders



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Wake versus Sleep

- **WAKE**

- Active and moving
- Aware of our surroundings
- Our behavior is interactive with the environment

- **SLEEP**

- Not moving
- Not aware of our surroundings
- Our behavior is not
- Interactive with our environment



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Wake versus Sleep



- However the brain is not such a simple structure.
- There are many states that are not entirely conscious or unconscious
- The patient is asleep but moving

Classification of abnormal sleep-related movements

Simple movements

Involving quick jerks of limbs or body

- Hypnic jerks
- Propriospinal myoclonus
- Benign myoclonus of infancy
- Epileptic myoclonus
- Isolated or nonperiodic limb movements

Involving muscles of mastication

- Bruxism
- Facial myoclonus
- Palatal myoclonus

Prolonged contractions

- Leg cramps



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Classification of abnormal sleep-related movements

Periodic movements

Of the limbs

- Periodic limb movements



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Classification of abnormal sleep-related movements

Rhythmical movements

Of the limbs

- Hypnic foot tremor
- Alternating leg muscle activation

Of the body or head

- Rhythmical movement disorder of sleep (body rocking, juxta capita)



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Classification of abnormal sleep-related movements

Complex movements and behaviors: Nonstereotyped

NREM sleep-related parasomnias

- Disorders of arousal (from NREM sleep)
 - Confusional arousals
 - Sleepwalking
 - Sleep terrors
- Sleep-related eating disorder

REM-related parasomnias

- REM sleep behavior disorder
- Recurrent isolated sleep paralysis
- Nightmare disorder

Other parasomnias

- Exploding head syndrome (sensory)
- Sleep-related hallucinations (sensory)
- Sleep enuresis
- Parasomnia due to a medical disorder
- Parasomnia due to a medication or substance

Psychogenic events originating in sleep

- Panic attacks
- Dissociative events

Classification of abnormal sleep-related movements

Complex movements: Stereotyped

Epileptic seizures

Psychogenic events (sometimes)



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Parasomnias

- Parasomnias are **undesirable physical events** (movements, behaviors) or **experiences** (emotions, perceptions, dreams) that occur during entry into sleep, within sleep, or during arousals from sleep. The observed behaviors are more complex and appear more purposeful than the stereotyped activity seen in movement disorders.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Classification of Parasomnias

The parasomnia category is divided into:

- (NREM)-related parasomnias
- (REM)-related parasomnias
- Other parasomnias.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

PATHOPHYSIOLOGY

- Sleep and wakefulness are not mutually exclusive states.
- Dysfunction in the orchestration of neural pathways regulating wake, (NREM) sleep, and (REM) sleep can produce state dissociation, resulting in the ability to perform complex motor behaviors outside of consciousness.



The general criteria for the NREM-related parasomnias include:

Recurrent episodes of incomplete awakening

Absent or inappropriate responsiveness

Limited or no cognition or dream report

Partial or complete amnesia for the event



ROWAN UNIVERSITY

School of
Osteopathic Medicine

(NREM)-related parasomnias



- Confusional arousals
- Sleepwalking
- Sleep terrors
- Sleep related abnormal sexual behavior
- Sleep-related eating disorder



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Confusional arousals

- Elpenor syndrome, sleep drunkenness, or sleep inertia
- Mental confusion or confusional behavior
- Patients appear to be awake and may exhibit goal-directed behaviors.
- Speech is generally slow and devoid of content
- Appear bewildered and have little to no memory of the event



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Sleep-related abnormal sexual behavior

- A confusional arousal variant that is characterized by abnormal sexual behaviors without awareness of intention
- Behaviors may include prolonged or violent masturbation and sexual vocalizations, initiation of sexual intercourse with bed partners, or sexual assault of minors or adults who may be in close proximity to the patient.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Sleep terrors

- Night terrors or pavor nocturnus
- Characterized by a sudden arousal from sleep associated with sitting up in bed, intense fear, and a piercing scream
- Intense autonomic activation including tachycardia, tachypnea, diaphoresis, facial flushing, and mydriasis



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Sleep terrors

- Individuals appear frightened and confused and are inconsolable and difficult to arouse
- Adults typically present with explosive episodes during which they may bolt out of bed in a violent or agitated manner and have partial dream recollection after the event



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Sleepwalking

- Sleepwalking (somnambulism) is characterized by a sequence of complex behaviors in sleep, including ambulation that is more elaborate and seemingly goal-directed than what is seen with confusional arousals.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Sleepwalking

- Episodes begin with a confusional arousal that is followed by the individual leaving the bed.
- Ambulation is typically slow and quiet, with the eyes open.
- Running, jumping, vocalization, and other automatic or purposeless behaviors, occasionally occur.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Sleepwalking

- Patients appear confused and can be agitated or aggressive when aroused.
- Self-injury is not uncommon
- Complete amnesia is typical, although some patients have partial recollection of their behavior.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Sleep-related eating disorder

- Involuntary eating associated with diminished levels of consciousness during an arousal from sleep
- Must be accompanied by consumption of inedible or toxic substances (eg, high caloric processed foods, frozen foods, cat food, cigarettes, or cleaning solutions), insomnia, sleep-related injury, occurrence of dangerous behaviors in the search for or while cooking food, morning anorexia, or adverse health consequences from recurrent binge eating of high caloric food, including weight gain, metabolic disorders (eg, diabetes mellitus, hyperlipidemia), hypertension, and OSA.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Clinical features of non-rapid eye movement (NREM) parasomnias in adults

	Confusional arousals	Sleep terrors	Sleepwalking	Sleep-related abnormal sexual behavior	Sleep-related eating disorder
Timing at night	First third of the major sleep period, less commonly in the morning during transition from sleep to wakefulness or during light NREM sleep	First third of the major sleep period	First third of the major sleep period	First third of the major sleep period	First third of the major sleep period
Gender distribution	Equal	Equal	Equal	Males > females	Females > males
Event semiology	Confusion and disorientation during an arousal from sleep; slow speech devoid of content	Screaming, agitation, intense fear, facial flushing, sweating; inconsolable, difficult to arouse	Slow and quiet ambulation, occasionally with more agitated behaviors	Abnormal sexual behaviors without awareness	Involuntary eating associated with diminished level of consciousness during an arousal from sleep
Event duration	3 to 15 minutes	3 to 15 minutes	3 to 15 minutes	3 to 15 minutes	3 to 15 minutes
Event recall	Typically none	May have partial dream recollection after event	Typically none	Typically none	May have partial awareness during event or recall after event
PSG characteristics	Slow wave sleep, with rhythmic theta or delta activity	Slow wave sleep, with rhythmic theta or delta activity; prominent tachycardia, increase in EMG tone	Slow wave sleep, with rhythmic theta or delta activity	Slow wave sleep, with rhythmic theta or delta activity	Slow wave sleep, with rhythmic theta or delta activity; rhythmic masticatory muscle activity on EMG

EMG: electromyography; NREM: non-rapid eye movement; PSG: polysomnography.

REM Sleep - Related Parasomnias

- Recurrent isolated sleep paralysis
- Nightmare disorder
- REM sleep behavior disorder



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Recurrent isolated sleep paralysis

- Characterized by the intrusion and persistence of REM sleep-related atonia into wakefulness
- Unable to move or call out, yet many will have a dramatic sense of impending doom or urgency to flee.
- May also be accompanied by hallucinations.

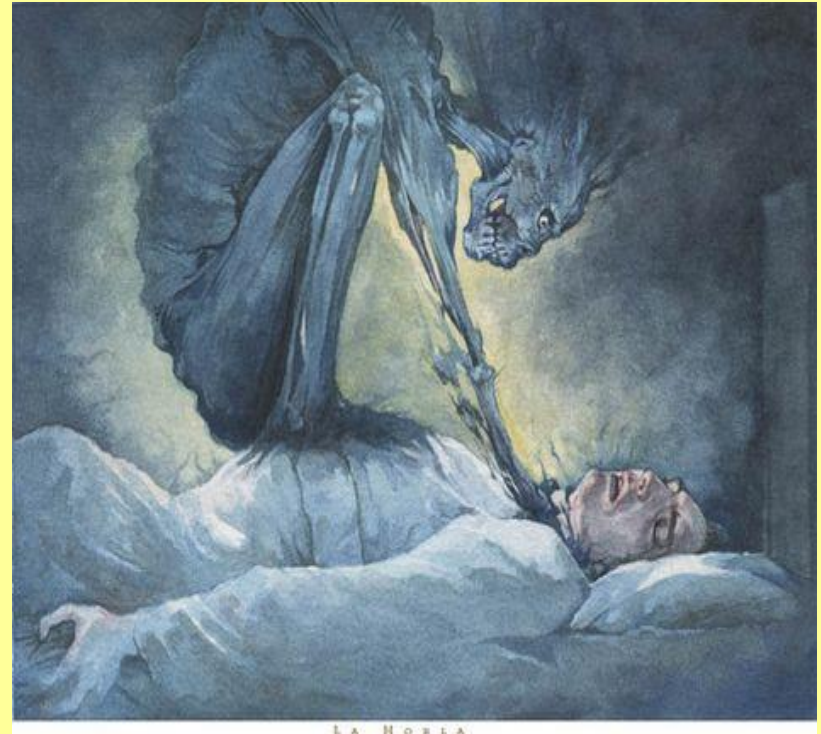


ROWAN UNIVERSITY

School of
Osteopathic Medicine

Recurrent isolated sleep paralysis

- Sleep paralysis is usually an isolated symptom.
- SP is related to sleep deprivation



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Nightmare disorder



- Nightmares are distressing dreams that have an emotional carryover into wakefulness.
- Nightmares usually do not have a motor component



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Nightmares

Did You Know?

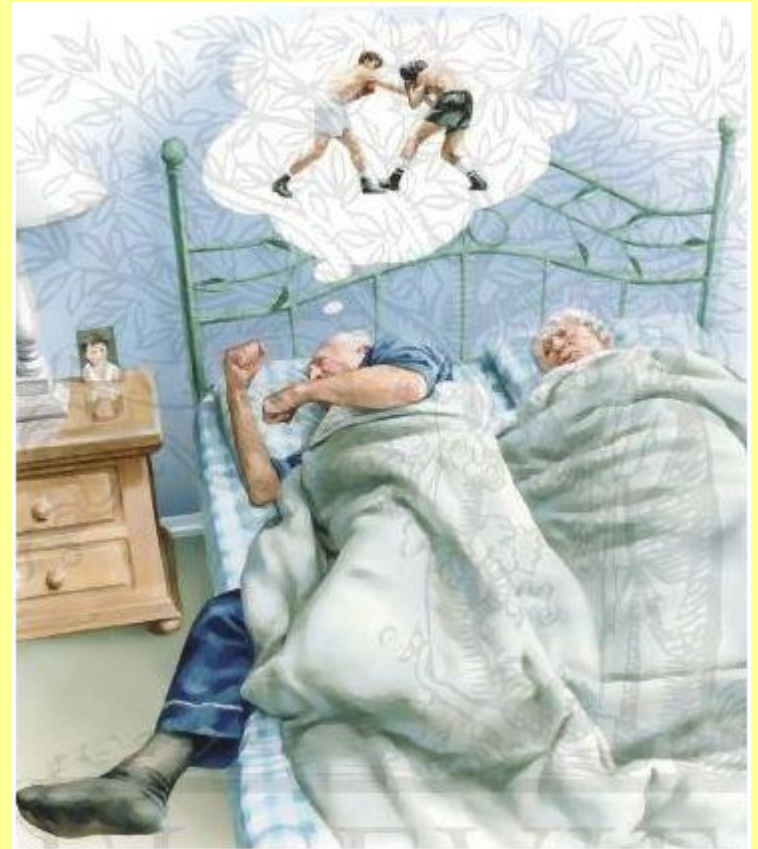
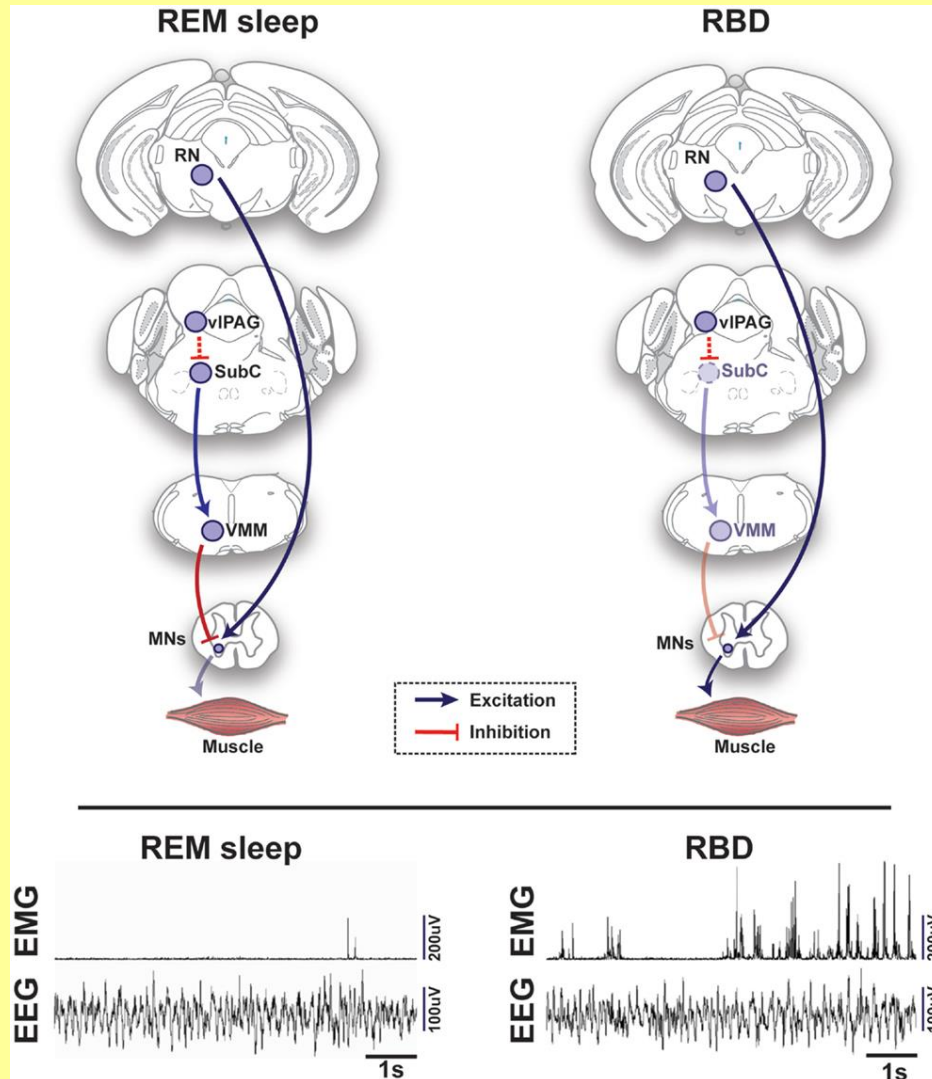
*Mary Shelley wrote
the classic story
Frankenstein
after a vivid
nightmare.
That must
have been
some bad
dream!*



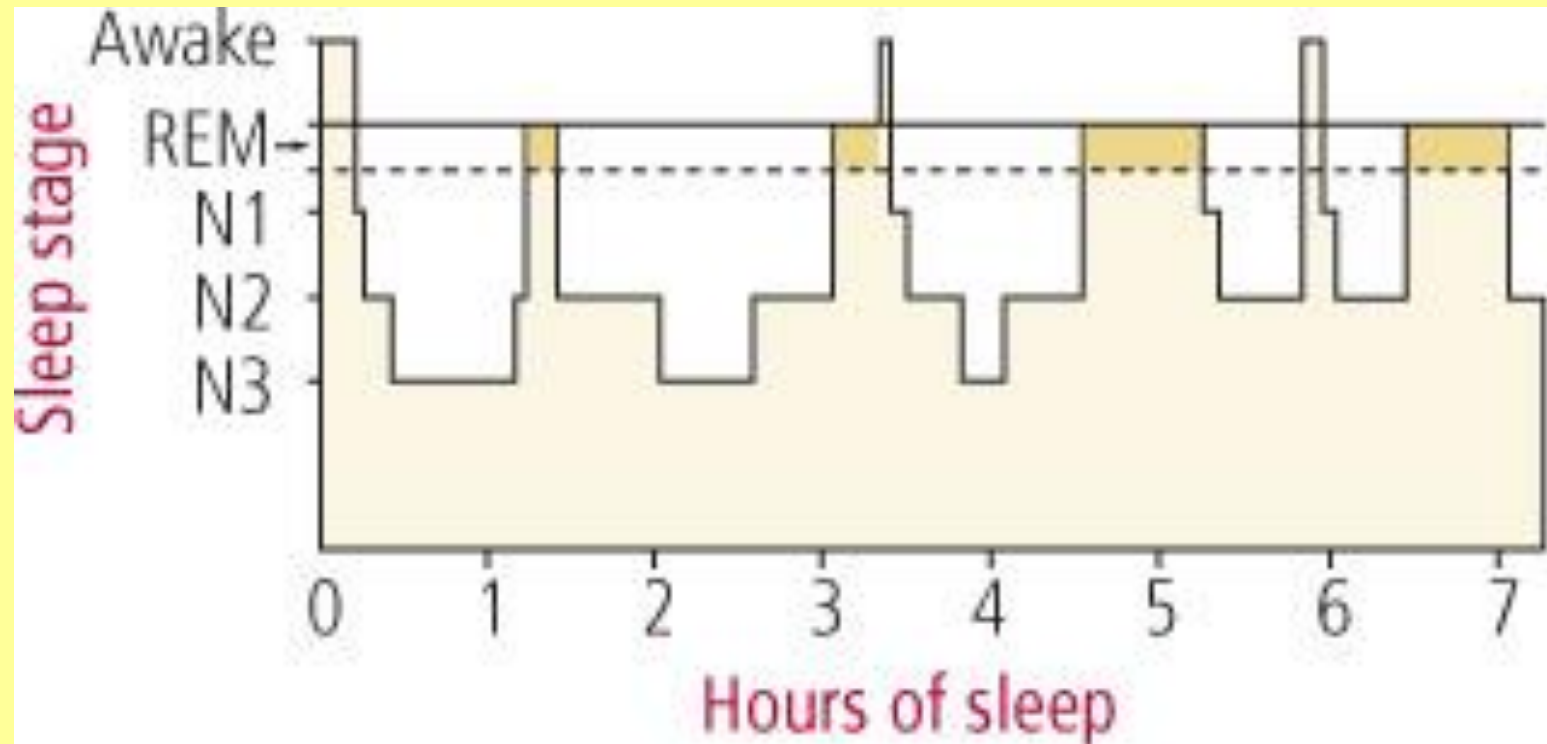
ROWAN UNIVERSITY

School of
Osteopathic Medicine

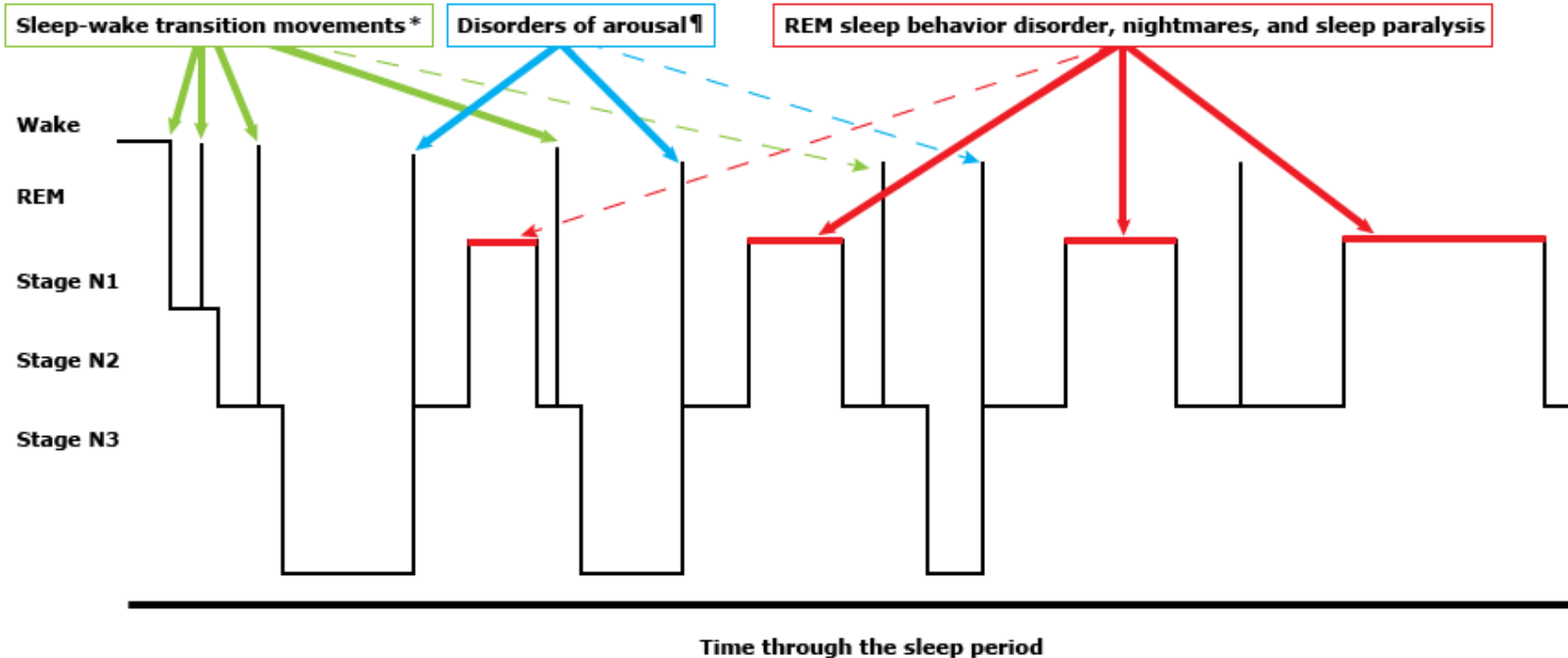
REM-related parasomnias



Normal Sleep Architecture



Timing of sleep-related movements and behaviors throughout the sleep period



* Examples include hypnic jerks, hypnagogic foot tremor, periodic limb movements, and sleep-related rhythmic movement disorder.

¶ Disorders of arousal from non-REM sleep include confusional arousals, sleep-related abnormal sexual behavior, sleep terrors, sleepwalking, and sleep-related eating disorder.

REM: rapid eye movement.

Other Parasomnias

- Exploding head syndrome
- Sleep-related hallucinations
- Sleep enuresis
- Parasomnia associated with medical disorders
- Parasomnia due to a medication or substance



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Exploding Head Syndrome

- Exploding head syndrome (EHS) is a disorder characterized by the perception of loud noises (e.g. a bomb explosion, gunshot or cymbal crash) when going to sleep or awakening.
- EHS is not associated with pain.

FRESE, A., SUMM, O. & EVERS, S. 2014. EXPLODING HEAD SYNDROME: SIX NEW CASES AND REVIEW OF THE LITERATURE, CEPHALALGIA, 1468-2982

BRIAN A.S. 2014. EXPLODING HEAD SYNDROME, SLEEP MEDICINE REVIEWS, 6: 489-493

Exploding Head Syndrome

- However the noise attacks can elicit a great deal of fear, confusion and distress in sufferers. Reports of tachycardia and palpitations are also common.
- Female > Male: Average age 50
- Usually self limited. Tricyclics and calcium channel blockers have been tried.



Sleep Related Hallucinations



- People report hearing voices, feeling phantom sensations and seeing people or strange objects in their rooms. Bugs or animals crawling on the walls are a common vision.
- Hypnagogic - onset
- Hypnopopic – awakening
- Associated with Narcolepsy

Sleep Enuresis

- Childhood
- Usually self limited and resolves with maturation
- adult bedwetting
- Genetics.
- Urinary tract infection (UTI)
- Small bladder
- Diabetes
- Kidney disease
- Enlarged prostate gland
- Prostate cancer
- Bladder cancer
- Side effects of medications
- Neurological disorders
- Stress, anxiety, fear, and other psychological issues
- Sleep apnea
- An imbalance of the antidiuretic hormone (ADH)

Sleep Enuresis

- Childhood
- Usually self limited and resolves with maturation
- Adult Onset isolated Night time only enuresis is VERY uncommon

Sakamoto K1, Blaivas JG. Adult onset nocturnal enuresis. J Urol. 2001 Jun;165(6 Pt 1):1914-7

Parasomias associated with other medical conditions

- Alpha-synuclein is a normal synaptic protein that may have a role in vesicle production. An aggregated and insoluble form of alpha-synuclein is a major component of Lewy bodies.
- It is also thought to play a role in the development of **Parkinson's Disease, Multiple System Atrophy and Lewy body dementia**



A Lewy body, pictured above, contains a mass of proteins, including synuclein, and is a characteristic feature of Parkinson's disease neural tissue.

Parasomias associated with other medical conditions

- Parkinson's Disease, Lewy body dementia,, and other “Synucleinopathies” are associated with REM Sleep Behavior disorder.
- REM Sleep Behavior Disorder may precede their neurologic decline.

AN
ESSAY
ON THE
SHAKING PALSY.
=====
CHAPTER I.
DEFINITION—HISTORY—ILLUSTRATIVE CASES.
=====
SHAKING PALSY. (*Paralysis Agitans.*)
Involuntary tremulous motion, with lessened muscular power, in parts not in action and even when supported; with a propensity to bend the trunk forwards, and to pass from a walking to a running pace: the senses and intellects being uninjured.

James Parkinson 1817

Parasomias associated with other medical conditions

- Medical problems that provoke arousals, such as chronic obstructive pulmonary disease (COPD), hypoglycemia, gastroesophageal reflux, congestive heart failure, or renal disease, and neurologic issues ranging from head trauma, brain tumors, and encephalitis, have been reported to initiate complex sleep-related movements or behaviors.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Parasomias due to a Medication or Substance

- Nightmares
 - sedative/hypnotics
 - β -blockers
 - Amphetamines
 - Dopamine agonists
 - Montelukast
 - Varenicline



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Parasomias due to a Medication or Substance

- REM Sleep Behavior Disorder
 - serotonergic antidepressants



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Parasomias due to a Medication or Substance

- Hallucinations
 - Hallucinogenic medications (LSD, etc)
 - Dopaminergic



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Parasomias due to a Medication or Substance

- Complex Movements
 - Zolpidem



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Provocative factors

- Poor sleep hygiene
- Sleep deprivation
- Circadian rhythm disturbances (eg, jet lag)
- Fever or other illnesses
- Emotional stress
- Medication use
- Ingestion of alcohol or sedatives before sleep onset
- Medical problems that provoke arousals



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Management of Parasomnias

- Management strategies vary according to:
 - the type of movement or behavior
 - its frequency and severity
 - whether or not an underlying sleep or other medical or neurologic disorder is present.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Management of Parasomnias

- Infrequently occurring disorders of arousal (eg, sleepwalking, confusional arousals, sleep terrors) rarely need to be treated.
- Educate about triggers for events, including sleep deprivation.
- Counsel about ensuring a safe sleep environment
- Remove causative agents (SSRI in RSBD, Zolpidem – Complex behaviors)

Management of Parasomnias

- For most parasomnias and abnormal movements, however, patients will continue to have minor occurrences, despite medication or behavioral modification.
- The overarching goal of therapy is to keep the patient and others safe.
- Patients should be reassured and clinicians should resist the urge to overtreat.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Failure of Treatment

- Repeat detailed history
- Event calendar
- Video EEG
- Confusional events at night in older adults may be a sign of medication intolerance or progression of an underlying neurocognitive disorder.



ROWAN UNIVERSITY

School of
Osteopathic Medicine

Complex movements during sleep: Distinguishing clinical features

	Disorders of arousal	Sleep-related eating disorder	REM sleep behavior disorder	REM nightmares	Recurrent isolated sleep paralysis	Psychiatric events	Nocturnal seizures
Behavior	Confused, semi-purposeful movement with eyes open	Eating high caloric or unusual foods with eyes open	Sometimes combative, violent dream enactment with eyes closed	Vivid, disturbing dreams, may end with a sudden jolt or jerk	Inability to move with preservation of eye and diaphragmatic movement	Variable, may involve panic or dissociative symptoms	Dependent on location of epileptic focus; may be brief jerks, simple or complex stereotypical behavior
Age of onset	Childhood or adolescence	Variable	Older adults	Childhood or adulthood	Variable	Adolescence to adulthood	Variable
Family history	Yes	Unknown	No	No	No	No	Variable
Time of occurrence	First third of night	First half of night	During REM sleep	Second half of the night most common (during REM sleep)	Upon awakening	Any time	Any time, but more likely in first half of night
Frequency	Once per night but not every night	Variable	Variable; a few times per month to nightly	May be nightly	Variable, less than weekly	Variable	Frontal lobe seizure can occur multiple times per night; less often for temporal lobe seizures
Duration	Minutes	Minutes	Seconds to a minute	Movement lasts seconds	Seconds to a minute	Variable (usually minutes or longer)	Usually less than three minutes
Memory of event	Usually none	Usually none, or limited	Fragmentary to full dream recall	Yes	Yes	None	Variable
Stereotypical movements	No	No	No	No	No	No	Yes
PSG findings	Arousals from slow-wave sleep	Arousal from NREM sleep	Excessive EMG tone during REM sleep	Awakening out of REM sleep appearing distressed	Arousal from REM sleep	Occur from wake state	Epileptiform activity
Associated clinical findings	May indicate another problem causing arousals (eg, sleep apnea)	Morning anorexia, unexplained weight gain, comorbid RLS/WED	May be associated with parkinsonism, narcolepsy, or medications (antidepressants)	May be associated with stress, psychological trauma, or medication effect	None (benign)	Other features of an underlying psychiatric disorder (eg, panic, anxiety, depression)	May find focal neurologic deficits

REM: rapid eye movement; PSG: polysomnogram; NREM: non-REM; EMG: electromyography; RLS/WED: restless legs syndrome/Willis-Ekbom disease.

Complex movements during sleep: Distinguishing clinical features

	Disorders of arousal	Sleep-related eating disorder	REM sleep behavior disorder	REM nightmares	Recurrent isolated sleep paralysis	Psychiatric events	Nocturnal seizures
Behavior	Confused, semi-purposeful movement with eyes open	Eating high caloric or unusual foods with eyes open	Sometimes combative, violent dream enactment with eyes closed	Vivid, disturbing dreams, may end with a sudden jolt or jerk	Inability to move with preservation of eye and diaphragmatic movement	Variable, may involve panic or dissociative symptoms	Dependent on location of epileptic focus; may be brief jerks, simple or complex stereotypical behavior
Age of onset	Childhood or adolescence	Variable	Older adults	Childhood or adulthood	Variable	Adolescence to adulthood	Variable
Family history	Yes	Unknown	No	No	No	No	Variable
Time of occurrence	First third of night	First half of night	During REM sleep	Second half of the night most common (during REM sleep)	Upon awakening	Any time	Any time, but more likely in first half of night
Frequency	Once per night but not every night	Variable	Variable; a few times per month to nightly	May be nightly	Variable, less than weekly	Variable	Frontal lobe seizure can occur multiple times per night; less often for temporal lobe seizures
Duration	Minutes	Minutes	Seconds to a minute	Movement lasts seconds	Seconds to a minute	Variable (usually minutes or longer)	Usually less than three minutes
Memory of event	Usually none	Usually none, or limited	Fragmentary to full dream recall	Yes	Yes	None	Variable
Stereotypical movements	No	No	No	No	No	No	Yes
PSG findings	Arousals from slow-wave sleep	Arousal from NREM sleep	Excessive EMG tone during REM sleep	Awakening out of REM sleep appearing distressed	Arousal from REM sleep	Occur from wake state	Epileptiform activity
Associated clinical findings	May indicate another problem causing arousals (eg, sleep apnea)	Morning anorexia, unexplained weight gain, comorbid RLS/WED	May be associated with parkinsonism, narcolepsy, or medications (antidepressants)	May be associated with stress, psychological trauma, or medication effect	None (benign)	Other features of an underlying psychiatric disorder (eg, panic, anxiety, depression)	May find focal neurologic deficits

REM: rapid eye movement; PSG: polysomnogram; NREM: non-REM; EMG: electromyography; RLS/WED: restless legs syndrome/Willis-Ekbom disease.

References

- UpToDate 2016

Classification of sleep disorders. Brooke G Judd, MD
Michael J Sateia, MD

Disorders of arousal from non-rapid eye movement sleep in adults. Nancy Foldvary-Schaefer, DO, MS

Approach to abnormal movements and behaviors during sleep. Bradley V Vaughn, MD

Rapid eye movement sleep behavior disorder. Michael Howell, MD, Carlos Schenck, MD