Sleep starts
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Introduction

This article includes discussion of sleep starts, hypnagogic jerks, and hypnic jerks. The foregoing terms may include synonyms, similar disorders, variations in usage, and abbreviations.

Overview

Also termed “hypnic” or “hypnagogic” jerks, sleep starts are characterized by a myoclonic jerk, especially of the axial or limb muscles, often associated with a sensation of falling in space (siderealism) and represent a physiological and universal accompaniment of the process of falling asleep. As such, they should be differentiated from other pathologic myoclonic activity of sleep, eg, the startle reaction of hyperekplexia, the epileptic myoclonias, the periodic limb movements of sleep, and the propriospinal myoclonus occurring at the transition from wakefulness to sleep. Occasionally, however, sleep starts of excessive frequency and intensity are a cause of anxiety and sleep onset insomnia.

Key points

• Sleep starts are myoclonic jerks involving the whole body or some or 1 limb, associated with a subjective impression of falling, or with some other impression.
• Sleep starts occur mainly at the transition from wake to sleep, and represent a physiological accompaniment of the process of falling asleep.
• When excessive, however, sleep starts may impede falling asleep and may be a cause of sleep onset insomnia.

Historical note and terminology

Sleep starts, also known as hypnic or hypnagogic jerks, represent a completely physiological accompaniment of falling asleep and, as such, are experienced by many normal people. When excessive, sleep starts may cause sleep onset insomnia. The syndrome was recognized and described more than 100 years ago by S Weir Mitchell (Mitchell 1890). Formerly classified within the sleep-wake transition disorders, sleep starts are currently included in the Isolated Symptoms, Apparently Normal Variants and Unresolved Issues section VII of the newly revised ICSD-II (American Sleep Disorders Association 2005), which comprises sleep-related symptoms that either lie at the borderline between normal and abnormal sleep or that exist on the continuum of normal to abnormal sleep.

Clinical manifestations

Presentation and course

A sleep start typically consists of a whole body myoclonic jerk that is produced by contraction of skeletal muscles. The main muscles involved are the axial ones, but contractions may also affect only 1 or 2 limbs or parts thereof. Sleep starts are often accompanied by a vivid dream, by the subjective impression of falling, or by some other sensation. Pure sensory phenomena in the absence of a body jerk (so-called “sensory sleep starts”) can also occur (Sander et al 1998). An utterance sometimes accompanies the sleep start. Sleep starts may be noticed only by a bed partner and not by the individual. When excessive in the degree of motor activity or frequency, sleep starts cause awakenings, and repetitive episodes can produce sleep onset difficulty. In extreme cases, tongue biting mimicking an epileptic seizure...
may occur (Kimura et al 2000).

**Prognosis and complications**

Physiological sleep starts are a benign phenomenon and do not require laboratory examinations or treatment. The natural history of excessive sleep starts (eg, sleep starts causing insomnia) is not known. They often remit spontaneously. However, propriospinal myoclonus at the transition from wakefulness to sleep shows no tendency to spontaneous remittance and may be a lifelong complaint that severely disturbs the quality of sleep (Montagna et al 1997).

**Biological basis**

**Etiology and pathogenesis**

The cause, in particular of excessive sleep starts, is unknown.

Sleep starts often occur in the transition from relaxation to sleep, a peculiar transitional state of consciousness associated with characteristic mental imagery and motor and sensory phenomena. The pathogenesis and pathophysiology of sleep starts are, however, unknown: synchronous volleys of pyramidal tract activity arising from the unstable transition from wakefulness to sleep have been suggested as responsible (Broughton 1994). However, the involvement of axial muscles as well as reflex origin and lack of jerk-locked EEG cortical activity (Clouston et al 1996) are features more in accordance with a subcortical origin. Indeed, in decerebrated cats myoclonic jerks arise on lesions of the ventral mesopontine junction and the retrorubral nucleus; and release of these structures has been hypothesized to modulate the appearance of myoclonic jerks during wakefulness and sleep (Lai and Siegel 1997a). Pharmacological manipulations seem to implicate the NMDA (Lai and Siegel 1997b) and the serotonergic system, the latter at the brainstem (especially inferior olivary) level (Welsh et al 2002). Motor activity, however, is not an obligatory feature of the sleep starts, which may occur restricted to purely sensory phenomena (Sander et al 1998).

**Epidemiology**

Sleep starts are common with a prevalence of about 60% to 70% of the population. In a recent sample of 276 young adult Nigerians, sleep starts together with confusional arousals and nightmares were the commonest parasomnias currently experienced; sleep starts had the second highest incidence rate for parasomnias, behind confusional arousals (Oluwole 2010). Rarely, “intensified sleep starts produce a sleep onset insomnia” (Broughton 1988).

Excessive sleep starts have also been reported as more frequent in patients with postpolio syndrome (Bruno 1998), in parkinsonism (Clouston et al 1996), and in children with migraine (Bruni et al 1999). Excessive sleep starts may appear in clusters in epileptic children with mental retardation and spastic dystonia due to birth asphyxia; in such cases EEG recordings excluded an epileptic origin of the jerks (Fusco et al 1999). Sleep starts and other parasomnias in children are also frequently associated with psychiatric and behavioral developmental problems, especially in females (Mahendran et al 2006), and, together with other sleep-wake transition disorders, occur more frequently in children who are long-term habitual snorers (Eitner et al 2007). Exceptionally, acoustic sleep starts causing sleep onset insomnia have been found to be associated with a brainstem lesion (Salih et al 2008).

**Prevention**

Excessive caffeine or other stimulant intake, prior intense physical work or exercise, and emotional stress have all been associated with an increase in frequency and severity of sleep starts. Among children, many sleep disturbances including sleep starts and other sleep-wake transition disorders are especially prevalent after TV exposure, in particular after passive TV exposure and viewing adult-targeted TV programs (Paavonen et al 2006).

**Differential diagnosis**

Sleep starts should be differentiated from another completely normal motor phenomenon of sleep, the so-called “physiological hypnic myoclonus,” also termed “partial hypnic myoclonias.” These are spontaneous contractions of the small muscles of the hand or face, sometimes involving only part of the muscle and mostly unassociated with observable movement. On EMG, physiological hypnic myoclonus resembles fasciculation potentials and is especially evident during stage 1 NREM and REM sleep (Walters 2007). In neonates, sleep starts should be differentiated from benign neonatal sleep myoclonus. Benign neonatal sleep myoclonus usually disappears by the age of 3 to 4 months,
Sleep starts may need to be differentiated from the excessive startle that can occur with the hyperexplexia syndrome (Tijssen et al. 2002; Shahar and Raviv 2004), from reflex myoclonic epilepsy in infancy (Zaferiou et al. 2003), and from episodes of brief epileptic myoclonus (Kotagal et al. 2002); the latter, however, are associated with epileptic EEG activity. Periodic limb movement disorder may seldom require differentiation; however, the muscle activity is longer in duration and involves mainly the feet and lower legs. Masticatory myoclonus during sleep (Aguglia et al. 1991), which may mimic sleep bruxism (Loi et al. 2007), is readily distinguished from the sleep starts. Nocturnal panic attacks, i.e., waking from NREM sleep in a state of panic, seldom need differentiation from the sleep starts (Craske and Tsao 2005). More complex motor behaviors, recently described in children as hypnagogic behavior disorder at the transition from wakefulness to sleep (Pareja et al. 2008), are easily differentiated from the sleep starts by their more complex and prolonged symptoms.

Sleep starts bear much resemblance to, and may represent, a phenomenon identical to propriospinal myoclonus occurring at the transition from wakefulness to sleep (Montagna et al. 1997; Tison et al. 1998; Vetrugno et al. 2001; Liu et al. 2007; Khoo et al. 2009). This is a condition in which myoclonic jerks occur in a quasi-periodic fashion when patients try to fall asleep or (more rarely) on awakening in the morning or intrasleep wakefulness. Jerks are usually spontaneous, are much more rarely evoked, and are not associated with other clear-cut neurologic abnormalities. Neuroimaging studies seldom disclose spinal abnormalities. The jerks may be so strong as to propel the patient out of bed and are usually the cause of severe sleep onset insomnia. They may respond partially to clonazepam. The actual relation of this kind of propriospinal myoclonus to the sleep starts is still unclear, mainly because of the dearth of information concerning the motor pattern of the starts.

Also similar to the sensory phenomena accompanying the sleep starts are the momentary sensations of impending loss of consciousness during relaxation, so-called “blip” syndrome (Lance 1996), and the so-called “exploding head syndrome;” the latter, however, occurs not only during sleep onset, but also throughout sleep, including REM sleep (Sachs and Svanborg 1991).

**Diagnostic workup**

The clinical features are usually diagnostic, even though the ICSD-R criteria for sleep starts showed only moderate interobserver reliability (kappa 0.41) (Vignatelli et al. 2005). If differentiation from an epileptic myoclonus is necessary, polysomnographic evaluation with electroencephalographic and electromyographic leads may be helpful. Sleep starts can occur during K-complexes or vertex sharp waves on the EEG, but sleep starts typically occur singly or in succession during transitions from wakefulness to sleep, usually at the beginning of a sleep episode. Two nights of polysomnographic recording may be helpful if the disorder is suspected of causing a sleep-onset insomnia.

The American Sleep Disorders Association lists the following ICSD-II diagnostic criteria for sleep starts (American Sleep Disorders Association 2005):

- The patient complains of sudden brief jerks at sleep onset, mainly affecting the legs or arms.
- The jerks are associated with at least 1 of the following:
  - a subjective feeling of falling
  - a sensory flash
  - a hypnagogic dream
- The disorder is not better explained by another sleep disorder, medical or neurologic disorder, mental disorder, medication use, or substance use disorder.

**Management**

Most individuals who suffer from sleep starts only need reassurance. When sleep starts are associated with sleep-onset insomnia, benzodiazepines (especially clonazepam) or other hypnotic medications may be helpful.

**Special considerations**

**Pregnancy**
Reported sleep starts diminish during the first trimester of pregnancy (Hedman et al 2002).

**References cited**


Oluwole OS. Lifetime prevalence and incidence of parasomnias in a population of young adult Nigerians. J Neurol 2010;257(7):1141-7. PMID 20143107


Sander HW, Geisse H, Quinto C, Sachdeo R, Chokroverty S. Sensory sleep starts. J Neurol Neurosurg Psychiatry 1998;64:690. PMID 9598699


**References especially recommended by the author or editor for general reading.
Former authors

Michael J Thorpy MD (original author) and Daniel Rifkin MD

ICD and OMIM codes

ICD codes

ICD-9:
Other dysfunctions of sleep stages or arousal from sleep: 307.47

ICD-10:
Other nonorganic sleep disorders: F51.8

Profile

Age range of presentation

02-05 years
06-12 years
13-18 years
19-44 years
45-64 years
65+ years

Sex preponderance

male=female

Family history

none

Heredity

none

Population groups selectively affected

none selectively affected

Occupation groups selectively affected

none selectively affected

Differential diagnosis list

other normal motor phenomenons of sleep
physiological hypnic myoclonus
partial hypnic myoclonias
benign neonatal sleep myoclonus
hyperexplexia syndrome
reflex myoclonic epilepsy in infancy
brief epileptic myoclonus
periodic limb movement disorder
masticatory myoclonus
sleep bruxism
nocturnal panic attacks
hypnagogic behavior disorder
propriospinal myoclonus
"blip" syndrome
exploding head syndrome

**Associated disorders**

Sleep-onset insomnia

**Other topics to consider**

Myoclonic seizures
Nocturnal leg cramps
Parasomnias
Restless legs syndrome
Sleep-related rhythmic movement disorder
Sleep disorders
Sleeptalking

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