SLEEP TERRORS IN CHILDHOOD

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Sleep terrors are dramatic events that represent a partial arousal state from deep sleep. Over the years, these episodes have also been referred to as *night terrors*, *parvor nocturnus* (in children), and *incubus attacks* (in adults). Sleep terrors are characterized by marked autonomic nervous system activation: tachycardia, tachypnea, tremulousness, mydriasis, and sweating are often present. Facial expressions of terror or intense fear are associated with uncontrollable shouting, screaming, gasps, moans, and agitation.[1] Although the respiratory rate is mildly increased, tidal volume is increased tremendously.[2] Some semipurposeful movements can occur, yet both speech and motor activities are perseverative and confused. The full-blown sleep terror is a fight-flight episode. Although some children with sleep terrors may remain in bed, others may walk or run during attacks. Bodily injury and property damage are possible.[3] The duration of sleep terrors is usually brief, often from less than a minute to several minutes; however, some sleep terrors may last as long as a half hour.[4] Attempts to awaken a child fully during a sleep terror may increase the child's agitation, and the sleep terror may actually be prolonged[5]; indeed there is a "curious paradox" with endogenous arousal coexistent with external unarousability.[6] Episodes cease rather abruptly,[2] with the child rapidly returning to a deep sleep.

Although some aspects of the sleep terror may be recalled by the child immediately after an episode, complete amnesia for the event the following morning is typical. In those instances when a child is able to relate some details of the imagery associated with a sleep terror, there is often no detailed storyline or sequence (in distinction to the typical nightmare). The child's descriptions are fragmented and brief. School-aged children may report indistinct recollections of threats (such as monsters, spiders, snakes, etc.) from which they have to escape or defend themselves.[7] They may speak only of "something" that "is after me" or "that is going to get me." It has been suggested that this perception of threat or attack may underlie the resistance to parental attempts at restraint.[8]

Sleep terrors form part of a larger group of parasomnias. Parasomnias are undesirable movements and behaviors that occur predominantly during sleep and include disordered arousal, partial arousal, and sleep stage transition.[1] The arousal disorders spectrum includes sleep terrors, sleep walking (somnambulism), and confusional arousals (often seen in children, with features common to both sleep walking and sleep terrors). Confusional arousals are marked by mental confusion after arousals and awakenings but do not include the fear or autonomic activation seen in sleep terrors; it should be borne in mind that many parasomnia events previously labeled as sleep terrors in the literature would be classified as confusional arousals on the basis of current classification schema (International Classification of Sleep Disorders).[1] In a landmark study, Broughton[9] summarized his prior work with Gastaut and their coworkers demonstrating that arousal disorder parasomnias such as sleep terrors and sleep walking occurred during arousal from slow-wave sleep, rather than from rapid eye movement (REM) sleep. He concluded that the slow-wave sleep arousal episode is a normal cyclic event, and that the postarousal state after slow-wave sleep appeared to be the necessary, but not sufficient, condition for confusional sleep disorders to occur. Importantly, "pre-existing constellations of physiological changes predispose a subject to a particular type of attack during the arousal episode."[9] Moreover, external stimuli delivered in slow-wave sleep may precipitate a sleep terror.[10]

EPIDEMIOLOGY

The prevalence of sleep terrors is greater in childhood than in later life, with a peak between ages 5 to 7 years and resolution typically before adolescence.[11,12] Sleep terrors have been reported to affect approximately 3% of children and <1% of adults.[13] Prevalence estimates may vary because of different criteria and definitions used, including the frequency of night terrors; in a recent sample of 480 children aged 6 to 11 years, 6.3% had more than 5 sleep terrors ("fearful awakenings") per month, with no gender difference reported.[14] Children have more slow-wave sleep than adults, and therefore sleep architecture differences could set the stage for sleep terror prominence in childhood.

EEG	Electroencephalography	REM	Rapid eye movement
PLMS	Periodic limb movements in sleep	RLS	Restless legs syndrome

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RISK FACTORS

Factors that may increase the likelihood of occurrence of sleep terrors in susceptible individuals include acute stress associated with fever[15] or sleep deprivation.[16] If sleep is disrupted from any cause, or if there has been inadequate prior sleep with a consequent stronger drive for restoring adequate slow-wave sleep, then a child may be further predisposed to sleep terrors. Children may, for example, have more frequent sleep terrors when naps are restricted or eliminated entirely. Thus, obtaining a detailed history about amounts of sleep and timing of sleep is a key part of evaluation of children with sleep terrors. If there is an indication that children are chronically sleep deprived, then having the parents take steps to increase the amounts of sleep is an important therapeutic step; sleep could be increased by reinstituting a daytime nap, fostering a more regular sleep schedule, or otherwise increasing sleep opportunities or sleep quality. Adults with arousal parasomnias (sleep walking) have been found to have lower slow-wave activity during the first sleep cycle, as well as lower sleep efficiency during the first sleep cycle compared with control subjects.[17,18] These findings of lower slow-wave activity compared with control subjects are somewhat surprising in view of the role of sleep deprivation facilitating sleep terrors in children through enhanced homeostatic sleep drive (and associated increased pressure for slow-wave sleep). Children with sleep terrors, like adults, may have sleep disturbances detected by electroencephalography (EEG) such as an increase in sleep instability and in microarousals during slow wave sleep that persist independently of frank sleep terror behavior.

Medications that can trigger sleep terrors include neuroleptics, sedative-hypnotics, stimulants, and antihistamines[6]; parents should always be asked about such medication use or exposure as part of the evaluation of sleep terrors. An association between childhood migraine headaches and parasomnias has been reported, possibly with a common underlying disturbance in serotonin levels.[16,19] Other medical conditions may precipitate arousal parasomnias, such as nocturnal asthma and gastroesophageal reflux.[20] Given the dramatic manifestations of sleep terrors, it has been debated whether psychic conflicts or psychopathology may play a role. Any associated psychopathological component is believed to be extremely rare in childhood[21]; in adults, there is controversy, but no close association has been established.[22] Nevertheless, the possibility of anxiety at bedtime and during sleep onset should be explored, because such fears may further exacerbate sleep terrors in childhood.

Intrinsic sleep disorders have also been implicated as important factors influencing sleep terrors. Recently, Guilleminault et al[7] reported in children that sleep-disordered breathing on polysomnography (ie, obstructive sleep apnea) or periodic limb movements in sleep-restless legs syndrome (PLMS-RLS) may trigger sleep terrors (and sleep walking) in childhood, because these parasomnias disappeared after treatment of the sleep-disordered breathing or PLMS-RLS.[7] In another recent study, examining a community-based cohort of children, those with sleep-disordered breathing experienced more parasomnias than those without.[14] In adults with sleep terrors and sleep walking, sleep-disordered breathing has also been found to be frequently associated with parasomnia episodes.[23] Thus sleep-disordered breathing needs to be considered as a risk factor for sleep terrors. Overnight polysomnography is recommended for those children who continue to have frequent sleep terrors in spite of efforts to restore adequate sleep or have a history suggesting that the child has obstructive sleep apnea or PLMS.

There has long been evidence of a genetic risk factor for sleep terrors. Hällström[24] found support for inheritance in a 3-generation family, possibly consistent with an autosomal dominant disorder. Kales et al[25] reported that the prevalence of sleep terrors and sleep walking in first-degree relatives of individuals with sleep terrors was 10-fold greater than in the general population; the authors calculated a 60% increased chance of a child being affected if both parents were affected. Ooki[26] in a questionnaire-based study of monozygotic and dizygotic twins found that sleep terrors were under moderate to strong genetic control. Importantly, sleep terrors may co-occur with other parasomnias as a result of shared genetic effects. Hublin et al[27] in twin studies found that sleep talking in children and adults co-occurred with sleep walking, nightmares, and bruxism. It should be kept in mind, however, that a shared family environment complicates interpretation of heritability. Moreover, the heritability of sleep terrors could be secondary to other sleep disorders because there is evidence of familial aggregation of RLS[28-30] and sleep-disordered breathing.[31-33] Thus other sleep disorders may result in familial sleep terrors indirectly.[7]

DIAGNOSIS

The diagnosis of sleep terrors may be supported in several ways. An adequate medical history is paramount, taken directly or aided by a questionnaire (For examples of screening questionnaires for pediatric sleep see references 34 and 35). A videotape of a typical episode recorded by parents at home may be very helpful to the clinician.[36] Sleep diaries can highlight irregularities of sleep/wake schedules and help determine whether episodes are triggered by sleep deprivation. The differential diagnosis of sleep terrors includes nightmares, panic attacks, epileptic events, and cluster headaches (in young children). Nightmares occur within REM sleep and are therefore more prominent in the second half of the night; children arousing from a nightmare usually become fully alert quickly, respond positively to comforting, and may offer a detailed description of dream content after awakening the following morning. Compared to sleep terrors, nightmares are characterized by lower levels of autonomic discharge, vocalization, and mobility, and by less intense apparent anxiety.[2] Epileptic seizures rarely present as sleep terrors or sleep walking episodes. Seizures are often very short-lived and stereotypic; a patient may or may not have daytime seizures in addition. Patients should be questioned about daytime staring spells that could represent nonconvulsive seizures, as well as paroxysms of repetitive limb movement or of increased muscle