



# Parasomnias

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Even if parasomnias do not directly impair the quality of sleep and recovery due to sleep, they may represent a major burden for the affected individuals. Nightmares may have a negative impact on the daytime mood; pavor nocturnus and sleepwalking are often experienced as embarrassing by adults, and furthermore even injuries may occur. It is in particular the fact that actions are carried out about which the individual has no control and cannot even recall in the morning that is perceived as distressful. Parasomnias are found more frequently in children, but they may also be observed in adults or persist until adulthood. About 5% of all adults report that they suffer from nightmares. Sleepwalking and night terrors (pavor nocturnus), however, are rather rarely found in adults (less than 1%).

The term parasomnia defines sleep disorders that occur “besides, parallel to” (para) “sleep” (somno), which means that these phenomena are observed during sleep but they do not directly impair the quality of sleep and recovery due to sleep.

In practice, however, this distinction is sometimes difficult to make. For example, female patients suffering from nightmares often report impaired quality of sleep and recovery due to sleep. This problem can be explained on one hand by waking up from negative dreams (impaired sleep continuity), and on the other hand by fear of again having a stressful nightmare after falling asleep. On the other hand, organic factors should never be dismissed in the context of changed subjective experiences such as dreaming. Hence, dream activity that is subjectively perceived as exhausting might also be associated with a REM-sleep associated sleep-related breathing disorder. The arousal occurring at the end of apneic phases in REM sleep may result in recalling the dream events very well and, thus, the person attributed the nonrestorative sleep to exhausting dreams. However, actually the sleep-related breathing disorder is responsible for the reduced recovery, and thus it is the correct diagnosis in this context. This example illustrates that diagnosing parasomnias should include comprehensive sleep differential diagnostics.

In this chapter, the most important types of parasomnia are presented, including non-REM

parasomnias such as night terrors (pavor nocturnus) and sleepwalking, as well as such REM parasomnias as nightmares and REM sleep behavior disorder. Other parasomnias are only rarely observed in adults; for these topics the authors refer to a short summary of those disorders listed at the end of this chapter.

### Classification of Parasomnias

- Disorders of arousal (associated with non-REM sleep)
  - Night terror (pavor nocturnus)
  - Sleepwalking (somnambulism)
  - Sleep drunkenness
- REM sleep parasomnias
  - Nightmares
  - REM sleep behavior disorders
  - Isolated recurrent sleep paralysis
- Other parasomnias
  - Enuresis
  - Sleep-related eating disorders

## 7.1 Pavor Nocturnus

### 7.1.1 Definitions

Night terrors (pavor nocturnus) are associated with sudden awakenings from slow wave sleep, i.e., from non-REM sleep. These episodes often start with a loud cry, sitting up in bed with eyes wide open. In about 30% to 50% of the cases of pavor nocturnus, sleepwalking may occur after the event; the two disorders are etiologically closely related. If the person calms again and continues sleeping, he/she usually does not recall the nightly event. Therefore, pavor nocturnus and also sleepwalking are termed disorders of arousal. Even if awakened, people cannot give comprehensive dream reports during or shortly after their arousal, even though the actions observed by others, for example, a man who wants to protect his wife during a pavor nocturnus event, clearly show that the person experiences a story during the episode (in this example, a threat to his wife). Mostly, only single images are recalled, for example, something threatening, an assailant, a fire in one's home, or a wall that tumbles down.

### 7.1.2 Etiology and Pathophysiology

The marked decrease of pavor nocturnus frequency between about 4 and 7 years of age suggests that cerebral maturation processes contribute to their development. The exact mechanisms of those maturation processes, however, are not yet clarified.

In some adult patients, a very high portion of slow wave sleep is observed, which indicates a component of predisposition. *Genetic influences* have been confirmed by twin and family studies.

*Stressors* such as school enrolment for children or professional or private stress in adults increase the probability of the occurrence of pavor nocturnus episodes. However, it has been shown that not only does extraordinarily severe stress influence the frequency but also that the usual daily stress may lead to nightly attacks when the person has the predisposition. Traumas that often lead to nightmares may also increase the incidence of pavor nocturnus episodes.

#### Practical Tip

Overall, a diathesis stress model explains the etiology of pavor nocturnus.

Besides stress, some behaviors that lead to slow wave sleep rebound may increase the probability that pavor nocturnus episodes will occur (e.g., a sleepless night, irregular sleep–wake rhythm, alcohol consumption). After a short or sleepless night, the sleep of the following night is characterized by more slow wave sleep (rebound), which increases the probability of night terror episodes. Also, elevated body temperature (fever) may increase the frequency of pavor nocturnus episodes in cases of predisposition.

In sleep practice, cases have also been reported in which sleep-related breathing disorders triggered pavor nocturnus episodes due to micro-arousals at the end of an apneic phase. Thus, in adults with pavor nocturnus comprehensive diagnostics seem to be appropriate with regard to sleep-related breathing disorders (see ► Chap. 4).

### 7.1.3 Epidemiology

About 20% of all children have experienced pavor nocturnus episodes at least once in their lives. The peak of their occurrence is observed between the ages of 4 and 7 years. The prevalence of pavor nocturnus episodes in adults that reach sufficient severity to require treatment is estimated at less than 1%.

### 7.1.4 Clinical Presentation

Because pavor nocturnus consists of a sudden *arousal* from slow wave sleep, the episodes mostly occur about 1 h after sleep onset due to the distribution of the sleep stages over the course of the night (see ► Chap. 1). Only very rarely does more than one attack occur per night.

From a clinical point of view, it must be mentioned that adult patients present with the desire to be treated even when the incidence of the pavor nocturnus episodes amounts to only once or twice per month. These patients are, for example, afraid of spending a night away from home because they fear that such an attack might occur. A young woman, for example, reported that she was afraid of participating in a course in a training center for 1 week because she might have screamed at night and disturbed the whole group. At home, her family was accustomed to this event.

A loud yell at the beginning of pavor nocturnus is often reported. Even if the physiological *anxiety reaction* that can be clearly seen by observers is generally great (heart rate increases from 60 to 180 beats per minute are frequently observed), the person is not fully awake and not oriented with regard to the surroundings even if the eyes are open. The brain is in a state between sleeping and waking. After the pavor nocturnus episode, *sleepwalking* may occur. This hybrid state allows simple actions such as orienting within the room, but more complex performances such as recognizing another person are not possible. The event is generally not recalled, in particular when the person falls asleep again.

Because of the subjectively perceived severe panic, hazardous actions may sometimes occur. The author knows of a case in which a patient jumped out of the window in the context of an episode (fortunately only from the low height of a first floor into

the front garden) because he thought his apartment was on fire. There are reports about two other patients who choked their partners because they erroneously considered them as attackers. These examples make clear that even a low incidence of pavor nocturnus episodes, for example, once per month, may justify treatment.

### 7.1.5 Diagnostics

In the context of diagnosing pavor nocturnus, a comprehensive *sleep history* is very important. One question is clarifying if other sleep disorders might induce the episodes. It is not always easy to distinguish pavor nocturnus from other parasomnias, for example, nightmares or REM sleep behavior disorders. In addition to asking the patients themselves, reports by their partners may be required because the affected persons often do not recall the nocturnal events.

First, it is important to ask about the typical time of night terror attack. In contrast to nightmares, the occurrence about 1 h after sleep onset is characteristic for pavor nocturnus. It is also relevant to know which behavior patterns are observed at night (screaming, subsequent sleepwalking). In addition, it is interesting to know if damage or injury had occurred in the context of the episodes and if the person awakening from such an episode may recall a vivid dream.

#### Practical Tip

According to the distribution of the sleep stages over the night, disorders of arousal (pavor nocturnus, sleepwalking) typically occur in the first half of the night, whereas REM-related parasomnias (in particular nightmares) are found mainly in the second half. This fact is relevant in the context of differential diagnostics.

The maximum *incidence of episodes* per night provides further important diagnostic hints. Even if single patients have been observed to have several sleep terror episodes per night, ten episodes or more indicate a possible epilepsy (see ► Sect. 7.1.7). So, it should be asked if epileptic seizures have already occurred during the daytime. In this context, it must be considered that some epilep-

sies are characterized by the fact that they are observed exclusively at night. Therefore, history taking alone cannot definitely exclude epilepsy. If simple, stereotype behaviors are observed with always the same procedure, epilepsy might be the correct diagnosis.

The question of restorative sleep may provide important hints. If recovery is impaired, questions about symptoms of sleep-related disorders (snoring, etc.) and restless legs disorder (mostly associated with periodic limb movements during sleep) should be asked, and if needed further examination should be induced (see ► Chaps. 4 and 8).

#### Diagnostic Criteria of Pavor Nocturnus, According to the AASM

First, all diagnostic criteria of disorders of arousal have to be fulfilled.

- Recurrent episodes with incomplete awaking from sleep (mostly during the first third of night sleep).
- Inappropriate or missing response to efforts of other people who want to intervene or lead the person experiencing the episode into another direction. The affected person may appear disoriented or confused, even several minutes afterward.
- Limited experience (e.g., one single visual scene) or no thoughts or dream images in the context of the episode.
- Partly or complete amnesia regarding the episode.
- The disorder cannot be better explained by any other sleep disorder, mental disorders, medical conditions, neurological diseases, psychological diseases, or drug intake or substance abuse.

In addition, there are specific criteria for pavor nocturnus.

- The disorder meets all criteria for disorders of arousal (see foregoing list).
- The episodes are characterized by sudden panic typically with alarming vocalizations such as a cry of fear.
- Intensive fear and heightened autonomous activity are seen that consists of mydriasis, tachycardia, rapid breathing, and sweating.

### 7.1.6 Sleep Diagnostics

Because one important differential diagnosis of pavor nocturnus is epileptic seizures at night, examination in a *sleep laboratory* is recommended for all adult patients for two nights. In children, a sleep deprivation electroencephalogram (EEG) is performed in the morning only when epilepsy is strongly suspected (observation of stereotype movements). However, it must be taken into account that severe pavor nocturnus episodes occur more rarely in a sleep lab than at home because of the unfamiliar environment (presence of medical staff; unfamiliar sleeping conditions that may lead to lighter sleep).

However, behavioral patterns may be observed such as sitting up in bed, picking at the blanket, or similar actions. To evaluate the nocturnal behaviors, continuous video monitoring and recording of the video signal are obligatory. For differential diagnostics, it applies that movements during pavor nocturnus are less stereotype and repetitive compared to nocturnal epileptic seizures. When cardiorespiratory *polysomnography* (PSG, in combination with video recording and history taking) does not allow the clear diagnosis of pavor nocturnus, *long-term epilepsy diagnostics* are recommended for at least 24 h (i.e., including one day and one night) with at least 12 electrodes placed on the patient's scalp. Sometimes it makes sense to perform the measurements after sleep deprivation.

To distinguish pavor nocturnus from REM sleep behavior disorders, it must be documented in the sleep lab from which sleep stage the behavior patterns occur. In this context it is optimal to have a *polysomnographic machine* that records the EEG and other channels synchronized to the video. Intact suppression of the muscle tone during REM sleep also contradicts REM sleep behavior disorder.

Because other sleep disorders such as sleep-related breathing disorders, as already mentioned, may trigger pavor nocturnus episodes, history taking is recommended with subsequent device-assisted diagnostics if relevant symptoms are found (see ► Chap. 4).

### 7.1.7 Differential Diagnostics

In practice it is not easy to distinguish pavor nocturnus from *other parasomnias* because several studies demonstrate that parasomnias, in particular pavor nocturnus, sleepwalking, and nightmares, frequently co-occur. Thus, in the context of comprehensive history taking and sleep lab examinations, it is not the question of either/or but of diagnosing all types of parasomnia that may be present.

Another differential diagnosis from the field of parasomnias is the *REM sleep behavior disorder*. In nearly all cases, sleep lab diagnostics is able to provide clear evidence (non-REM sleep associated versus REM sleep associated) due to the heightened muscle tone in REM sleep behavior disorder, especially when the patient's history does not allow drawing clear conclusions on the time of pavor nocturnus occurrence (typically at the beginning of the night sleep).

Furthermore, nocturnal *epileptic seizures* must be distinguished. Based on the history (number of the episodes per night), PSG, and video recordings (stereotype, repetitive movements), generally epilepsy can be excluded with high probability so that comprehensive examination with the entire set of EEG electrodes is required only in exceptional cases.

### 7.1.8 Therapy

Even if adults experience pavor nocturnus with low frequency of only one to two events per month, therapeutic intervention might be indicated because the episodes are perceived as very distressing by many people and their partners, and also as embarrassing when the individuals have to sleep somewhere else. If children suffer (or also the parents as a consequence of caring for the child) from pavor nocturnus, information given to the parents is of high significance because they consider the nocturnal events (severe physiological fear reaction, unresponsiveness) as much more dramatic than does the child, who usually cannot recall the episode in the morning.

Because imagery rehearsal therapy that is very effective in cases of nightmares (see ► Sect. 7.3.8)

cannot be applied to pavor nocturnus, an exact diagnostic differentiation is crucial. However, this is not always easy because these disorders may co-occur.

### Therapeutic Steps in Cases of Pavor Nocturnus

- Information
- Create a safe sleep environment
- Information about the handling of pavor nocturnus episodes by bed partners or parents
- Sleep hygiene
- Relaxation exercises before going to bed
- Psychotherapeutic measures

First of all, the adults should be informed about the symptomatology and etiology of the disorder. Often they are very worried because they do something at nighttime they cannot control. These concerns are much more important in adults than in children because adults typically do not sleep in such a well-protected environment. Most patients, or the parents in cases of affected children, are already reassured when they know that pavor nocturnus is a disorder itself and not a symptom of a major psychiatric disease. That these extraordinary nocturnal activities can be described by a specific term and are known to specialists often implies some form of relief.

The descriptive explanation of the *diathesis stress model* also helps in particular when it is emphasized that normal daily stress may lead to pavor nocturnus in persons with a predisposition. Parents can be reassured because they often think that something went wrong in their upbringing. Also the influence of organic factors such as fever, sleep deprivation, or alcohol should be mentioned because many patients have already observed this correlation.

The proverbial *somnambulistic confidence*, however, is a myth. Many adults suffering from pavor nocturnus or sleepwalking have already experienced injury. Nonetheless, injuries to children are only very rarely reported. On the one hand, the brain is not fully functional, and in the dark the people cannot see everything even if their eyes are open. If the individual tends to leave the

apartment, it is usually sufficient to lock the door and to put the key somewhere else. During the sleepwalking that often occurs after pavor nocturnus, patients are generally not able to perform complex searching activities (see ► Sect. 7.2).

It also appears to be useful to inform the people around the affected person about the occurrence of pavor nocturnus episodes. In this way, embarrassing situations at night may be avoided, and that knowledge that there is someone that could help (calming the person, guiding him/her back to bed) might already reduce the probability of pavor nocturnus episodes with loud screaming and walking around.

Another important factor concerns *sleep hygiene* when dealing with pavor nocturnus. Because pavor nocturnus is linked to slow wave sleep, a slow wave sleep rebound (caused by previous sleep deprivation) leads to an increased probability of occurrence. Regular bedtimes are recommended for those patients, and spending sleepless nights is discouraged. Furthermore, only moderate alcohol consumption, or even abstinence from alcohol, is recommended. One patient from the author's own practice reported increased pavor nocturnus episodes in the second and third night after alcohol consumption; in this context it was probably also triggered via a slow wave sleep rebound.

### Practical Tip

If a child or an adult wakes up all of a sudden and sits upright in bed or walks around, it is recommended to talk quietly and calmly to the person and to guide him/her back to the bed.

Excepting emergency cases that represent a risk for the affected person, serious attempts to awaken the person should be avoided because this might even reinforce the fear. Generally the individual is not able to recognize the helper, which means that the close person may be considered strange or menacing.

In accordance with the diathesis stress model, it is important to *reduce stress*. Adults are recommended to learn *relaxation techniques*, for example,



autogenic training or progressive muscle relaxation according to Jacobson.

Especially in the context of autogenic training, it is important that the exercises are performed in a sitting position before going to bed to achieve the full effect of relaxation. Otherwise, the patient risks falling asleep before the end of the exercise. Regular exercises result in a reduction of the impact of normal daily stress on sleep. In this way the frequency of pavor nocturnus episodes can be significantly reduced. Even for children as young as 6 years in age, relaxation techniques are available that are based on autogenic training.

In cases in which those approaches cannot be successfully applied, *cognitive behavioral therapy* is recommended in particular for adults. The aim is developing coping strategies for stressful situations including associated thoughts and emotions. Furthermore, specific strategies are taught about coping with stress situations. Although positive outcomes could be achieved by means of psychotherapeutic therapy of pavor nocturnus, controlled trials are not yet available.

The data base with regard to *drug therapy* of pavor nocturnus is also unsatisfactory. Even if positive effects could be shown in single cases with the application of benzodiazepines (clonazepam, diazepam) or antidepressants such as imipramine and paroxetine, randomized placebo-controlled trials are completely lacking. Only in extreme cases with several pavor nocturnus episodes per night does a long-term medication seem to be appropriate.

## 7.2 Sleepwalking

### 7.2.1 Definitions

Sleepwalking is an activity that a person performs at night out of non-REM sleep stage 2 or slow wave sleep without being fully awake. After about 30% or 50% of pavor nocturnus episodes (see ► Sect. 7.1), sleepwalking may occur; the two disorders are etiologically closely related.

Many of these activities termed sleepwalking take place in bed. If the person actually leaves the bed, mostly well-automatized activities are performed. The person's eyes are open; however, he/she is not in full possession of his/her mental

power and usually cannot recall the episode when subsequently returning to bed and continuing to sleep.

### 7.2.2 Etiology and Pathophysiology

Sleepwalking and pavor nocturnus are closely related and are termed disorders of arousal. It is assumed that an awakening stimulus (from the outside or the inside) does not lead to complete awakening but the brain remains in an intermediate state between wakefulness and sleep. That is to say, parts of the brain are awake and other parts are asleep, which may explain the loss of memory of the nocturnal event in the morning, as well as the impaired responsiveness and the activities that sometimes appear rather meaningless.

Formerly, the *gravity force of the moon* was considered responsible for sleepwalking. Many pictures exist showing so-called lunatics who walk in the direction of the moon. From a current point of view, the explanation is rather simple. The sleepwalking person who has his/her eyes open just walks in the direction of the greatest brightness to see better.

Furthermore, the opinion once prevailed that the person was *acting out dreams* during sleepwalking. This explanation could also be disproved as it is well known today that the muscle tone is actively inhibited by the sleep centers during REM sleep (when intensive dreaming takes place) to impede this kind of acting out. Sleepwalking occurs from non-REM sleep, that is, of sleep phases without active inhibition of the skeletal muscles. However, reports are available where projects, for example, a task that has not been finished in the evening before, were accomplished during an episode of sleepwalking, suggesting that sleepwalking is also associated with subjective experiences. This explanation seems plausible because in non-REM sleep dreaming also takes place that is mostly less intensive or pictorial. In the context of REM sleep behavior disorder, which is the most important differential diagnosis of sleepwalking, however, exactly this acting out of dreams occurs (see ► Sect. 7.4). The most significant difference is that the person suffering from REM sleep behavior disorder mainly follows dream images, whereas the sleepwalker perceives the environment (in a limited way) and associates



## 7.2 · Sleepwalking

it with their own concepts and ideas, for example, of doing something.

The current status regarding the etiology of sleepwalking is a *diathesis stress model*. As in other parasomnias (pavor nocturnus, nightmares), an increased family incidence is observed. Normal stressors such as school enrolment of children, spending the night elsewhere, and occupational stress or stress at home may increase the incidence of sleepwalking episodes. Also, physiological stressors such as fever, previous sleep deprivation, or significant alcohol consumption may trigger sleepwalking. Furthermore, a sleep disorder may lead to a fragmented sleep profile (sleep apnea syndrome, periodic limb movements during sleep) that may increase the incidence of sleepwalking. Environmental noise that would cause other people to awaken might induce episodes of sleepwalking in affected individuals.

### 7.2.3 Epidemiology

About 30% of all children have sleepwalked at least once in their lives. The occurrence peak, comparable to pavor nocturnus, is between the ages of 4 and 7 years.

In adults, the prevalence of sleepwalking is estimated to be less than 1%. The burden of adult patients, however, may also be clinically relevant when the incidence of sleepwalking episodes is rather low (about once or twice per month). Adults experience those episodes as very embarrassing when they perform activities during the night that they cannot control and cannot recall in the morning. Marked fear arises when the person wants to sleep elsewhere, not in the familiar home setting.

### 7.2.4 Clinical Presentation

Sleepwalking episodes typically last for some seconds up to several minutes, rarely longer. Mostly, the activities occur in the middle and/or at the end of the night. In practice, cases have also been described wherein sleepwalking has occurred in the first half of the night.

Many of these activities take place in bed, for example, sitting up and looking around, pulling at the blanket, or examining the wall near the bed. If the person leaves the bed,

mostly well-automatized activities are performed, for example, dressing, walking into another room, or opening the windows. The person's eyes are open, and simple visual-motor coordination works well; however, the individual is not in full possession of their mental powers and usually cannot recall the event when returning to bed and continuing to sleep. The responsiveness to external stimuli, as in addressing the person, is reduced.

Frequently, the person who addresses the sleepwalker is not recognized so that sometimes violent counterreactions (beating, etc.) may be observed. In the US, one patient who was assessed by a portable monitoring unit had driven his car during a sleepwalking episode. The situation becomes dangerous when the person leaves her or his home.

Amnesia for sleepwalking is very often observed; sometimes single dream-like memories are reported, and the persons have a sensation in the morning that something might have happened at night.

For the discipline of forensics, the topic of sleepwalking is of great interest because every now and again people claim that they have committed a crime in a state of sleepwalking. The German law includes a paragraph that states that a person cannot be guilty when unable during the commission of an act to understand the criminal character of this act because of a pathological mental disorder, deeply disturbed consciousness, mental deficiency, or any other severe mental disorder. In such a context, independent experts face the difficulty of determining whether the person was sleepwalking at the time of committing the crime, as no EEG electrodes have been attached that might confirm the state of sleepwalking; and so it is only possible in individual cases to judge based on the person's history, on polysomnographies performed in the further course (if needed with awakening provocations), and on the action itself.

#### Case Reports

One patient reported that he wanted to go to the toilet. He opened the door, urinated, and went back to bed. The next morning, however, he found that it wasn't the toilet that he had been using during the sleepwalking episode but his wardrobe.

One patient reported that she had woken up from a sleepwalking episode when she was already in the kitchen and wanted to prepare a

sandwich. She was very scared because she was holding a sharp bread knife in her hands, and for this reason she sought advice at the sleep clinic.

In contradiction to the proverbial somnambulistic certainty, sometimes injuries occur. Another patient reported fracturing his ankle after a sleepwalking episode during which he caught his foot on a shelf (even if the eyes are open, it might be difficult to orient oneself when the room is dark).

Another patient reported massive bruises that had developed when she tried to open the skylight of her bedroom.

## 7

### 7.2.5 Diagnostics

Regarding the diagnostics of sleepwalking, comprehensive *case history taking including bedpartner/relatives* is essential. On one hand it should be assessed exactly at what time of night the sleepwalking episodes occur and if they are observed as being caused by current stressors. On the other hand, it is essential to clarify if the person responds and if amnesia regarding the nocturnal events is observed. A detailed description of which behaviors and actions are performed may provide relevant information to distinguish sleepwalking from epileptic seizures. In the same way, questions should be asked about intensive dream experience at the beginning and during sleepwalking episodes so that a differentiation from REM sleep behavior disorder is possible.

#### Diagnostic Criteria of Sleepwalking According to the AASM

First, all diagnostic criteria of disorders of arousal have to be met.

- Recurrent episodes with incomplete awaking from sleep.
- Inappropriate or lacking responsiveness toward efforts of other people to intervene or to guide the person experiencing the episode to another direction. The affected person may be disoriented and confused even several minutes after the event.

- Limited experiences of (e.g., single visual scenes) or no ideas or dream images in relation to the episode.
- Part or complete amnesia for the episode.
- The disorder cannot be explained by any other sleep disorder, mental disorders, medical conditions, neurological disease, psychological disease, or drug intake or substance abuse.

In addition, there are the specific criteria of sleepwalking.

- The disorder meets all criteria of disorders of arousal.
- The episodes are characterized by walking around or other complex behaviors that are performed outside the bed.

### 7.2.6 Sleep Diagnostics

To complete history taking, generally an *examination in a sleep lab* over two nights is recommended because some disorders may be confounded with sleepwalking.

Because of the “well-protected” sleep environment, severe sleepwalking episodes with leaving the bed only rarely occur in sleep labs, but behaviors such as sitting up in bed, pulling up the blankets, or other actions like looking around may be observed. If typical polysomnography equipment is used (no telemetry system but electrode wires that are firmly connected with the device), attention must be paid that the staff attentively monitors the patient to quickly awaken him/her when he/she starts to leave the bed. In those cases, awakening is not only done to avoid tearing off the electrodes but also to conduct an interview with the patients to assess if the person is easily oriented and knows where he/she actually is. At the same time, video monitoring that is synchronized with the EEG is essential.

Sleep lab diagnostics also serve to exclude other sleep disorders such as sleep-related breathing disorders or periodic limb movements during sleep as the origin or at least a triggering factor of sleepwalking.

### 7.2.7 Differential Diagnostics

The most important differential diagnosis that has to be taken into consideration is *REM sleep behavior disorder*. It is not always easy to differentiate these disorders if based only on the history of the affected person, so in adults comprehensive diagnostics in a sleep lab are nearly always indicated. Generally, it becomes obvious that the person with a REM sleep behavior disorder rapidly bumps into an obstacle because he/she has a dream vision, whereas the sleepwalker recognizes the environment and walks around almost safely (attention: limited sight in the dark). If the person awakens the sleepwalker is not able to report about the episode with the exception of single images, whereas generally a vivid dream is reported by persons with REM sleep behavior disorder, mostly with strong emotions and/or marked body movements as part of the dream action.

Another differential diagnosis of sleepwalking (such as *pavor nocturnus*) is the occurrence of nocturnal *epileptic seizures*. Generally, the movements in cases of epileptic seizures are stereotypic and may be observed frequently in one night (ten times or even more often). Because the epileptic event is not always visible in scalp EEG in the context of focal seizures, video documentation is of highest significance in these patients.

In older people, nocturnal *states of confusion*, for example, in the context of dementia or hypnotics consumption (benzodiazepines), may be confounded with sleepwalking. In the sleep history taking in elderly people, the assessment of medications and the question about possible dementia symptoms must not be forgotten.

In recent times, also *sleep-related eating disorder* came into the focus of discussion. It is partly different from sleepwalking. Some of the patients perform this kind of eating in a somnambulistic way, being not fully awake. Another group of patients with sleep-related eating disorder generally completely wake up, can recall the nocturnal event, and are only able to fall asleep again when they have eaten a snack (biscuits, bread, etc.). Similar to insomnia, it is the question of conditioning processes (eating has a calming effect and promotes falling asleep).

Another disorder that can be categorized to sleepwalking is the so-called *sexsomnia*, that is, the sleepwalking person performs sexual actions on

himself or herself or harasses the bed partner. This behavior is very embarrassing for the affected persons because they cannot control it, and additionally, it might enormously stress the relationship.

### 7.2.8 Therapy

Because *pavor nocturnus* and sleepwalking are etiologically closely related, the treatment strategies are also very similar. In the context of adult sleepwalking, consultation/treatment is also indicated when the episodes of sleepwalking occur rarely or only under stress because the affected persons feel extremely embarrassed. Furthermore, there is the risk of injury of the sleepwalker. For children who sleepwalk frequently, it is recommended to initiate further therapeutic interventions in addition to comprehensive information about the disorder given to the parents.

#### Therapeutic Steps in the Context of Sleepwalking

- Information
- Securing of environment
- Information of bedpartner/relatives about how to handle sleepwalking episodes
- Sleep hygiene rules
- Relaxation exercises before going to bed
- Intentional formulas
- Psychotherapeutic interventions

First of all, the affected adults or parents of affected children should be *informed* about the disorder. Adults especially are very worried about doing something at night they cannot control. Most patients are reassured when they learn that sleepwalking (and *pavor nocturnus*, if they occur together) is an independent disorder and not the symptom of an underlying psychiatric disease. The fact that those extraordinary nocturnal activities have a specific definition and are known to specialists may already lead to relief. The descriptive explanation of the diathesis stress model helps affected persons in particular when it is emphasized that already normal stress may lead to sleepwalking in persons with the predisposition for sleepwalking.

*Securing the environment* is very important because the proverbial somnambulistic security is a myth. Many adults suffering from sleepwalking (and/or pavor nocturnus) have already experienced injury.

If the person tends to leave the home, it is usually sufficient to lock the door and to store the key in a remote location because the person is not able to perform complex searching actions during sleepwalking. Also, windows and doors to “dangerous” rooms (kitchen, crafts room, boiler room) may be secured in this way. Sharp-edged furniture or objects that may potentially lead to injury should be removed from the bedroom.

The people around the affected person should also be *informed*. In this way, embarrassing scenarios at night may be avoided because those persons know that it is most appropriate coping strategy to calmly address the patient and to guide him/her back to bed. Waking the person up is only recommended when the person endangers himself/herself or others. The knowledge that the sleepwalking person does not fully access the mental abilities is important to understand why, for example, familiar persons are not recognized at night and, as already mentioned, why somnambulistic activities sometimes seem to be bizarre.

It is important when managing sleepwalking as well as pavor nocturnus to observe *sleep hygiene*. Regular bedtimes and avoiding sleep deficits are recommended. Only moderate alcohol consumption, or even abstinence, is advised. A short nap during daytime may decrease the sleep pressure of the following night and in this way reduce the probability for sleepwalking episodes.

With regard to the diathesis stress model, it is important to *reduce stress*. For adults, it is recommended to learn relaxation techniques, for example, autogenic training or progressive muscle relaxation, according to Jacobson. Autogenic training should be exercised in a sitting position to avoid the patient falling asleep before the end of the exercise. The training objective, that is, relaxed sleep, would not be achieved otherwise. By regular exercising, the body learns to start sleeping in a more relaxed way and to reduce the impact of daily stress on sleep. The incidence of sleepwalking can be significantly reduced in this way. Child-appropriate relaxation techniques may also be very helpful for children at about 6 years or older (see ► Sect. 7.1.8).

In the context of autogenic training, a technique is available that has already shown effects in single cases: training of *intentional formulas*. Hereby, the affected individual imagines a sentence after the instructions of the relaxation procedure, for example, “When my feet touch the ground, I will fully wake up.” This internally spoken sentence is then also supported by vivid imagination. In this way, the body is trained with regard to new behavioral patterns in waking that may terminate sleepwalking at night. However, only a few anecdotal reports are available for the effectiveness of this approach.

Only in cases wherein these approaches are not successful is further *cognitive behavioral therapy* recommended, particularly for adults. Such therapy aims at coping with stress situations and the associated negative thoughts and emotions as well as learning basic strategies to cope with stressful situations.

Data for *drug therapy* are unsatisfactory. Even if the administration of benzodiazepines (clonazepam, diazepam, tricyclic antidepressants) shows positive effects in single cases, evidence-based recommendations are completely lacking. Long-term medication seems to be useful only in exceptional cases.

## 7.3 Nightmares

### 7.3.1 Definitions

Nightmares are strongly negative dreams that lead to awakening in most cases. They are distinguished from distressing dreams or anxiety dreams that also show negative emotions but do not directly lead to waking up.

For the dreamer, this difference (being woken up by the dream or not) is not always easy to recognize. Regarding some dream contents, for example, falling dreams, it seems to be obvious because the person wakes up directly before hitting the ground. In more complex dreams (persecution, death of closely related persons), however, it is more difficult to distinguish if awakening occurred independently from the dream action or was induced by the strong emotions that occurred in the dream. Therefore, the diagnostic criteria (see ► Sect. 7.3.5) focus more on the stress caused by nightmares than on awakening criterion.

### 7.3.2 Etiology and Pathophysiology

In the nineteenth century, the assumption prevailed that dyspnea or heavy meals are responsible for nightmares, but today the etiology is based on a *diathesis stress model*.

#### Factors in Nightmare Etiology

- Genetic factors
- Personality dimension, so-called thin boundaries
- Neuroticism, anxiety
- Stress
- Trauma
- Medication
- Maintaining factors (cognitive avoidance)

A large Finnish twin study confirms a genetic influence for the occurrence of frequent nightmares in adults. Further genetic studies (genome-wide association studies, GWAS) are currently not available.

Also, the findings published by Ernest Hartmann can be categorized into the field of predisposition. He described a personality type with so-called *thin boundaries* in people suffering from frequent nightmares. Persons with thin boundaries have difficulties in distancing from external stimuli; they have extraordinary sensual experiences and intensive and conflictual relationships, but they are also very creative and emphatic.

The correlation with *anxiety* and *neuroticism* (emotional instability) seems to be apparent because the continuity hypothesis of dreaming predicts that waking life is reflected in dreams. Anxiety events and experiencing other negative emotions during daytime lead to more nightmares. This correlation corresponds to the observation that *stress* (occupational or partnership) leads to a significant increase nightmare frequency.

Experiencing a *trauma* such as sexual abuse, war events, violence, or a car accident with severe injuries may lead to the full symptomatology of a posttraumatic stress disorder. In this context, trauma-related nightmares represent one of the key symptoms. However, the frequency of nightmares is also increased in people who do not fully develop posttraumatic stress disorder. These nightmares may contain non-trauma-related

dreams as well as trauma-related content (or both).

Another possible origin for nightmares is a *medication* such as L-DOPA (medication for Parkinson's disease), serotonin reuptake inhibitors (antidepressants), donepezil (medication for dementia), and some blood pressure agents.

The etiology of nightmares is based on an interaction of predisposition and current stressors. Especially with regard to the treatment, however, it is important to consider another factor that might perpetuate the disorder: *avoidance*. In many nightmares, anxiety plays a major role, for example, in dreams of being chased in which the dream-self runs away, that is, avoids confrontation. From research on anxiety disorders, for example, arachnophobia, it is well known that the wish to avoid fear contributes to preserving the fear or even aggravates it because a fear of the anxiety develops. Only the confrontation and coping with fears can lead to long-term improvement. In cases of nightmares, this avoidance strategy is often applied, for example, when using the sentence, "It was only a dream." Many people try to forget distressing dreams as quickly as possible. However, in this case no active coping with the anxiety takes place, and reoccurrence of nightmares is very likely.

### 7.3.3 Epidemiology

Nightmares are a phenomenon that nearly everybody experiences in childhood or adolescence. Nightmares peak between the 6th and 10th year of life. About 5% of all children have nightmares at least once per week or more frequently. Even if nightmares occur more frequently in children, studies show that about 5% of adults also report distressing nightmares, i.e., a nightmare disorder. Women are more frequently affected than men. According to cross-sectional studies, frequency of nightmares decreases with age, so that young adults report nightmares more often than older people.

### 7.3.4 Clinical Presentation

In practice, three phenomena that are associated with nocturnal awakenings associated fear can be distinguished (■ Table 7.1).



**Table 7.1** Different types of awakenings related to fear

Characteristics	Pavor nocturnus	Nightmares	Posttraumatic re-enactments
Time of waking up	Mostly in the first half of the night	Mainly in the second half of the night	Both
Sleep stage	Slow wave sleep	REM sleep	REM and non-REM sleep
Physiological fear reaction	Very strong	Moderate	Strong to very strong
Dream content	Almost no content, single images	Detailed dream	Relatively direct replay of the trauma
Awareness after waking up	Almost no orientation, impaired responsiveness	Often fully oriented; fear of the dream may persist	Often fully oriented, strong aftereffect
Recall in the morning	Rare recall of the event	Good dream recall	Good dream recall

In the context of pavor nocturnus (see ► Sect. 7.1), that is, in sudden awakening from slow wave sleep, the person is barely oriented and cannot recall the event. Nightmares, however, can be *well recalled* because the patient awakens from a very emotional dream.

The typical *contents* of nightmares in children and adolescents are the following:

- Being chased (50%)
- Own death or injury (20%)
- Death or injury of others (15%)
- Falling into bottomless space (10%)

Although detailed studies on the content of nightmares in adults are scarce, the predominating topics encompass falling, being chased, being paralyzed, being late, and the death of close persons.

Nightmares occur mainly in the second half of the night because at that time the REM sleep phases are longer and the dreams are more intensive than at the beginning of the night.

In comparison to pavor nocturnus, the vegetative *fear reaction* is moderate. Especially in children, the fear that arose during the dream may persist after awakening although the children are generally fully oriented after awakening. This fear may make it difficult for them to reinitiate sleep after the nightmare.

So-called posttraumatic re-enactments should be distinguished from nightmares. The dream contents are very close to experienced trauma (war events, sexual abuse, natural catastrophes,

etc.) and may occur at any time during the night independently of the sleep stage. Posttraumatic re-enactments can be compared to flashbacks, that is, trauma-related intrusions that occur during the daytime.

#### Practical Tip

Nightmares - as typical REM parasomnia - occur more frequently in the second half of the night, whereas the disorders of arousal pavor nocturnus and sleepwalking occur during slow wave sleep, which means that the events mainly occur in the first half of the night. After awakening from a nightmare, the affected person is usually rapidly oriented and recalls the dream content well. In the context of pavor nocturnus or sleepwalking, the person, if awakened, is barely oriented, and the event is hardly recalled.

### 7.3.5 Diagnostics

Comprehensive *sleep anamnesis* is generally sufficient to diagnose nightmares if no further hints regarding the occurrence of other parasomnias (pavor nocturnus) and acting out of dreams (REM sleep behavior disorder) are mentioned (see ► Sect. 7.3.7). Regarding the etiology, the patient must be asked when nightmares started to occur

(predisposition) and if stressors are currently present. Also, exact assessment of the current medications is essential to determine a possible correlation.

#### Diagnostic Criteria of Nightmare Disorder According to the AASM

- A. Recurrence of extended extremely dysphoric, and well-recalled dreams that typically contain threats to survival, security, or physical integrity.
- B. After awakening from a distressing dream, the affected person rapidly orients herself and becomes alert.
- C. The dream experiences or the sleep interruption caused by nightmares causes clinically relevant distress or impairment in social, occupational, or other important areas of functioning. At least one of the following nightmare effects should be reported:
  - Mood disturbances (e.g., persistence of the nightmare emotion, anxiety, dysphoria)
  - Sleep resistance (e.g., fear of going to bed, fear of falling sleeping because then nightmares might occur)
  - Impaired cognitive performance (e.g., distracted by intrusive nightmare images, impaired concentration, impaired memory)
  - Negative effect on the caregiver or family (e.g., because of sleep disruptions at night)
  - Behavioral problems (e.g., avoiding going to bed, fear of darkness)
  - Daytime sleepiness
  - Fatigue, low energy
  - Impaired performance at work or problems at the place of education
  - Problems with social and interpersonal relationships

### 7.3.6 Sleep Diagnostics

Sleep diagnostics are usually not indicated for the diagnosis of nightmares. As already mentioned, it is not always easy to differentiate nightmares from other parasomnias (*pavor nocturnus*, REM sleep behavior disorders), so that in unclear cases sleep lab diagnostics might be appropriate.

turnus, REM sleep behavior disorders), so that in unclear cases sleep lab diagnostics might be appropriate.

However, clinical reports as well as empirical findings suggest that nightmares occur less often in the sleep laboratory than at home, which is again a reason to perform polysomnography only for differential diagnostic purposes. In particular, when posttraumatic nightmares occur, sleep examination should be performed in cases of possible sleep-related breathing disorders or periodic limb movements during sleep, because some studies reported that those two disorders occur more frequently in patients with posttraumatic stress disorder than in the normal population.

### 7.3.7 Differential Diagnostics

Nightmares must be distinguished from *pavor nocturnus*, which occurs predominantly in the first half of the night and is rarely recalled (■ Table 7.1). The differentiation is important not only from an etiological point of view but also regarding the treatment; the approach for nightmares described next is not effective for non-REM parasomnias such as *pavor nocturnus*.

Usually it is very simple to distinguish nocturnal *panic attacks* that may also develop from a nightmare, as the anxiety or panic reaches its peak only in wakefulness and is accompanied by panic-related thoughts (fear of death, etc.). Even if most patients suffering from panic disorders develop panic attacks during the daytime as well as at night, sometimes cases are reported in which patients only have panic attacks at night. Those persons should undergo cognitive behavioral therapy as the treatment of choice.

If the patient or the patient's bedpartner reports that severe acting out occurs in the context of nightmares, a *REM sleep behavior disorder* may be probable, and polysomnography (PSG) including video documentation should be initiated. In REM sleep behavior disorder, muscle tone during REM sleep does not decrease (see ► Sect. 7.4).

If nightmares occur regularly, in particular when they have replicative content, the differential diagnosis of *posttraumatic stress disorder* has to be considered. It is not always easy to differen-



tiate these two disorders (nightmare disorder and posttraumatic stress disorder) because severe traumas do not always lead to the full picture of posttraumatic stress disorder. In those cases, nightmares may represent the most relevant after-effect of the trauma. The additional symptoms of posttraumatic stress disorder are:

- Occurrence of intrusions during daytime (thoughts, flashbacks)
- Consciously avoiding activities, places, and persons that might lead to recalling the trauma
- Limited spectrum of affect (e.g., inability to have tender feelings)
- Impression of a limited future

In many psychiatric and/or psychosomatic clinics specialized wards have been established for persons suffering from traumatic experiences. If such a clinical department is not available in the individual's area, the affected person may be referred to a psychiatrist or psychotherapist for further diagnostics and treatment.

The therapeutic approach (see ► Sect. 7.3.8) can be applied to idiopathic as well as posttraumatic nightmares. In posttraumatic stress disorder the nightmare intervention should be used as add-on to standard psychotherapeutic treatment.

### 7.3.8 Therapy

Nightmares require treatment when they occur once per week or even more often, especially when the distress caused by nightmares becomes manifest in the form of fear of falling asleep or daytime functioning is impaired by nightmares, i.e., presence of a nightmare disorder.

Controlled trials are available on the effectiveness of *systematic desensitization* (within the context of behavioral therapy). The patient is confronted with the fear of the nightmare in his/her imagination (in wakefulness) after having learned relaxation procedures with increasing intensities. It is the objective of this intervention to imagine the fear of the nightmare without losing the physical sensation of relaxation.

The most effective and simplest method for treating nightmares was developed by Barry Krakow and colleagues and tested in many trials. The approach is termed *imagery rehearsal treatment* and consists of three steps.

- *Confrontation*: writing down the nightmare or drawing the dream situation.
- *Coping with the nightmare situation*: writing a new end of the dream or finalizing the drawing in such a way that fear is reduced.
- *Training of coping strategies*: the new “dream” is repeated in sensu once per day for about 5 to 10 min during the next 2 weeks.

With a rather low expenditure of one to two sessions that may be conducted in small groups, the therapeutic principle can be taught and practiced based on a recent nightmare. After the person has described the dream, he/she is invited to imagine a new end for this dream.

For children, drawing the most important dream picture is the method of choice. Then, the question is raised as to what the child may add to the picture so that he/she feels less afraid. For the therapist it is important not to make suggestions because the aim is to encourage and stimulate the child's potential to find solutions. Only when this coping strategy is not active or constructive should the child be asked to find other coping strategies for the nightmare situation. If the person suggests, for example, hiding or flying away, the person is asked if there are any other options because those avoiding behaviors like hiding and flying away only lead to short-term attenuation of the fear and the anxiety can reoccur (the pursuer is finally able to find the person or can also fly). Therefore, constructive approaches such as “looking the danger in the eye” or “asking somebody for help” are more effective in the long term.

Having developed a coping strategy for the nightmare situation, the affected individual is asked to write down the new “dream” and to go through it once per day for about 5 to 10 min during the next 2 weeks. In this context, the person should imagine the new behavior as concretely and vividly as possible; for example, not running away but confronting the threatening figure. If the nightmares still persist after 2 weeks, another dream can be chosen and worked on.

Interestingly, the clinical experience with this therapy shows that not only do the nightmares that have been selected for this intervention change but also dreams with other stressful content. It is plausible that the general principle of “facing a fearful situation is equated with searching for coping strategies” has been learned so that

### 7.3 · Nightmares

the dream-self is also more self-confident in other situations.

#### Case Report

A 22-year-old woman consulted the sleep clinic because of nightmares that had occurred almost every night for several months.

History taking also revealed singular pavor nocturnus attacks. The patient reported that she often did not sleep well in unfamiliar environments. Diagnostics performed in the sleep lab, however, were unremarkable except for low sleep efficiency. Nightmares or pavor nocturnus did not occur during the two nights in the sleep lab. A questionnaire indicated that the subjective quality of sleep and the feeling of being refreshed in the morning were only slightly reduced, but the patient suffered from a relevant increase in daytime tiredness. In the first session, the patient reported a current conflict in her core family that had led to a discontinuation of contact with her parents.

We explained the therapeutic principles of confrontation and coping with the nightmare situation and compared this treatment with the typically applied intervention for anxiety disorders and phobias. This was well understood by the patient.

During the nightmare the night before the consultation, the patient was in the changing room of a fitness center. First, the whole family was present; then her mother was in the foreground and insulted and criticized her. She felt completely helpless with regard to those accusations.

Being asked how she could change such a dream, the patient had several suggestions such as ignoring the mother's accusations but also being proactive by firmly stating her own needs. The new "dream" contained an active confrontation and the sentence: "I am very well able to handle my life."

In the next session 2 weeks later, the patient reported that she had regularly trained the "new" dream for 1 week. Although dreams containing her mother had not reoccurred since the first session, several other negative dreams had occurred, including a recurrent dream she has had for many years. The dreamer was sitting in her grandmother's kitchen. First the atmosphere was pleasant, but then she sensed a threat from outside, something threatening that might come

into the house. Then the scene changed, and the dreamer was in a white room with friendly mythical creatures. Two of those creatures encouraged her to face the threat on her own. At about 5 AM, the patient awakened from the nightmare and still clearly felt the fear of the dream.

After a conversation about the elements of the dream (e.g., the relationship with her grandmother), the patient was again asked to imagine a new end of the dream. The patient imagined how she decided to face the threat with the support of the friendly mythical creatures.

In the final session another 2 weeks later, the patient reported that she had not had any nightmares and that the dreams she had recalled contained new behavioral patterns. Being confronted with other dream persons, the dreamer felt much more self-confident and was able to express her own needs. At the same time, she reported improvement of her daytime tiredness.

Despite the fact that the current stressor (problems with core family) did not change, the intervention was able to reduce the nightmares by strengthening the dream-self. The negative impact of the stress on dreaming and sleep was significantly reduced.

The team of Barry Krakow showed in several controlled trials that this simple treatment approach is effective in persons who had been suffering from nightmares for many years and who had undergone many different and unsuccessful psychotherapeutic or pharmacological treatment attempts. This treatment approach was also effective in a group of female patients who suffered from nightmares as a consequence of sexual assault. Because the therapeutic principle of confrontation and coping strategies is well understood by many patients, the imagery rehearsal method can be well implemented in sleep medical practice.

The effectiveness of these approaches based on cognitive behavioral therapy is well documented, whereas *medication* that suppresses REM sleep (e.g., tricyclic antidepressants) or benzodiazepines has been shown to be less effective for the treatment of nightmares. One exception are the positive effects of prazosin or similar substances such as doxazosin and terazosin on the frequency of posttraumatic nightmares that occur in the context of a posttraumatic stress disorder.

## 7.4 REM Sleep Behavior Disorder

### 7.4.1 Definitions

In REM sleep behavior disorder, dreams are acted out, mostly intensive dreams with marked body movements. Many movements occur in bed, but leaving the bed is also possible. The risk of injury is high because the person sees the dream situations in his/her mind and only barely recognizes the real sleep environment.

### 7.4.2 Etiology and Pathophysiology

The REM sleep behavior disorder is strongly linked to neurodegenerative diseases such as Parkinson's disease or dementia with Lewy bodies, which means that patients with REM sleep behavior disorder are likely to develop neurodegenerative disease 10 to 15 years later. Therefore, it is assumed that it is a particular course of a neurodegenerative disease showing the decline of muscle tone-inhibiting areas in the brainstem as the first symptom.

### 7.4.3 Epidemiology

The prevalence of this disorder is very low less than 1% of the overall population. Men at the age of 50 years or older are most frequently affected. In cases of Parkinson's disease, REM sleep behavior disorder occurs in at least one third of patients; in cases of other degenerative diseases such as multiple system atrophy, the percentage is even higher. Also, patients suffering from narcolepsy reveal an increased incidence of REM sleep behavior disorder. Nearly all patients with REM sleep behavior disorder develop a neurodegenerative disease in the further course (within 13 years on average).

### 7.4.4 Clinical Presentation

The following examples illustrate the problems that are associated with REM sleep behavior disorder.

### Case Reports

A 67-year-old man reported the following dream: "I was playing football as halfback. And they all expected me to run forward. But there was this 140-kg opponent and according to the rules I tackled him with my shoulder. When I woke up, I stood in front of the chest of drawers and I had thrown everything, lamps, mirror, off the top, hit my head on the wall and my knees on the chest of drawers."

Another patient from our consultation reported about a dream in which his wife drove their car. During the trip she lost control, and the patient tried to regain control of the steering wheel by moving his arm to that direction. When he woke up, he had hit his wife, who was lying calmly beside him, in the face.

Dream-associated movements are explained by the loss of the muscle tone blockade that is active in healthy sleepers during REM sleep. Even though laboratory studies could show that minimal muscle potentials in the extremities may occur in accordance with the dream experience, the efferent neural signals of the motor cortex of the brainstem are strongly inhibited to avoid movements along with the dream images. In the 1960s and 1970s, the French sleep researcher Michel Jouvet studied cats during their sleep that had undergone surgery destroying the centers that are responsible for this inhibition. Those cats showed behaviors such as licking, hunting, and defending during REM sleep. i.e., they had artificially induced REM sleep behavior disorder.

The dream contents of those patients are often described as being aggressive or intensive (body movements). However, until now no studies have been available that examine normal dreams of those persons, that is, dreams that are not acted out. It seems obvious that dreams with intensive movements that are most likely to overcome the weakened muscle tone inhibition represent only the tip of the iceberg, whereas normal dreams can still be well inhibited and thus are not accompanied by extensive movements. Because awakenings due to acting out dream scenes or injuries does not occur in these cases, these normal dreams are not recalled.

### 7.4.5 Diagnostics

First of all, *history taking* must clarify if intensive dream contents are acted out by movements (see ► Sect. 7.4.4, case reports). This step is important to distinguish this phenomenon from sleepwalking, during which single thoughts and images are reported but no intensive dream experience is recalled.

Because REM sleep behavior disorder can occur in narcolepsy patients, narcoleptic symptoms (tendency to fall asleep, cataplexy, sleep paralyzes) should be asked about in the interview, and if needed suitable diagnostics should be conducted (e.g., multiple sleep latency test).

For further diagnostics, it has to be clarified if REM sleep behavior disorder is part of an already manifest neurodegenerative disease such as Parkinson's disease, dementia with Lewy bodies, or multiple system atrophy.

A comprehensive *neurological examination* is required; regular follow-up in the further course of the disease should be performed by a specialized neurologist.

#### Diagnostic Criteria of REM Sleep Behavior Disorder According to the AASM

- Repetitive episodes of sleep-related vocalizations or complex motor behavior; these are linked to dream experiences occurring simultaneously so that this phenomenon is termed “acting out one’s dreams.”
- These behaviors occur during REM sleep documented by polysomnography or most probably occur during REM sleep based on the clinical history.
- The polysomnographic recording confirms the presence of REM sleep without atonia (according to the current version of the scoring manual of the American Association of Sleep Medicine).
- The disorder cannot be better explained by any other sleep disorder, mental disorder, or medication or substance abuse.

#### Annotations:

If the patient's history allows the most probable conclusion of REM sleep behavior disorder but the criteria of atonia during REM sleep (see ► Chap. 2) are only partly fulfilled, a preliminary diagnosis can be made. As medication may unmask an existing REM sleep behavior disorder, the diagnosis is generally also made when the REM sleep behavior disorder occurs in the context of medication.

### 7.4.6 Sleep-Related Diagnostics

In addition to history taking, an *examination in a sleep lab* must be performed over two nights because polysomnography is mandatory (documenting REM sleep atonia), as some disorders (see ► Sect. 7.4.7) may be confused with REM sleep behavior disorder. As with nightmares and non-REM parasomnias, the probability of measuring an active episode with acted-out dreams in the sleep lab is rather low, first because the incidence of acted-out dreams is also quite low in the home setting, and in the protected environment intensive dreams that are typically accompanied by movements (the tip of the iceberg) occur rarely.

Nevertheless, these patients show relevant characteristics in the PSG. The *muscle tone* (chin electromyogram (EMG)) is significantly increased during REM sleep (in healthy individuals, the minimum is reached during REM sleep). The minimal muscle tone during non-REM sleep serves as reference; thus, the disorder can be diagnosed with high certainty without actual acting out of a dream in the sleep lab.

In sleep diagnostics, special attention must be paid to the occurrence of *periodic limb movements during sleep* because they occur more frequently in patients with REM sleep behavior disorder compared to healthy sleepers. The extreme form of leg movements (with hitting and kicking the bed partner) in patients with periodic limb movements during sleep can be misinterpreted as possible REM sleep behavior disorder, so that in these cases the polysomnographic examination of the leg movements is important.

### 7.4.7 Differential Diagnostics

*Sleepwalking* has to be taken into consideration as an important differential diagnosis. Sleepwalking occurs out of non-REM sleep and can be differentiated by overnight polysomnography. Based on the anamnesis it might be sometimes difficult to differentiate, but generally the patients suffering from REM sleep behavior disorder are not able to walk around for a longer time like sleepwalkers but bump into things because they see dream images and are usually not aware of the actual environment in their bedrooms. Furthermore, good recall of dream images is characteristic of REM sleep behavior disorder.

### 7.4.8 Therapy

Some case reports are available showing that application of *melatonin* may improve the symptoms of REM sleep behavior disorder.

However, the most effective therapy consists of administering 0.5–2.0 mg *clonazepam*. Clinical experience shows that up to 90% of patients benefit from this treatment. The effect is mostly seen already in the first night: acting out of dreams disappears. Even after longer treatment periods, the drug tolerance for this benzodiazepine is generally not problematic. After several years, the effect of this medication can still be seen even if smaller movements during REM sleep may reappear after initial suppression.

## 7.5 Other Parasomnias

In this chapter, parasomnias are presented that are observed very rarely in sleep medicine.

### 7.5.1 Sleep Drunkenness

Sleep drunkenness is classified as non-REM parasomnia and also termed a disorder of arousal comparable to sleepwalking and pavor nocturnus. The diagnostic criteria of disorders of arousal are described in the context of pavor nocturnus (see ► Sect. 7.1.5) and sleepwalking (see ► Sect. 7.2.5). The person in these cases is dizzy and not fully oriented. Confused actions may even be performed.

Polysomnographic studies revealed that extreme sleep drunkenness is observed after awakening from slow wave sleep. For some persons it is particularly stressful because they have difficulties waking up in the morning. In our sleep medical clinic, a considerable number of individuals have presented who had overslept in the morning despite having set several alarms because they had not heard them or turned them off and continued sleeping. The solution was that they were woken up by another person in order to get to work on time.

The etiology of sleep drunkenness and difficulties of waking up is mostly unclear; treatment approaches are unknown.

### 7.5.2 Isolated Sleep Paralysis

Isolated sleep paralysis is defined by waking from REM sleep with complete paralysis of the voluntary movable muscles except the eye muscles. The episodes may last for several minutes. Frequently, bizarre perceptions are described in this condition, for example, a stranger standing beside the bed. The affected individuals are often in panic, in particular during first occurrence because of the complete paralysis. Sleep paralyzes are mostly observed after waking up in the morning; in rare cases they are also reported during sleep onset.

Sleep paralysis may be a symptom of *narcolepsy* (see ► Sect. 5.1), so that patients who report frequent sleep paralysis episodes should undergo PSG evaluation. While taking the sleep history it should be asked if the extremities are really paralyzed because some patients confound extreme tiredness resulting in the difficulty to immediately getting up with this condition.

The incidence of persons who experience such sleep paralysis once in their lifetime is estimated to be as high as 40%. Repeated occurrences of this symptom outside the diagnosis of narcolepsy, however, are very rare (less than 0.1% in the general population).

In the course of the disorder, patients try to move one part of their body, such as an arm or leg, by concentrating on this movement to rapidly end the paralysis quicker. So far, the effectiveness of REM-suppressing antidepressants that are also applied for the treatment of REM sleep-related symptoms of narcolepsy has not been demonstrated.



### 7.5.3 Enuresis

Bedwetting (enuresis) is subdivided into two types:

- *Primary enuresis*: children who have never been successfully trained to control urination
- *Secondary enuresis*: children who have been dry for at least 6 months but revert to bedwetting

The incidence of enuresis is estimated to be about 5% in 10-year-old children. In adults, enuresis is extremely rare.

In the etiology, organic factors such as disorders of the bladder function or an underlying disease such as diabetes mellitus may be involved, and further diagnostics by a specialized urologist are recommended. In some cases, the development of a sleep apnea syndrome in childhood may cause enuresis, so that the clinical hints (see ► Sect. 11.1) should be followed up by a comprehensive sleep anamnesis (if needed, with polygraphic or polysomnographic evaluation of the nocturnal respiratory function).

In addition, psychosocial stressors (parents' divorce, birth of a sibling, abuse, neglect) may result in the development of bedwetting. In clinical practice, behavioral therapy has turned out to be effective, for example, positive feedback after dry nights and awaking schedules in which the affected child is awakened twice per night and taken to the toilet. Those awakenings are first applied after the first and second third of the night sleep and then successively pre- and postponed so that finally no more awakenings are required.

### 7.5.4 Sleep-Related Eating Disorders

Sleep-related eating disorders may manifest in different ways.

In cases of *night-eating syndrome*, patients consume at least 20% of their daily calories after dinner. This late food intake frequently causes problems with initiating sleep. The disorder, however, has not been investigated in detail and requires behavioral therapy.

In the context of *sleep-related eating disorder*, the difference is made between a condition comparable to sleepwalking in which the patients are not completely awake and only barely or not at all recall their nighttime activities and a second type

in which where the patient completely wakes up but has the impression that he/she is only able to reinitiate sleep after eating (in most cases, a snack such as a biscuit or toast suffices).

In cases of eating during sleepwalking, some studies could show an association to the restless legs syndrome. For these patients, treatment with dopamine agonists such as pramipexole can be beneficial. Furthermore, clonazepam and topiramate have been successfully applied. Simple behavioral measures such as locking away all food does not seem to work appropriately according to clinical experience because the affected person may react very angrily if food is not available. In addition, the hypothesis has been developed that eating problems that occur during daytime reappear in the sleepwalking episodes. In these cases, therapeutic measures as described in ► Sect. 7.2.8, that is, physiological relaxation before going to bed, should be applied. If the patient is completely waking up and has problems of reinitiating sleep without eating something, this can be interpreted as learning processes that are also observed in the etiology of primary insomnia (see ► Chap. 3). Therefore, methods of behavioral therapy regarding sleep training are probably effective.

### 7.6 Questions

1. What is the difference between *pavor nocturnus* and nightmares?
2. What is the difference between sleepwalking and REM sleep behavior disorder?
3. Which are the most important treatment strategies of sleepwalking?
4. What must be taken into account in the further time course of REM sleep behavior disorder?

### Further Reading

1. American Academy of Sleep Medicine. The international classification of sleep disorders. ICSD-3. Darien: American Academy of Sleep Medicine; 2014.
2. Schenck C. Paradox lost: midnight in the battleground of sleep and dreams: violent moving nightmares (REM sleep behavior disorder). Minneapolis: Extreme-Nights; 2005.