

# Research on the parasomnia's classifications, symptoms and treatments

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**Abstract.** Parasomnia is a neurological disorder that refers to abnormal behavior during sleep. This disease has received increasing attention and research over the past few decades. In the 1950s, the symptoms of parasomnia were first described and further studied. This paper describes the three classifications of parasomnias, and details the symptoms and treatment options for these three classifications. By reading and analyzing the previous literature, it can be concluded that the types of parasomnia can be roughly divided into circadian dysrhythmia sleep disorder, sleep apnea syndrome, and restless leg syndrome. Circadian dysrhythmia sleep disorder is characterized by late sleep, insufficient or excessive sleep duration, resulting in daytime fatigue, a lack of concentration, and other symptoms. The treatment method is light therapy. The main symptom of sleep apnea is that breathing stops during sleep, resulting in a lack of oxygen supply. The treatment is to improve the maxillofacial structure through surgery to reduce the problem of dyspnea. The most obvious symptom of restless leg syndrome is discomfort and unbearable numbness in the lower legs and feet while sleeping. There are three ways to treat this condition. A more non-pharmacological treatment is to do some exercise to reduce the discomfort of the leg muscles, a medical treatment is to give the patient levodopa, and if the syndrome is caused by a lack of iron in the body, iron supplementation is sufficient.

**Keywords:** clock gene, circadian dysrhythmia, restless leg syndrome, levodopa, sleep apnea syndrome.

## 1. Introduction

Sleep is an integral part of human life and has a significant impact on both physical and mental health. However, some people experience sleep differently from normal sleep patterns. They may wake up during the night and have trouble falling asleep, or they may feel sleepy during the day and have trouble staying awake. These abnormal sleep experiences are called parasomnias. Parasomnia refers to a series of abnormal phenomena that occur during the normal sleep cycle. Parasomnia can be caused by a variety of factors, including genetics, obesity, gender, age and so on. These factors may lead to decreased sleep quality and affect daily life and work performance. Therefore, the purpose of this paper is to make people understand the types, symptoms and treatment methods of parasomnia, so as to improve their understanding of it.

## **2. Analysis of parasomnia's classifications and symptoms**

In this chapter, parasomnia is divided into three categories (i.e., circadian dysrhythmia sleep disorder, sleep apnea syndrome, and restless leg syndrome), and describes the three different forms of symptoms.

### *2.1. Circadian dysrhythmia sleep disorders*

Circadian dysrhythmia refers to a sleep disorder in which the body's biological clock is out of sync with the 24-hour day-night cycle, resulting in abnormal sleep-wake patterns. The biological clock refers to the natural biological rhythm inside the human body, which is based on periodic changes in the natural environment, such as light, temperature, food intake, etc. Circadian rhythms refer to the body's daily changes in a 24-hour cycle. Circadian dysrhythmia usually refers to the mismatch between the biological clock and the circadian rhythm, which leads to a series of symptoms: Daytime fatigue and sleepiness: due to poor sleep quality, patients often feel tired and drowsy during the day, affecting work and life. Insomnia: Patients have difficulty falling asleep or waking up multiple times during the night, resulting in poor sleep quality. Early awakening: Patients have difficulty falling back asleep after waking up in the morning, resulting in insufficient sleep time. Emotional instability: Sleep disorders and circadian rhythm disorders may lead to emotional instability, irritability, anxiety, depression, etc. Lack of concentration: Insufficient and low-grade sleep can affect patients' cognition and concentration, resulting in reduced learning and work efficiency. Altered appetite: Disturbed circadian rhythms may affect the patient's appetite and digestive system, leading to problems such as an upset stomach and decreased or increased appetite.

The normal operation of circadian rhythm is determined by a core set of CLOCK genes, including the PRE gene family (including PRE1, PRE2 and PRE genes), the CRY gene family (including CRY1 and CRY2 genes), the CLOCK gene and the BMAL1 gene [1]. These genes encode a series of clock proteins and regulate the circadian clock cycle through complex interactions. Therefore, abnormal and dysregulated circadian rhythms are associated with genetic factors. According to Mansour et al, Nievergelt et al and Wellcome Trust Case Control Consortium, circadian rhythm disturbances are associated with variations in clock genes [2]. Because these genes interact through a complex regulatory network to control the body's circadian rhythm. And when the expression of these genes is mutated or mutated, the circadian rhythm becomes dysregulated, leading to a series of sleep disorders and physiological diseases. The etiology of such parasomnia is related to genetic factors.

### *2.2. Sleep apnea syndrome*

One type of parasomnia is Sleep Apnea Syndrome (SAS), which is a common sleep disorder[3]. The main feature is apnea during sleep, which results in insufficient oxygen supply and causes a series of health problems. Sleep apnea syndrome is divided into two main types, namely obstructive sleep apnea (OSAS) and central sleep apnea (CSAS). Obstructive sleep apnea is caused by a partial or total blockage of the upper airways, resulting in a pause in breathing. Central sleep apnea is caused by damage or disturbance to the respiratory control center, resulting in the suspension of breathing [4]. Obstructing sleep apnea is characterized by apnea and snoring caused by partial or total obstruction of the upper airway, and symptoms include frequent nighttime awakenings, drowsiness, daytime fatigue, and inattention [4, 5]. Central sleep apnea is characterized by apnea due to damage or disturbance of the respiratory control center. Its symptoms are similar to those of obstructive sleep apnea, but are often accompanied by cardiovascular and neurological problems, such as hypertension, arrhythmia and cognitive impairment. Both types of sleep apnea can lead to decreased sleep quality, which in severe cases can affect quality of life and health.

Obesity factors, age, and gender can all influence the incidence and severity of sleep apnea syndrome.

First, obesity is one of the most common risk factors for sleep apnea syndrome. Excessive fat accumulation can cause the tissue in the throat to relax, leading to obstruction or narrowing of the airways, which can affect breathing. Studies have shown that obese people are four to five times more likely to develop sleep apnea. In addition, studies have found that the symptoms of sleep apnea syndrome can be significantly improved by weight loss [6].

Secondly, age is also an important factor affecting sleep apnea syndrome. With age, muscle tone and the elasticity of the respiratory system decrease, which can easily cause apnea. Studies have found that the incidence of sleep apnea syndrome increases with age, especially in men [7].

Finally, gender is also associated with the incidence and severity of sleep apnea syndrome. Men are more likely to suffer from sleep apnea than women, and the reason may be related to the physiological structure of the male throat and neck, which is more likely to cause airway obstruction or narrowing. In addition, hormones have an impact on respiratory function in both men and women. Among them, male hormones have a certain impact on the collapse of the upper respiratory tract [8], which may indirectly lead to the generation of obstructive sleep apnea.

### *2.3. Restless legs syndrome*

Restless legs syndrome (RLS) [9, 10] is a neurological disorder characterized clinically by discomfort or unbearable sensations of numbness, tingling, or tearing in the lower limbs, especially the calves and feet, but also involving the thighs and buttocks. These symptoms become more pronounced at night. As a result, the disease can cause symptoms such as difficulty falling asleep, lack of deep sleep, lack of concentration during the day and irritability, all of which seriously affect the quality of life of patients. Some studies have shown that the prevalence of RLS is age-related, with increasing age increasing the incidence of RLS, and that RLS is more common in women than in men [11]. In addition, the syndrome is associated with periodic limb movements (PLMS), which are also present in about 80% of RLS patients. PLMS, which can be diagnosed by polysomnography, is characterized by unilateral or bilateral limb movements that may reduce the quality and quantity of sleep at night and disrupt the sleep of bed-mates. Therefore, treating RLS and PLMS is very important to improve sleep and quality of life [12].

Genetic factors are being studied as a possible cause of restless legs syndrome. Therefore, the twin experiment is an appropriate research direction to prove the existence of this factor. In Ondo's study, it was found that there was a strong concordance of restless legs syndrome in monozygotic twins and a low concordance in dizygotic twins [13]. In another study, a mother and two of her identical twin children were also found to have RLS [14]. One conclusion we can draw from these two sets of studies is that there is a genetic link to restless legs syndrome.

## **3. The treatment of parasomnia**

### *3.1. The treatment of circadian dysrhythmia disorders*

Light therapy is a common treatment for sleep disorders with circadian rhythm disorders. This treatment is mainly achieved by acting on the retina of the human body. Light-sensitive pigments (photoreceptors) in the retina sense light and send messages to the brain that affect the sleep clock. Specifically, when the human eye is exposed to bright light, the photopigment is stimulated, and the signal to the pituitary gland that regulates melatonin secretion is reduced, thus reducing melatonin levels. In contrast, when people are in the dark, the pituitary gland releases regulatory signals that increase, promoting the secretion of melatonin, so that melatonin levels rise. Therefore, light therapy can help patients regulate their circadian clock and sleep cycle by regulating the level of melatonin secretion through the intensity and duration of light [15].

### *3.2. The treatment of sleep apnea syndrome*

The surgical treatment of sleep apnea syndrome mainly includes laryngeal surgery and maxillofacial surgery. Larynx surgery includes tonsillectomy, palatal obturation resection, tongue base resection, etc. These operations mainly treat upper respiratory tract obstruction factors, and improve respiratory tract patency by reducing obstruction sites. Maxillofacial surgery includes maxillofacial bone advancement surgery, mandibular advancement surgery, etc. These operations mainly treat maxillofacial deformity and other factors, and reduce upper respiratory tract obstruction by improving the maxillofacial structure. This treatment is often used to treat sleep apnea. In the report of Olsen et al. [16], six patients with obstructive sleep apnea were presented. All six patients underwent surgery to correct airway obstruction

and relieve sleep apnea, thus avoiding permanent tracheotomies. These cases also show that surgical treatment can effectively help patients with obstructive sleep apnea relieve their pain.

*3.3. The treatment of restless leg syndrome is divided into two categories: non-drug treatment, drug treatment and supplement nutrients.*

*3.3.1. Non-drug therapy.* Restless leg syndrome is a common neurological disorder, that is usually treated with drugs to relieve symptoms. However, non-drug therapies can also be used as adjunctive treatments to help reduce the symptoms of restless leg syndrome and improve quality of life. Non-drug treatments include exercise, massage, physical therapy, etc.

Exercise is a very effective non-drug treatment, and proper exercise can ease the discomfort of restless leg syndrome, thus reducing symptoms. At the same time, appropriate physical exercise can also increase the duration of deep sleep and reduce the duration of light sleep. In addition, exercise can also reduce anxiety, depression and other negative emotions, promote physical and mental health, and further improve sleep quality [17]. The type of exercise can be walking, jogging, swimming, yoga, etc., but it should be noted that the exercise time should not be too late, so as not to affect sleep.

Massage is another non-drug treatment that reduces the symptoms of restless leg syndrome by relieving muscle fatigue, improving blood circulation, and calming the nervous system. The method of massaging calf muscles is usually used, and massage services provided by professionals can be selected, or a simple massage can be carried out by an individual.

Physical therapy is another non-drug treatment method, and commonly used physical therapy includes hot and cold compresses, electric therapy, etc. A hot compress can relieve muscle fatigue and relax muscles, thus reducing the symptoms of restless leg syndrome. A cold compress can relieve muscle pain and swelling. Electrotherapy is a treatment method that improves nerve and muscle function through electrical stimulation, and reduces the symptoms of restless leg syndrome by stimulating the nervous system.

In conclusion, non-drug therapy can be used as an auxiliary means for the treatment of restless leg syndrome, which can not only reduce symptoms, but also improve physical and mental health, which is conducive to improving life.

*3.3.2. Drug treatment.* Levodopa is a drug used to treat restless legs syndrome [18]. L-dopa is converted into dopamine in the body, which is a neurotransmitter that helps reduce the symptoms of restless legs syndrome. Levodopa is an oral medication, usually taken before bed, and its effects can last for about four hours. However, it should be noted that long-term use of levodopa may lead to a gradual weakening of its efficacy, so the dose needs to be gradually increased. In addition, long-term use of levodopa may cause side effects, such as nausea, vomiting and dizziness. Therefore, it is necessary to follow the doctor's advice and pay attention to the dosage and timing of drug use to ensure the safety and effectiveness of drug therapy. In addition to medication, some non-medication treatments, such as regular exercise, changes in the sleeping environment, and emotional stress relief, can also help reduce the symptoms of restless leg syndrome.

*3.3.3. Supplement nutrients.* Iron supplementation can improve restless leg syndrome, so it is the primary goal of iron supplementation therapy to observe the index of iron storage in the human body. The most appropriate method is to determine the iron content of the human body by serum ferritin, transferrin, and transferrin saturation [19]. It has also been shown that iron depletion can make RLS more severe [20, 21]. Iron supplements include oral gluconate, which can cause gastrointestinal side

effects including nausea, abdominal pain and constipation. Due to the existence of side effects, it is necessary to control the dosage of oral supplements to avoid iron overload [22].

#### 4. Conclusion

The causes of parasomnia are complex, involving genetics, obesity, gender, age and other factors. Therefore, the treatment of parasomnia is also challenging. At present, the treatment of parasomnia includes surgical treatment, behavioral treatment and drug treatment. Behavioral therapy includes daily physical activity, and drug therapy includes the use of levodopa. It should be pointed out that there are some limitations to the current treatment of parasomnia, such as the possible side effects of medication. Therefore, the treatment of parasomnia needs further exploration and improvement.

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