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Module 4.3: Stages of Sleep

Sleep is not a uniform state of being. Instead, sleep is composed of several different stages that can be differentiated from one another by the patterns of brain wave activity that occur during each stage. These changes in brain wave activity can be visualized using EEG and are distinguished from one another by both the frequency and amplitude of brain waves. Sleep can be divided into two different general phases: REM sleep and non-REM (NREM) sleep. **Rapid eye movement (REM)** sleep is characterized by darting movements of the eyes under closed eyelids. Brain waves during REM sleep appear very similar to brain waves during wakefulness. In contrast, **non-REM (NREM)** sleep is subdivided into four stages distinguished from each other and from wakefulness by characteristic patterns of brain waves. The first four stages of sleep are NREM sleep, while the fifth and final stage of sleep is REM sleep. In this section, we will discuss each of these stages of sleep and their associated patterns of brain wave activity. The hypnogram in Figure 4.4 shows a person's passage through the stages of sleep.

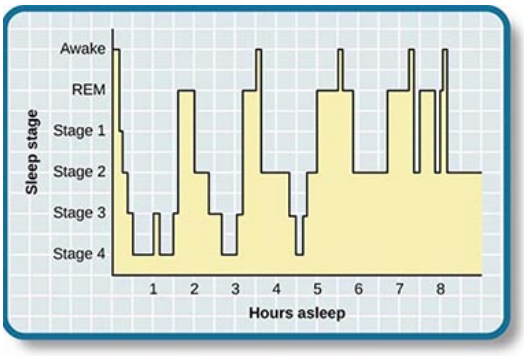


Figure 4.4 A hypnogram is a diagram of the stages of sleep as they occur during a period of sleep. This hypnogram illustrates how an individual moves through the various stages of sleep.

NREM Stages of Sleep

The first stage of NREM sleep is stage 1 sleep. **Stage 1 sleep** is a transitional phase that occurs between wakefulness and sleep, the period during which we drift off to sleep. This stage lasts for 5-10 minutes. It is relatively easy to wake someone from stage 1 sleep; in fact, people often report that they have not been asleep if they are awoken during stage 1 sleep.

Stage 2 is characterized by light sleep. During this time, your body gets ready for deep sleep by slowing your heart rate and respiration and by decreasing both overall muscle tension and core body temperature.

Stage 3 and **stage 4** of sleep are often referred to as **deep sleep or slow-wave** sleep because these stages are characterized by low frequency (up to 4 Hz), high amplitude **delta waves** (Figure 4.5). During this time, an individual's heart rate and respiration slow dramatically. It is much more difficult to awaken someone from sleep during stage 3 and stage 4 than during earlier stages, and if woken, a person is typically disoriented for a few minutes. Also, it is during stage 3 that abnormalities exist, such as sleepwalking, sleep talking, nightmares, and bed-wetting.

REM Sleep

As mentioned earlier, REM sleep is marked by rapid movements of the eyes, and occurs about 90 minutes after a person falls asleep. The brain waves associated with this stage of sleep are very similar to those observed when a person is awake, as shown in Figure 4.6, and this is the period of sleep in which dreaming occurs. It is also associated with paralysis of muscle systems in the body with the exception of those that make circulation and respiration possible. Therefore, no movement of voluntary muscles occurs during REM sleep in a normal individual; REM sleep is often referred to as paradoxical sleep because of this combination of high brain activity and lack of muscle tone. Like NREM sleep, REM has been implicated in various aspects of learning and memory, although there is disagreement within the scientific community about how important both NREM and REM sleep are for normal learning and memory.

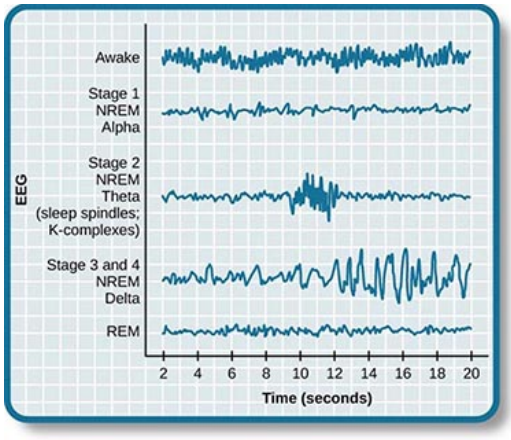


Figure 4.5 Brainwave activity changes dramatically across the different stages of sleep.

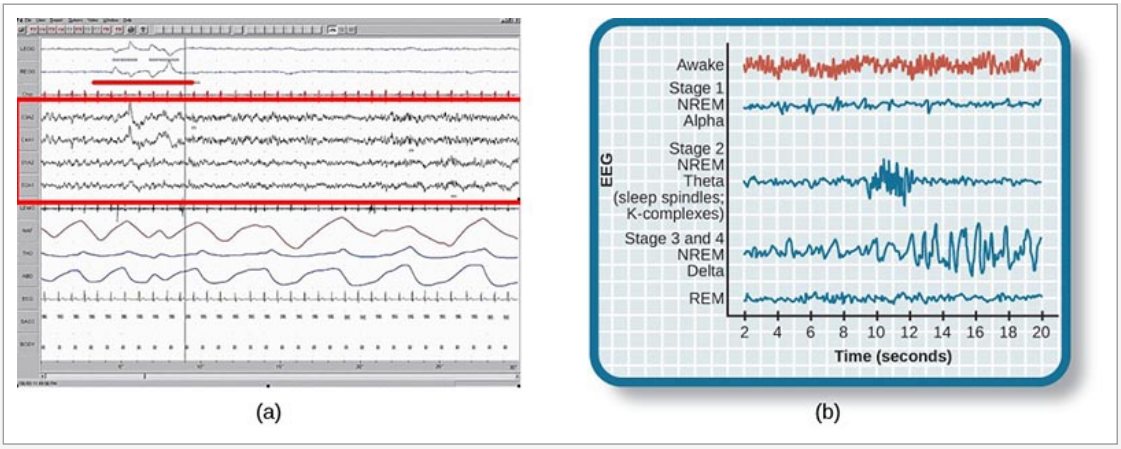


Figure 4.6 (a) A period of rapid eye movement is marked by the short red line segment. The brain waves associated with REM sleep, outlined in the red box in (a), look very similar to those seen (b) during wakefulness.

Link to Learning

Watch this brief video describes the various stages of sleep.

Aside from the role that REM sleep may play in processes related to learning and memory, REM sleep may also be involved in emotional processing and regulation. In such instances, REM rebound may actually represent an adaptive response to stress in non-depressed individuals by deemphasizing the emotional impact of stressful or upsetting events that occurred in wakefulness.

Dreams

The meaning of dreams varies across different cultures and periods of time. By the late 19th century, German psychiatrist Sigmund Freud had become convinced that dreams represented an opportunity to gain access to the unconscious. By analyzing dreams, Freud thought people

could increase self-awareness and gain valuable insight to help them deal with the problems they faced in their lives. Freud made distinctions between the manifest content and the latent content of dreams.

- **Manifest content** is the actual content, or storyline, of a dream.
- **Latent content** refers to the hidden meaning of a dream.

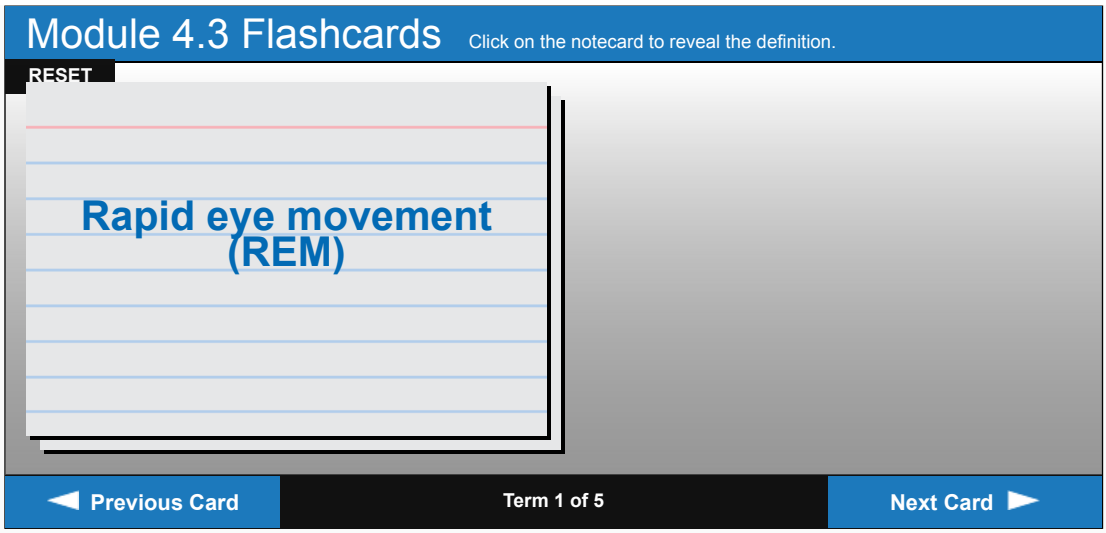
Freud was not the only theorist to focus on the content of dreams. The 20th century Swiss psychiatrist Carl Jung believed that dreams allowed us to tap into the collective unconscious. The **collective unconscious**, as described by Jung, is a theoretical repository of information he believed to be shared by everyone. According to Jung, certain symbols in dreams reflected universal archetypes with meanings that are similar for all people regardless of culture or location.

The sleep and dreaming researcher Rosalind Cartwright, however, believes that dreams simply reflect life events that are important to the dreamer. For example, she and her colleagues published a study in which women going through divorce were asked several times over a five month period to report the degree to which their former spouses were on their minds. These same women were awakened during REM sleep in order to provide a detailed account of their dream content. There was a significant positive correlation between the degree to which women thought about their former spouses during waking hours and the number of times their former spouses appeared as characters in their dreams.

Recently, neuroscientists have also become interested in understanding why we dream. For example, John Hobson (2009) suggests that dreaming may represent a state of proto-consciousness. In other words, dreaming involves constructing a virtual reality in our heads that we might use to help us during wakefulness. Among a variety of neurobiological evidence, Hobson cites research on lucid dreams as an opportunity to better understand dreaming in general. **Lucid dreams** are dreams in which certain aspects of wakefulness are maintained during a dream state. In a lucid dream, a person becomes aware of the fact that they are dreaming, and as such, they can control the dream's content.

Check Your Knowledge

As you read your assignment for this lesson, pay close attention to the key terms and phrases listed throughout the chapter. These terms and concepts are important to your understanding of the information provided in the lesson.



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