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**NEUROPHYSIOLOGY ASSIGNMENT**

**1.) PHYSIOLOGY OF SLEEP**

Sleep is a state of reduced awareness and responsiveness. In humans, sleep is also associated with reduced movement. Sleep consists of two different phases:

i .) Rapid eye movement (REM) sleep AND

ii.) Non-REM sleep or slow wave sleep.

**I.) RAPID EYE MOVEMENT SLEEP “REM”**

REM sleep is characterised by the presence of rapid eyemovements during sleep. This type of sleep is less restful than slow-wave sleep and is associated with dreaming and bodily muscle movements. During REM sleep a person’s threshold to be aroused by external stimuli is higher than during slow-wave sleep. Heart rate and breathing become irregular during REM sleep, a feature of the dream state.

The brain is extremely active during REM sleep. The electroencephalogram shows patterns of brain wave activity similar to those that occur during the waking hours. Due to this feature of REM sleep, it is often also referred to as paradoxical sleep as it is a paradox that one can be asleep and yet the brain is incredibly active.

II.)**NON-RAPID EYE MOVEMENT SLEEP/ SLOW WAVE SLEEP**

In contrast, non-REM sleep is characterised by deep sleep. The duration of REM sleep episodes is longer earlier in the night when one is most tired. As one becomes more rested during the night, the duration of REM sleep episodes decreases.

During non-REM sleep the blood pressure, breathing and metabolic rate are all depressed significantly. Bodily movements do not occur during non-REM sleep.Non-REM sleep is also referred to as slow wave sleep as during this period the brain waves are very strong and of a very low frequency (i.e. slow).While non-REM sleep is sometimes referred to as dreamless sleep, dreams and even nightmares can occur during non-REM sleep. These are not associated with movement and are not remembered as they are not consolidated to memory during this sleep phase.

**SLEEP CYCLE**

REM sleep occurs at about 90 minute intervals. There are usually 4 to 6 cycles of REM and non-REM sleep each night. Later into the night, the REM episodes become longer and non-REM sleep becomes shorter and lighter. Non-REM sleep can be defined as stage 1, 2, 3 or 4. Stages 1 and 2 are often referred to as light sleep and stages 3 and 4 as deep sleep, slow wave sleep or delta sleep

.The level or lack of sensory inputs also influences our ability to fall asleep. A number of these sensory inputs include:

**Pain and discomfort**: Awakening during the night is more common in individuals with chronic disease such as rheumatoid arthritis or multiple sclerosis. Pain is also associated with increased tossing and turnings that also result with increased awakenings during the night;

**Temperature**: An ambient temperature of 18 °C is ideal for falling asleep and staying asleep. Increased and decreased temperatures result in disrupted sleep;

**Physical activity**: Exercise promotes wakefulness during the activity and also for 3 hours after the activity. Exercise close to the time of going to bed can delay and decrease melatonin secretion. This is important as melatonin is a hormone produced by the pineal gland which promotes sleep;

**Sexual activity**: Unlike other forms of activity, sexual intercourse usually promotes falling asleep;

**Noise**: A noisy environment can impair sleep and increase arousal from sleep. The noise level that causes an individual to wake varies between people and also changes with age. A person is also more likely to wake up if the noise is significant to the person, the crying of an infant to its parents;

**Hunger**: Hunger is associated with wakefulness. Carbohydrates and milky drinks that contain tryptophan, a compound which is broken down in the body to produce melatonin, are excellent at promoting sleep. Bananas, peanuts and figs are also rich sources of tryptophans. High protein foods are rich in tyrosine (a hormone which promotes wakefulness) and can lead to wakefulness. Large meals can cause reflux and heartburn and also drive wakefulness; and

**Light exposure**: Seasonal changes in the duration of daylight affect the sleep-wakefulness cycle. During sleep, 5-10% of light reaches the retina and light exposure can result in arousal from non-REM sleep. Light exposure during the day also increases alertness, motor function and mood, elevates body temperature and heart rate.

**SLEEP REGULATION**

Sleep is regulated by some neurotransmitters

I.) SEROTONIN: aids sleep

ii.) NOREPINEPHRINE & DOPAMINE : reduce sleep

iii.) ACETYLCHOLINE: increases sleep

**FUNCTIONS OF SLEEP**

a.) Restorative, homeostatic function.

b.) Thermoregulation function

c.) Energy conservation.

**SLEEP DISORDERS (APPLIED PHYSIOLOGY (**

Sleep disorders can be broadly divided into two:

a.) Parasomnias

b.) Dyssomnias

**DYSSOMNIAS**

Primary insomnia, Primary Hypersomnia, Nacrolepsy, Breathing related sleep disorder, Circadian rhythm sleep disorder

**PARASOMNIAS**

Nightmares, sleep terror disorder, sleepwalking disorder

**2.) ROLE OF BASAL GANGLIA IN COORDINATING MOVEMENT**

The basal ganglia or basal nuclei are clumps of gray mass located below the cortex in the depth of both cerebral hemispheres (1). These nuclei can have different shapes and are involved in the control of movement.The basal ganglia are surrounded by a white mass of the cerebral hemisphere, and the individual nuclei that enter into their composition build the walls of the lateral cerebral chambers. The basal ganglia include:

- corpus striatum

- claustrum

- the amygdala

- substantia nigra

- subthalamic sails

**FUNCTIONS OF BASAL GANGLIA**

In order to understand the functions of the basal ganglia, we must mention the **extrapyramidal system**. This system is the part of the brain and brain stem that participates in motor control except for the corticospinal (pyramid) system. The role of the extrapyramidal system is to control automatic movements, skeletal muscle tone, and maintenance of postural reflexes.

The basal ganglia exert their role in motor control through constant interaction with the cerebral cortex and the corticospinal pathway. They get information mainly from the cerebral cortex and send out information.

The function of the basal ganglia is to fine-tune the voluntary [movements](/en/library/anatomy/types-of-movements-in-the-human-body). They do so by receiving the impulses for the upcoming movement from the [cerebral cortex](/en/library/anatomy/cortical-cytoarchitecture), which they process and adjust. They convey their instructions to the [thalamus](/en/library/anatomy/thalamus), which then relays this information back to the cortex. Ultimately, the fine-tuned movement instruction is sent to the [skeletal muscles](/en/library/anatomy/histology-of-skeletal-muscle)through the tracts of the pyramidal motor system. Basal ganglia mediate some and other higher cortical functions as well, such as planning and modulation of movement, memory, [eye](/en/library/anatomy/eye-anatomy) movements, reward processing, and motivation.