NAME: OGWUEGBU U. CHARLES

MATRICULATION NUMBER: 17/MHS03/025

DEPARTMENT: MBBS

COURSE: NEUROPHYSIOLOGY

COURSE CODE: PHS305

ASSIGNMENT TITLE: NEUROPHYSIOLOGY

**ASSIGNMENT**

* Discuss the physiology of sleep
* Discuss the role of basal ganglia in coordinating movement

**ANSWER**

**PHYSIOLOGY OF SLEEP**

Sleep is a brain process. Sleep is a state of unconsciousness, a reversible state in which the body has little or no response to environmental/external stimuli. There are two types of sleep; REM (Rapid Eye Movement)/desynchronization sleep and NREM (Non-Rapid Eye Movement) sleep, which is further divided into four stages; Stages 1, 2, 3 and 4. NREM and REM alternate cyclically throughout the whole sleep period usually starting with NREM except in some sleep disorders e.g. NARCOLEPSY in which the individual sleep directly through REM

NREM & REM SLEEP CYCLES

Normal sleep starts out with NREM stage 1 then goes into stage 2, 3 and 4, then finally into REM, but it isn’t going to stay at REM throughout the night rather it’s going alternate between the NREM and REM stages. NREM stage accounts for 75-80% of total sleep in which stage 2 account for most of it as sleep progresses. REM stage accounts for 20-25% of total sleep which is associated with the presence of desynchronized brain activity, muscle atonia, bursts of rapid eye movement, saw tooth wave forms and theta activity. The first REM cycle is about 70-100 minutes but during second and later cycles it becomes longer, about 90-120 minutes.

FOUR STAGES OF NREM SLEEP

STAGE 1:

* Serves a transitional role in sleep cycling i.e. begins the sleep cycle.
* Requires relatively less stimuli to awaken compared to the other stages.
* Lasts for 1-7 minutes in the initial cycle, accounting for 2-5% of total sleep.
* Brain activity on the EEG (Electroencephalograph) shows a transition from wakefulness (associated with rhythmic alpha waves, with frequency of 8-13 cycles/second) to low-voltage, mixed frequency waves.

STAGE 2:

* Lasts for 10-15 minutes in initial cycle and then lengthens, accounting for 45-55% of total sleep.
* Requires more stimuli to awaken compared to stage 1
* Brain activity on the EEG shows low voltage, mixed frequency waves with characteristic SLEEP SPINDLES (associated with memory consolidation, so therefore it’s higher in individuals who have learnt a new task) and K-complexes.

STAGE 3 & 4: They collectively referred to as SLOW-WAVE SLEEP.

STAGE 3:

* Only lasts a few minutes but constitutes 3-8% of total sleep.
* Brain activity of EEG shows high voltage, slow wave activity.

STAGE 4:

* Lasts 20-40 minutes in the initial cycle, accounting for 10-15% of total sleep.
* Associated with high-voltage, slow wave activity on the EEG.

In addition to the changes mentioned above, other systems undergo changes too as a result of sleep and are they are as follows:

* CARDIOVASCULAR SYSTEM: Changes in blood pressure and heart rate levels and are determined by the autonomic nervous system. For instance, there’s a brief sudden increase in blood pressure and heart rate at K-complexes and during arousal.
* SYMPATHETIC NERVOUS SYSTEM: Sympathetic nerve activity decreases ad NREM sleep deepens.
* RESPIRATORY SYSTEM: Ventilation and respiratory flow changes and becomes more erratic and increasingly faster.
* CEREBRAL BLOOD FLOW: There is a decrease in cerebral blood flow in NREM, while the blood flow in REM is similar to that of wakefulness.
* RENAL SYSTEM: There is a decrease in excretion of sodium, potassium, chlorine, and calcium for concentrated and reduced urine flow.
* ENDOCRINE SYSTEM: Growth hormone, Thyroid hormone and melatonin (induces sleep) secretion are influenced by sleep.

**ROLE OF BASAL GANGLIA IN COORDINATING MOVEMENT**

The basal ganglia, with their inhibitory efferents, control motor outputs either directly by projections into the MIDBRAIN MOTOR REGIONS or indirectly via THALAMIC NUCLEI. Neural mechanisms in the basal ganglia act selectively to remove or enhance the inhibition, giving rise to different combinations of motor signals, which may act as neural templates for motor learning. Hence, assisting in movement coordination.