



# CNS PHYSIOLOGY

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قال ﷺ « وإن الملائكة لتضع أجنحتها  
لطالب العلم رضاً بما يصنع »

# Definition

- ▶ **Synapse:** it is a junction where the axon or some other portion of one cell (**presynaptic cell**) terminates on the **dendrites, soma, or axon** of another neuron (**post synaptic cell**).
- ▶ **Axodendritic:** synapses between the axon of one neuron and the dendrite of another neuron.
- ▶ **Axosomatic:** synapses between the axon of one neuron and the soma of another neuron.
- ▶ **Axoaxonic:** axon to axon.
- ▶ **Dendrodendritic:** dendrite to dendrite.
- ▶ **Dendrosomatic:** dendrite to soma.
- ▶ **Stimulatory field:** the neuronal area stimulated by each incoming nerve fiber.
- ▶ **Excited zone:** discharge zone of the incoming fiber.
- ▶ **Facilitated zone:** to each side the neurons are facilitated but not excited.
- ▶ **Convergence:** signals from multiple inputs uniting to excite a single neuron.
- ▶ **Pyramidal tract:** the motor tract which originates from the cerebral cortex and descends to the spinal cord( the corticospinal tract ) passes through the pyramids of the medulla.
- ▶ **Extrapyramidal tract:** the rest of the descending motor pathways which do not travel through medullary pyramids.
- ▶ **Autonomic nervous system:** is the efferent portion of the peripheral nervous system that controls involuntary (subconsciously) to adapt the changes in environment by regulating individual organ, homeostasis and visceral functions.
- ▶ **Motor unit:** it is the axon + nerve fibers that innervates that muscle.
- ▶ **Reflex:** reflex is a fast, predictable, automatic response to changes in the environment.
- ▶ **Renshaw cells:** they are small neurons located in the anterior horns of the spinal cord, in close association with the motor neurons.
- ▶ **Synaptic delay central delay:** is the time of reflex to pass through neurons of the spinal cord.

# Cont.

- ▶ **Reaction time:** reaction time= reflex time= synaptic delay + time spent in conduction of action potentials through the afferent and efferent nerves.
- ▶ **Recruitment of motor units:** the increase in the number of active motor units
- ▶ **Signal prolongation:** often the output discharge (initiated by a signal entering a spinal pool) is prolonged for a few milliseconds or many minutes after the incoming signal is over.
- ▶ **Reverberatory (oscillatory) circuitry:** is caused by positive feedback within the circuit in which the output neuron sends a collateral nerve fiber back to input neuron itself making it discharge repetitively for a long time.
- ▶ **Flexor reflex:** in the spinal or decerebrate animal, almost any type of cutaneous sensory stimulus from a limb is likely to cause the flexor muscles of the limb to contract, thereby withdrawing the limb from the stimulating object.
- ▶ **Crossed extensor reflex:** about 0.2 to 0.5 second after a stimulus elicits a flexor reflex in one limb, the opposite limb begins to extend.
- ▶ **Irradiation:** spread of impulses up and down to different segments and motor neurons in the spinal cord.
- ▶ **Stretch reflex:** is a reflex contraction of muscle resulting from stimulation of the muscle spindle (MS) by stretching the whole muscle.
- ▶ **Proprioception:** inform the CNS about muscle length & rate or velocity of change in muscle length & provide information about position.
- ▶ **Coactivation:** with alpha motor neurons, in most instances the gamma motor neurons (31%) are stimulated simultaneously.
- ▶ **Inverse stretch reflex:** relaxation in response to strong stretch.

# Cont.

- ▶ **Brainstem:** lower portion of the brain that connects the cerebrum with spinal cord.
- ▶ **Conjugate eye movement:** refers to motor coordination of the eyes that allows for bilateral fixation on a single object.
- ▶ **Light :** 'electromagnetic' radiation that is capable of exciting the human eye' + its extremely fast .
- ▶ **Dark adaptation :** increased sensitivity of the photoreceptors when vision shifts from bright to dim light.
- ▶ **Nyctalopia:** ( night blindness) vitamin A deficiency (main source of retinal of rhodopsin) cause rods , cones & retinal degeneration & loss of rods .
- ▶ **Light adaptation:** when light switched on again, the rods are knocked out of action ( they stop sending AP at high levels of light) & cones start to function to adjust & adapt to the level of brightness in 5 min this is called light adaptation.
- ▶ **Color vision:** It the ability to discriminate between different colors.
- ▶ **Color blindness:** Weakness or total blindness in detecting a primary color.
- ▶ **Trichromats:** see the 3 Iry colors (normal or have slight weakness in detecting red or green or blue color).
- ▶ **Dichromats:** boy's slide: (blind to one Iry color) girl's slide: "have only 2 cone pigments systems only so he is completely blind to red or green or blue (so they may have protanopia, deuteranopia, or tritanopia) they get color by mixing only 2 of the primary colors".
- ▶ **Monochromats:** have only one color pigment (system) or loss of all so see only black or grey or have no color perception.
- ▶ **Protanopia** (red blindness): no red cones system so person has shortened spectrum wave length If only weakness in red color vision is called Protanomaly.

# Cont.

- ▶ **Deuteranopia (green blindness):** no green cones system so person see only long & short wave length. If only weakness in green color vision is called Deuteranomaly.
- ▶ **Tritanopia (blue blindness):** no blue cones system. If only weakness in blue color vision is called Tritanomaly.
- ▶ **Ishihara chart:** which are plates contain figures made up of colored spots on background of similarly shaped colored spots.
- ▶ **Eye:** fluid-filled sphere enclosed by three specialized tissue layers.
- ▶ **Sclera:** tough outer covering of connective tissue.
- ▶ **Choroid:** The middle layer is the choroid, containing blood vessels.
- ▶ **Retina:** innermost layer which contains light sensitive cells.
- ▶ **Cornea:** modified ant 1/6 of sclera) to allow light to enter the eyes, transparent and avascular.
- ▶ **Conjunctiva:** Transparent membrane covers the anterior surface of eye, reflected on inner surface of eyelids.
- ▶ **Pupil:** Behind center of cornea, control & allow light to enter the eye.
- ▶ **Iris:** Colored part., Has radial muscle dilates the pupil as in dim light > supplied by sympathetic. Has circular muscles constrict the pupil as in bright light > supplied by parasympathetic.
- ▶ **Pupillary Muscles:** consists of > Radial and Circular parts.
- ▶ **Ciliary muscles (body):** Thick ant part of choroid to which attached suspensory ligaments (Zonule).
- ▶ **Lens:** transparent, biconvex, semisolid, dioptric power 15-20 D, held in place by zonule.
- ▶ **Crystallins:** proteins found within the cells of the lens, and are arranged like the layers of an onion which make the refractive media of the lens.
- ▶ **Uvea:** = Choroid + iris + ciliary muscles.

# Cont.

- ▶ **Optic Disc (Blind Spot ):** point of exit of optic nerve fibers, contains no photoreceptors.
- ▶ **Retinopathy in diabetes:** -Vessels have weak walls causes hemorrhaging and blindness.
- ▶ **Diopter:** o Measurement of refractive power.
- ▶ **The Aqueous Humour:** transparent, slightly gelatinous (gel-like) fluid similar to plasma, continually being formed and reabsorbed.
- ▶ **The Vitreous Humour:** is the transparent, colorless, gelatinous mass o It fills the vitreous chamber between the posterior surface of lens of the eye and the retina o The vitreous humour is clear and allows light to pass through o For nourishing retina & keep spheroid shape of the eye).
- ▶ **Glaucoma:** is an eye condition that develops when too much fluid pressure builds up inside of the eye.
- ▶ **Binocular Vision:** are the areas in the centre of visual field of the two eyes in which any object in this area will be seen by both eyes.
- ▶ **Hypermetropia (hyperopia = far-sightedness):** Short eyeball, focus behind retina, • An affected individual has to use accommodation even for distant objects to bring image on retina causes muscular effort on ciliary muscle & prolonged convergence, this leads to headache & finally squint & hypertrophy of ciliary muscle.
- ▶ **Myopia (nearsightedness):** Genetic, large eye ball, longer anteroposterior diameter, • refractive power of lens system or cornea due to its too curved surface or due to long anteroposterior diameter of the eye • cause image to focus in front of retina.
- ▶ **Astigmatism:** Uneven & ununiformed corneal curvature, very rare ununiformed lens curvature • Rays refracted to different focus blurred vision.
- ▶ **Presbyopia:** eye near point recedes by age due to loss of accommodation.

# Cont.

- ▶ **Emmetropic Eye:** can see all distant objects clearly with its ciliary muscle relaxed & see close objects clearly with ciliary muscles contracted. Normal eye = Emmetropia.
- ▶ **olfactory chemoreceptors :** which are specialized endings of afferent (bipolar) neurons that convert olfactory stimuli (chemicals in gaseous state) into nerve impulse.
- ▶ **Anosmia:** loss of smell sensation.
- ▶ **Hyposmia:** decreased ability to smell.
- ▶ **Dysosmia:** distorted identification of smell.
- ▶ **Parosmia :** Altered perception of smell in the presence of an odor, usually unpleasant.
- ▶ **Phantosmia:** Perception of smell without an odor present.
- ▶ **Agnosia:** Inability to classify or contrast odors.
- ▶ **Hyperosmia:** increase in smell sensation.
- ▶ **Taste Buds:** Barrel shaped structures that contain taste receptors. A Taste bud is a specialised receptors in the oral cavity, but mainly on the tongue, some on the palate.
- ▶ **Ageusia:** complete loss of taste.
- ▶ **Dysgeusia:** disturbed taste.
- ▶ **Hypergeusia:** adrenal insufficiency.
- ▶ **Hypogeusia:** it can be caused by many diseases, and drugs such as penicillamine.

# Cont.

- ▶ **Conjugate eye movement:** refers to motor coordination of the eyes that allows for bilateral fixation on a single object.
- ▶ **Preservation and protection theory:** Sleep preserve energy and it provides activity.
- ▶ **The reticular activating system:** A diffuse network of nerve pathways in the brainstem connecting the spinal cord, cerebrum, and cerebellum, and mediating the overall level of consciousness.
- ▶ **Sleep (Physiological definition):** is a state of unconsciousness from which a subject can be aroused by appropriate sensory or other stimuli.
- ▶ Sleep may also be defined as a normal, periodic, inhibition of the reticular activating system. ( Anatomical definition)
- ▶ **Awake:** This is the state of readiness / alertness and ability to react consciously to various stimuli.
- ▶ **Coma:** is a state of unconsciousness from which a person cannot be aroused by any external stimuli.
- ▶ **Restoration theory:** Body wears out during the day and sleep is necessary to put it back in shape.
- ▶ **Insomnia:** Inability to sleep.
- ▶ **Somnolence:** Extreme sleepiness.
- ▶ **Nightmare:** Frightening dreams, awake from REM.
- ▶ **Sleep paralysis:** Subject is awake but unable to speak or move. Sleeping Sickness.
- ▶ **Somnambulism:** Walking during sleep.
- ▶ **Night terrors:** Sudden arousal from sleep and intense fear accompanied by physiological reactions (e.g. rapid heart rate, perspiration) that occur during slow-wave sleep.
- ▶ **Narcolepsy:** Excessive sleepiness may occur while talking, sitting, decreased ability to regulate sleep.
- ▶ **Sleep apnea:** Failure of breathing when asleep.



# Thank you!

اعمل لترسم بسمة، اعمل لتمسح دمة، اعمل و أنت تعلم أن الله لا يضيع أجر من أحسن عملا.

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اقتراحات وشكاوي

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