

Unit 3 Notes

Anatomy of a neuron

- Franz Gall: said you could observe/feel the skull to find out about a person
- neuron: single nerve cell, basic building block of the nervous system
 - transmit specialized info thruout brain/body
- * dendrites, cell body, myelin sheath, terminal buttons
- dendrites: branch-like extensions, receive messages
- cell body (soma): life source, houses nucleus, maintains function
- axon: tail-like structure, transmits neural impulse away from the cell
 - * may be more than one axon
 - * axon hillock: point where axon begins soma
- myelin: fatty substance that protects neuron, speeds up transmission
 - * Nodes of Ranvier: gaps btwn myelin deposits
- action potentials: series of neural impulses
- synapse: where communication btwn neurons will happen

Neural Communication

- neurons communicate thru electrochemical impulses
 - Two processes occur:
 - * intraneuron communication (neuron sending impulse thru axon to the terminal buttons)
 - * interneuron communication: action potential (brief electrical charge that travels down axon)
- inter neuron stuff: threshold is what is required to "awaken" neuron (-55 millivolts)
- action potential occurs along axon
- neurotransmitters: chemical messengers (some excitatory: cause action in next neuron) (some inhibiting: inhibiting action in next neuron)
- reuptake: when neurotransmitters saved for later use
- when at rest, neuron has negative charge

Assignment 7.2

- 1) dendrites receive message from other cells
- 2) Dendrite sends message into axon
- 3) Action potentials occur along axon
- 4) neural impulse arrives at terminal button
- 5) Terminal buttons release NTs into synapse
- 6) Some NTs not absorbed will be reabsorbed by terminal button (reuptake)
- 7) NTs absorbed by dendrites of the second receiving neuron

Neurotransmitters

- senses rely on neurons/electrochemical impulse
- neurons release neurotransmitters into synapse
- * dendrites receive, axons transport, terminal buttons release NTs into synapse
- NTs: chemical messengers
- excitatory NTs: cause activity
- inhibitory NTs: decrease activity] some are both
- acetylcholine (ACh): activates muscle action, helps w/ learning/memory
 - affects Alzheimers
- dopamine (DA): influences movement, learning, attention, emotion
 - * controls reward/pleasure centers
 - * must be balance

- serotonin: mood, sleep, arousal/focus, hunger
- norepinephrine: alertness *fight/flight
- GABA: inhibitory, slows electrical activity in the brain
- glutamate: memory, thinking
- agonists mimic neurotransmitters and binds to receptors
- antagonists directly stop neurotransmitters

Assignment 7.3

Neurotransmitter	Functions
ACh	- muscle action - learning - memory
DA	- movement - learning - attention - emotion - reward - pleasure
Serotonin	- mood - sleep - arousal - focus - hunger
norepinephrine	- alertness *fight/flight
GABA	- slows brain activity
glutamate	- memory - thinking

The nervous system

*body's communication network

- nerve cells:

- 2 parts:

· central: brain, spinal chord

· peripheral: connects central to rest of body

- sensory neurons: carry info from receptors to brain

- motor neurons: carry info from brain to muscles

- interneurons: communicate between sensory/motor

- afferent pathways: info body → brain (sensory)

- efferent pathways: info brain → body (motor)

- somatic system: controls skeletal muscles
- autonomic system: controls glands/muscles of internal muscles
- sympathetic: expands energy (expends for stress/surprise)
- parasympathetic: calms body, preserves energy
- reflex: simple, automatic response to sensory stimulus
 - spinal reflex creates instant reflex to avoid damage (doesn't involve brain)

The endocrine system

- endocrine system: collection of glands that secrete hormones throughout the body (balance!)
- hormones made thru endocrine glands, travel thru blood
- pituitary gland: controls endocrine system, releases growth hormones
- thyroid gland: responsible for metabolism, releases thyroxine
 - * too little thyroxine = hypothyroidism (tired, sluggish, weight gain)
 - * too much = hyperthyroidism (anxious, edgy, weight loss)
- pancreas: gland that regulates glucose levels, releases insulin
- adrenal gland: releases adrenaline/vise versa (fight/flight)
- ovaries: female sex hormones
- testes: male sex hormones

Brain structures

- brainstem: central core of brain - responsible for automatic functions
 - medulla: automatic - breathing, digestion, heartbeat
 - pons: messenger btwn spine/brain
 - midbrain's reticular functions: mental arousal, alertness, sleep
- thalamus: sensory switchboard (receives messages, sends them) all but smell
- cerebellum: movement, balance, nonverbal learning/memory
- limbic system: memory, emotions, drives
 - hippocampus: memory formation, organization, storage
 - amygdala: aggression, fear
 - hypothalamus: eating, drinking, temp, endocrine, emotional reward

Assignment

Structure	Functions
Amygdala	aggression, fear
Brainstem	central core of brain - responsible for automatic functions
cerebellum	movement, balance, nonverbal learning, memory
hippocampus	memory formation, organization, storage

hypothalamus	- hypothalamus: eating, drinking, temp, endocrine, emotion/reward
limbic system	memory, emotions, drives
medulla	automatic - breathing, digestion, heart beat
pons	messenger btwn spine/brain
midbrain's reticular formations	mental arousal, alertness sleep

cerebral cortex

↳ wrinkled outer layer, wrinkled to increase surface

- cerebral cortex: control/info processing center for brain

- brain divided into 2 halves

- longitudinal fissure: separates right/left hemispheres

- cortex divided into lobes:

- frontal: planning, thinking, decision making, higher-level thought processes

- parietal: mediates attention

- occipital: visual processing

- temporal: auditory processing, understanding speech/music

- * primary motor complex (back of frontal lobe): controls all voluntary movement

- * somatosensory area (front of parietal): receives sensations of skin/muscles

- * auditory complex: receives/processes sound

- * visual cortex: receives/processes visuals

- broca's area: allows 4 speech

- wernicke's area: allows 4 for u to understand speech

Assignment

Lobe	Functions/Importance
Frontal	- planning, thinking, decision-making, higher-level thought processes * primary motor complex: voluntary movement
Parietal	- mediates attention * somatosensory: receives sensations from skin/muscles

Occipital	visual processing * visual cortex: receives/processes visuals
Temporal	Auditory information, processing speech, music * auditory complex: receives/processes sound

The amazing brain

- left hemisphere specialized for language
- corpus callosum: connects two hemispheres (severing it reduces seizures)
- neurogenesis: brain can grow new neurons
- plasticity: brain's ability to change/reorganize

Brain Research/Imaging

- ablation: removal of a part of the brain
- deep lesioning: destruction of brain tissue via microelectrodes
- ESB: electrodes activate brain tissue via electrical stimulation
- EEG: electrode stuck to detect brain wave activity
- angiogram: dye used for brain during X-ray (*vascular health)
- CAT scan: takes pics of the brain
- MRI: magnetic field used to take pics - very clear
- PET scan: glucose injected into blood stream: to measure brain activity/function
 - the colorful pics