

Midterm Study Guide

- **Monism** is the idea that the mind and body consist of the same substance (Physical matter)
 - most monist take the position that the mind and everything else are physical.

- **Dualism** - the idea that the mind and the brain are separate. (Physical + mental/spiritual) ^(materialistic monism)

- **Equipotentiality** - the idea that the brain functions as an undifferentiated whole. the extent of damage, not the location, is what determines how much function is lost. "every part of the brain is involved w/ everything."

- **Localization** - the idea that specific areas of the brain carry out specific functions
 - functions are as much distributed as they are localized; behavior results from the interaction of many wide spread areas of the brain.

- **Genotypes** (combinations of genes) ^{description of physical or behavioral characteristics} must phenotype are influenced by genotypes.

- **Phenotype** (characteristics) or behavioral
- **Physiological** - relating to the branch of biology that deals with the normal functions of living organisms and their parts.

- **Ontogeny** - the origin and development of individual organisms.

- **Genes** do not provide explanations of behavior but they control the production of proteins.

- **Proteins** - affect the development of brain structures, the production of neural transmitters and the receptors that respond to them.

- RNA codes are for making proteins

1. Provides structure of cells.
2. Governs body's chemical reaction (enzymes)

explanations of behavior
Genetics is the study of how organisms are transferred

behavior is influenced by genes

O W C S C P C

C P C C O W S

- **chromosomes** - 23 pairs per cell
XY - male XX - female
- **sperm** cells can give X or Y sex chromosome
- **ovum** only gives X chromosomes
- **Heritability**: Genetic influence on our behaviors
• about half of the differences in behavioral characteristics among people are attributed to heredity.

- 50% intelligence, 60% to 90% skitz, 40% to 50% ^{personality characteristics}
90% height

Important molecules & ions:

oxygen - O_2	
chloride - Cl	water - H_2O
Potassium - K^+	carbon dioxide - CO_2
Calcium - Ca^{++}	sodium - Na

- **Neurons** - communication specialist
• estimated 100 billion in the brain
- Irreplaceable (mostly)
- use glucose for energy - O_2 required to process glucose
- **Neuron membranes** - made of 2 layers of lipid molecules. - impermeable except to a few molecules. * H_2O , O_2 , CO_2 can get through the membrane
- Protein channels allow only a few ions to pass. (Na^+ , K^+)

Major parts: 4 main parts

- more than one) • **Dendrites** - receives input from sensory structures & other neurons (branched like roots of a plant)

- ONLY 1) • **Soma** - cell body of neuron, POWER PLANT
- **Axon** - passes messages away from the cell body to neurons/muscles

- covered w/ myelin sheath (which helps speed neural impulses)
- Pre-synaptic - store, release, reabsorb chemicals used for neuron communication

"outside in"

- **Sensory Neurons**
 - get physical info from the environment to the nervous system (located in dorsal ganglia of spinal cord)
- **Motor Neurons** :- initiate movement (impulses pass from brain to muscle)

REFLEXES

Interneurons - a neuron that transmits impulses between other neurons (dendrite & axon are within the same structure (brain or spinal cord))

4 types

Glia cells : surround neurons and provide support for and insulation. "supporting cells" 2-5x + prevalent

Functions of Glia cells

(yellow)

Oligodendrocytes - myelinates axons of the neurons in the central nervous system

(blue)

Shwann - myelinates axons of the neurons in the peripheral nervous system

- guide axon regrowth

- guide neuron migration

Radial Glia - helps development

(green)

Microglia - synchronize activity of neurons

- cleans up cellular debris and dead neurons from nervous tissue via phagocytosis (cell eating)

- mediate immune responses in the CNS

(red)

Astrocytes - support & repair neurons (axon guidance)

- control/form the blood brain barrier and blood flow

- synaptic support (synapse between nerve cells)

(BBB)

Blood Brain Barrier

- tight arrangements of cells in the brain's blood vessels. *NOT a membrane*

- controls what can and cannot pass through to the brain.

• **Neuron communication** : communicate via sudden electrical & chemical events. the synapse is the gap between neurons & muscles or neurons & glands.

* Within - Action Potential (electrical current)

* Between - Neurotransmitters (chemical, gases)

SUB

MADE
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Resting Potential: electrical potential of a neuron when not stimulated or involved.
Amplitude: Resting x Action: a snake which is coiled to strike.
Resting potential: "on the go" - prepared state.
Potential: electrical difference. *neuron is not in use but ready to use.*
Process: the membrane becomes polarized so there's more negative voltage inside the neuron. (positive outside)

- Na^+ & K^+ ions inside & outside
- Na^+ channels shut

- K^+ channels in membrane are "leaky"
- sodium potassium pump in membrane

Pump: * 2 K^+ IN neuron / 3 Na^+ OUT of neuron.

- **Action Potential**: Polarized neuron membrane can be depolarized

- rapid switch from negative to positive

- Na^+ channels open (axon hillock)

- Na^+ rushes in axon * becomes positive inside

- Positive charge flows down the axon

- then cause neurotransmitter release

- **Repolarization**: When the membrane potential becomes more positive (action potential likely)

- **Hyperpolarization**: When membrane potential is more negative. (action potential less likely)

- Threshold of excitation - rapid switch -

- Nodes of Ranvier: gaps in the myelin sheath.

- It allows ions to move in and out of neuron

- then the electrical signal flows down the axon that causes salutary conduction "salsa"

- **Synapse**: A gap that impulses pass by diffusion of a neurotransmitter

- Presynaptic neuron (A) releases neurotransmitter

- Postsynaptic neuron (B) receives neurotransmitter at its receptor sites

(Jump from node to node)

- **Neurotransmitter**: chemicals, liquids or gas influence the membrane of neuron B (post)

• **Neuron A** (Presynaptic)

- synthesis of NT occurs in: cell body (from there)
Axon Terminal
Storage in vesicles

• **Neuron B** (Postsynaptic)

- NT's fit specific receptor sites (on dendrites)
- open ion channels (ionotropic receptors) or Nat
- starts a metabolic reaction
- >1 receptor type for a single NT

Action Potential

↓
Ca²⁺ ions enter A
↓
NT gets released

- **Receptor site**: the part of a nerve that receives and reads chemical signals

- **Agonist**: a chemical that binds to a receptor and activates it to produce a response.
- **Antagonist**: bully, blocks agonist from having reaction.
causes opposite response to occur.

- **Summation**: graded potentials can be summated to create an action in "B"

(time) • **temporal summation** - repeated excitatory messages from neuron A

(space) • **spatial summation** - multiple excitatory messages coming from Neurons A1, A2, A3

prolif:

stem - neurons slice

CNS - brain & spinal cord

lateral - side

medial - middle

Dorsal - top

Ventral - bottom

anterior - front

posterior - back

superior - above

inferior - below

sensory
motor

Spinal cord: 30 segments

gray matter somas & dendrites

Sensory - dorsal

motor - ventrally

HIND

M P RF

Athletes love
Cerebellum

MID - sensations & movements
VTA - reward pathways

FPOT

3 Occipital - visual primary

1 Frontal - motor cortex

Prefrontal = moral

2 Parietal - body, pain

4 Temp - auditory olfaction

emotional behavior