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**The Architecture of the Nervous System:**

- Central Nervous System (CNS) – Includes the brain and spinal cord
- Peripheral Nervous System (PNS) – All nerves elsewhere and are connected to the CNS via the spinal cord
  - Composed of the Somatic Nervous System (SNS), which has the efferent nerves that control the skeletal muscles and afferent nerves that carry information from the sense organs to CNS
  - Also composed of the Autonomous Nervous System (ANS), which has the efferent nerves that regulate the glands and smooth muscles of internal organs and vessels as well as afferent nerves that bring the CNS information about the internal systems
    - Divided into the sympathetic branch
      - “Revs” body up for an action
    - Also divided into parasympathetic branch
      - Restores the body’s internal activities to normal after an action
- Brain is in cerebrospinal fluid that acts as a shock absorber

**Anatomy of the Brain:**

- Spinal cord that goes into brain forms the brain stem
- Medulla is at the bottom of the brain stem
  - Controls breathing, blood circulation, and maintains balance
- Pons is above the medulla
  - Controls attentiveness and governs sleep/dreaming
- Behind the brain stem is the cerebellum
  - Controls balance, coordination, and spatial reasoning
- The midbrain and thalamus are on top of the pons
  - Relay information to the forebrains
  - Midbrain regulates experience of pain and moods
- The forebrain is on top of all of these
  - Outer part of the forebrain is the cerebral cortex
    - High surface area
    - Deepest groove is the longitudinal fissure that splits the left cerebral hemisphere from the right
    - There is the frontal lobe and parietal lobe divided by the central fissure
    - The bottom edge of the frontal lobes is marked by the lateral fissure and makes the temporal lobe distinct
    - The occipital lobes are in the back of the brain
- Hypothalamus is underneath the thalamus and controls eating, drinking, and sexual activity
- The limbic system surrounds the thalamus and hypothalamus
  - Amygdala is a component and determines if a stimulus is a threat or not to relay emotional reactions
- The hippocampus is right nearby and controls learning and memory

**Lateralization:**

- Lateralization - Asymmetry in function between the two brain halves
- The halves work together via the commissures (thick bundles of fibers that carry information between the two hemispheres)
  - Corpus callosum is the largest and most important commissure

**The Cerebral Cortex:**
Cerebral Cortex is the “thinking” center
- Sensory areas – Receive input from eyes, ears, and other sense organs
- Motor areas – Control movements
- Association areas – Remaining areas that control thinking
- Projection areas – Areas where the brain tissues seems to form a “map” of sensory information
  - Primary projection area – Designates initial receiving station for information arriving from the sense organs
- Contralateral Control – Stimulating the left hemisphere moves the right side of the body and vice versa
- Motor homunculus – Schematic picture showing each body part next to the motor projection area that controls the movement
- Primary somatosensory projection area – Behind the primary motor projection area
  - Receives sensory information from skin senses
  - The more sensory information needed for a specific part of the body, the bigger the projection area
- Unlike sight and movement, auditory projection areas are not contralateral since both hemispheres receive input
- Nonprimary motor areas appear critical for initiating and coordinating skilled movements

Cortical Damage:
- Apraxias – Lesions in the cortex that causes disturbances in the organization of voluntary activity
- Primary motor areas are responsible for producing movements of individual muscles
- Nonprimary motor areas are responsible for organizing and initializing sequences
- Visual agnosia – Produced by damage to the occipital lobe that causes people not to recognize what they see
  - Prosopagnosia – Subtype of agnosia that involves damage to areas in the temporal and parietal lobes where the patient cannot recognize faces
- Neglect syndrome – Person does not realize the left-hand side of the world exists due to damage of the right side of the parietal lobe
- Aphasias – Lesions in the left hemisphere that cause disruptions of the comprehension/production of language
  - Nonfluent aphasias – Aphasias having to do with production of speech due to lesions in Broca’s Area
  - Fluent Aphasia – Aphasias having to do with comprehension of speech due to damage of Wernicke’s Area
- Prefrontal area – Foremost part of the frontal lobe
  - Damage here (like Phineas Gage) disrupts executive control over thinking
  - Preservation – Continuing to do a task regardless of the fact they’ve been told it’s been done incorrectly

Plasticity:
- Brain plasticity – Brain’s capacity to alter its structure and function
- Neurons can alter their output and change sensitivity to input as well as make new synapses
- New neurons can be made throughout a person’s lifetime
  - This is called neurogenesis
    - Very slow in an adult brain and the neurons don’t live long
- The nervous system can only self-repair the PNS
- Implantation of stem cells is an attempt to regenerate damage neurons