Spinal Cord

Psychology 372
Physiological Psychology
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Overview
- Has a central core of non-myelinated neurons (gray matter) surrounded by myelinated neurons (white matter)
- Gray matter is shaped like an H
- Is shorter than the vertebral column
- Is separated into regions which contain structures.

Some Structures
- Dorsal Horn
  - Contains sensory nuclei
  - Forms clusters of nuclei
  - Receives information from outside the CNS
- Ventral Horn
  - Contains motor nuclei
  - Receives information from major motor pathways
  - Sends information to muscles
  - Does not contain clusters – are arranged in columns that run the length of the spinal cord

Some Structures
- Are different sizes depending on where you are in the spinal column.
- E.g.
  - Ventral horn is larger where motor neurons innervate the arms and legs.
  - Need neurons for regulation
  - Dorsal Horn is larger where sensory nerves from the limbs enter the spinal cord.
  - Need more neurons because you have more receptors.

Internuncial Neurons
- Also called interneurons
- Are also in gray matter
- Modulate information flowing from sensory neurons towards the brain, and higher brain centers to motor neurons
- Modulates neural activity within motor systems.
- Are also involved in reflexes.
White Matter
- Surrounds the Gray Matter
- Divided into three columns
  - Dorsal
  - Lateral
  - Ventral
- Each column contains bundles of ascending and descending axons

Dorsal Column
- Lie between the two dorsal horns
- Sends only sensory information via axons to the brain
- Uses the Gracile Fasciculus (lower limbs) and Cuneate Fasciculus (upper body) pathways.

Lateral Columns
- Sends information to the brain
- Also sends information from the brainstem and cortex to lower motor neurons.
- Lateral Corticospinal tract.
  - Sends motor information to Final Common Pathway
  - Most motor information is sent in this pathway.

Ventral Columns
- Includes ascending and descending axons
- Ascending sends information about pain and thermal sensation.
- Descending pathways help control axial muscles and posture.
  - Uses Ventral Corticospinal tract and others
  - Sends remaining motor information
Spinal Cord

- Divided into four major regions
  - Cervical
  - Thoracic
  - Lumbar
  - Sacral
- Are related to body development segments
- Nerves enter and leave through the intervertebral foramen.

Cervical Nerves

- Has 8 segments
- Involved with
  - sensory perception
  - Motor function on the back of the head, neck, arms

Thoracic

- Has 12 segments
- Innervates upper body

Lumbar and Sacral

- Lumbar - 5 segments
- Sacral - 5 segments
- Innervates the lower body, the back, and legs
- Spinal Cord usually terminates in the lumbar area.

Pyramidal Decussation

- Located in the Medulla
- Is where the majority of fibers cross over to the opposite side of the body
  - E.g., 80-85% of motor fibers cross over to contralateral (opposite) side
  - Uses the lateral corticospinal tract
  - 15-20% remain ipsilateral (on same side)
    - Uses the ventral corticospinal tract.

Other Things

- Few sensory axons enter at sacral level
- As you ascend up the spinal column, more sensory neurons enter.
- Most descending axons terminate at cervical levels
- Thus, the sacral level has less white matter than at cervical levels.