
بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ
In the name of Allah, the most gracious, the most merciful


PLEASE
DON'T LITTER!
HELP KEEP YOUR
COMMUNITY CLEAN

RELEXES OF POSTURE AND LOCOMOTION

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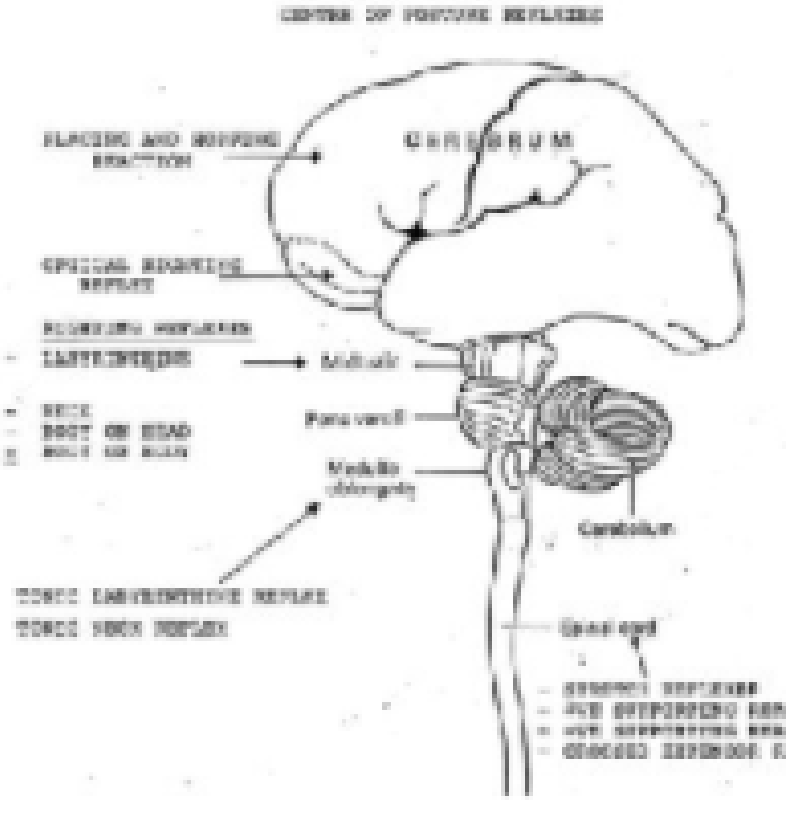
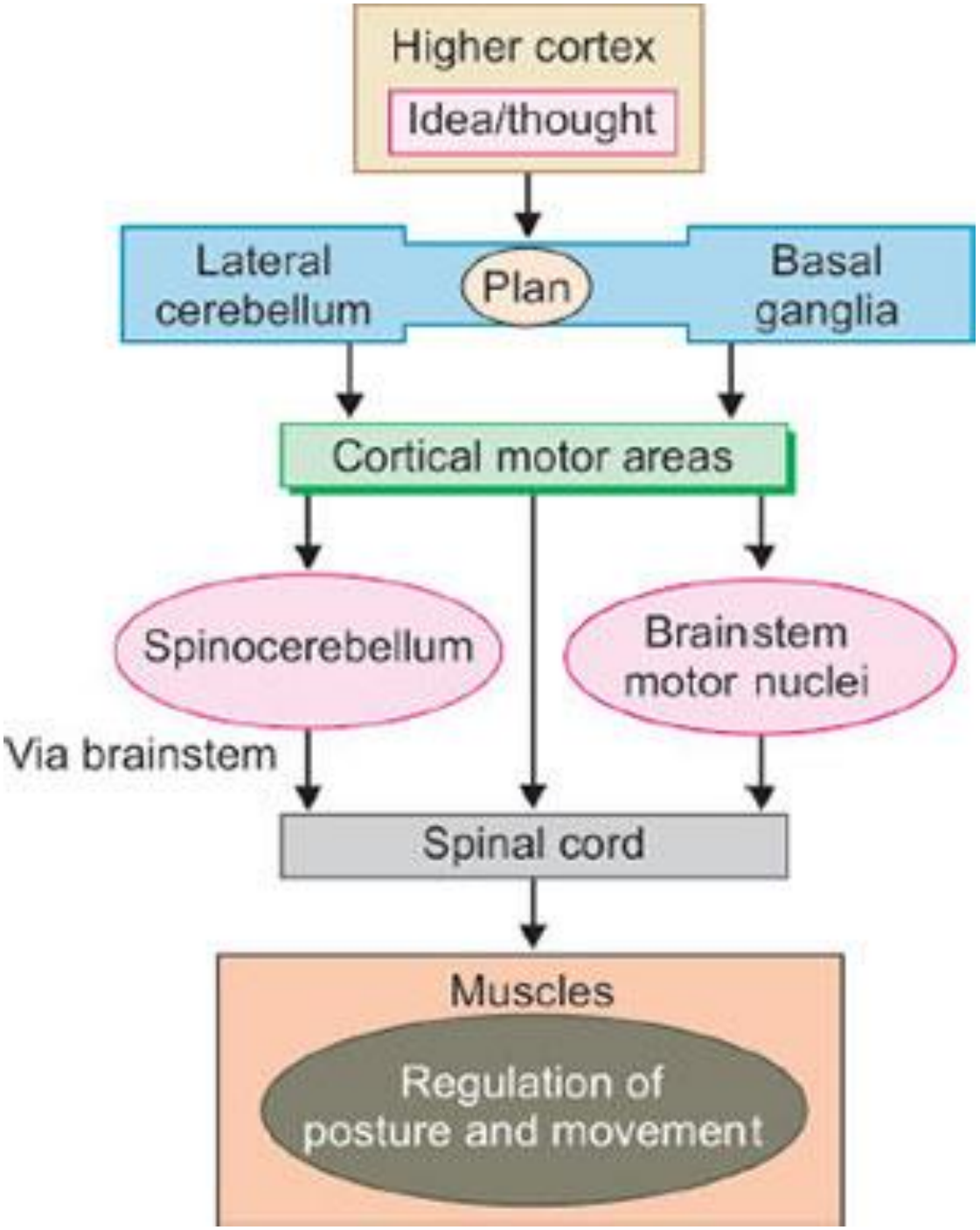
Learning Objectives

- Enumerate Postural Reflexes.
- Describe Locomotive Reflexes.
- Describe Scratch reflex.
- Explain Spinal cord reflexes causing muscle spasm.
- Describe Autonomic reflexes in spinal cord.
- Describe Spinal cord transection and Spinal shock.

- **Postural Control Centers :**

- **Cerebral cortex**
- Optical Righting reflex
- Placing Reaction
- Hopping Reaction
- **Midbrain : the Midbrain Righting Reflexes →**
- (a) Labyrinthine
- (b) Neck
- (c) Body on Head
- (d) Body on Body
- **Medulla**
- (1) Tonic Labyrinthine Reflex
- (2) Tonic Neck Reflex
- **Spinal Cord**
- Positive and Negative Supporting Reaction
- Stretch Reflex




Higher cortex
Idea/thought
Lateral cerebellum
Plan
Basal ganglia
Cortical motor areas
Spinocerebellum
Brainstem motor nuclei
Via brainstem
Spinal cord
Muscles
Regulation of posture and movement

Postural and Locomotive Reflexes of Cord

Postural Reflexes

a. Positive Supportive Reaction

b. Cord Righting reflexes

Stepping and Walking Movements

a. Rhythmical stepping movement of a limb

b. Reciprocal Stepping of Opposite limbs

c. Diagonal stepping of all 4 limbs

d. Galloping Reflex

Postural Reflexes

Positive Supportive Reaction

- Pressure on the footpad of a decerebrate animal causes the limb to extend against the pressure applied to the foot

- involves a complex circuit in the interneurons

- **Magnet reaction** → light finger pressure on a toe pad causes a slow reflex contraction of the lower extremity to follow the examiner's hand, as if drawn by a magnet

Magnet Reaction

https://youtu.be/xUIlWVboozA

Cord “Righting” Reflexes

When a spinal animal is laid on its side, it will make incoordinate movements trying to raise itself to the standing position (Opossum)

Stepping and Walking movements

Stepping and Walking movements

A. Rhythmical Stepping Movements of a Single Limb.

- observed in the limbs of spinal animals when lumbar cord is separated and transected in middle vertically
- Forward flexion of the limb is followed a second or so later by backward extension, then flexion occurs again, and the cycle is repeated over and over
- **Stumble Reflex**

Stumble Reflex

- if top of foot encounters an obstruction during forward movement, it will stop temporarily and cross over the obstruction
- the cord is an intelligent walking controller

B. Reciprocal Stepping of Opposite Limbs

- If the lumbar spinal cord is not split down its center, every time stepping occurs in the forward direction in one limb, the opposite limb ordinarily moves backward

- This effect results from **reciprocal innervation** between the two limbs

C. Diagonal Stepping of All Four Limbs—"Mark Time" Reflex

- If a well-healed spinal animal is held up from the floor and its legs are allowed to dangle, the stretch on the limbs occasionally elicits stepping reflexes that involve all four limbs

- MARK TIME REFLEX is a manifestation of reciprocal innervation

Diagonal Stepping of All Four Limbs—"Mark Time" Reflex

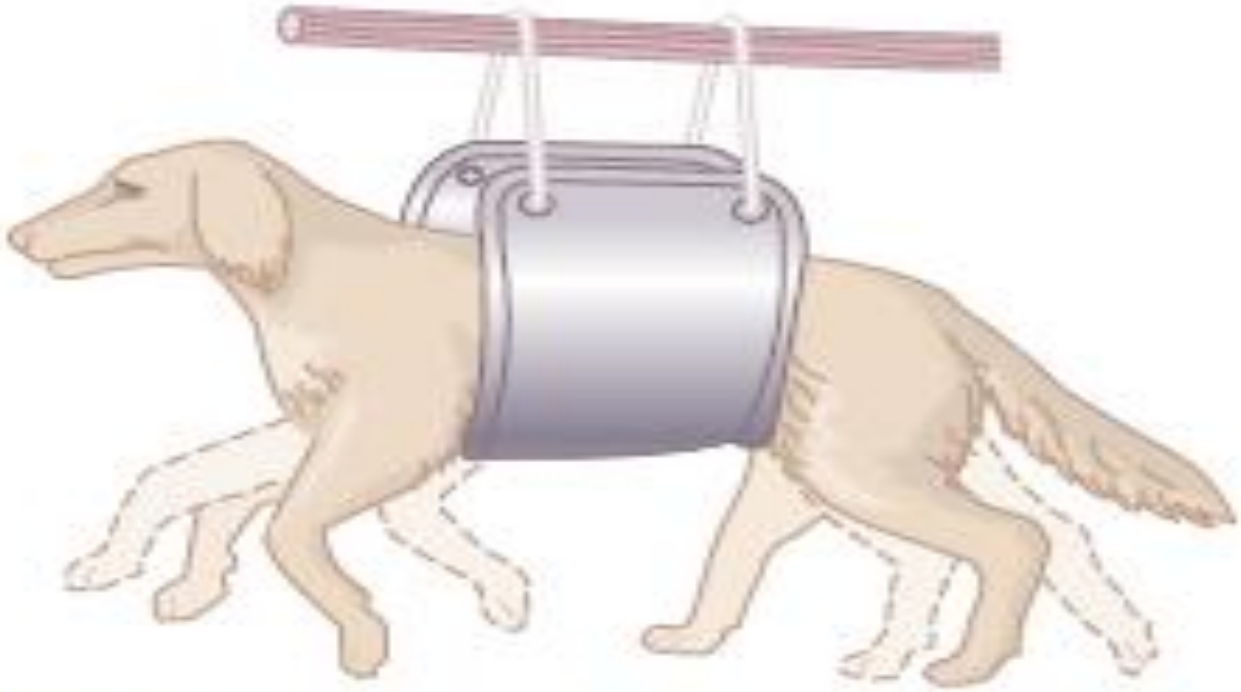


Figure 54–12

Diagonal stepping movements exhibited by a spinal animal.

D. Galloping Reflex

- Another type of reflex that occasionally develops in a spinal animal is the galloping reflex, in which both forelimbs move backward in unison while both hind limbs move forward

Scratch Reflex

Initiated by itch and tickle

- **a position sense** *that* allows the paw to find the exact point of irritation on the surface of the body, and
- **a to-and-fro scratching movement** (involve reciprocal innervation)

Scratch Reflex

Spinal Cord Reflexes That Cause Muscle Spasm

- **Muscle Spasm Resulting from a Broken Bone**
- **Abdominal Muscle Spasm in Peritonitis**
- **Muscle Cramps caused by local irritation/metabolic abnormality;**

  fatigue, cold, ischemia

Autonomic Reflexes In Spinal Cord

1. **Changes in vascular tone** → changes in local skin heat

2. **Sweating** → localized heat on the surface of the body

3. **Intestino-intestinal reflexes**

4. **Peritoneo-intestinal reflexes** that inhibit GI motility in response to peritoneal irritation

5. E**vacuation reflexes** for emptying the full bladder or the colon

all the segmental reflexes elicited simultaneously in the form of **MASS REFLEX**

Mass Reflex

Mass Reflex

In spinal animal/human being

Excessive cord excitation usually due to a strong pain stimulus/ ↑filling of a viscus

- **Strong flexor spasm** a major portion of the body's skeletal muscles goes into spasm
- **Evacuation of colon and bladder**
- **Rise in arterial pressure** sometimes to a systolic pressure well **over 200 mm Hg**
- **Profuse sweating** → large areas of the body break out into sweat

Spinal Cord Transection and Spinal Shock

If the spinal cord is suddenly transected in the upper neck, initially **all cord functions, including the cord reflexes, immediately become depressed to the point of total silence→ Spinal Shock**

Due to loss of excitatory signals from higher centers

After hours to weeks spinal neurons regain their natural excitation

Spinal Shock…..

- **Normal activity of the cord neurons depend on continual signals from higher centers transmitted through**

- **The vestibulospinal tract**
- **The reticulospinal tract**
- **The corticospinal tract**

Effects of Spinal Shock

- **Arterial blood pressure falls** (40mmHg)→ sympathetic nervous activity is blocked to extinction, returns to normal in a few days

- **Skeletal muscle reflexes are blocked** during initial stages (2 weeks to several months to return to normal)

- **Sacral reflexes for control of colon and bladder emptying are suppressed**(for first few weeks)

In spinal shock

a. arterial blood pressure rises initially
b. skeletal muscle reflexes are blocked
c. evacuation reflexes are exaggerated
d. cord neurons do not regain excitability
e. flexor spasm occurs

Decerebration and Decortication

- **Decorticate posturing** may be damage to cerebral hemispheres, the internal capsule, thalamus and may also indicate damage to the midbrain

- **Decerebrate posturing** is usually indicative of more severe damage at the rubrospinal tract and the red nucleus

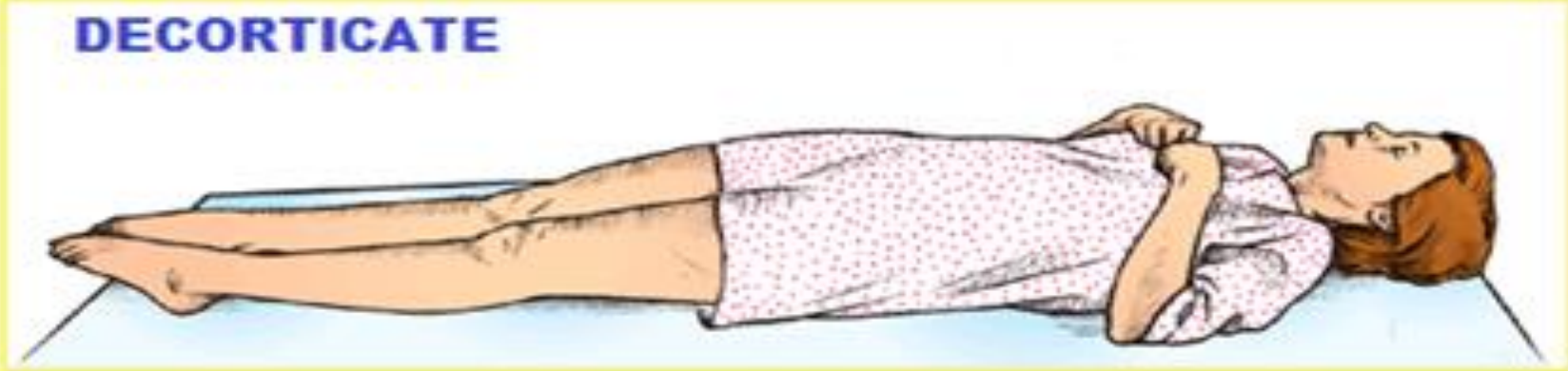
Comparing decerebrate and decorticate postures

Decerebrate posture results from damage to the upper brain stem. In this posture, the arms are adducted and extended, with the wrists pronated and the fingers flexed. The legs are stiffly extended, with plantar flexion of the feet.

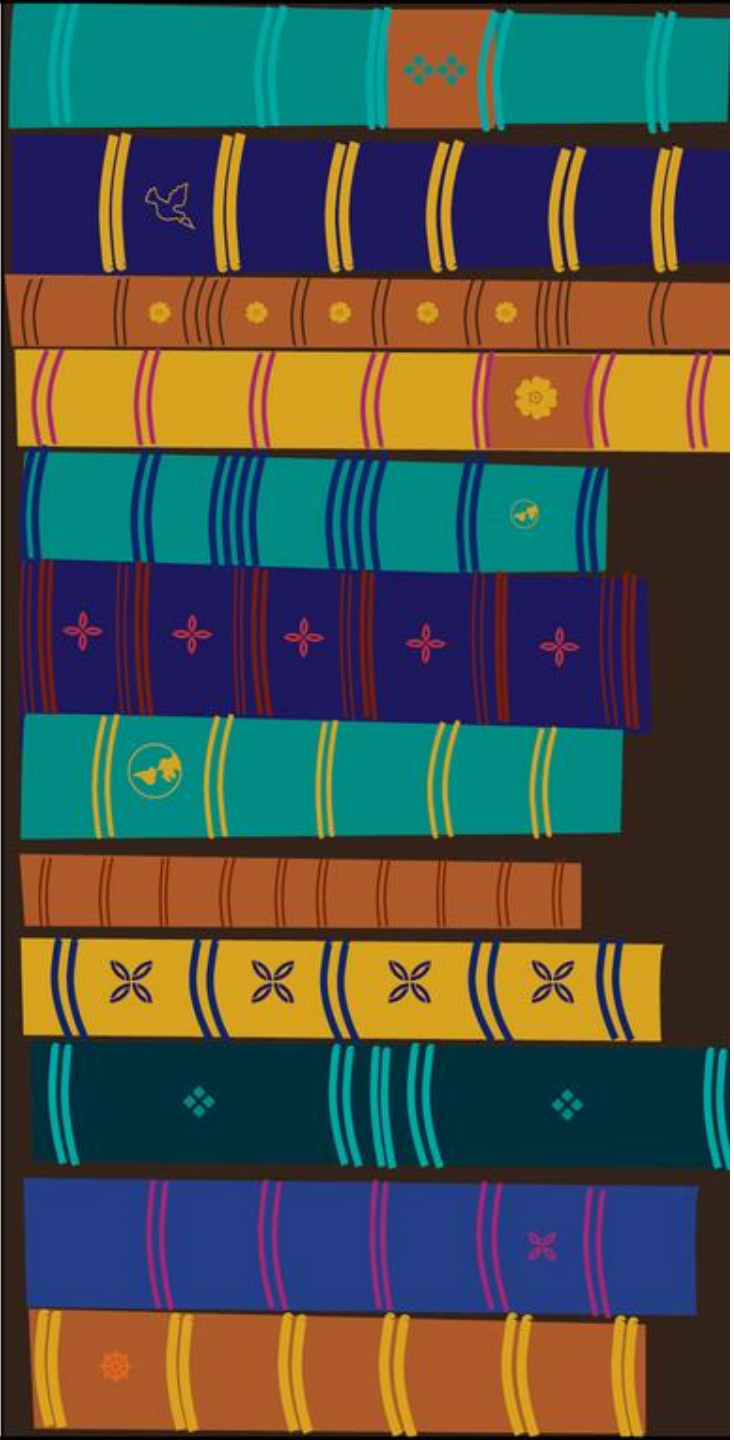
DECEREBRATE

Decorticate posture results from damage to one or both corticospinal tracts. In this posture, the arms are adducted and flexed, with the wrists and fingers flexed on the chest. The legs are stiffly extended and internally rotated, with plantar flexion of the feet.

DECORTICATE




Any
questions



References

- Guyton and Hall
- Sherwood Physiology
- Ganong’s Physiology

Thank You