

POSTURE-II

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Postural Reflexes

TYPES OF POSTURAL REFLEXES

- Postural reflexes are of two types-
 - (A) **Static Reflexes**
 - (B) **Statokinetic Reflexes**

Reflex Arc Of Postural Reflex

- **Afferent Pathway**- comes from the eyes, the vestibular apparatus and the proprioceptors
- **Integrating Centres**- are formed by neuronal network in the brain stem and spinal cord
- **Efferent Pathway- α -motor neurons** supplying the various skeletal muscles i.e. the effector organ

(A) Static Reflexes

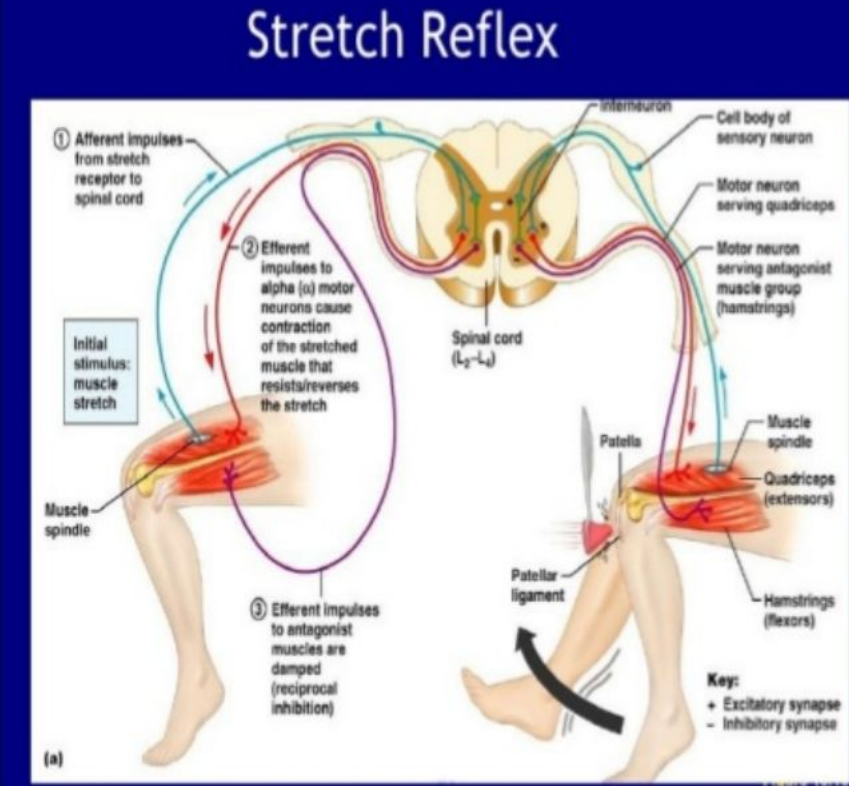
- Static reflexes are involved in adjustments to displacements produced by gravity
- It is of three types-
 - (1) Local static reflexes**
 - (2) Segmental static reflexes**
 - (3) General static reflexes**

(1) Local static reflexes

- They exert their effect on the same limb from which the stimulus was initiated
- The **centre** -- Located in **Spinal Cord**
- Some important local static reflexes include:
 - i) **Stretch reflex**
 - ii) **Positive supporting reaction**
 - iii) **Negative supporting reaction**

I) STRETCH REFLEX

- This is the most important local static reflex which controls the tone in those extensor muscles which keep the body upright (antigravity muscles)



II) POSITIVE SUPPORTING REACTION

- It is characterized by simultaneous reflex contraction of both extensors and flexors of a limb
- It plays an important role of steadying the ankle joint in standing position



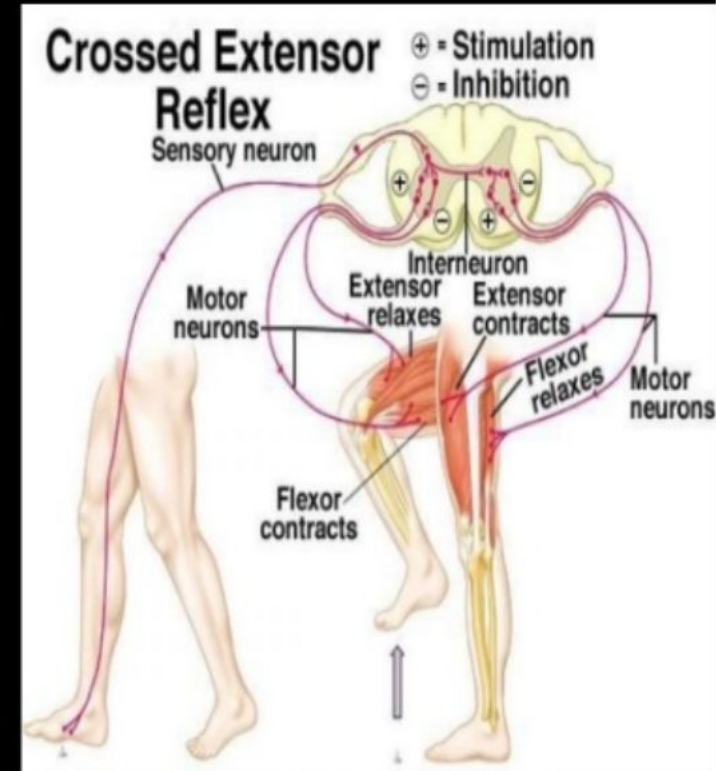
III) NEGATIVE SUPPORTING REACTION

- It refers to disappearance of positive supporting reaction
- It is initiated by stretch of the extensor muscles



(2) SEGMENTAL STATIC REFLEXES

- It is characterized by a bilateral reflex response when stimulus is applied to one limb
- The best example of segmental static reflex is crossed extensor reflex response component of withdrawal reflex
- The centre of this reflex is in spinal cord



(3) GENERAL STATIC REFLEXES

- It is characterized by a generalized effect from many muscle groups in the body in response to a stimulus that arises at one side of the body
- General static reflexes can be divided into three groups:
 - a) Attitudinal reflexes**
 - b) Long loop stretch reflexes**
 - c) Righting reflexes**

A) ATTITUDINAL REFLEXES

- These reflexes are initiated when the attitude of the body is changed i.e. while standing on an inclined plane
- These reflexes are of two types
 - 1) Tonic Labyrinthine Reflex**
 - 2) Tonic Neck Reflex**

C) RIGHTING REFLEXES

- Righting reflexes help to correct the position of the body when it goes off balance and falls down
- These reflexes consists of a chain of reactions following one another in an orderly sequence

CENTERS OF RIGHTING REFLEXES

- Chief center for all righting reflexes, **except the optical righting reflex** is **Red Nucleus** lying in the mid brain
- The center for **optical righting reflex** is in the **Visual Cortex**

(B) Statokinetic Reflexes

1. Vestibular placing reaction

- Stimulus- linear acceleration
- Receptors- in utricle and saccule
- Center- cerebral cortex
- Response- as soon as foot comes in contact of any firm surface, it is reflexly placed on surface in position to support the body

(B) STATOKINETIC REFLEXES

2. Visual placing reaction

- Stimulus- visual cues
- Receptors- eyes
- Center- cerebral cortex
- Response – as in above

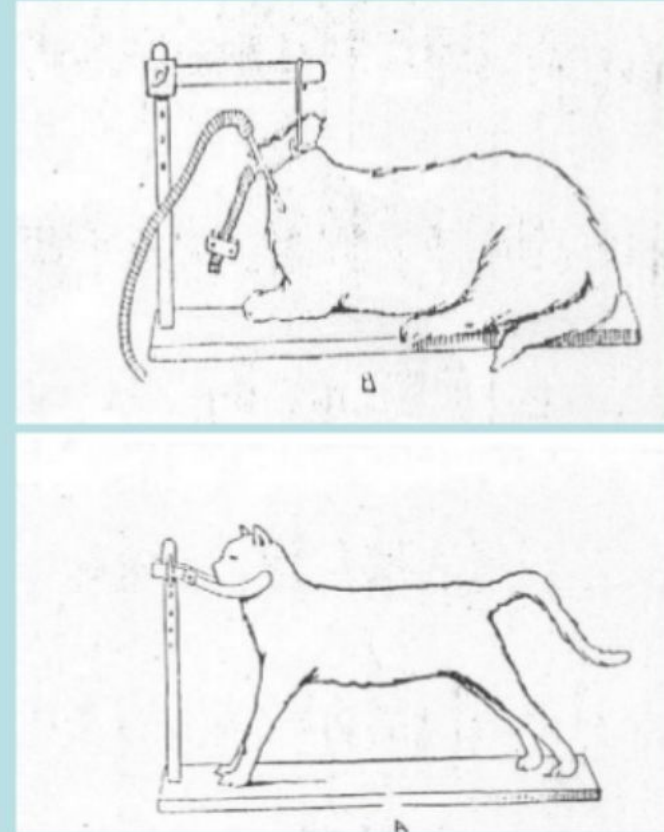
(B) STATOKINETIC REFLEXES

3. Hopping reaction

- Stimulus- lateral displacement while standing
- Receptors- muscle spindle
- Center- cerebral cortex
- Response- hopping movement that keeps the limb in position to support the body when standing animal is pushed laterally

Experimental Animal preparations to study the Postural reflexes

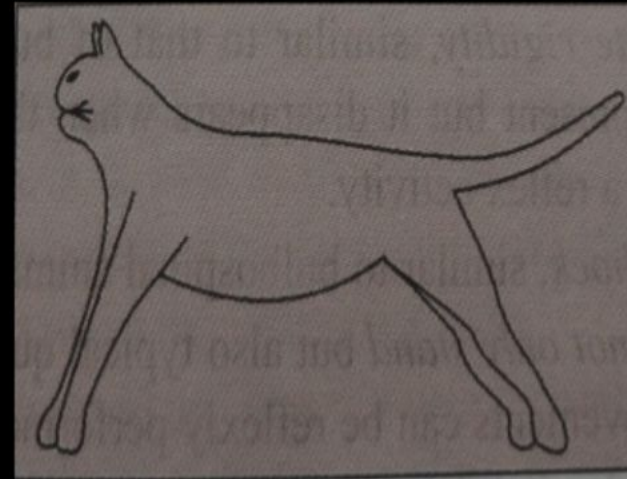
1. Spinal animal
2. Decerebrate animal
3. Mid brain animal
4. Thalamic animal
5. Decorticate animal



DECEREBRATE ANIMAL

■ Features of decerebrate rigidity

- hyperextension of all four limbs
- dorsiflexion (hyperextension) of tail and head
- extreme hyperextension of the spine (opisthotonus) produces concave configuration of the back
- the animal can be made to stand on four limbs but is easily toppled by slight push



MECHANISM OF DECEREBRATE RIGIDITY

- Rigidity occurs due to increased activity of motor neurons that facilitate stretch reflex
- Facilitation of stretch reflexes occur due to increased rate of γ motor neuron discharge

DECORTICATE ANIMAL

- Decorticate animal is one in whom the whole cerebral cortex is removed but the basal ganglia and brain stem are left intact
- Characteristic features:
 - (i) **Moderate rigidity is present**
- Cortex inhibit medullary reticulospinal tract
- Therefore, removal of cortex results in facilitation of γ motor neuron discharge
- Seen only when the animal is at rest

Spinal animal

Preparation:

- Prepared by **sectioning the cord at the cervical level.**

Significance:

- **Segmental and intersegmental reflexes can be studied.**

Eg: Stretch reflex, Positive and negative supporting reaction, Crossed extensor reflex.

Characteristics:

- Absence of reflexes for a period of days or weeks.
- Spinal man cannot stand unsupported.