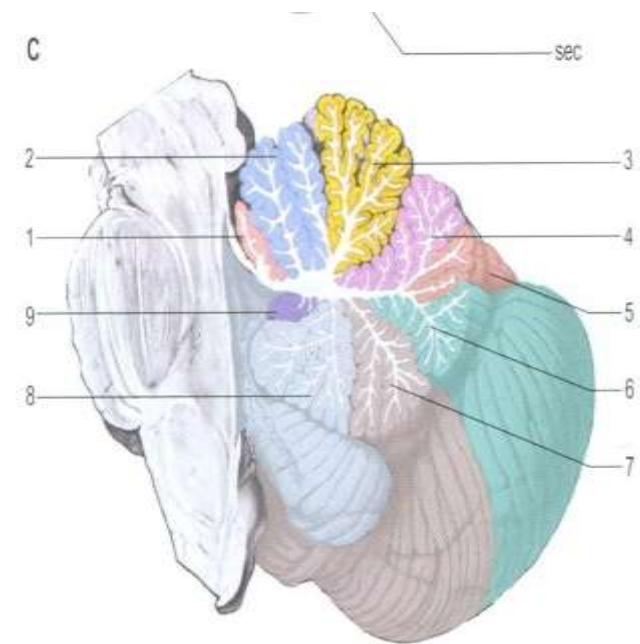
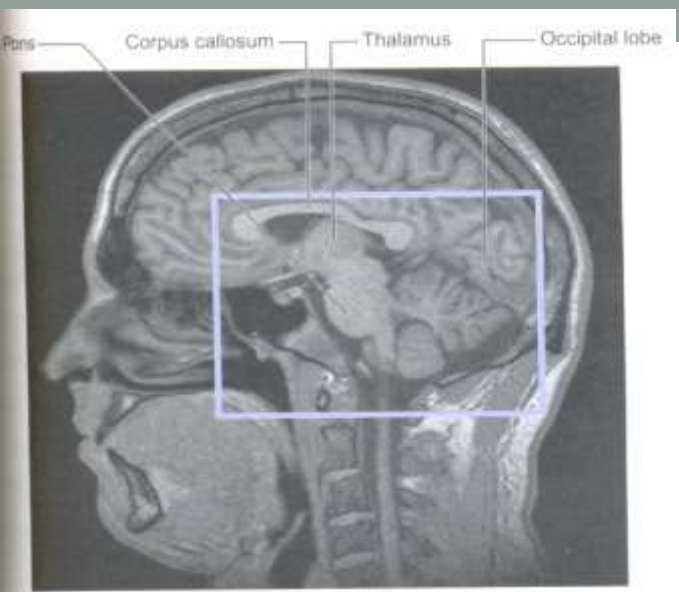


CEREBELLUM

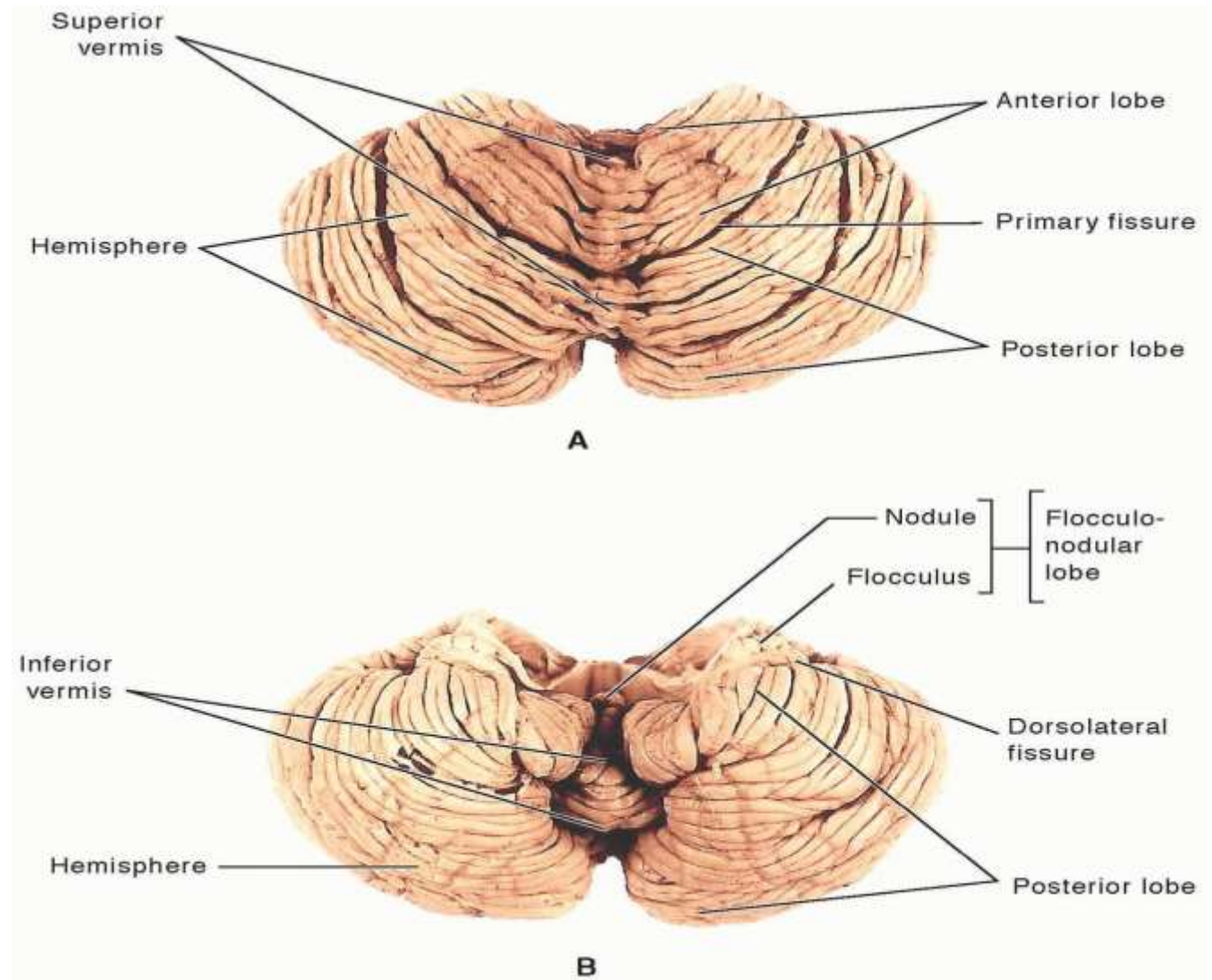


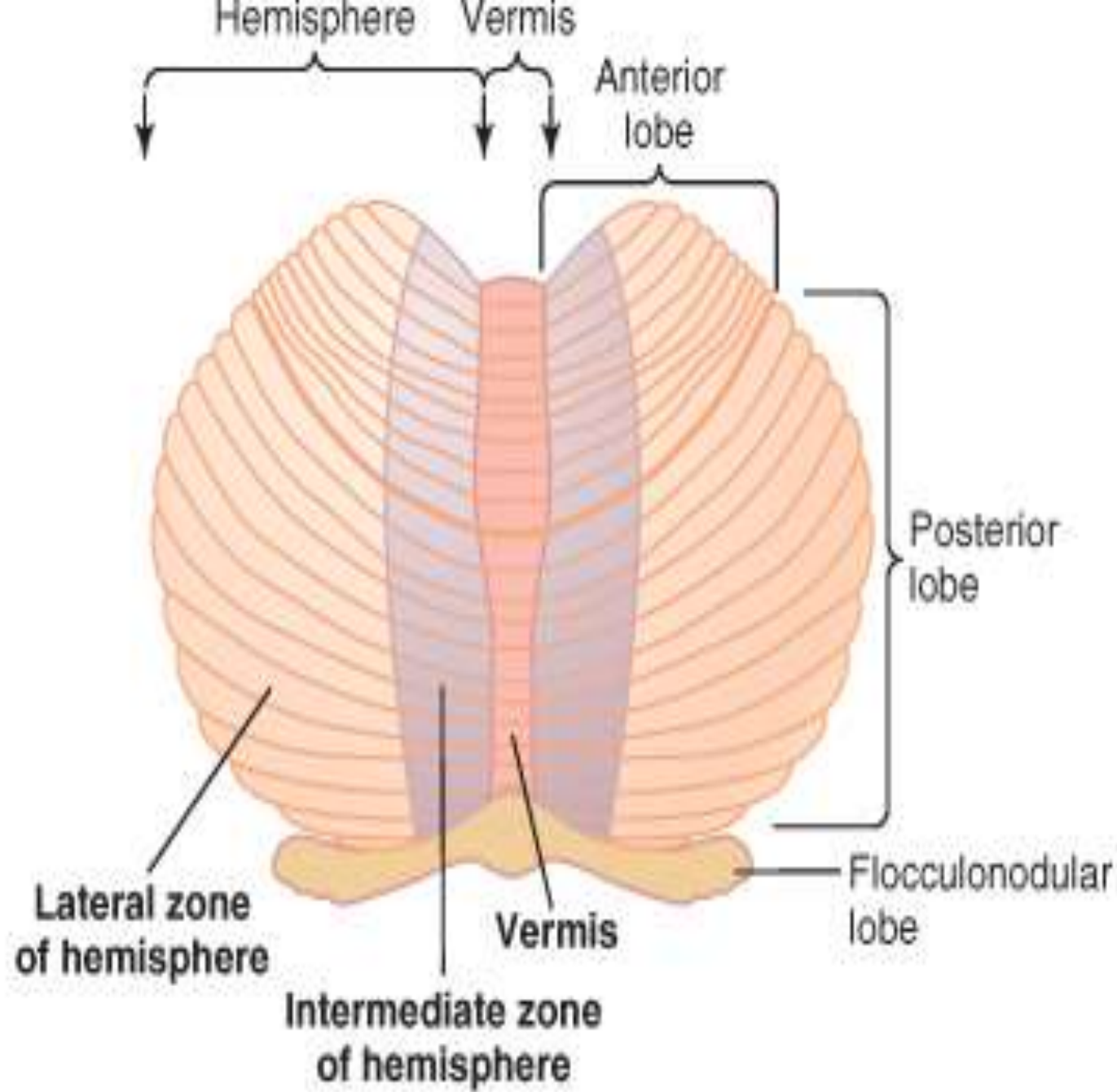
Introduction

- Cerebellum is a **Latin** word means “little brain”. It is situated in hindbrain between temporal lobe and occipital lobe and separated by brain stem by three peduncle.
- Cerebellum plays a very important role in integration of sensory perception, co-ordination and motor control
- Cerebellum is also called silent area of brain and controls ipsilateral movement of body
- 3 key role-
- Coordination of movement
- Balance & posture
- Tone of muscle

Structure of cerebellum

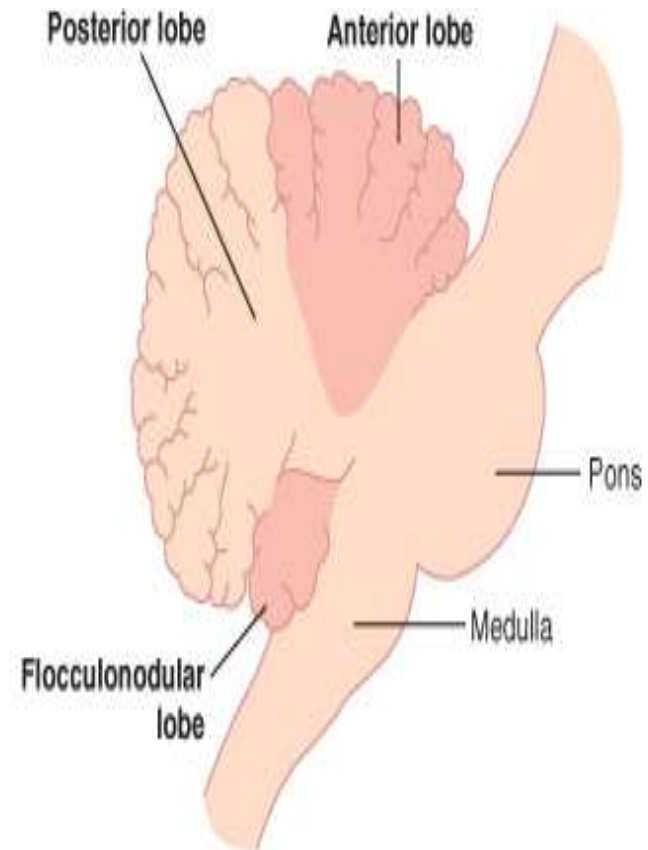
Gross:





Anatomical division:

- Anterior lobe
- Posterior lobe
- Flocculonodular lobe

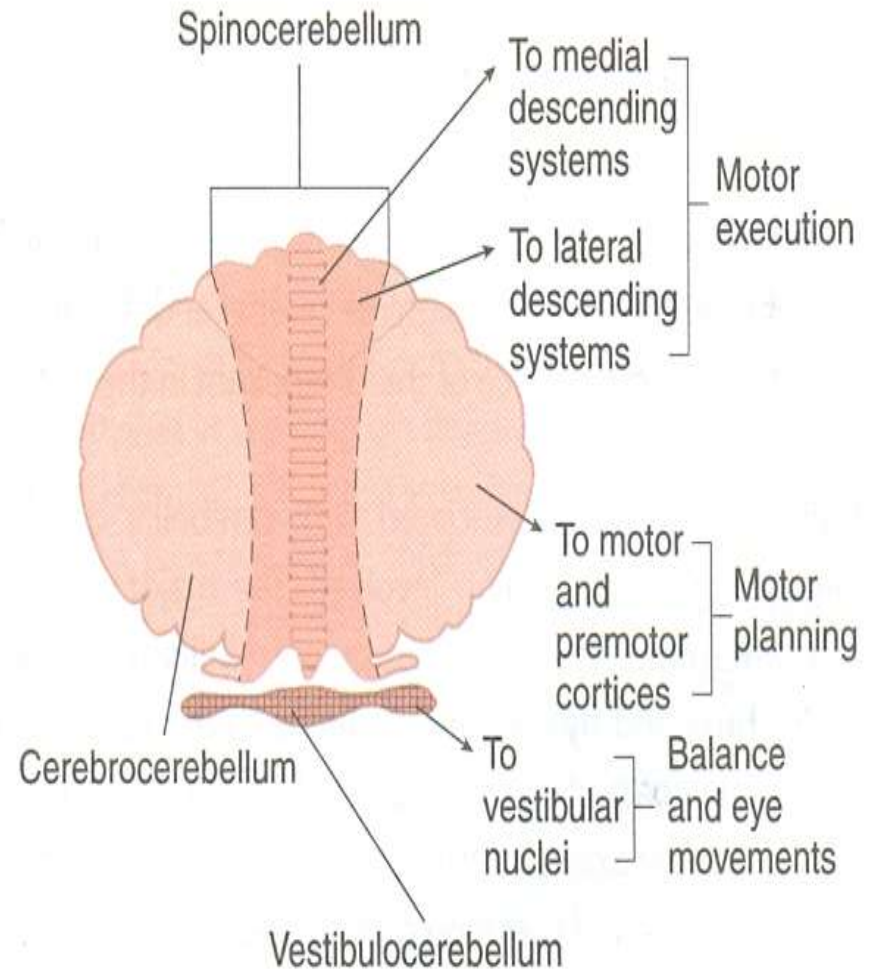


Phylogenitcal division:

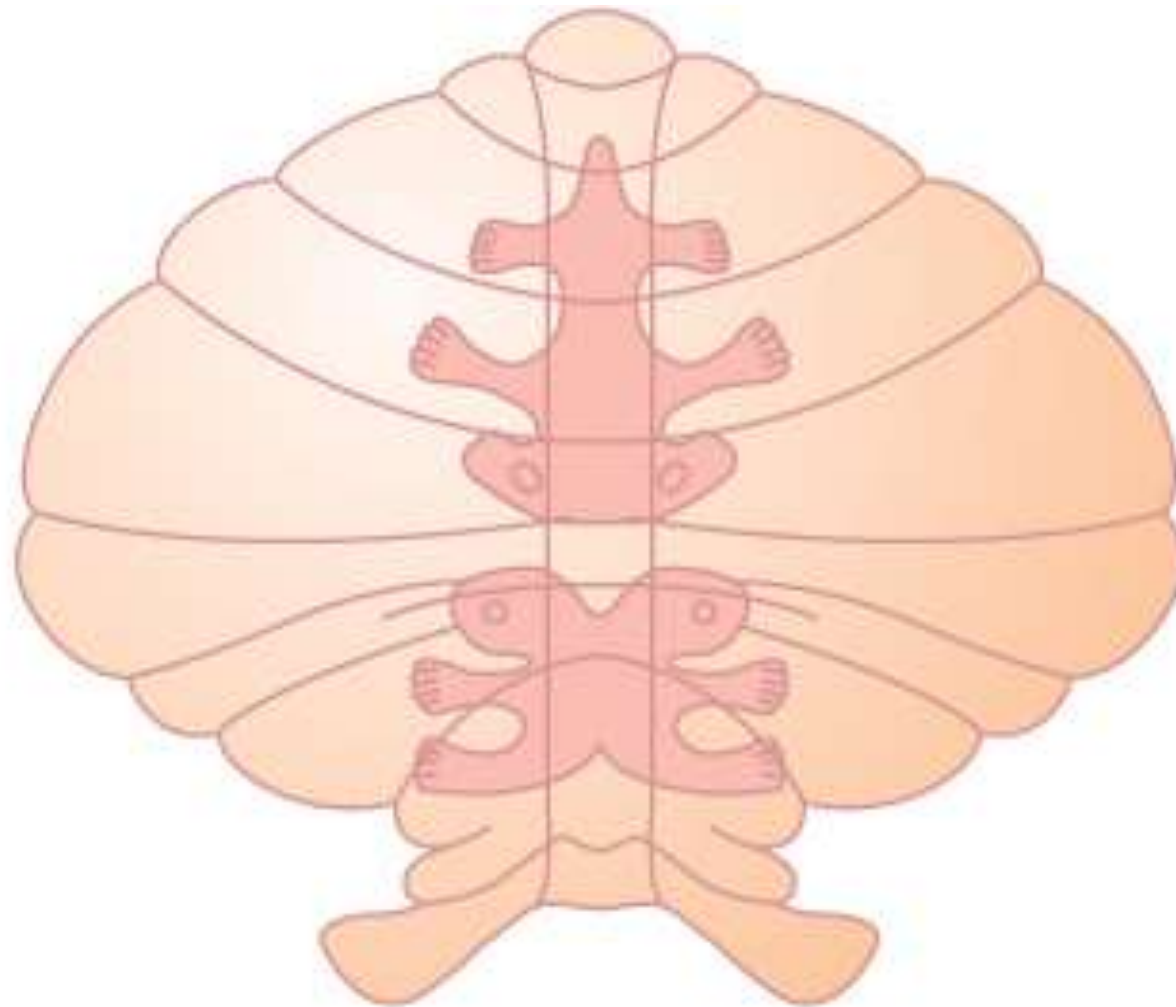
- Archicerebellum
- Paleocerebellum
- Neocerebellum

Functional Division:

- **Vestibulocerebellum**
 - Flocculonodular lobe
 - Adjacent part of vermis
- **Spinocerebellum**
 - Anterior and posterior vermis
 - Intermediate zone
- **Cerebrocerebellum**
 - Lateral hemisphere



Topographical representation of body in cerebellum



• CONNECTIONS

Neuronal cells in cerebellar cortex

1)Molecular layer

2)Purkinje cell layer

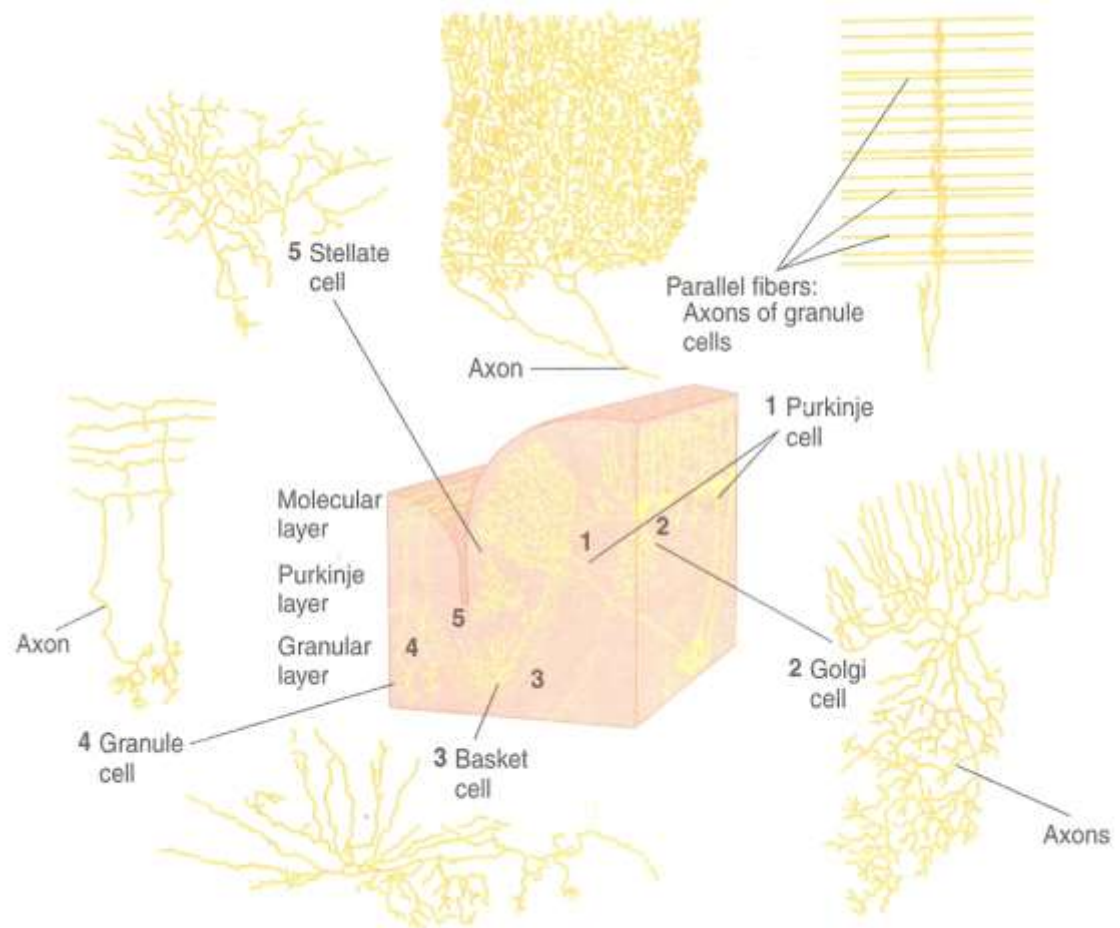
3)Granule cell layer

Cells are- Granular,

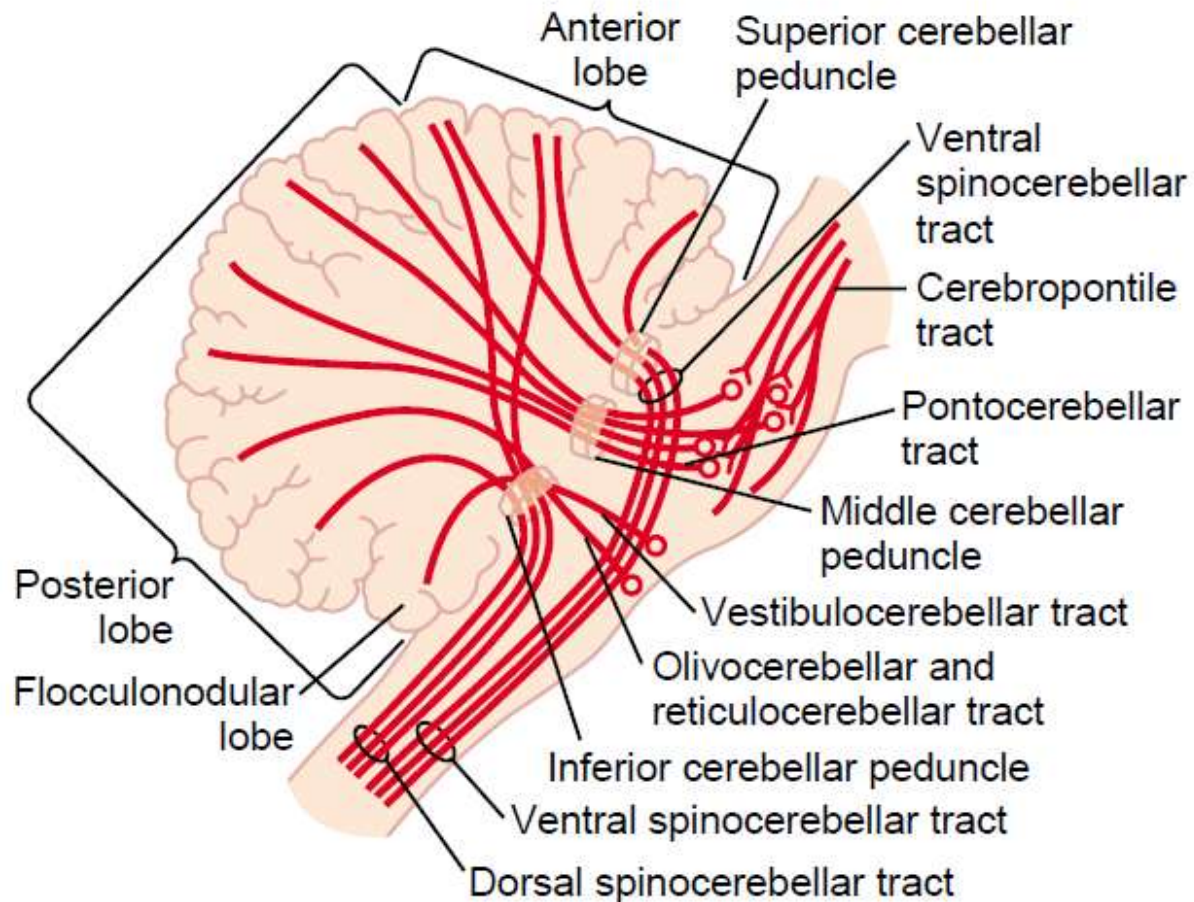
Purkinje

Basket

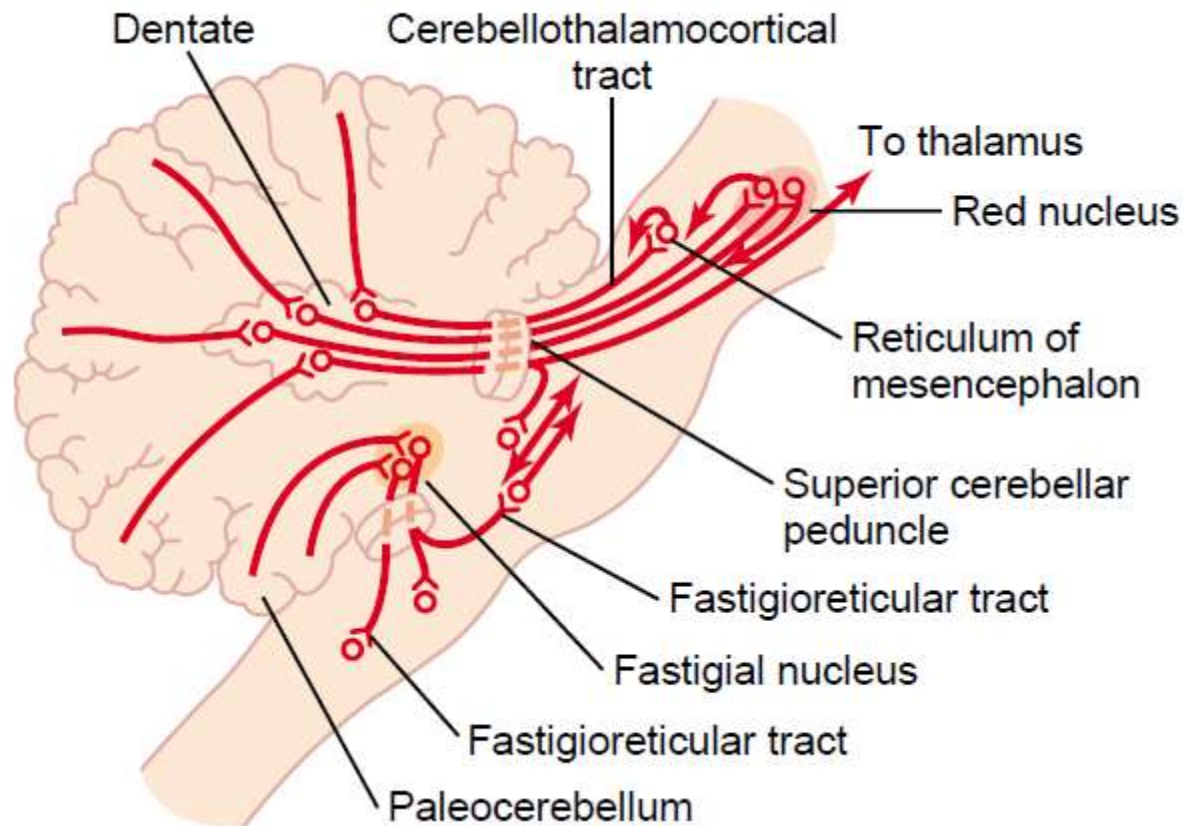
Stellate



Afferent Tracts

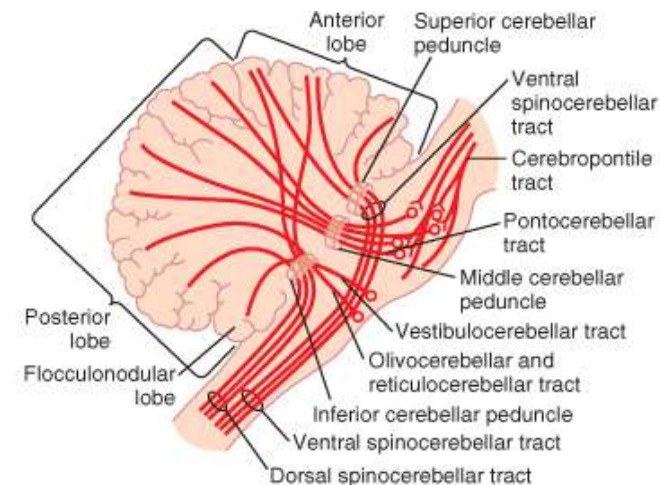


Efferent Tracts



Afferents fibers & Efferents fibers

- **Superior Cerebellar Peduncle**
- **Middle Cerebellar Peduncle**
- **Inferior Cerebellar Peduncle**



Afferent pathways

- Dorsal spinocerebellar tract
- Ventral spinocerebellar tract

Functions of Cerebellum

- According to functional point of view, cerebellum is divided into 3 divisions

1) Vestibulocerebellum-

Regulation of posture and equilibrium

2) Spinocerebellum –

Control of voluntary movements

Regulation of muscle tone

3) Cerebrocerebellum-

Planing, Sequenceing, and Timing of Complex Movements

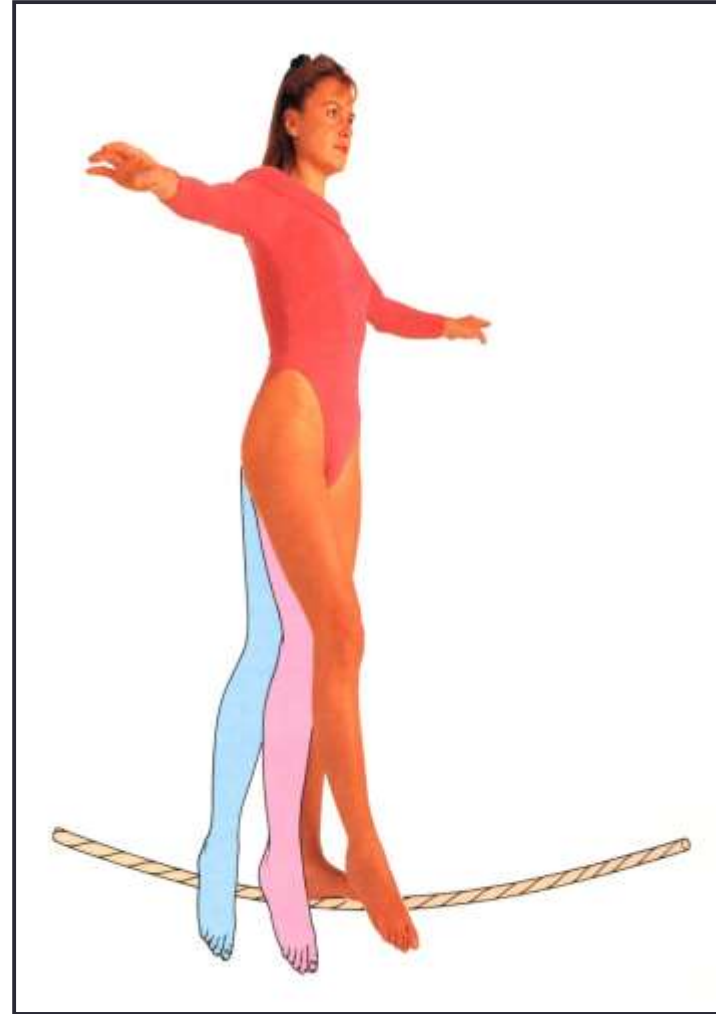
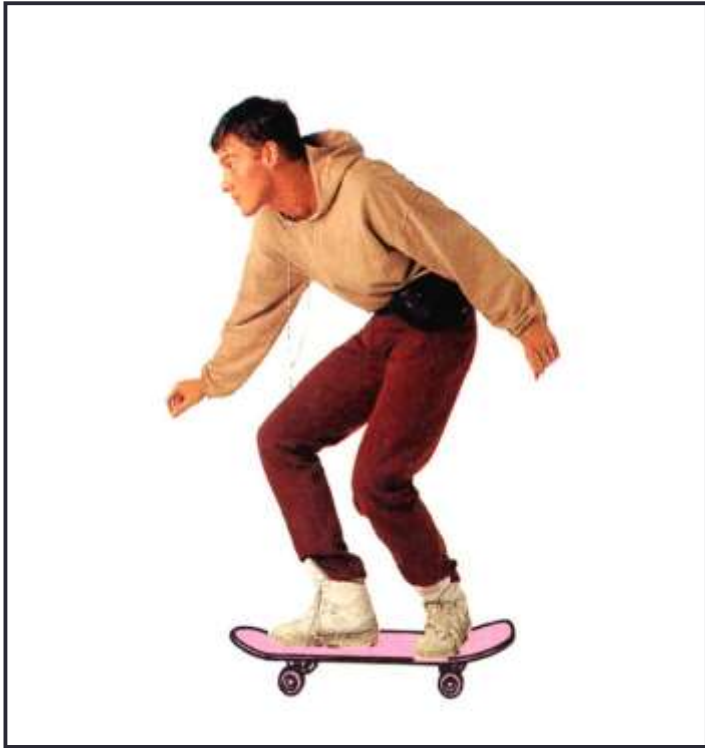
Vestibulo-Cerebellum or Archicerebellum

Control of equilibrium and postural movements

- Inputs from:
 - Vestibular Nuclei
 - Proprioceptors
- If body loses balance it sends corrective signals via
 - Extra-pyramidal tracts to Vestibular nuclei and postural muscles thus Posture and Equilibrium is maintained.
- controls balance between agonist and antagonist muscle contractions of the spine, hips, and shoulders during rapid changes in body positions

- Calculates in advance rates and directions where the different parts of body during rapid action for next sequential movement
- Peripheral and vestibular apparatus signals are used to provide anticipatory correction of postural motor signals necessary for maintaining equilibrium

Body Posture and Equilibrium



Spinocerebellum-

1) Feedback Control of Voluntary Movements

- When movement is performed, intermediate zone of cerebellum receives two types of information
 - Information from motor cortex and from midbrain red nucleus so cerebellum knows intended sequential plan of movement for the next few fractions of a second
 - Receives feedback information from distal proprioceptors of the limbs, so cerebellum knows actual movements that are performed
- Spinocerebellum compares intended movements with the actual performed movements.
- The cerebellar motor control system performs **smooth, coordinate movements** and carries out acute purposeful patterned movements of the distal limbs

2) Damping action- Prevents overshoot of movements

- So back and forth actions beyond intended point are avoided to prevent action tremor or intention tremor.

3) Control of Ballistic Movements-

- Movement is preplanned and set into motion to go a specific distance and then to stop.
- eg.-movements of the fingers while typing
- It has built-in timing circuits

4) Maintenance of Muscle tone

- Cerebellum is an important site of linkage of alpha-gamma systems responsible for muscle tone.

Cerebrocerebellum—

1) Planning, Sequencing, and Timing Complex Movements

- coordination of complex purposeful movements of the hands, fingers and feet and of the speech apparatus
- involved with what movement is happening at a given moment and also what will be happening during the next sequential movement
- Causes progressive smooth orderly succession from one movement to the next.



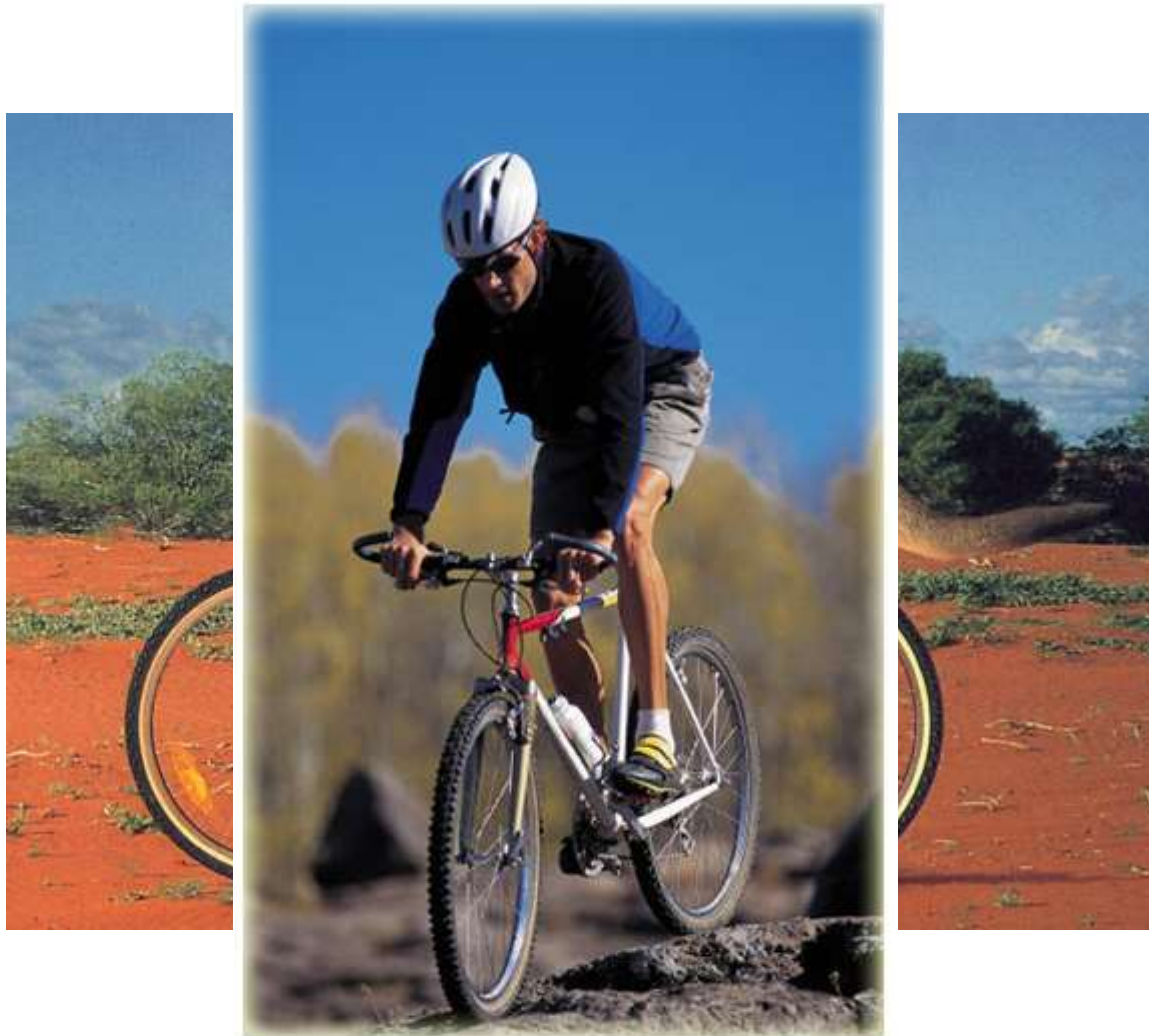
2) Timing Function-

- provides appropriate timing for each succeeding movement
- Person is able to determine when the next sequential movement needs to begin
- Causes smooth progression of movements

3) Extramotor Predictive Functions-

- Helps to 'time' events other than movements of the body
- Eg.-Rates of progression of both auditory and visual stimuli can be predicted by the brain
- Walking towards a wall with help of auditory and visual input

Coordination of Voluntary Movements



Cerebellar Lesions

- Common causes of cerebellar damage are
 - Vascular occlusions
 - Tumors
 - Injuries

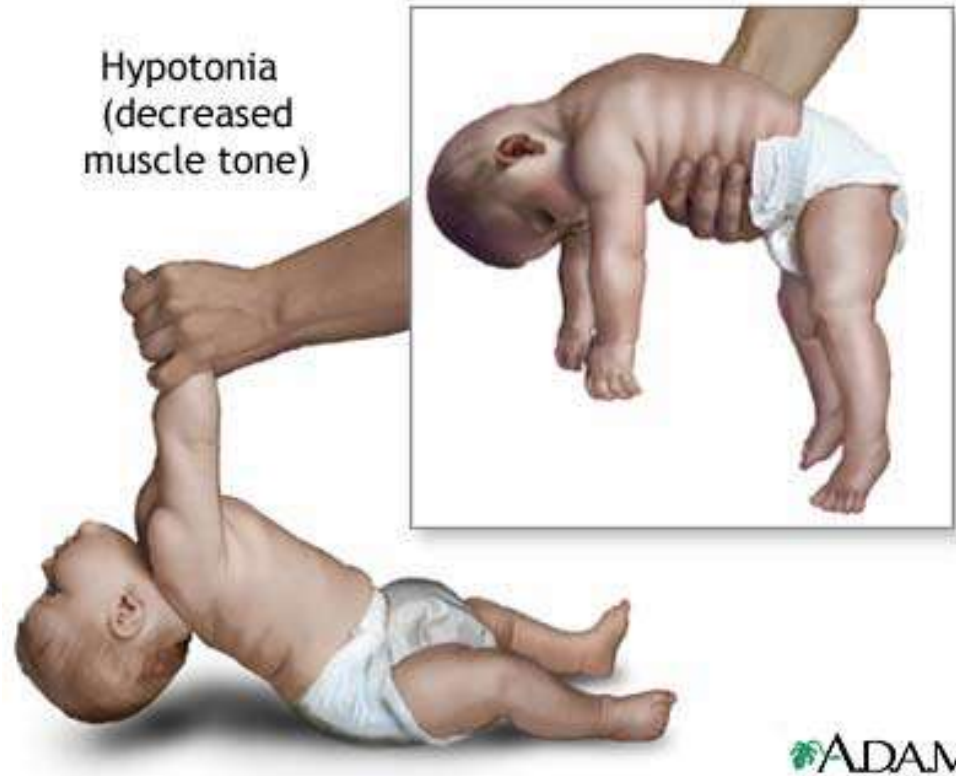
Cerebellar signs

- Hypotonia
- Nystagmus- repetitive to and fro movement -eyes
- Intention tremors
- Ataxia and dysmetria
- Dysdiadochokinesia
- Dysarthria-- slurred, scanning speech
- Drunken-man gait
- Pendular knee jerk

Cerebellar Dysfunction Signs

Hypotonia

Hypotonia
(decreased
muscle tone)



Nystagmus



Dysdiadochokinesia



**Intention
tremor**



Dysarthria

Ataxia



Clinical tests for cerebellar dysfunctions

- Finger-Nose Test
- Diadochokinesis
- Heel-knee test
- Walking on straight line
- Romberg's test



Thank you

