

**SNS COLLEGE OF PHYSIOTHERAPY  
COIMBATORE - 641035**

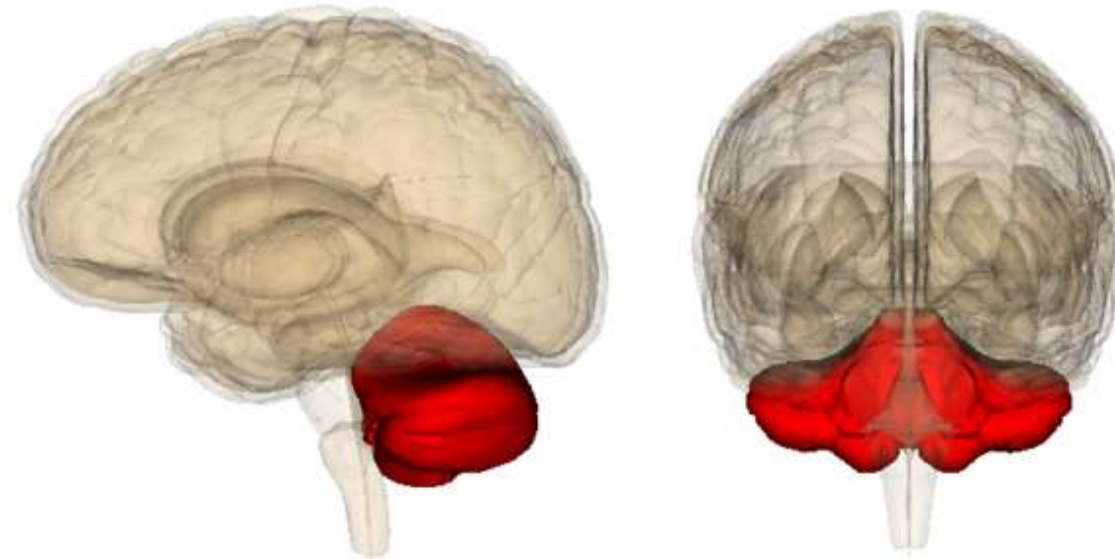
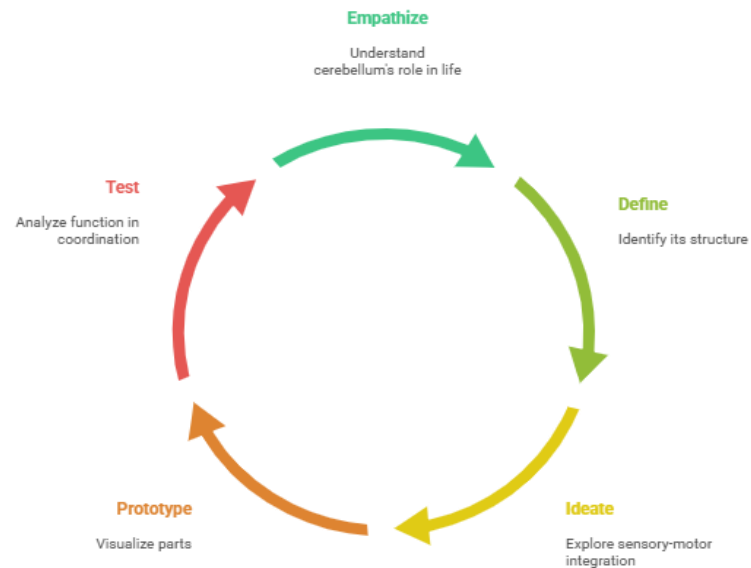


**COURSE NAME : BPT., Physiotherapy IV Year**  
**SUBJECT :PT in Neurology**  
**UNIT : 1**  
**TOPIC : Structure and Functions of Cerebellum**  
**PREPARED BY : Dr.R.Rajakrishnan MPT(NEURO)., DYHE.,  
CDNT.,CKTP., IASTM PRACTITIONER.,  
MARHYTHE PRACTITIONER.,  
Assistant professor  
SNS College of Physiotherapy**

# Structure and Function of Cerebellum

- Precision, Coordination, and Balance in Motion and Mind

## Design Thinking Cycle for Cerebellum Study

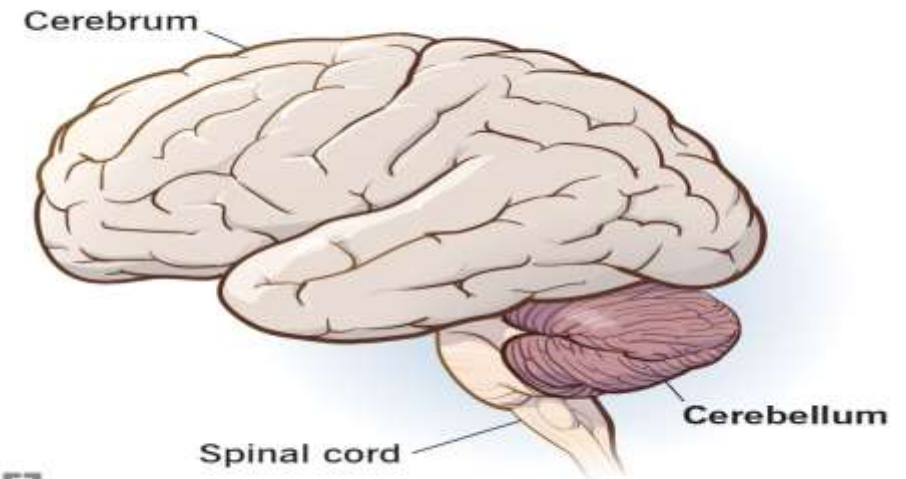
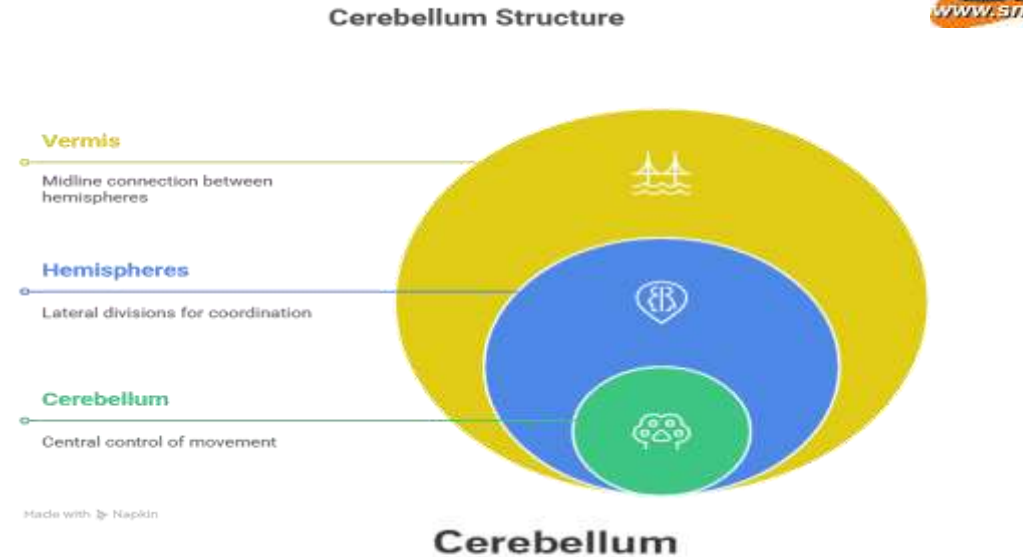


# Position and Relations

- Second largest part of brain
- Lies posterior to pons and medulla
- Divided into two hemispheres by vermis
- Located in posterior cranial fossa
- Covered superiorly by tentorium cerebelli
- Lies dorsal to the 4th ventricle

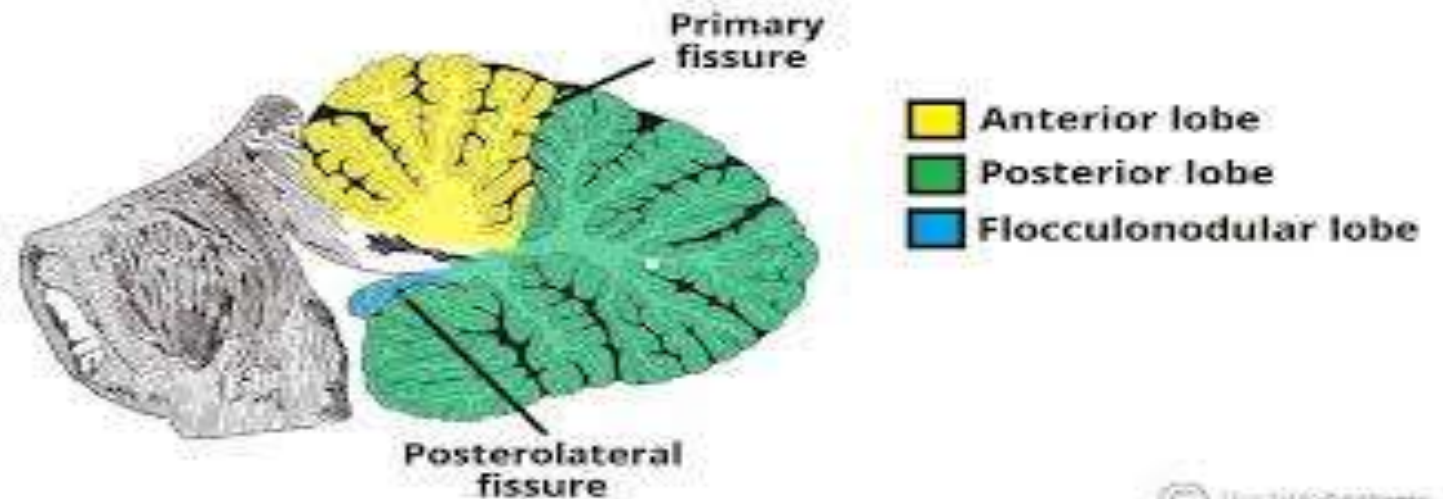
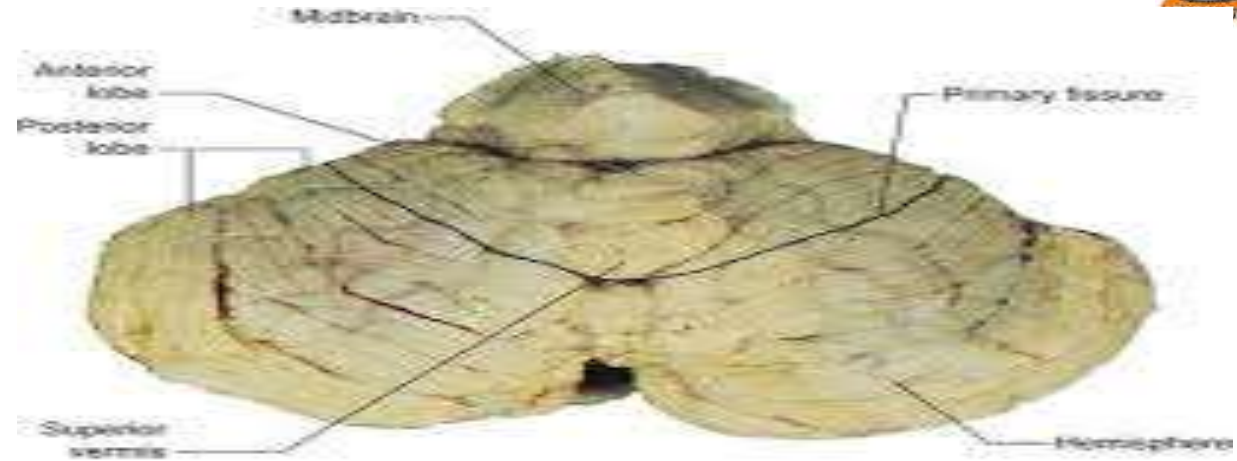
## ANATOMICAL LOBES AND FUNCTIONAL LOBES

- Anterior(**spinocerebellum**) lobe: control axial(trunk), limb muscles and postural reflexes.
- Posterior(**neocerebellum**) lobe: control skilled voluntary muscles.
- **Flocculonodular lobe**: (related to vestibular apparatus) control body posture balance, equilibrium and maintaining visual fixation.



# External Surface Anatomy

- Two hemispheres connected by vermis
- Three surfaces: superior, inferior, anterior
- Horizontal fissure divides lobes

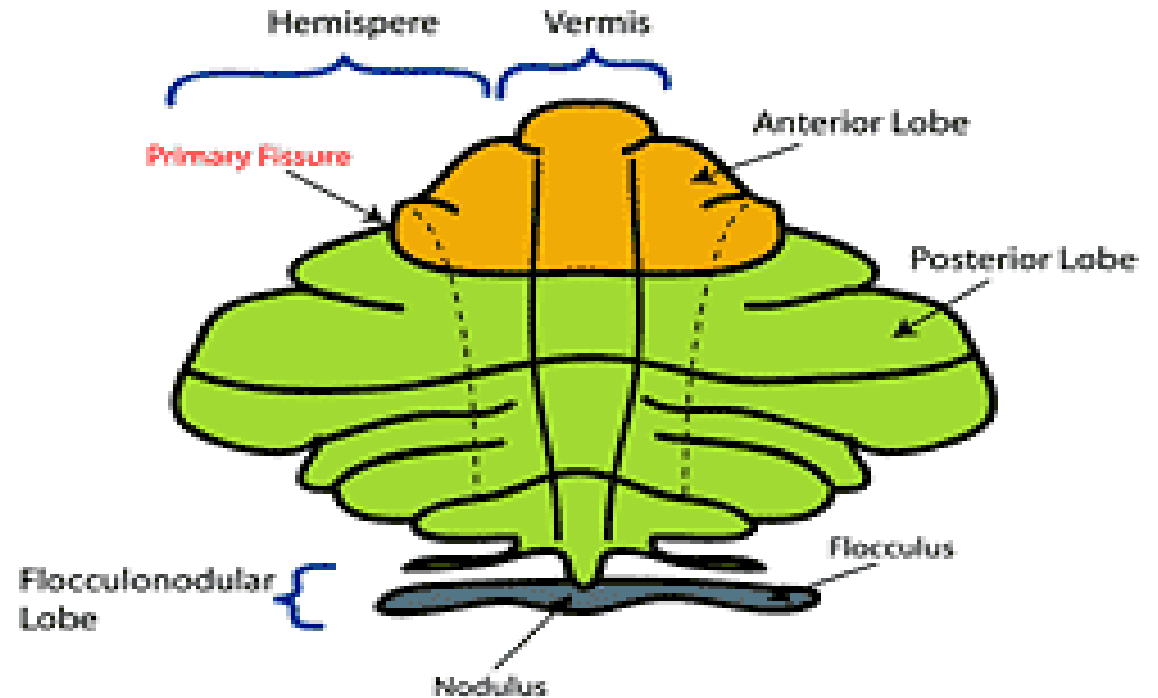


## Functional Subdivisions

- Vestibulocerebellum – equilibrium
- Spinocerebellum – posture and tone
- Cerebrocerebellum – planning and coordination

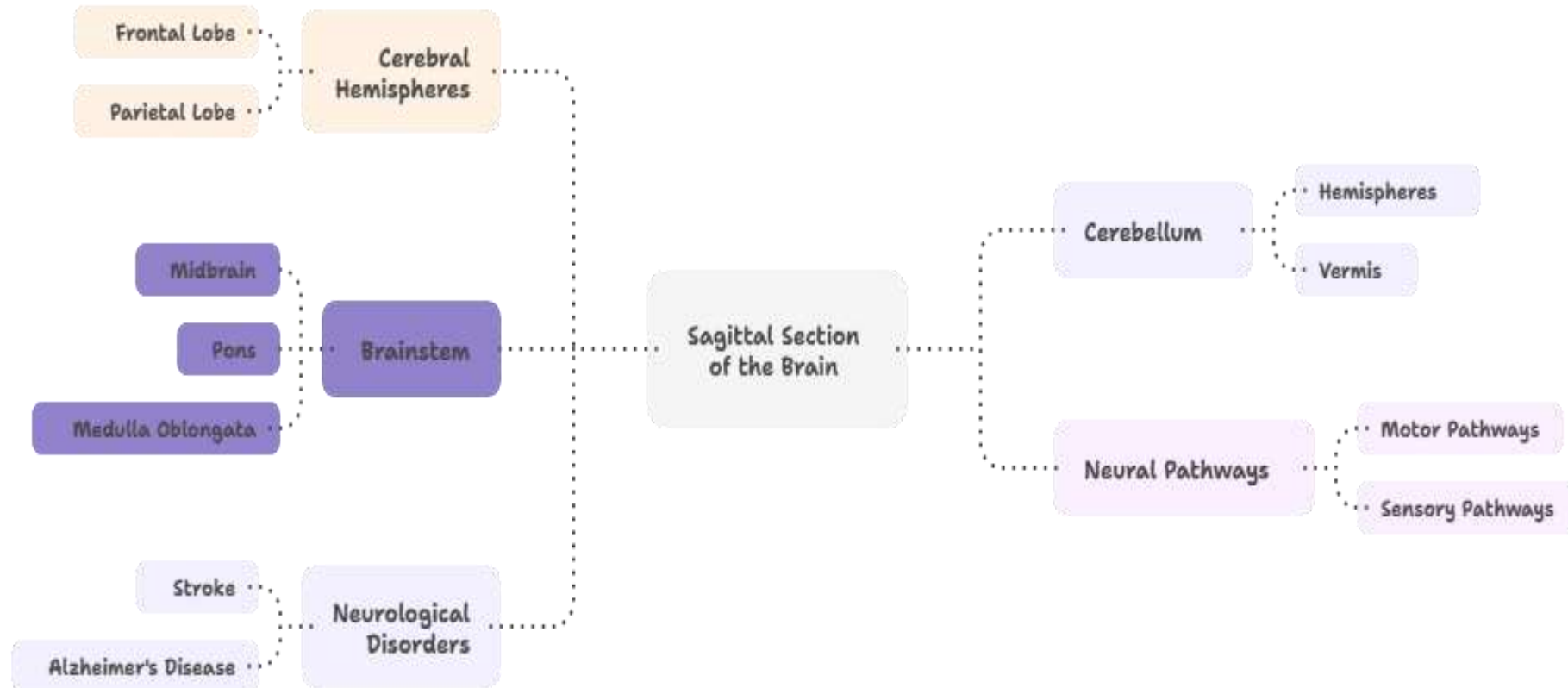
### Internal Organization

- Cortex → gray matter
- Medulla → white matter
- Deep nuclei: dentate, emboliform, globose, fastigial



# Cerebellar Cortex Layers & Cerebellar Peduncles

## Sagittal Section of the Brain: Anatomy and Functions



# Cerebellar Cortex Layers & Cerebellar Peduncles

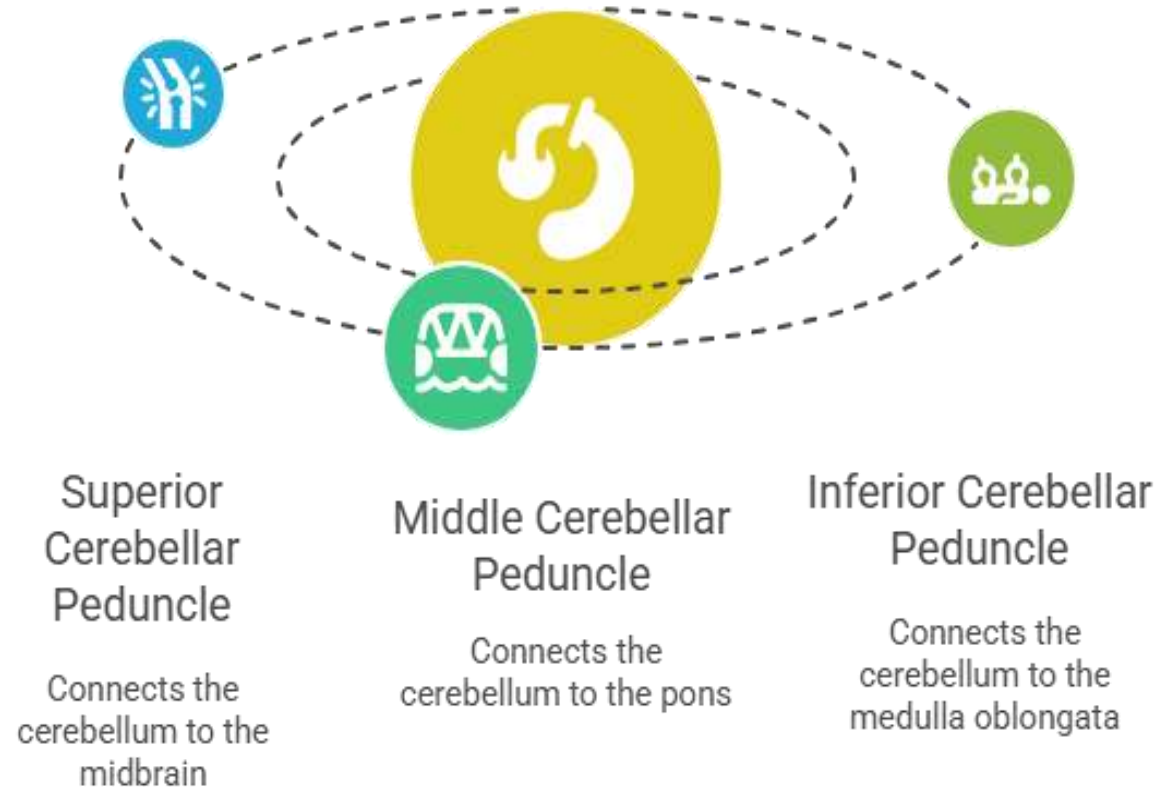
## Cortex layers

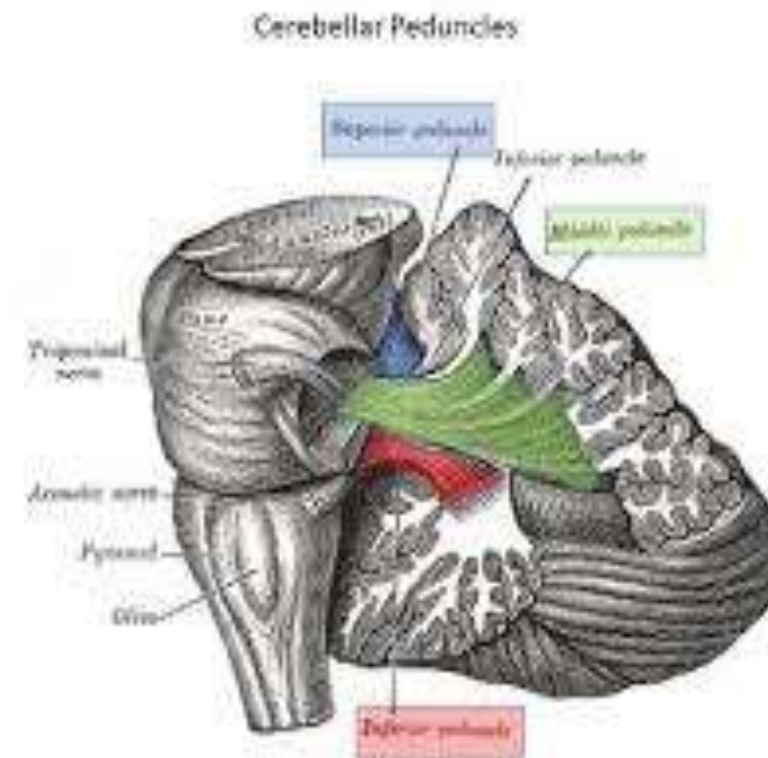
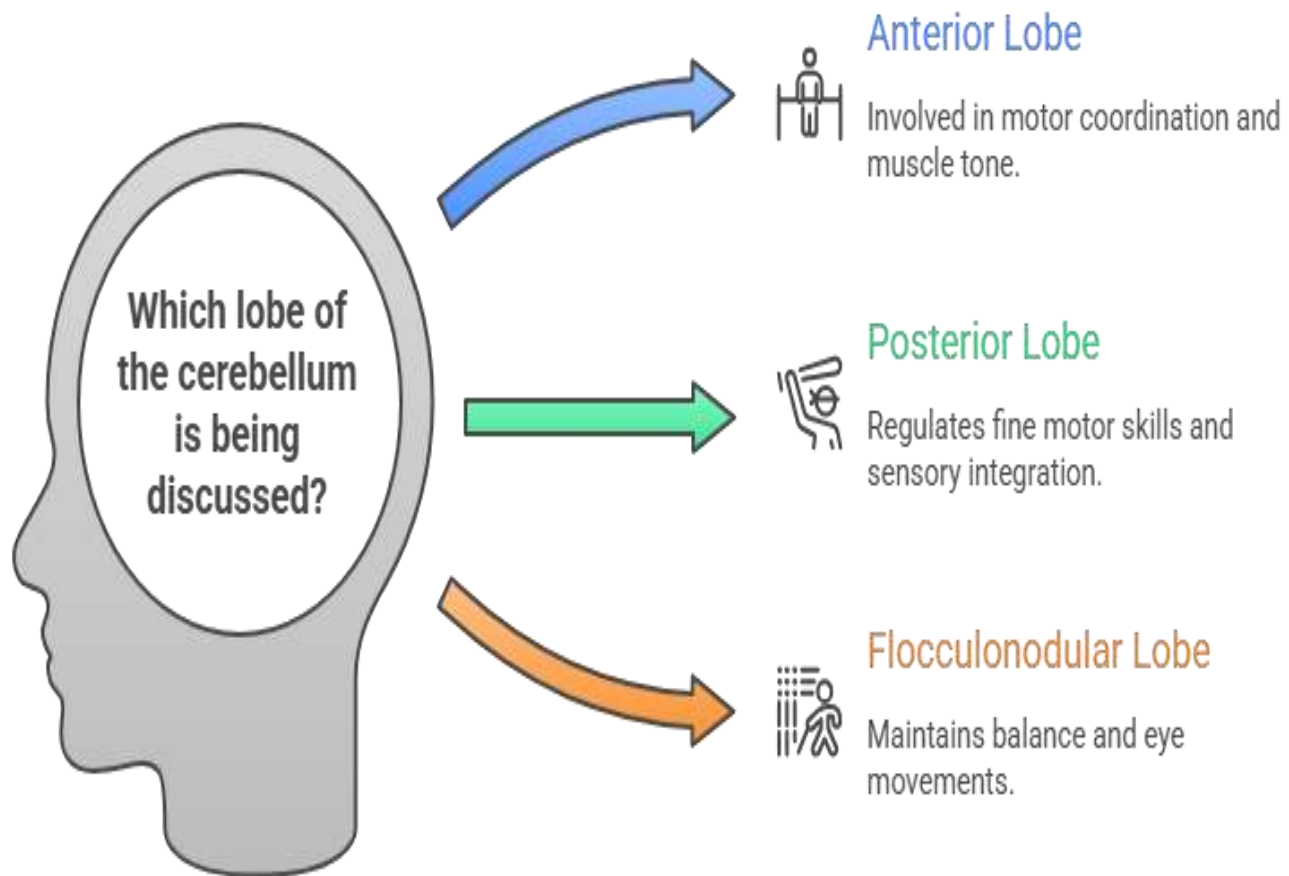
1. Molecular layer – stellate & basket cells
2. Purkinje cell layer – output neurons
3. Granular layer – granule & Golgi cells

## Peduncles

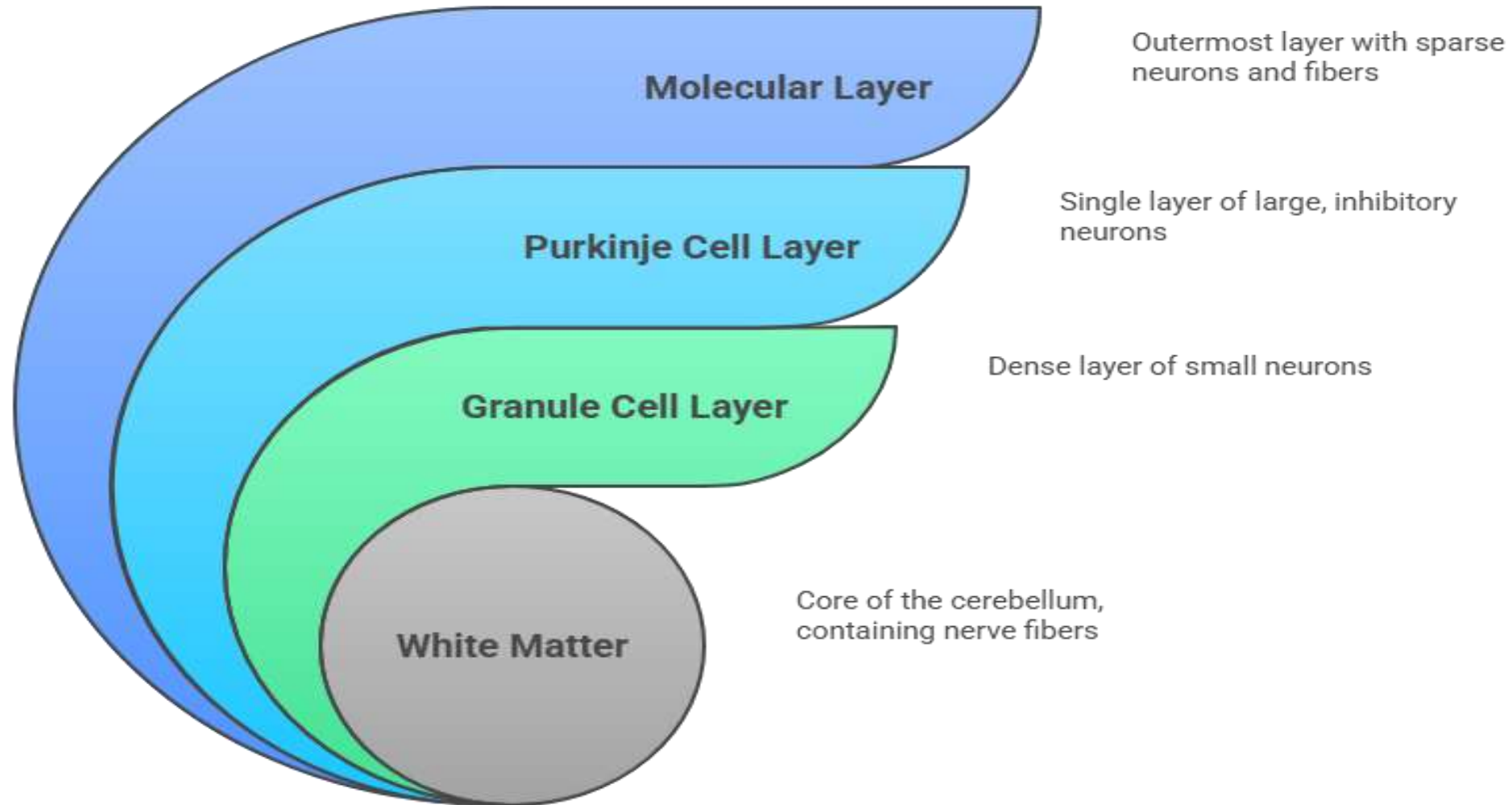
- Superior – efferent to midbrain
- Middle – afferent from pons
- Inferior – connects medulla & spinal cord

## Cerebellar Peduncles: Connecting the Cerebellum to the Brainstem





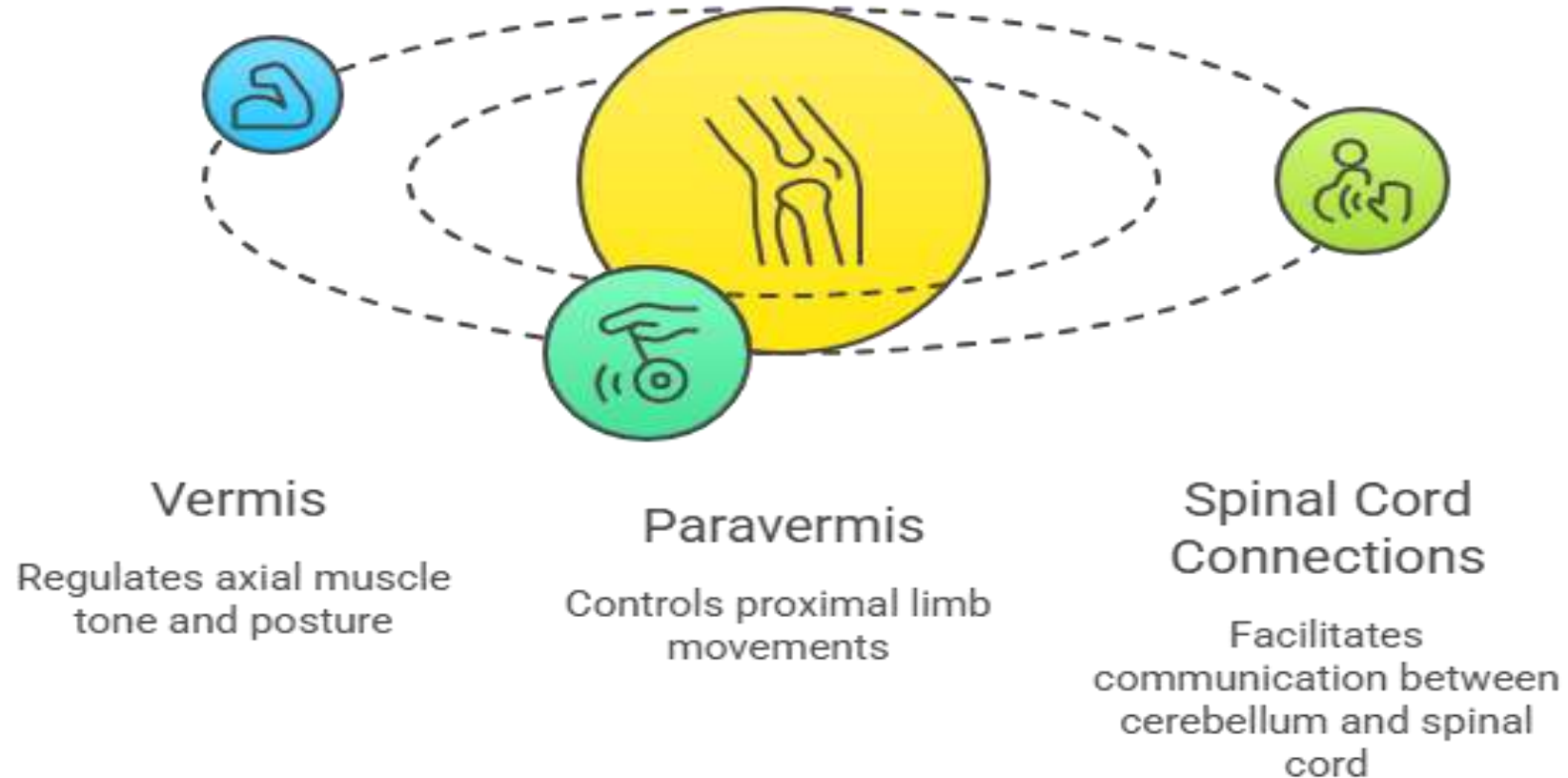
## Cerebellar Cortex Layers



# Functional Divisions of the Cerebellum

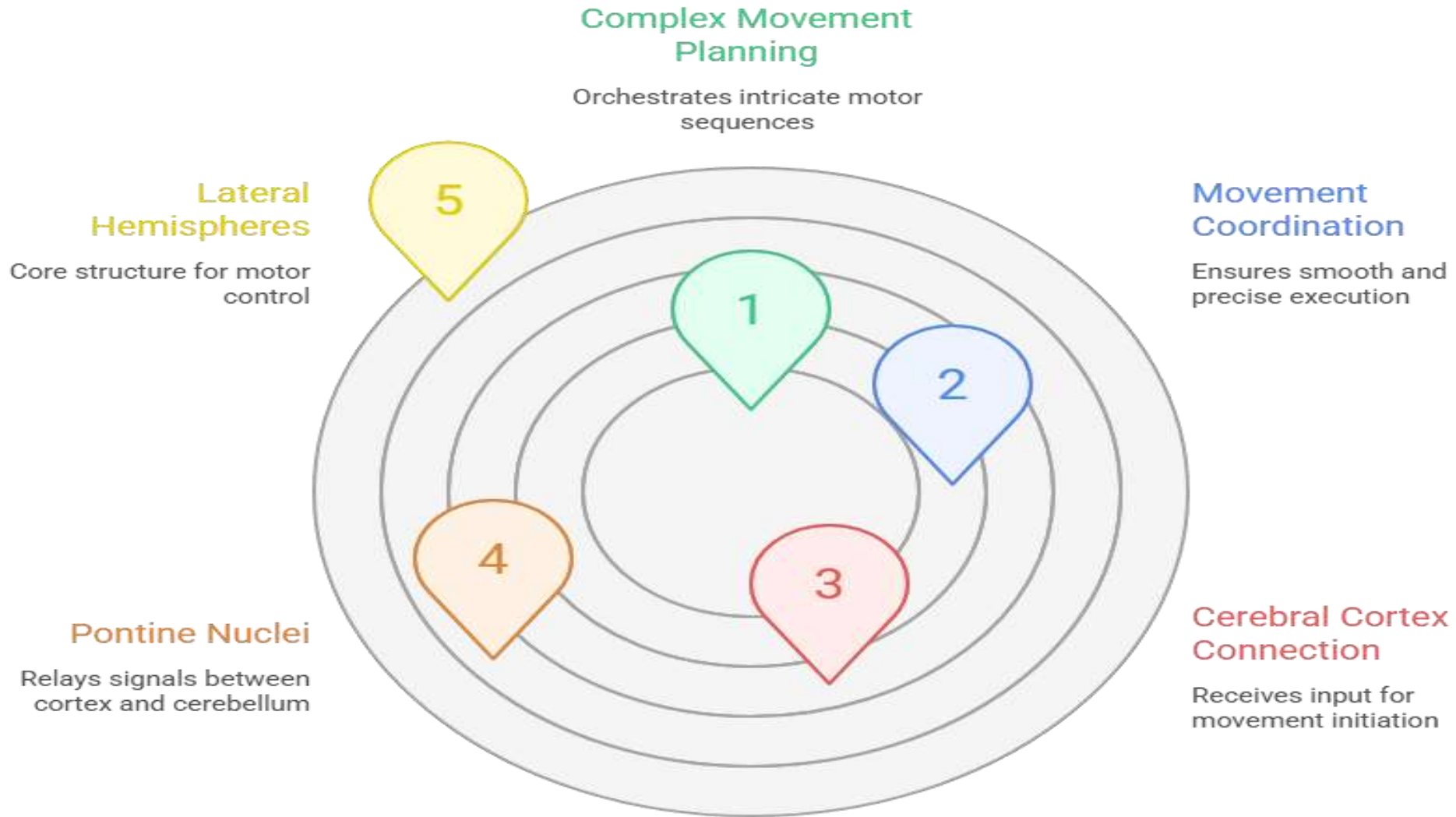
## Spinocerebellum

### Cerebellar Region for Proximal Limb and Trunk Control

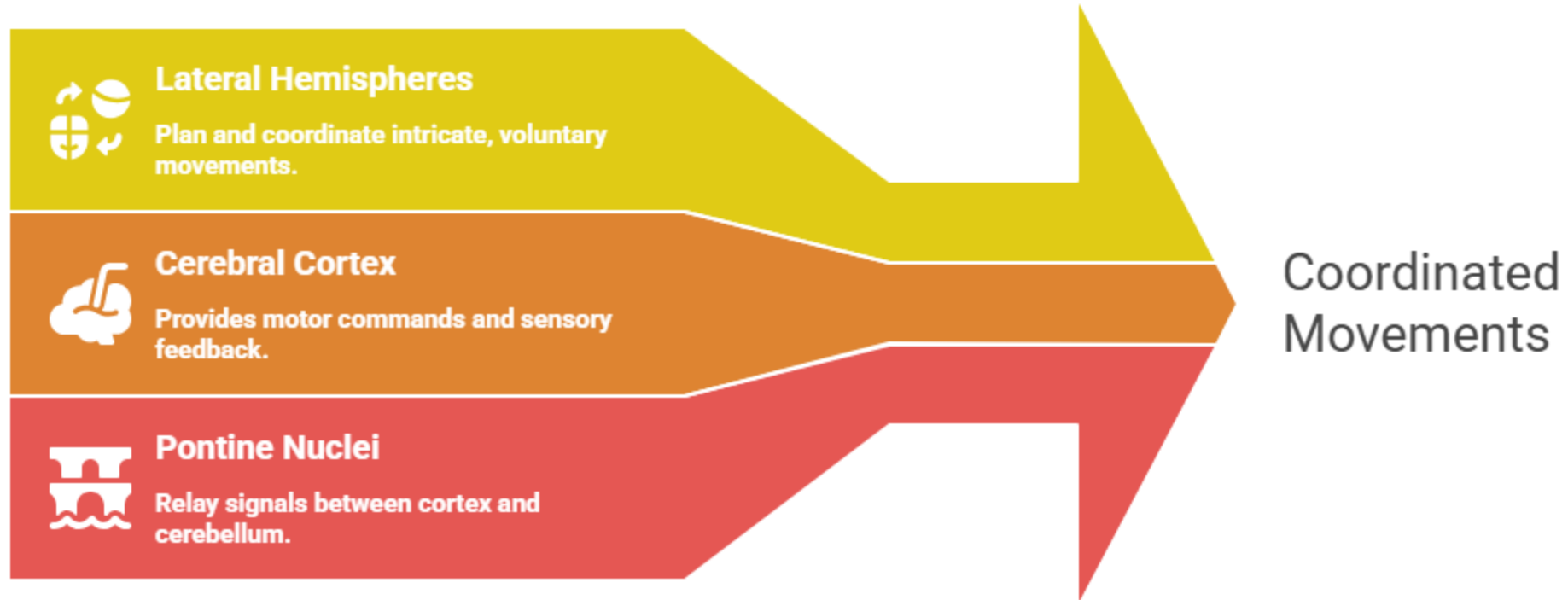


# Cerebrocerebellum

## Cerebrocerebellum Function

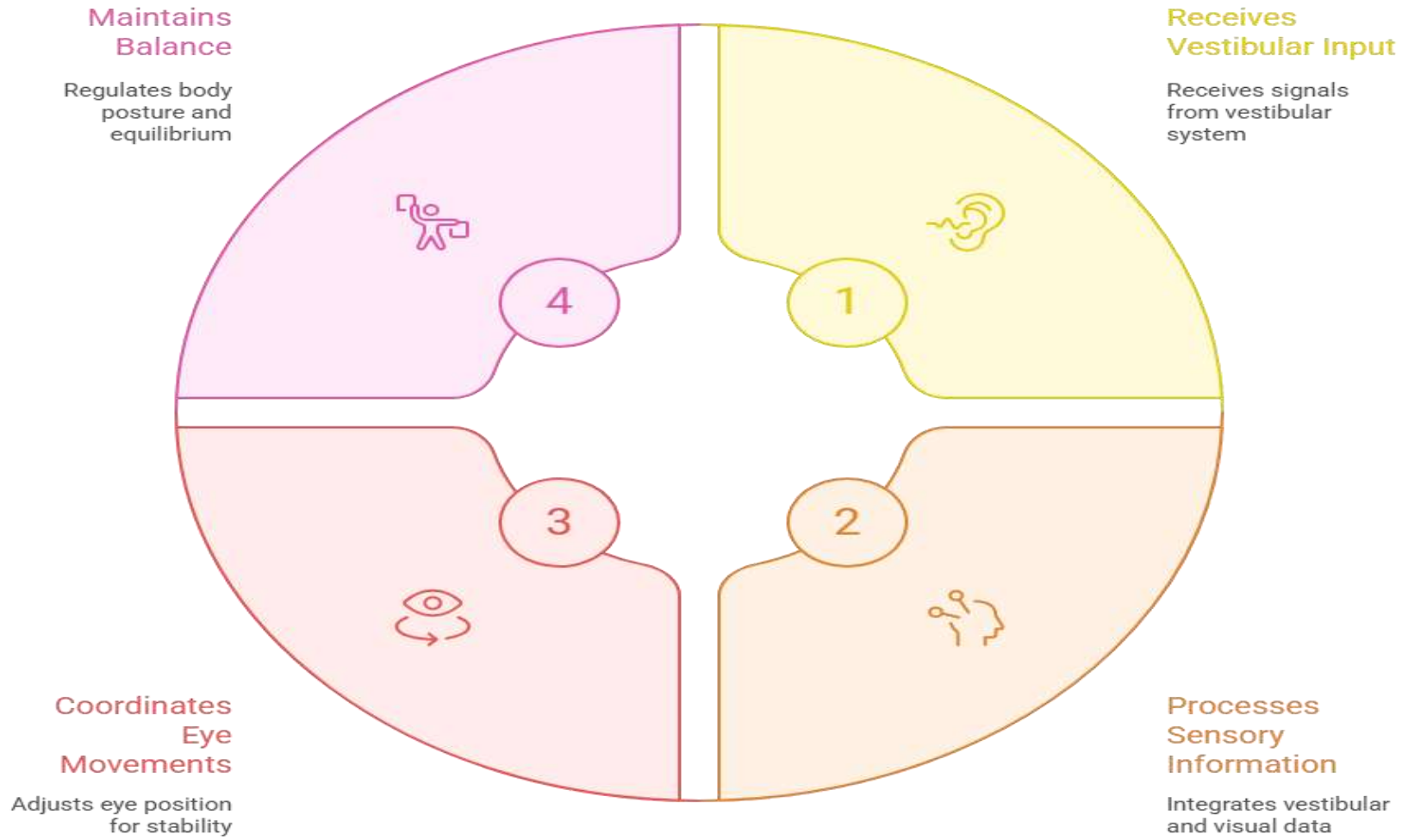


## Cerebellar Coordination



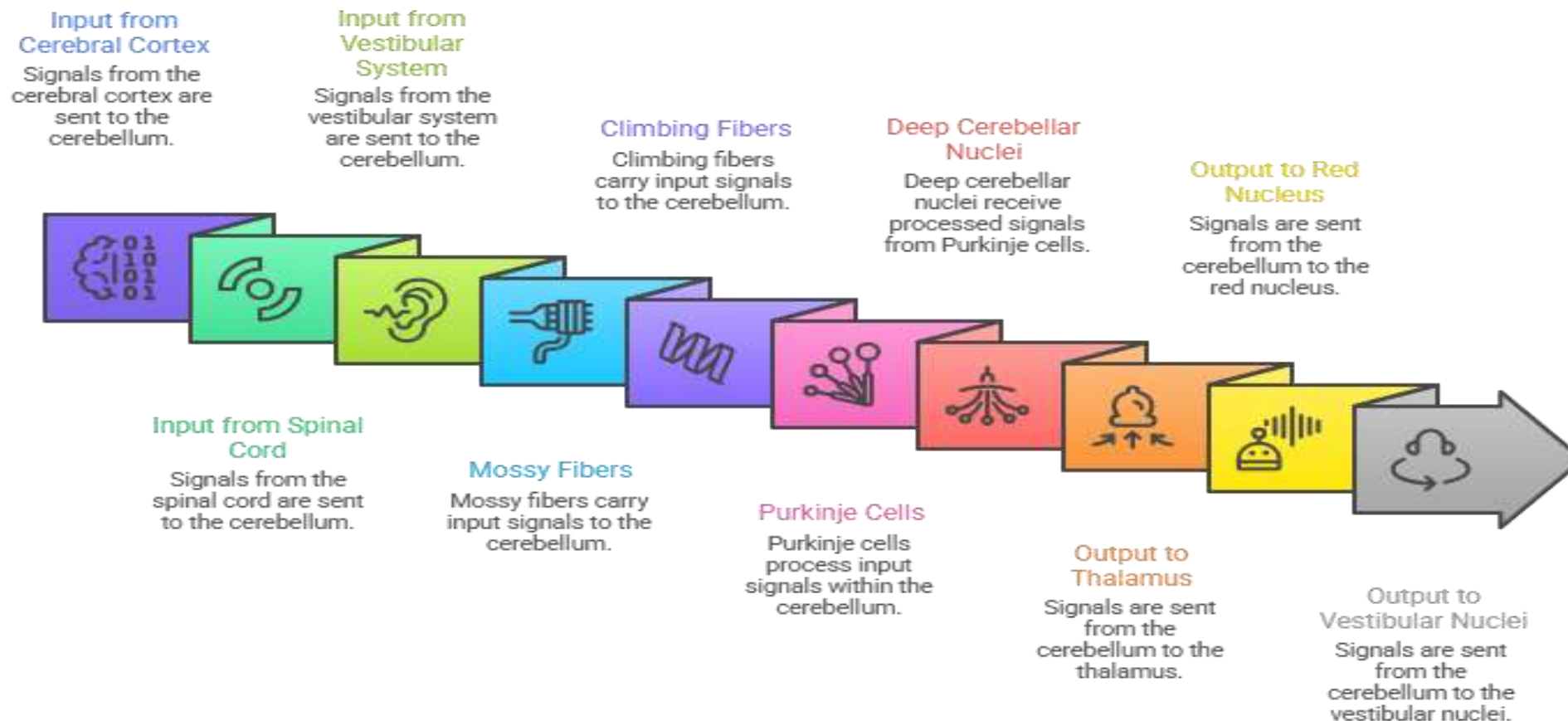
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# Vestibulocerebellar Function Cycle



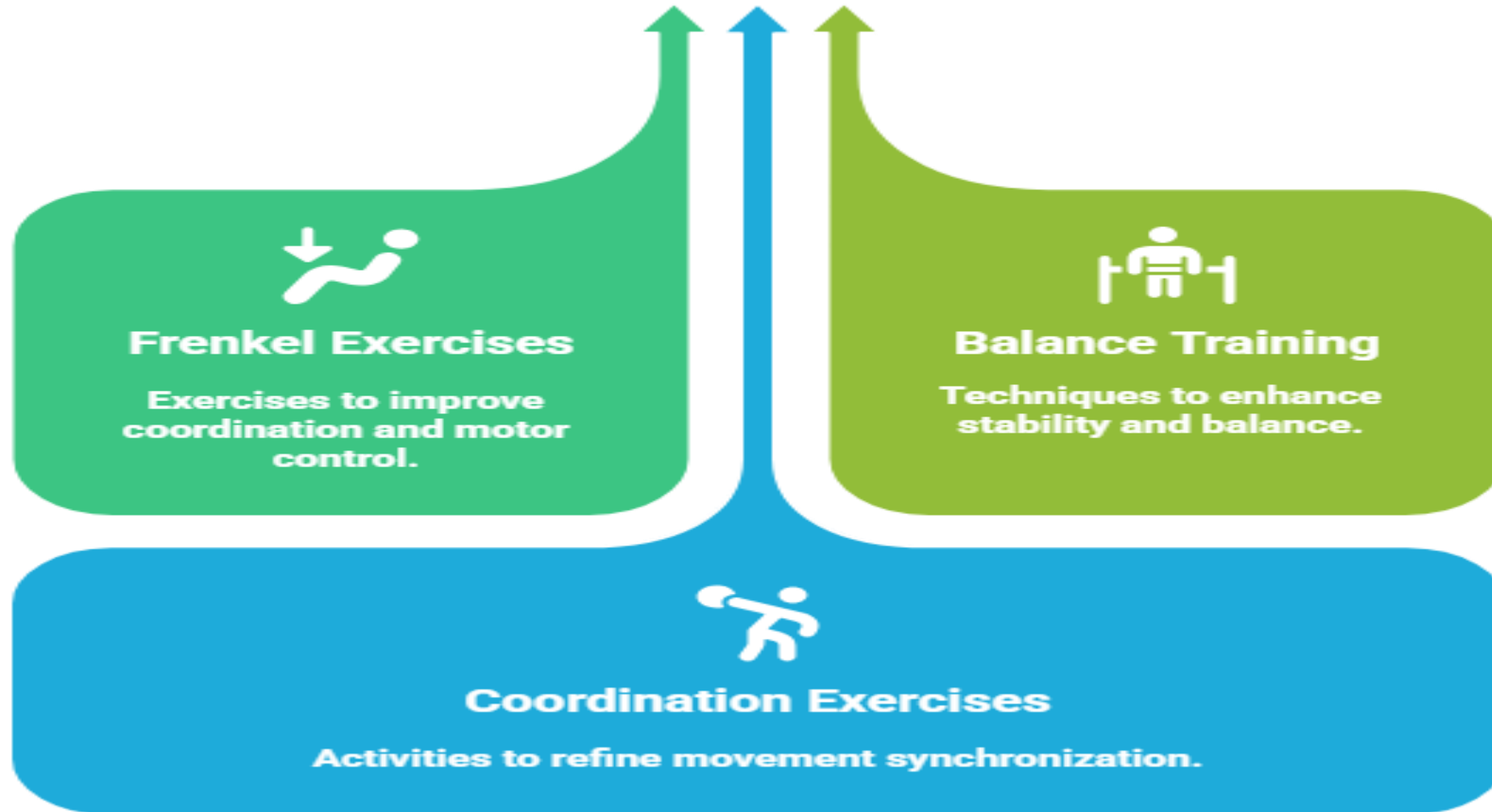
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## Cerebellar Input and Output Pathways



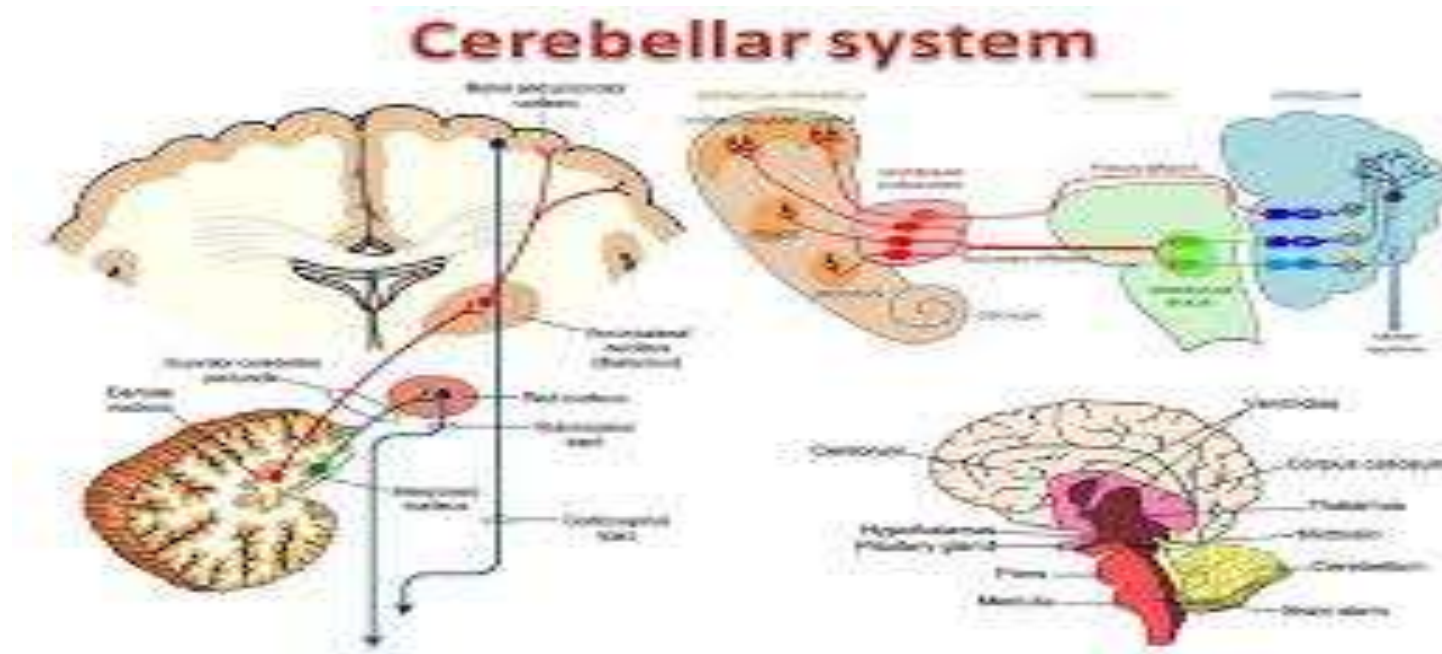
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# Physiotherapy for Cerebellar Disorders



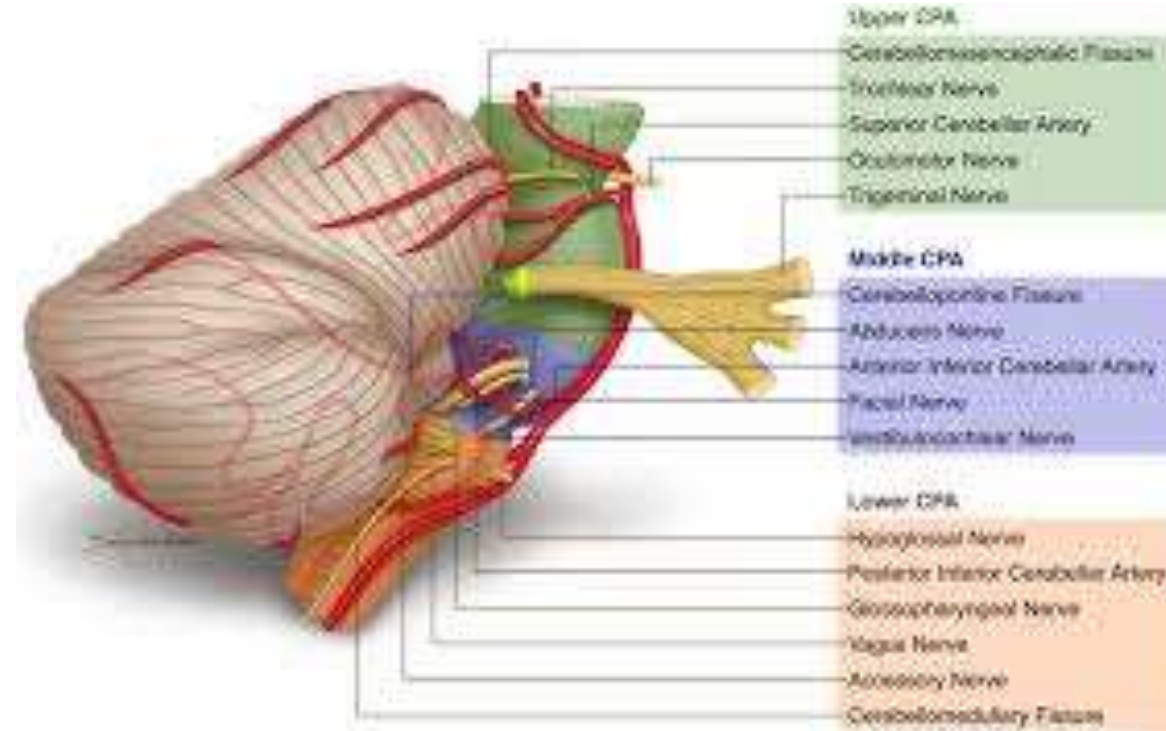
# Neural Pathways

- Afferent: Corticopontocerebellar, olivocerebellar, vestibulocerebellar
- Efferent: Dentatothalamic, fastigiovestibular



# Blood Supply

- Arteries: SCA, AICA, PICA
- Venous drainage: Superior and inferior cerebellar veins

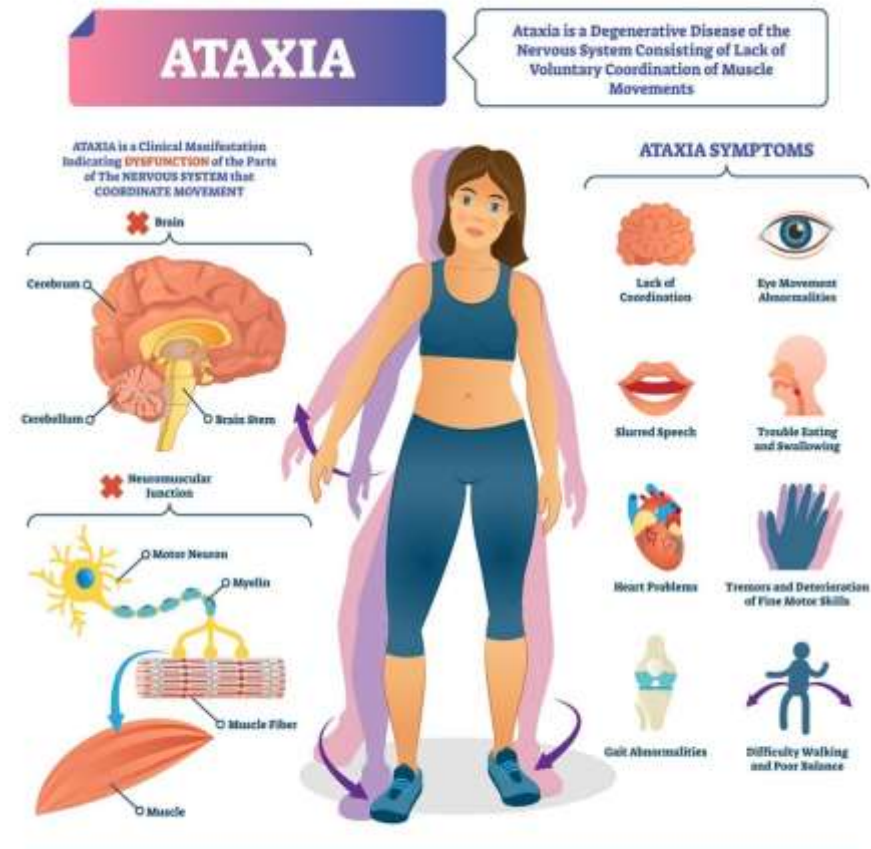


# Functions of the Cerebellum

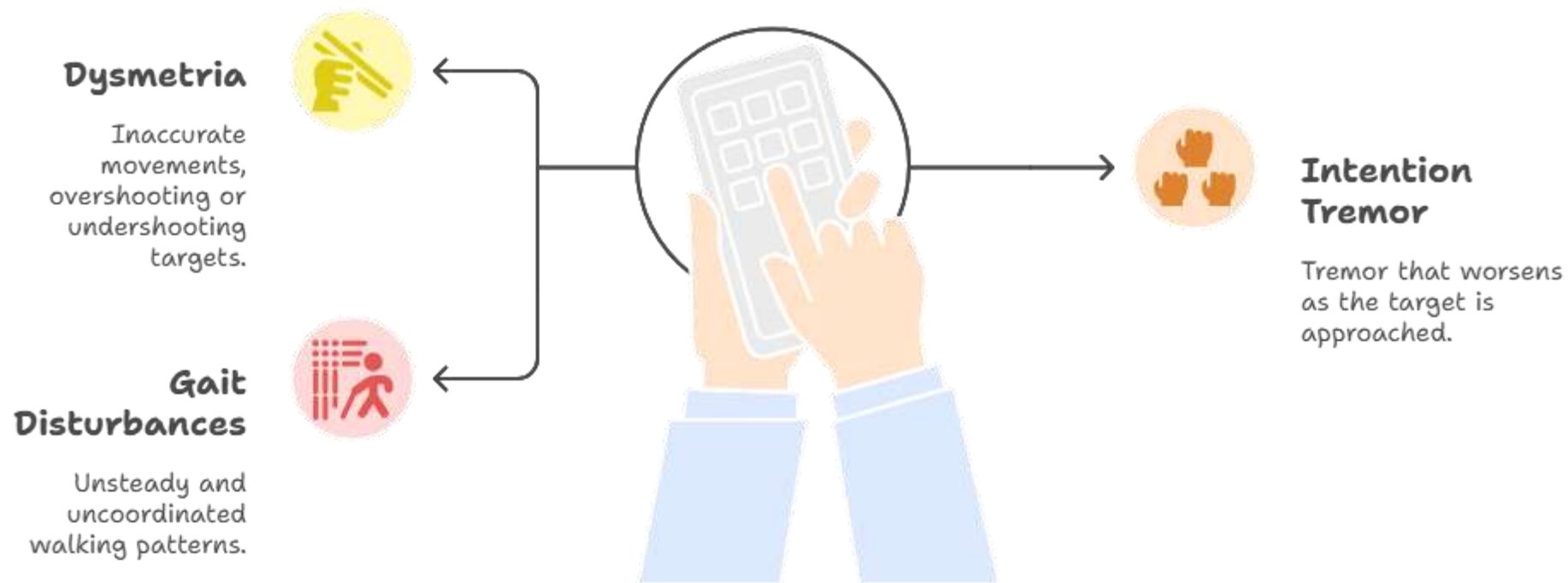
- Coordinates voluntary movements
- Maintains muscle tone & posture
- Controls balance
- Motor learning and adaptation

# Clinical Correlation

- Ataxia – loss of coordination
- Intention tremor
- Dysmetria – overshooting
- Hypotonia



## Cerebellar Ataxia Signs



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# Prototype: Real-Life Examples

- Standing balance on one leg
- Catching a ball
- Learning to play piano

# Test: Functional Evaluation

- Finger-to-nose test
- Heel-to-shin test
- Rapid alternating movement
- Romberg's test



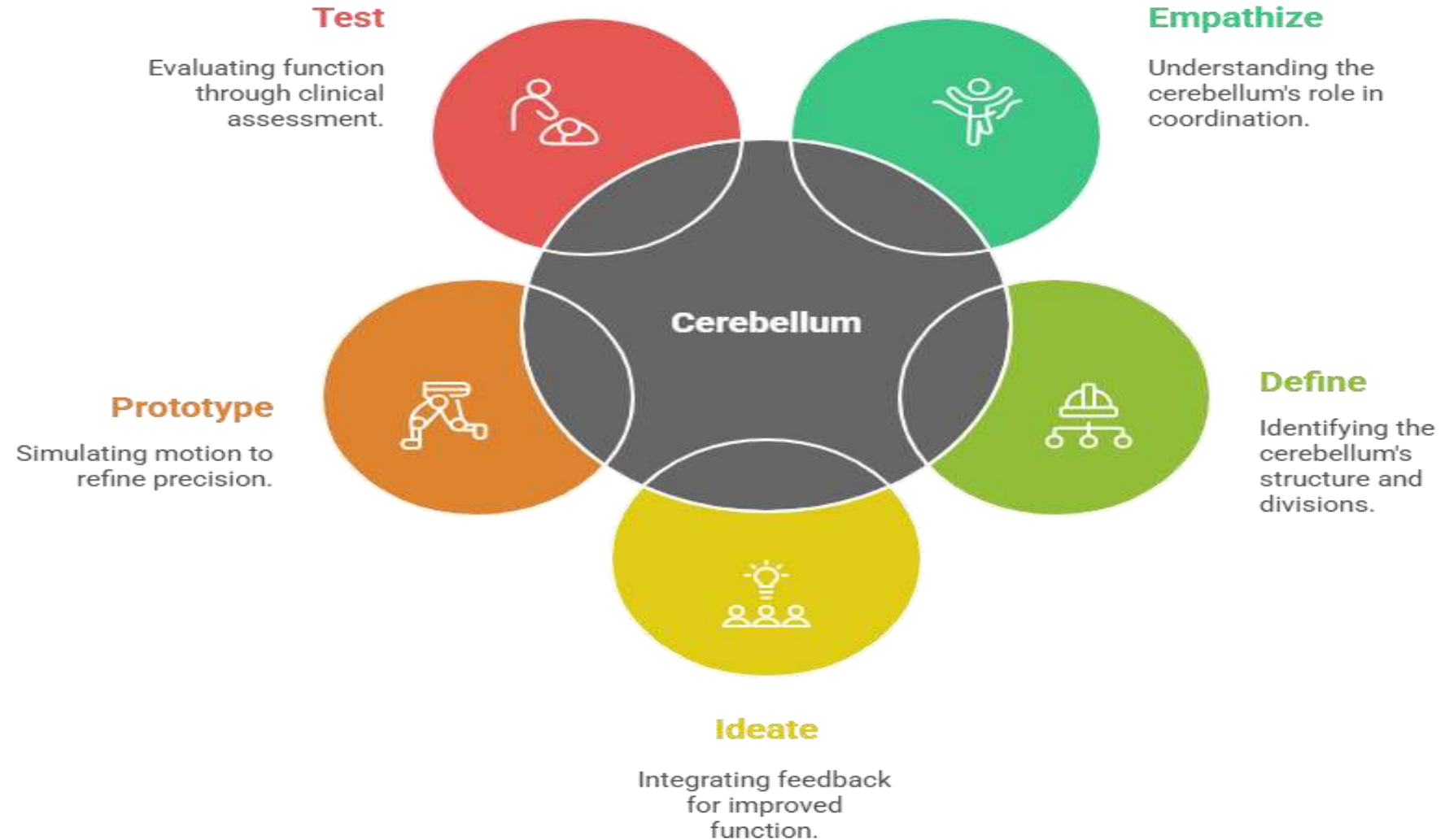
# Summary

- Empathize – Role in coordination
- Define – Structure and divisions
- Ideate – Feedback integration
- Prototype – Motion simulation
- Test – Clinical assessment
  
- 'The cerebellum is the designer of precision.'

## FACTS TO REMEMBER

- Cerebellum or a little brain acts like younger sibling of the large cerebrum.
- It control tone, posture, equilibrium and fine movements of the body. It cannot initiate the movement.
- Its is connected by cerebellar peduncle (inferiorly, middelly and superiorly).
- Number of the neurons is about half of the cerebrum, though is much smaller than the cerebrum.
- Its structure is uniform through out, i.e. **homotypical**.
- Its control is **ipsilateral**.

## Cerebellar Design Process



## CASE: “LOCALISE BEFORE YOU REHABILITATE”

### Case Scenario (Given to Students)

A 58-year-old right-handed male presents with:

- Weakness of **right face and upper limb** > lower limb
- Expressive speech difficulty**
- Increased tone and exaggerated reflexes on the right side
- Impaired fine touch and proprioception in the right hand

MRI shows cortical involvement of the **left cerebral hemisphere**.



### Q1. Problem Framing

- Which **hemisphere** is involved?
- Is this the **dominant or non-dominant hemisphere**?

*Students must justify based on symptoms.*

### Q2. Functional Mapping

Identify **three cortical regions** involved and link each to a symptom:

- Motor cortex
- Sensory cortex
- Language area

### Q3. Vascular Decision

- Which **cerebral artery** is most likely affected?
- Why is the **lower limb relatively spared**?