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Basal Ganglia & Cerebellum – a quick overview

MHD-Neuroanatomy – Neuroscience Block

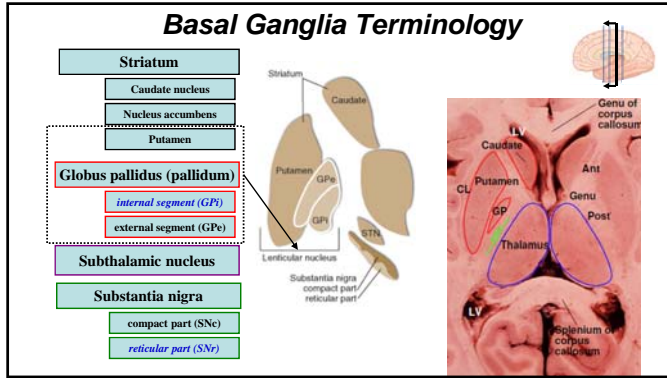
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Outcomes you want to accomplish

Basal ganglia review

- ✓ Define and identify the major divisions of the basal ganglia
- ✓ List the major basal ganglia functional loops and roles
- ✓ List the components of the basal ganglia functional “circuitry” and associated neurotransmitters
- ✓ Describe the direct and indirect motor pathways and relevance/role of the substantia nigra compacta

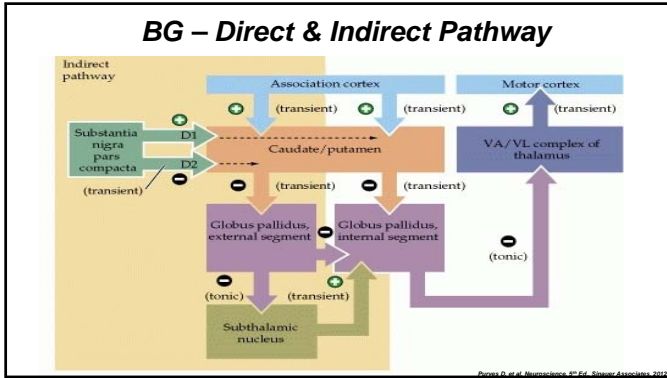


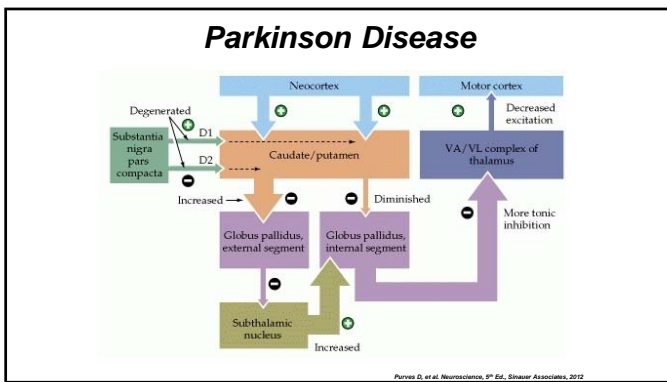
Basal ganglia "circuitry"

- BG have **no major outputs to LMNs**
 - Influence LMNs via the cerebral cortex
- **Input** to striatum from cortex is **excitatory**
 - Glutamate is the neurotransmitter
- Principal **output** from BG is **via GPI + SNr**
 - Output to thalamus, GABA is the neurotransmitter
- **Thalamocortical projections are excitatory**
 - Concerned with motor "intention"
- *Balance of excitatory & inhibitory inputs to striatum, determine whether thalamus is suppressed*

BG circuits are parallel loops

- **Motor loop**
 - Concerned with learned movements
- **Cognitive loop**
 - Concerned with motor "intention"
- **Limbic loop**
 - Emotional aspects of movements
- **Oculomotor loop**
 - Concerned with voluntary saccades (fast eye-movements)

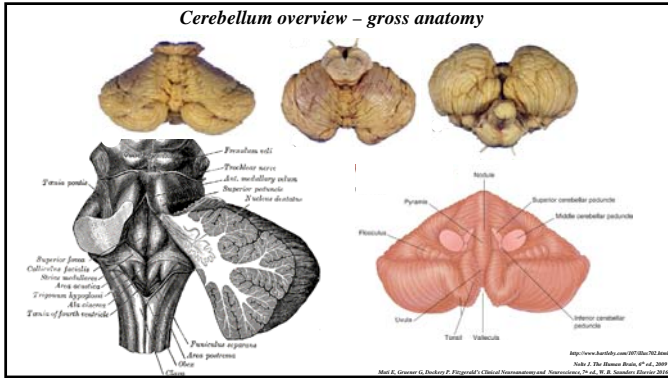


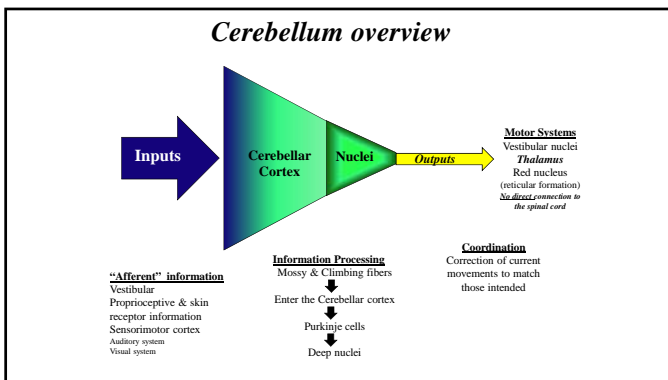


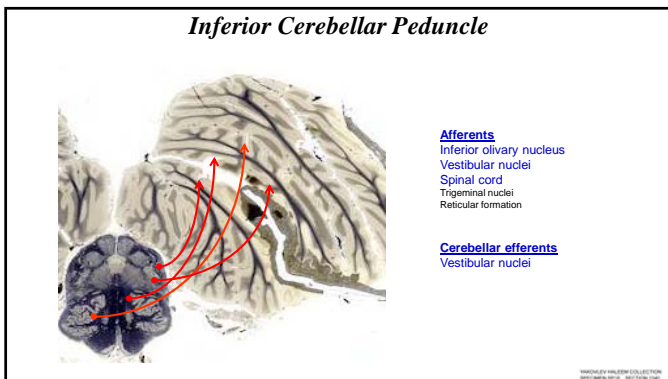
Outcomes you want to accomplish

Cerebellum review

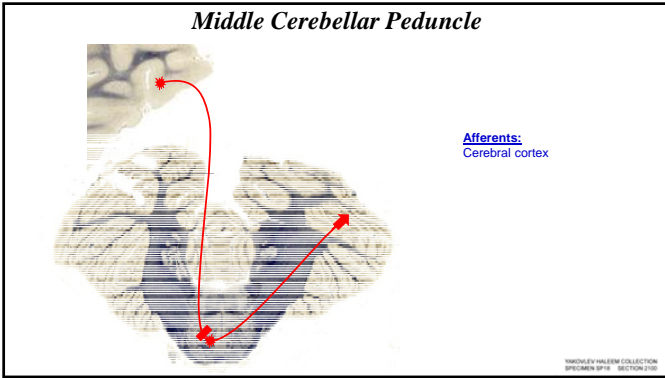
- ✓ Identify cerebellar peduncles and the names/projections of the deep cerebellar nuclei
- ✓ List afferent and efferent components of the cerebellar peduncles
- ✓ Define the origins of the mossy and climbing fibers
- ✓ Define the functional components of the cerebellum (e.g. How would an injury to the cerebellar hemisphere differ from one to the flocculonodular lobe?)
- ✓ Describe the “wiring diagram” of the cerebellum and the different terminations of the mossy and climbing fibers







Middle Cerebellar Peduncle



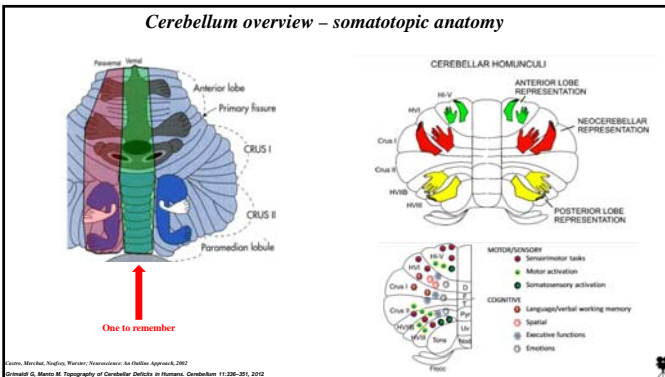
Afferents:
Cerebral cortex

“For the detailed minded among you”

Primary Afferents to the Cerebellum

Tract	Origin	Termination	Peduncle
Vestibulocerebellar	Vestibular ganglia	Nodulus and uvula - Ipsilateral	Inferior
Vestibulocerebellar	Vestibular nuclei	Flocculus, nodulus and vermis - Bilateral	Inferior
Anterior spinocerebellar	Ascends in contralateral spinal cord (T1-L5)	Vermis and intermediate zone - Ipsilateral	Superior
Posterior spinocerebellar	Clarke's nucleus (T1-L2/3)	Vermis and intermediate zone - Ipsilateral	Inferior
Cuneocerebellar	Lateral cuneate nucleus (medulla)	Vermis and intermediate zone - Ipsilateral	Inferior
Rostral spinocerebellar	Ipsilateral spinal cord (cervical)	Vermis and intermediate zone? - Ipsilateral	Inferior Superior
Reticulocerebellar	Lateral, paramedian, reticular tegmental nuclei	Vermis and intermediate zone - Ipsilateral	Inferior (Middle - reticular tegmental nuclei)
Trigemino-cerebellar	Spinal and main sensory nucleus of V	Vermis and intermediate zone - Ipsilateral	Inferior
Olivocerebellar	Inferior olivary, accessory olivary nuclei	All contralateral areas	Inferior
Pontocerebellar	Pontine nuclei	Anterior and posterior lobes - Contralateral Vermis - Ipsilateral	Middle

Cerebellum overview – somatotopic anatomy



One to remember

