ANATOMY

Basal Ganglia nuclei

Summary of the Basal Ganglia

- Putamen and Caudate are the input nuclei
- GP is the main output nucleus.
- SNpc → dopaminergic fibers to Putamen
- STN: receive inhibitory fibers from GPe and send excitatory fibers to GPi.

Caudate	**Play a role in:** - movement processing - Cognitive executive functions - working memory, learning and language. - Responds to visual beauty (neural correlate for romantic love)	**Connections**: From dorsolateral prefrontal cortex → dorsolateral part of caudate → dorsomedial nucleus of thalamus → back to prefrontal cortex.
STN	Part of Indirect (inhibitory) loop of BG (Send glutaminergic fibers to stimulate GPi)	lesion would cause hemiballismus – Impulsivity
GP		Input: from putamen, STN (no direct afferent from cortex) Progects to:

Other brain/brainstem nuclei

Amygdala	Part of limbic system, involved in memory, emotions and decision making. Efferents go through 3 main pathways: 1- Stria terminalis pathway (main pathway) from medial nucleus to nucleus of stria terminalis then to thalamus and hypothalamus. 2- Amygdalofugal pathway: from lateral nucleus to thalamus (dorsomedial nucleus), hypothalamus, BG and brain stem. 3- Anterior commissure pathway: to the opposite temporal lobe
Nucleus accumbens	Involved in anticipating reward and habit formation
Red nucleus	Motor coordination (mainly shoulder and upper arm), arm movements during walking, crawling (baby); movement initiation.
Locus ceruleus	Located in Pons. Involved in reaction to stress and panic, attention and memory. principal site for brain synthesis of norepinephrine
Nucleus basalis of Meynert	Located in basal forebrain, principal site for brain synthesis of Ach. Sends widespread projections to neocortex, lesion would cause marked decrease in mental capacity and learning as seen in Alzheimer and PD.
Raphe nuclei	Located in the medial portion of the brainstem from medulla to pons. Major source for serotonin in the brain. Involved in sleep-wake cycle and circadian rhythm.

Cerebellar Components

Mossy fibers	Fibers from DSCT, CCT, VCT & PCT when reach the cerebellum form mossy fibers that terminate in granular cells which then project to Purkinje cells (indirect).
Climbing fibers	Glutaminergic fibers, originating from inferior olivary nucleus → Purkinje cells (direct).
Purkinje fibers	The only fibers that project from cerebellar cortex to cerebellar nuclei.