MODULATION OF MOVEMENT: The Basal Ganglia - movement selection

Peter Wallén
Striatum

Inputs to the Basal ganglia

Intrinsic circuitry and outputs of the Basal ganglia

The somatotopic organization is maintained through the Basal Ganglia and Thalamus
Planning, Selection, Initiation and Adaptation of Motor Programs

Motor Cortex

Basal Ganglia

Motor Centers

Cerebellum

Central Motor Program

Muscle

Adaptation

Sensory Feedback

Proprioception

Neurons in the striatum are active before movement initiation

"Medium Spiny Neuron" in Putamen

Intrinsic circuitry and outputs of the Basal ganglia

MOTOR INFRASTRUCTURE

Neuronal networks that co-ordinate different movements

Cerebellum

Sensory feedback

Proprioception
Neuronal circuitry in the Basal ganglia

Two different populations of Medium spiny neurons

- High threshold for activation from cortex or thalamus
- Filter function

Medium spiny neurons in striatum (input stage)

- High threshold for activation from cortex or thalamus
- Filter function

Pallidal neurones (output stage)

- Keep motor programs under tonic inhibition

The direct loop through the Basal ganglia:
Initiates movement

Disinhibition - requires background activity!

The indirect loop through the Basal ganglia:
Stops movement
The Direct & Indirect pathways split in the Striatum

**D1/D2** and **D1/D2/ENK** expressing neurons. Mixed population of projection neurons (MSNs), innervating the different targets.

Fig 18.11

**Hypokinesia:** Parkinson

**Hyperkinesia:** Huntington