What Does Your Brain Look Like?

Brain Anatomy

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Functional Organization of Nervous System

- Sensory system
- Motor system
- Association areas of cerebral cortex
Organization of the Nervous System

The Nervous System

Central Nervous System (CNS)
- Brain
- Spinal Cord

Peripheral Nervous System (PNS)
- Motor Neurons
- Sensory Neurons

Somatic Nervous System

Autonomic Nervous System
- Sympathetic
- Parasympathetic
Structure of Neurons

Neurites (processes, fibers):
Axons (軸突): to deliver information
Dendrites (樹突): to receive information
Synapses can be chemical or electrical.
Voltage-gated Ca\(^{2+}\) channel

Synaptic vesicle

Neurotransmitter molecule

Docking proteins

Postsynaptic receptor

Vesicle that has fused with membrane and released contents

Axon terminal
Spinal Cord
Brain
The Cerebral Cortex

Frontal Lobe
- Premotor Area
- Higher Intellectual Functions
- Speech Motor Area

Parietal Lobe
- Primary Sensory Area
- Sensory Association Area
- Visual Association Area

Occipital Lobe
- Primary Visual Area
- Visual Association Area

Temporal Lobe
- Memory

Motor Area
- Leg
- Trunk
- Arm
- Hand
- Face
- Tongue

Sensory Area
- Arm
- Hand
- Face
- Tongue

Language Comprehension & Formation
- Primary Auditory Area

The Cerebral Cortex [Brain Diagram]
Dorsal column-medial lemniscal pathway

1. Touch sensation
2. Position sensation (proprioception)
1. Pain sensation
2. Temperature sensation

Spinothalamic pathway
Distal muscle: limbs

Axial muscle: trunk muscle
Secondary Motor Cortex
Distal muscle: limbs

Axial muscle: trunk muscle
Interaction of CNS areas involved in movement

- Primary motor cortex
- Nonprimary motor cortex
- Basal ganglia modulation
- Brain stem
- Cerebellar modulation
- Spinal cord
- Muscles of head and neck
- Muscles of body

Output via α motor neuron for movement
Basal Ganglia

The basal ganglia include
- Caudate nucleus
- Putamen
- Globus pallidus (internal segment, external segment)
- Subthalamic nucleus
- Substantia nigra (pars compacta, pars reticulata)

Striatum:
caudate nucleus + putamen
Organization of **Inputs** to Basal Ganglia
Parkinson’s Disease

Pathology hallmarks

- Nigostriatal degeneration
- Degeneration of dopaminergic neurons in substantia nigra
Parkinson’s Disease

Clinical symptoms

- Repetitive “pill rolling” movement
- Persistent tremors
- Shuffling gait, taking small steps
- Forward tilt of trunk
- Reduced arm swinging
- Shuffling gait with short steps
- Rigidity and trembling of head
- Rigidity and trembling of extremities
Parkinson’s Disease

Clinical symptoms

- mask-like faces
- decrease facial mobility = blunted expression
- decreased blinking
- characteristic stare
Muhammed Ali

Michael J Fox

former pope John Paul II

Yasser Arafat