Physiology of Sport and Exercise

Neuro Control of the Movement

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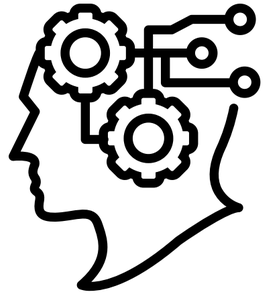
Learning Objectives

The basic structures of the nervous system

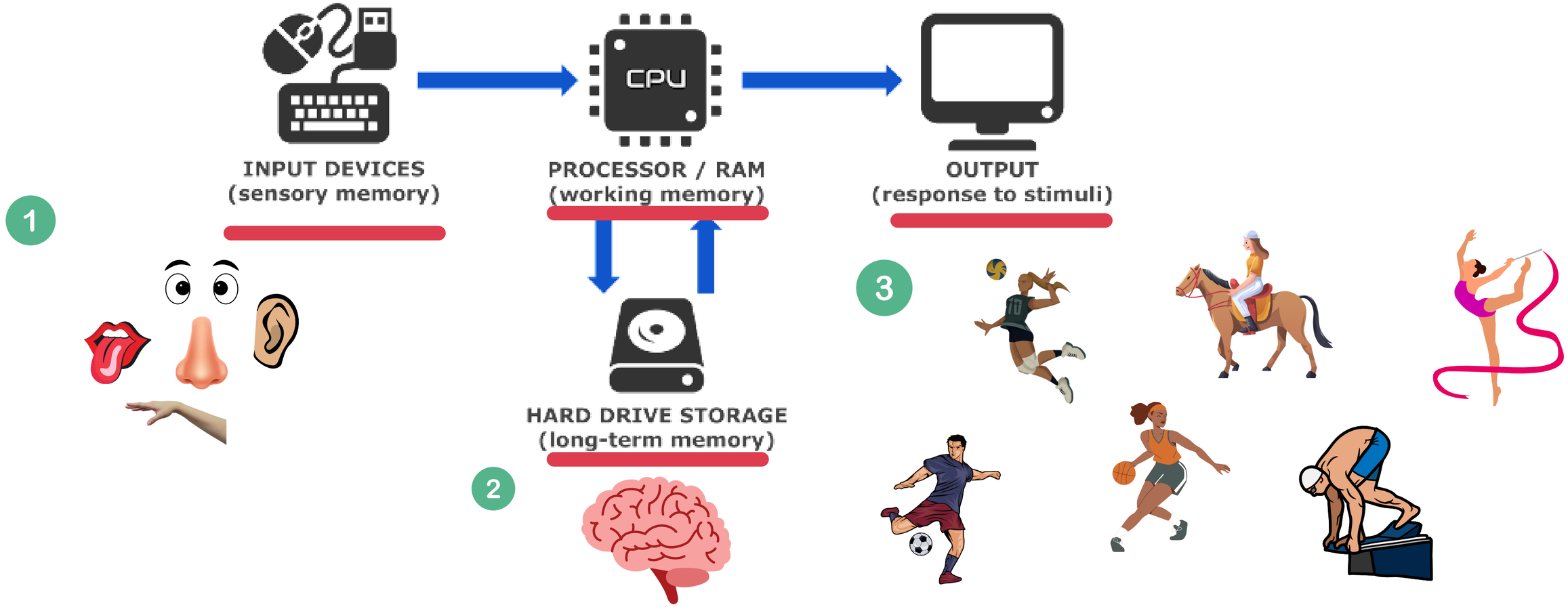
Motor control pathway

Example of study in neuroscience and sport

Information Processing Model

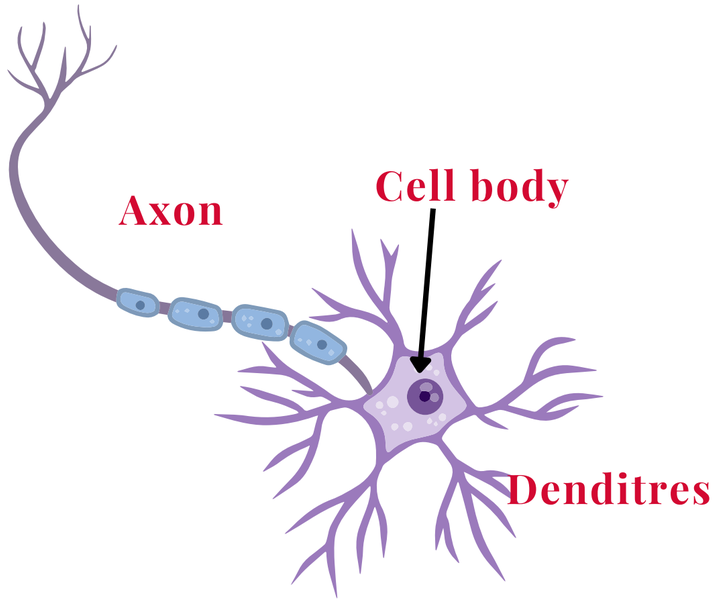


Brain similar to a computer in the information process



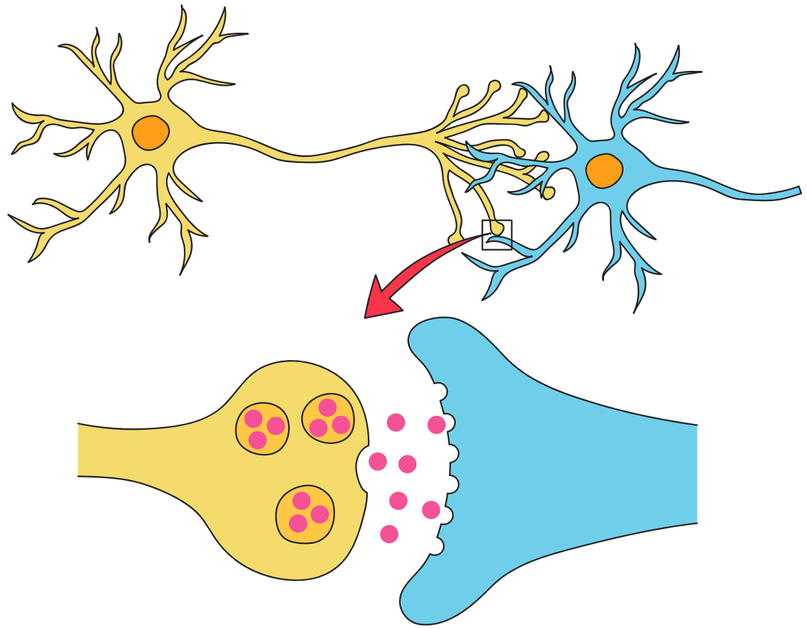
The neuron

Axon terminal



Smaller morphofunctional unit of the NS

Information transport



Synapse

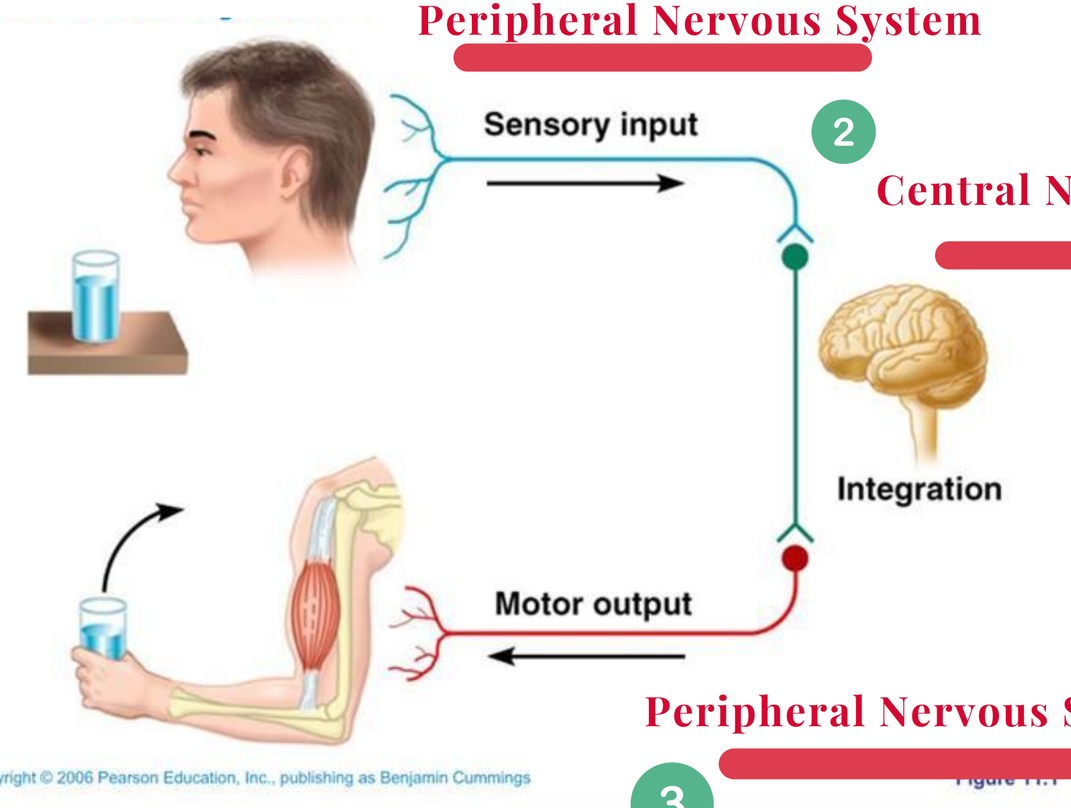
Point of connection and communication between neurons

one hundred million neurons ?

Nervous System

1

Peripheral Nervous System



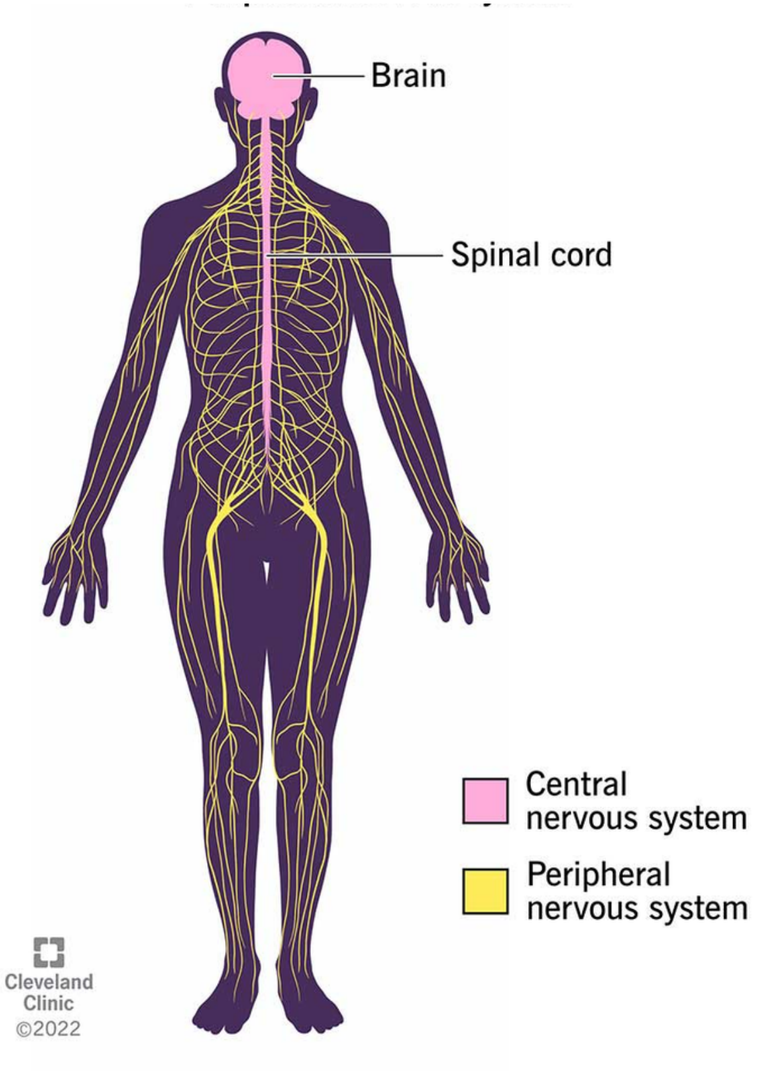
2

Central Nervous System

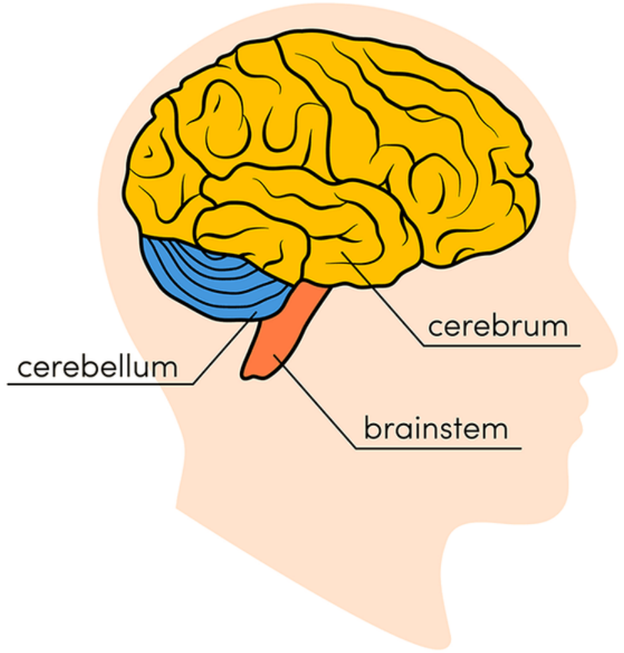
3

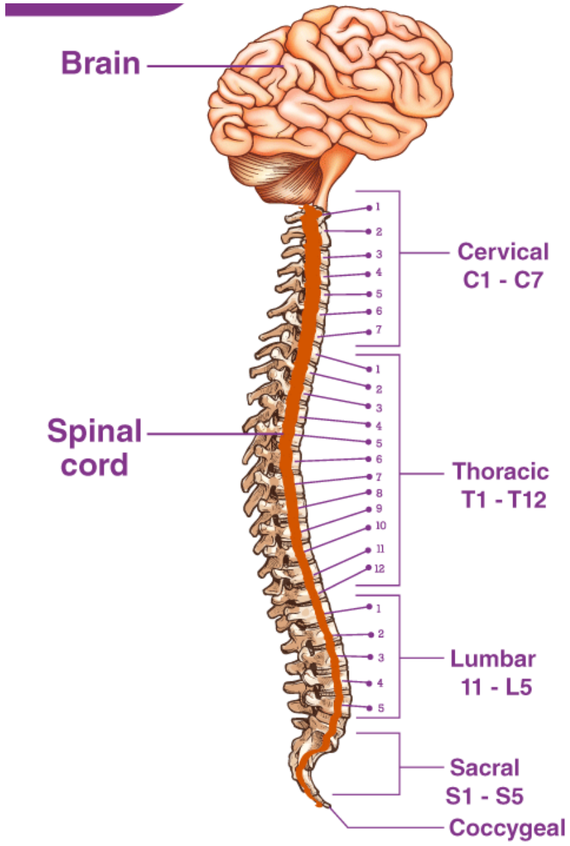
Peripheral Nervous System

Central Nervous System



Central Nervous System

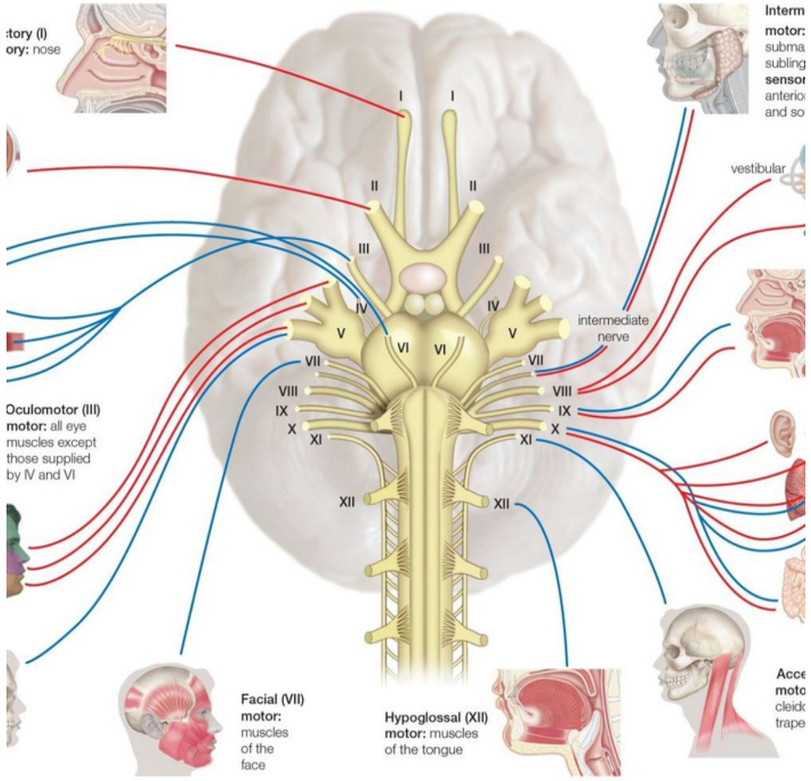




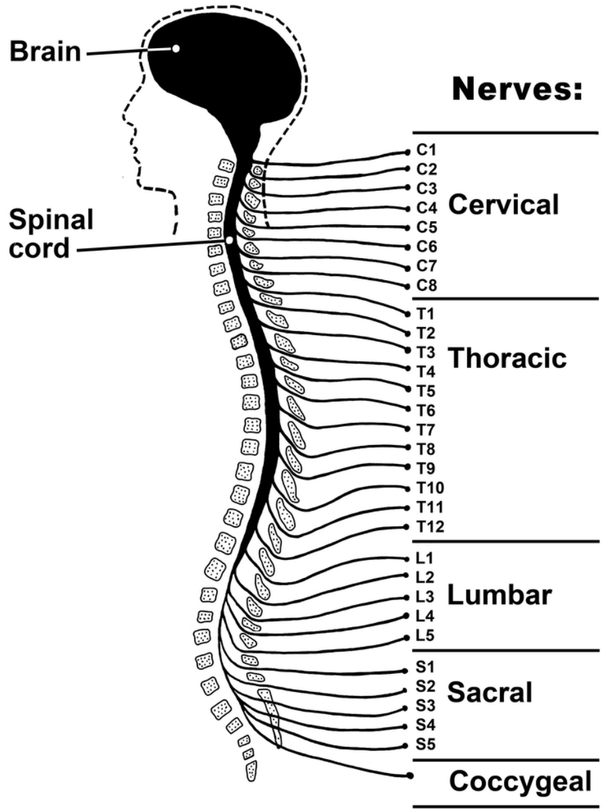
Periferal Nervous System

Nerves and Glanglia

12 pairs of cranial nerves connected with the brain

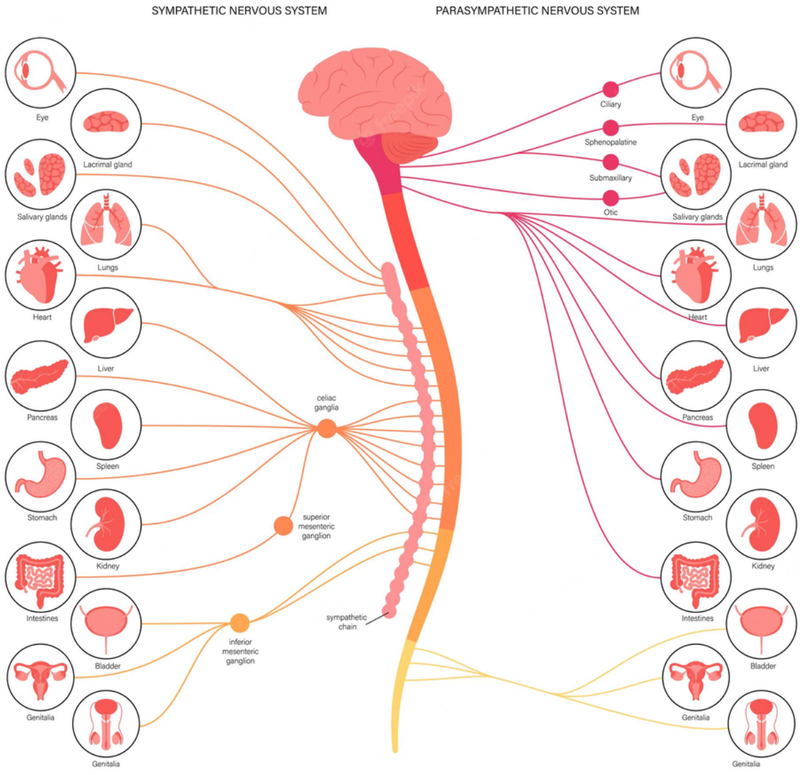


31 pairs of spinal nerves connected with the spinal cord



Periferal Nervous System

Control the physiological functions that are **unconscious** in nature.



Autonomic System

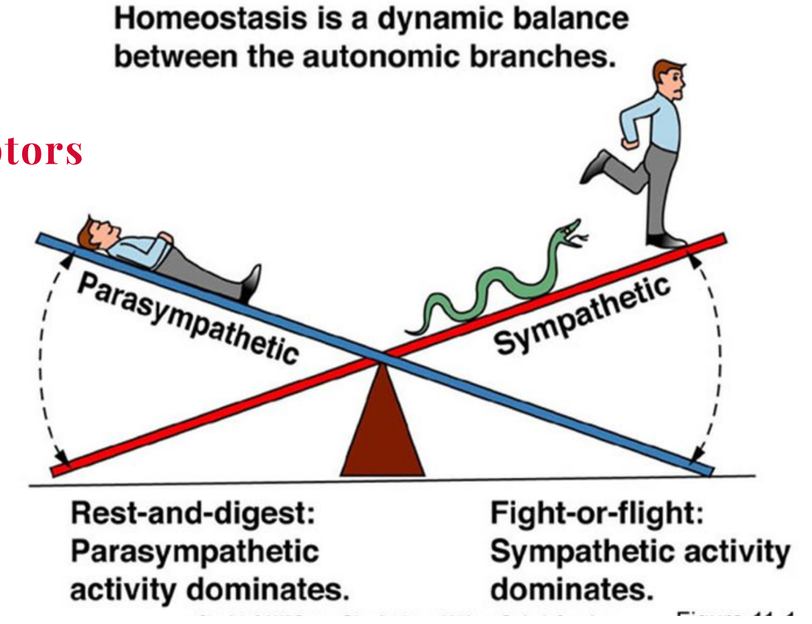
Sympathetic

Stimulate the physiological systems. Activate under the stress. 'Fight-or-flight'

Parasympathetic

Responsible for the body's constant or resting homeostatic state.

1. **Input from internal receptors**
2. **Output to smooth muscles and glands**



Periferal Nervous System

Somatic System

Allows coordinating actions and responses to the external environment. Conscious control of the movement.

Mechanoreceptors
Thermoreceptors
Nociceptors
Photoreceptors
Chemoreceptors

Afferent Neurons

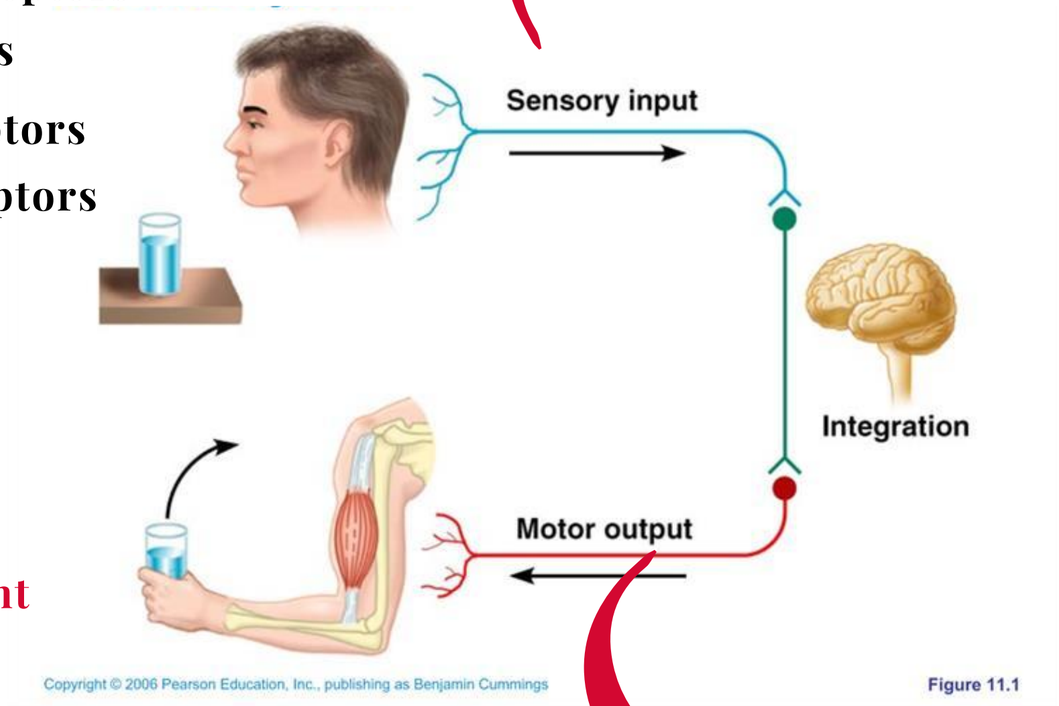


Figure 11.1

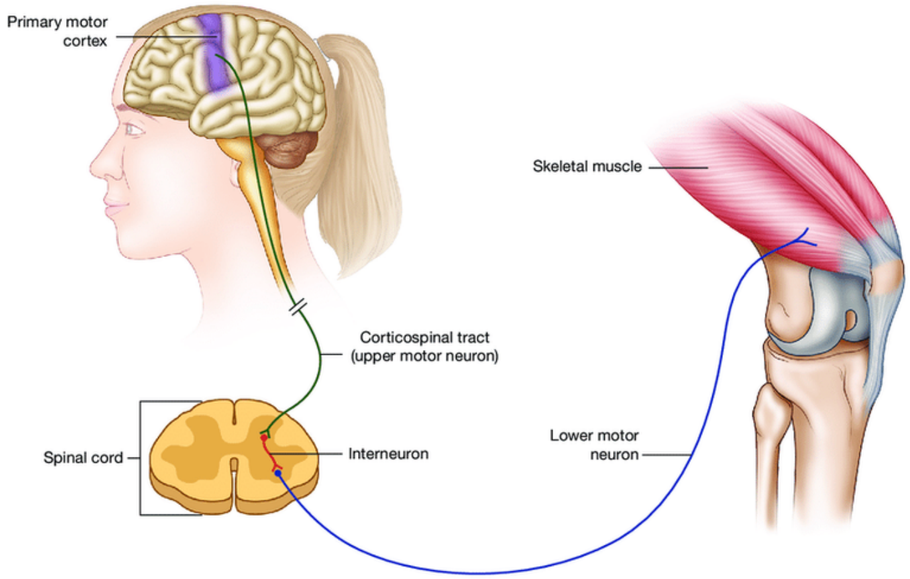
Moviment

Efferent Neurons

Motor Control

Motor Pathways

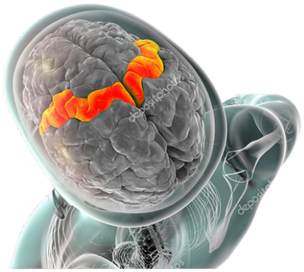
Motor Pathways



Cortex

Premotor cortex: planning the movement (complex)

Primary motor cortex: command the execution of the movement



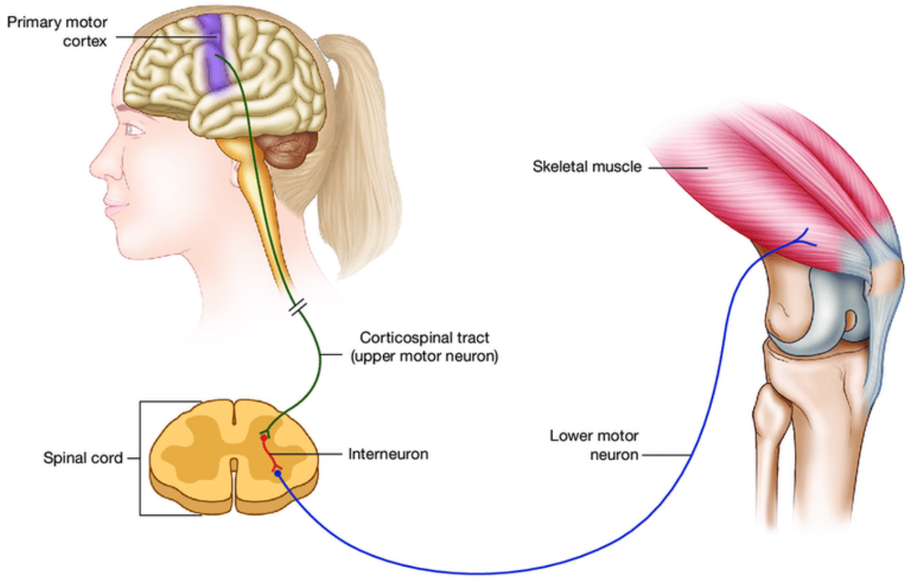
Basal Ganglia

Control and adjust of the movements

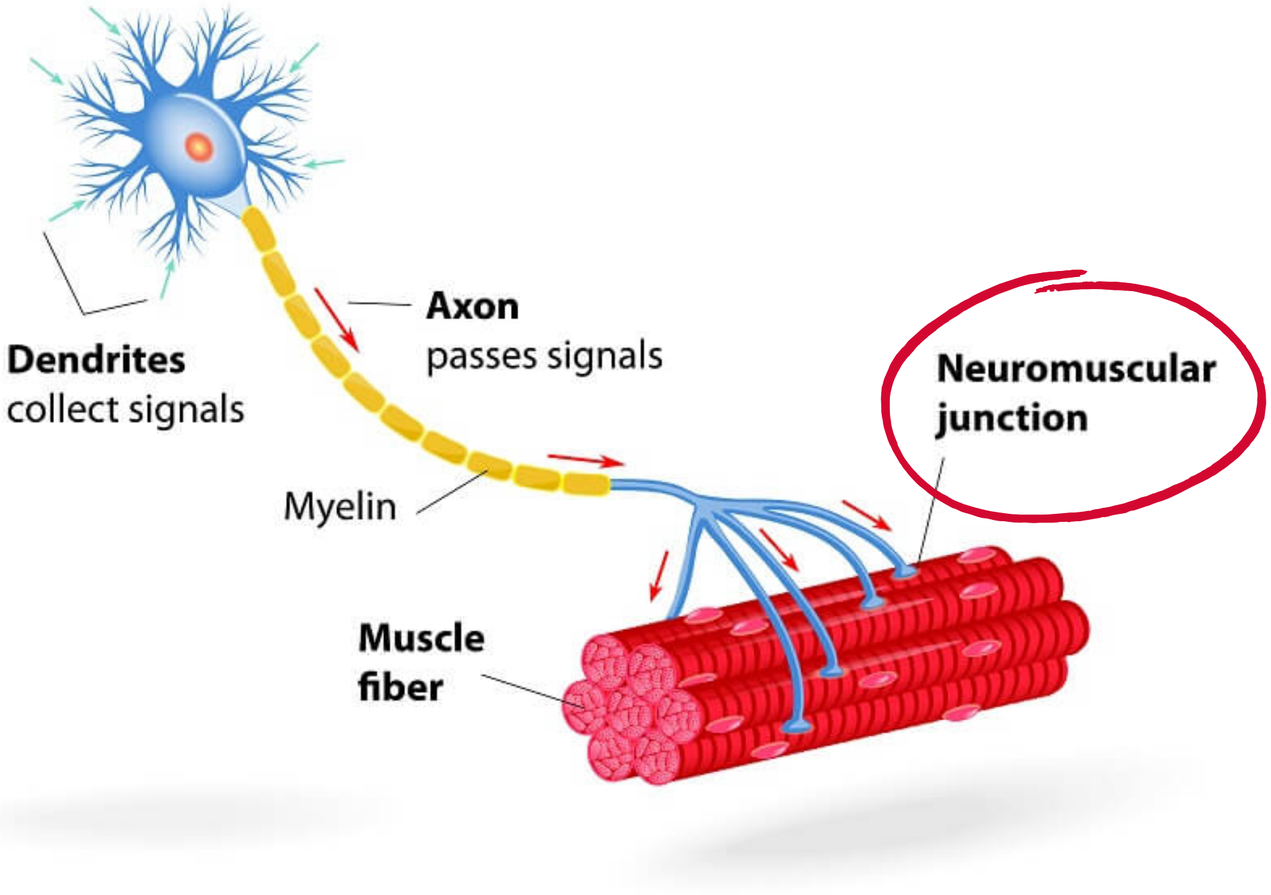
Cerebellum

Control and adjust the movements. Movement memory, timing, 'learn with mistakes'

Motor Control



Motor Neuron



Motor Control

Motor Reflex Reaction

Quickly and an unconscious responses provided by our body to protect from dangerous situations

The first response involves the peripheral nerves and the spinal cord. The brain is not aware of the first response. The message will come to the brain for further actions

Simple Reflex

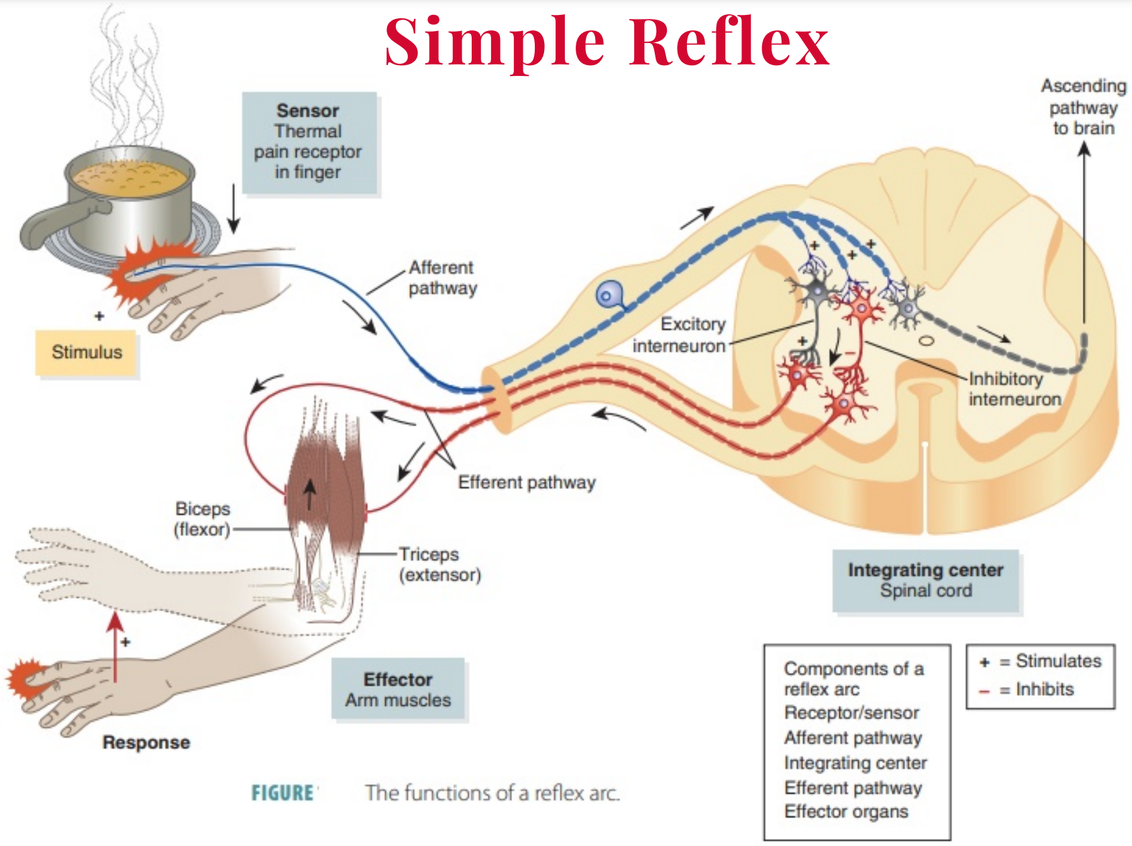
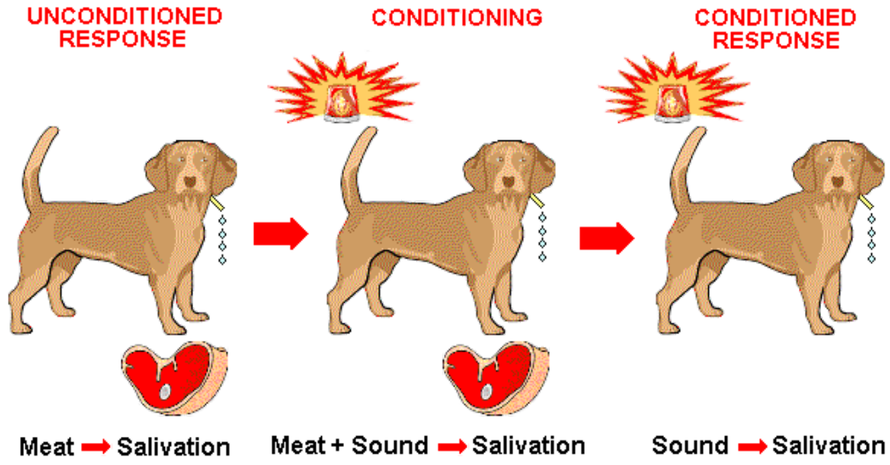


FIGURE The functions of a reflex arc.

Conditioning Reflex



Motor Control

Neural adaptation

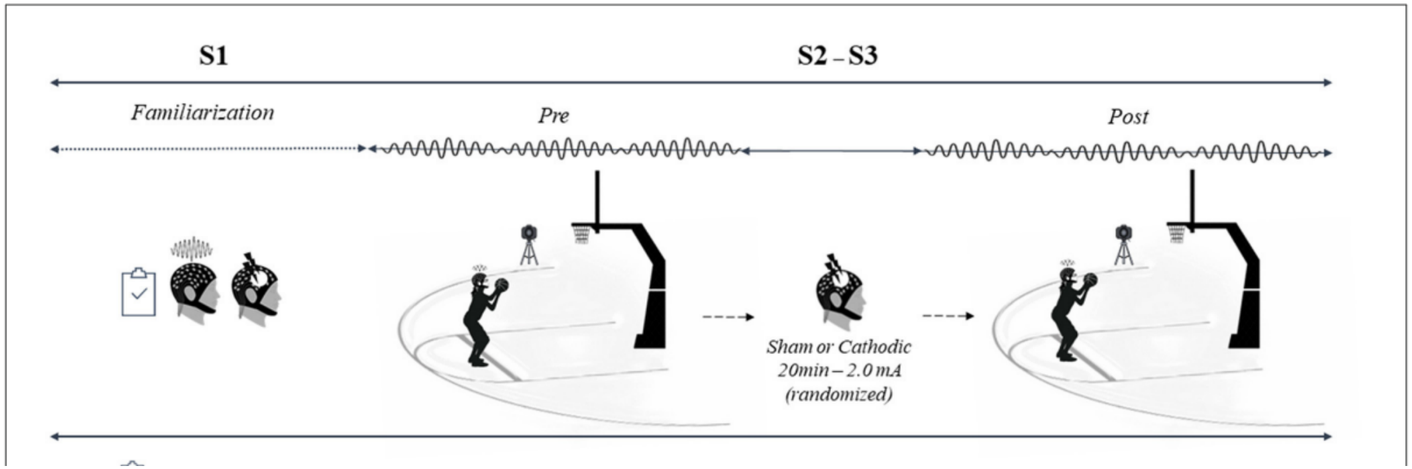
Continuous practice of neuromuscular trains the reflexes to automatically respond to sensory stimuli

Motor Control

Application in sport practice

Does high-definition transcranial direct current stimulation change brain electrical activity in professional female basketball players during free-throw shooting?

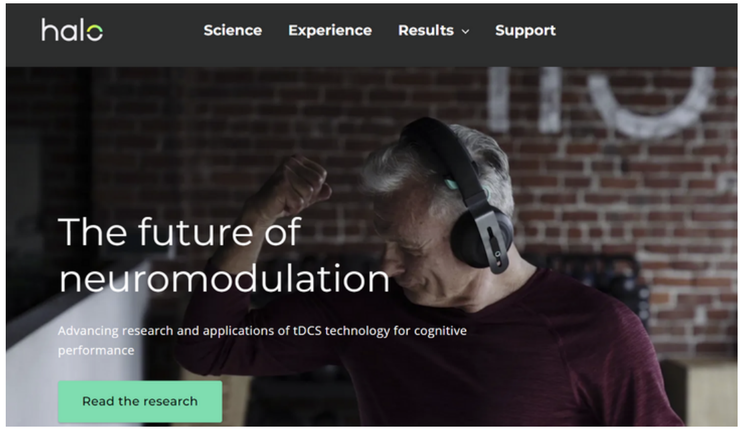
Luciane Aparecida Moscaleski[1], André Fonseca[1], Rodrigo Brito[2], Edgard Morya[3], Ryland Morgans[4], Alexandre Moreira[5*] and Alexandre Hideki Okano[1]



Professional female basketball players were performing the free-throw shooting task through a more automatic pathway reducing the activity of the explicit memory.

Motor Control

Application in sport practice



Obrigada

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Complementary:

What are Nerve Cells, Neurons & Synapses?

https://www.youtube.com/watch?v=n0Zc01e1Frw&list=PLW0gavSzhMlQPcIX1RcT3TgrmRoWYbwLW&index=7

What is a Reflex Arc

https://www.youtube.com/watch?v=Nn2RHLWST-k&list=PLW0gavSzhMlQPcIX1RcT3TgrmRoWYbwLW&index=31