Exercise Stimulates Neuronal Growth

Source: TH

Why in News?

A study by the ***Massachusetts Institute of Technology (MIT)*** has revealed that exercise **not only strengthens muscles** but also **stimulates neuron growth** through biochemical and physical mechanisms.

Note: Muscle is a specialized tissue that **generates force and enables movement**. Composed of contractile proteins **like actin and myosin,** it facilitates contraction and relaxation.

- The human body has three muscle types: **Skeletal** (voluntary, striated, controls movement and posture), **Cardiac** (involuntary, striated, pumps blood), and **Smooth** (involuntary, non-striated, maintains organ functions).

What are the Key Findings of the Study?

- **Nerve-Muscle Crosstalk:** The study challenges the traditional view that nerves only control muscles, revealing a **bidirectional relationship**:
  - In which muscles promote nerve growth by releasing **chemical signals,** while the **mechanical forces** from muscle contractions help improve nerve structure and support regeneration.
- **Role of Myokines:** Exercise increases the secretion of **myokines**, **a biochemical compound** released by muscles. Which significantly enhance **neuronal growth** (4x faster) and improve **neural maturity** and functional abilities.
- **Physical Stress and Neuronal Growth:** Physical forces generated during muscle contraction mechanically stimulate nerves, promoting neuronal growth comparable to myokine exposure.

What are Key facts about Nervous System and Neurons?

- **Nervous System:** The nervous system facilitates communication between body parts using **electrical and chemical signals**, enabling responses to internal and external changes.
- **Types and Function:** It has two main components like **the Central Nervous System (CNS)** and the **Peripheral Nervous System (PNS).**
  - The CNS includes the **brain (**controls **body functions and consciousness),** and the **spinal cord** (**transmits signals** to and from the body).
  - The PNS consists of all nerves outside the CNS and is divided into the **Autonomic Nervous System** (which **regulates involuntary functions,** like heart rate and digestion) and the **Somatic Nervous System** (which controls **voluntary movements** and sensory input).

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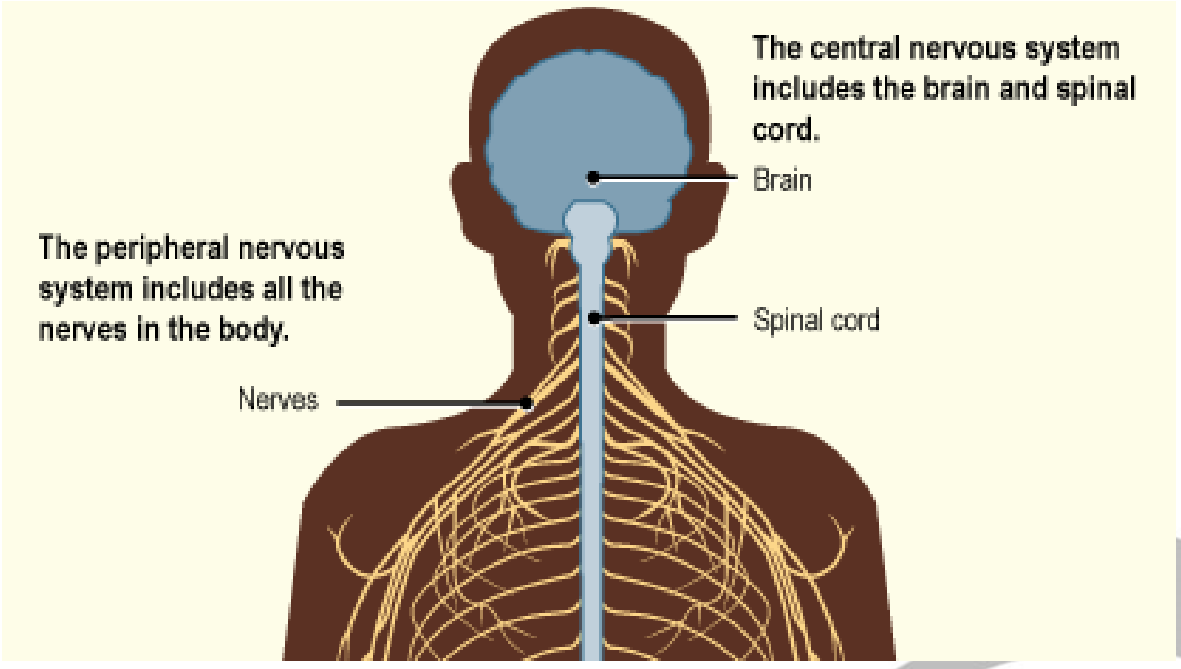
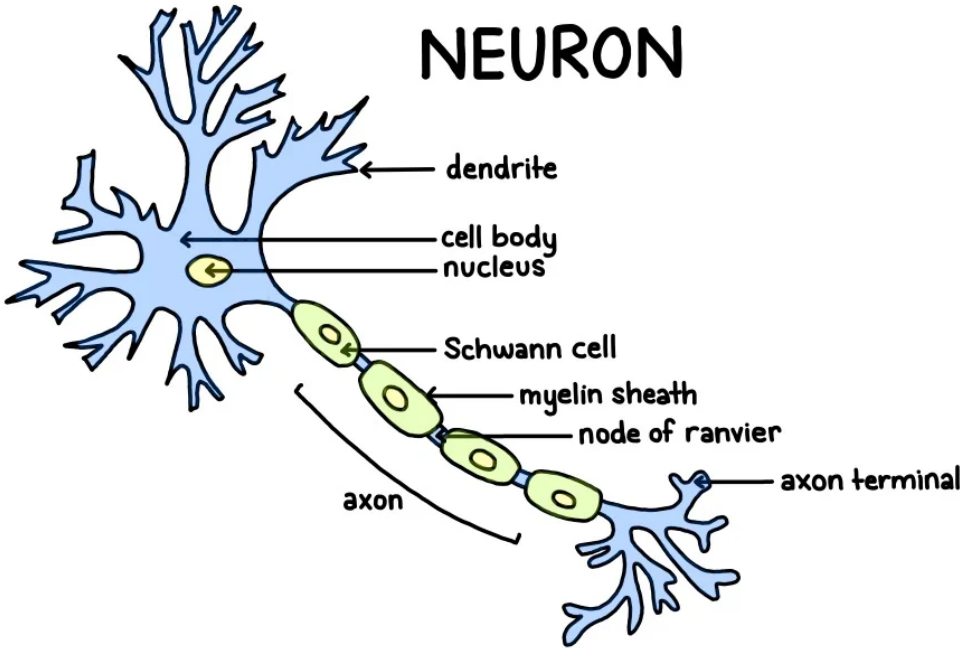


- **Neurons:** Neurons (also called neurons or nerve cells) are the **fundamental units of the brain and nervous system.**
    - The cells responsible for **receiving sensory input from the external world**, for sending motor commands to our muscles, and for transforming and relaying the electrical signals at every step in between. Each neuron has three main parts:
        - **Dendrites**: Receive incoming signals from other neurons or sensory receptors.
        - **Axon**: Carries electrical impulses away from the cell body to other neurons or muscles.
        - **Axon Terminals**: Release neurotransmitters to pass signals to the next cell.
    - **Neurons communicate with each other through synapses**, where neurotransmitters bridge the gap between cells.



UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

What is the Cas9 protein that is often mentioned in the news? (2019)

(a) A molecular scissors used in targeted gene editing

(b) A biosensor used in the accurate detection of pathogens in patients

(c) A gene that makes plants pest-resistant

(d) A herbicidal substance synthesised in genetically modified crops

Ans: (a)