BHARATHIDASAN UNIVERSITY

Program: M.Sc., Biomedical Science

Course Title : Neurobiology

cortex and brainstem contain motor control center

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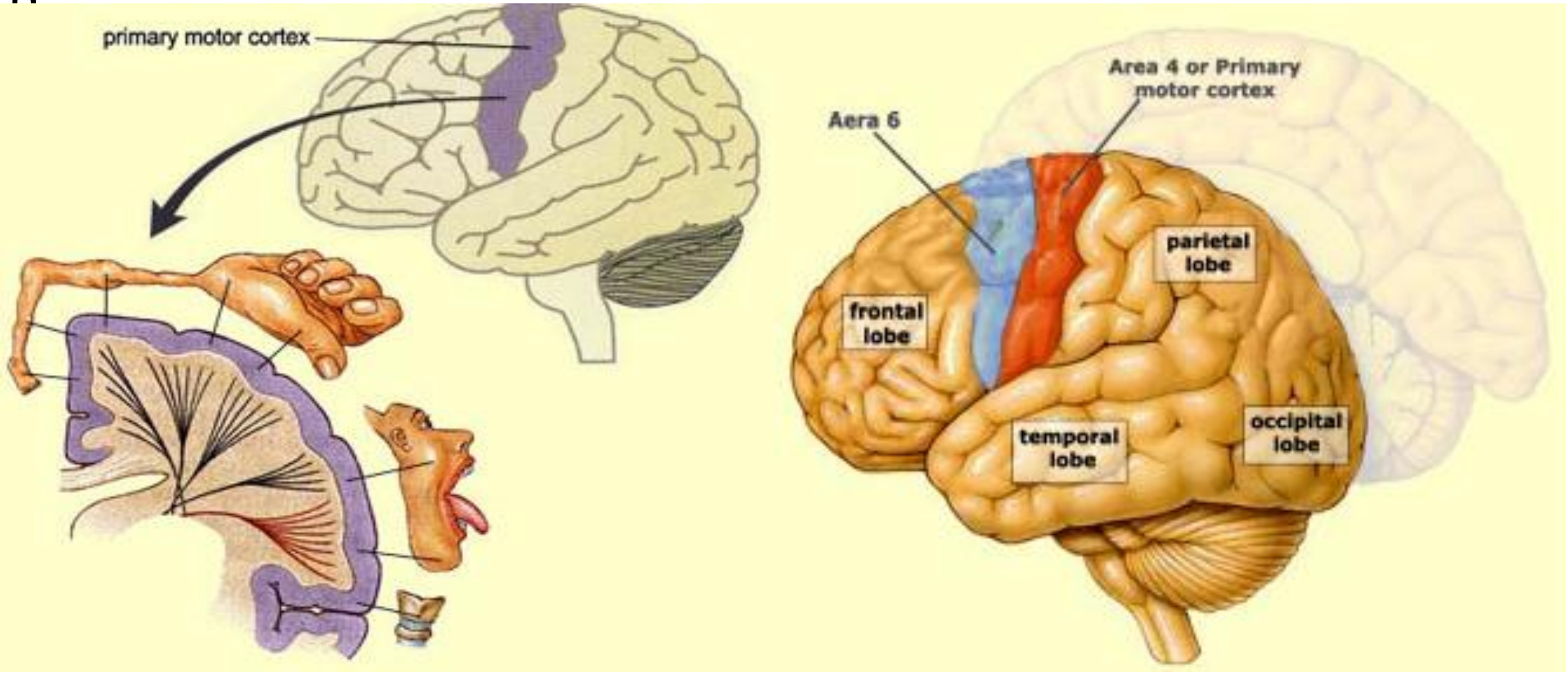
Both cortex and brainstem contain motor control centers critical to voluntary movement

Cortex contain motor control centers critical to voluntary movement

- Motor control centers (area-6 and area-4) in the rear end of cerebral cortex just before central sulcus, produce movements through descending pathways that ultimately result in the activation of motoneurons, which in turn produce muscle contraction.
- Area-6 & 4 are critical to fine movements of the digits, face,

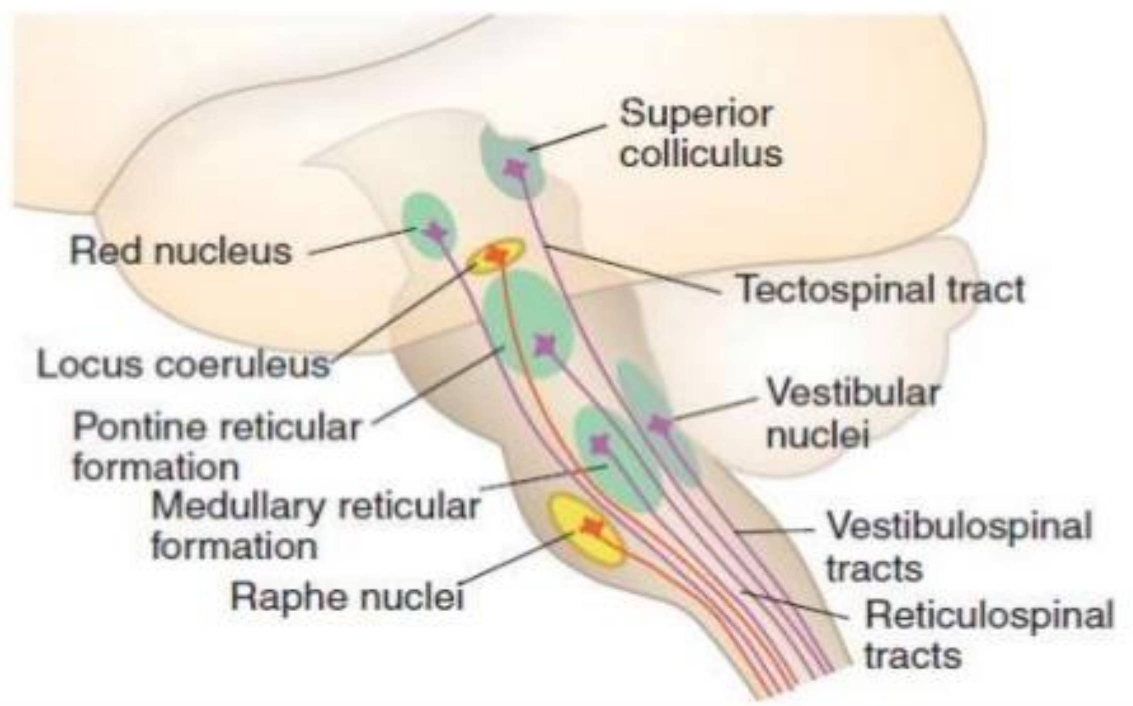
and mouth.



Brainstem contain motor control centers critical to voluntary movement

- The brainstem also contains motor control centers, ones critical for the maintenance of posture, orienting movements, and stereotypical movements such as chewing, swallowing, and locomotion.

Motor control centers in the brain stem:



The major brain stem nuclei sending fibers to the spinal cord.

The cerebellum learns from past motor experiences to ensure accurate movement execution

- cerebellum looks like a miniature version of the brain or cerebrum (Latin meaning is diminutive of cerebrum)
- ensures that the movements we make are those that we intend to make.
- acts on movements involving several muscles and acting across several joints.

As an example of cerebellar function

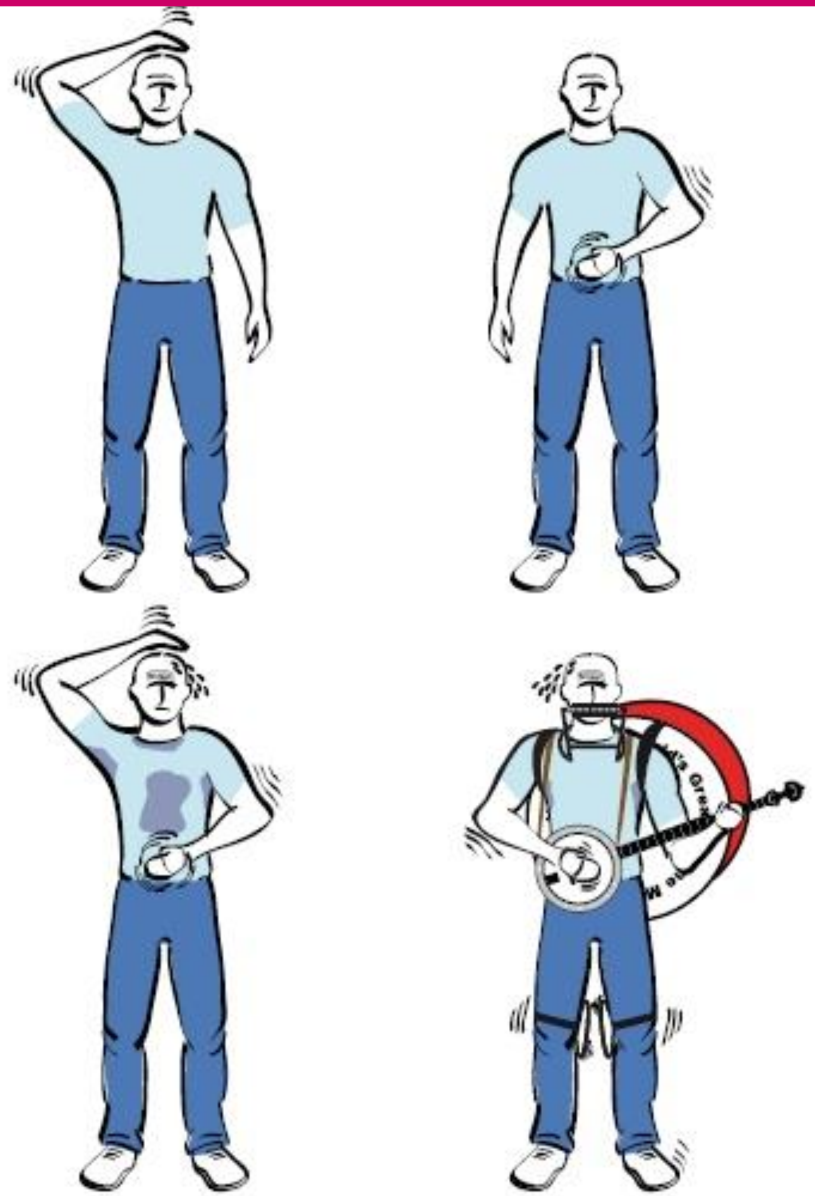
- when reaching out to shake someone's hand,
    1. our hand must travel toward the other person's hand,
    2. Slow down just before reaching it, and
    3. then grasp the other's hand.
- Falling short of the outstretched hand or failing to slow upon nearing it will either make us appear hesitant and unfriendly or result in hitting the other in the stomach.
- To prevent such inaccuracies, *the cerebellum learns what signals to send to which muscles to generate the forces necessary to achieve a designated action.*
- The cerebellum also functions to allow movements to proceed smoothly even when we encounter changed conditions while performing a familiar movement.
- As an example, when stepping from a boardwalk onto a sandy beach, we must walk with more force. The cerebellum adjusts gait and other movements to the ever-changing environment.

The basal ganglia choose which movements occur

- all have only one set of muscles, and each muscle can do only one thing at a time
- A person can only do one or a limited number of actions — chew gum and walk — at a single time.
- try to pat your head or rub your stomach
- try to pat your head and rub your stomach while also

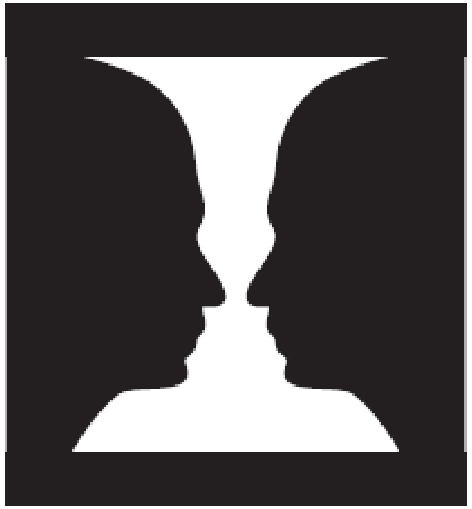
moving your foot back and forth and counting up by sevens

- This group of actions is impossible.
- our nervous system is not built for multiple simultaneous actions.
- why these actions cannot occur simultaneously, and each individual action is easy to accomplish when performed alone.
- only obstacle to performing multiple actions simultaneously is *within the brain*
- Apparently, the brain chooses to do one or a very few related actions while simultaneously suppressing all other movement
- Within the human brain, the "chooser" is the basal ganglia.



The basal ganglia are the ultimate arbiter (judge)

- basal ganglia decide which movement occurs and whether a movement continues or to be interrupted.
- you can only have one perception at a time.



a white vase ? or
two silhouette profiles
facing each other

basal ganglia choose movements,
Also “choosing” perceptions, thoughts, and emotions.