



Biological Control of Movement ^[1]

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The study of movement control in the biological perspective is important in understanding human behavior. The biological control of movement involves the peripheral motor neurons and the brain.

Motor System

In order to understand how movement is controlled, we have to know about the functional unit of the motor system – the muscle. There are three types of muscles: (1) smooth muscles which control the internal organs' movements (involuntary), (2) the skeletal muscles which control movement of the bones (voluntary), and (3) the cardiac muscles which control the movement of blood in the heart. Smooth muscles and cardiac muscles are unconsciously controlled by the brain, whereas the skeletal muscles are controlled under one's conscious mind.

There are muscles which help a person move a limb towards his body called the flexor muscles, while extensor muscles are the ones responsible for limb movement away from the body.

Each muscle is made up of muscle fibers which consist of myofibrils. These myofibrils are comprised of two kinds of myofilaments- the myosin which is thick, and the actin which is thin. The molecules of these two myofilaments group into sarcomeres.

Neural Control of Movement

Muscle contract starts at the alpha motor neurons located at the spinal cord and the brain stem. At the neuromuscular junction, motor neurons secrete acetylcholine, a neurotransmitter that signals the generation of an action potential in the muscle fiber. As this occurs, the muscle structure becomes more permeable to calcium. As more calcium goes inside, the myosin myofilaments get connected to the actin myofilaments via cross bridges. These myofilaments move, passing one another. When the cross bridges break they perform reattachment, which in turn results to the shortening of the sarcomere. This leads to the shortening or contraction of the muscles, and thus, the movement of the attached bones. During muscle relaxation, myosin and actin are in their original states.

Brain Control of Movement

Movement is controlled by the brain via the primary motor cortex ^[3] situated at the frontal lobe. Motor neurons are found in column groups called “colonies”. When a single motor neuron in a colony is activated, the other neurons get excited as well, causing the movement of muscles. Each colony has a specific movement under its control.

The information needed before a movement is elicited comes from the three cortical areas other than the primary motor cortex. These are the primary somatosensory cortex (receiver and processor of sensory input about the amount of force required for a movement), the posterior parietal cortex (integrator of visual, auditory and somatosensory data) and the secondary motor cortex (planner and sequencer of voluntary movement/s).

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Links

[1] <https://explorable.com/biological-control-of-movement>

[2] <https://explorable.com/users/sarah>

[3] http://thebrain.mcgill.ca/flash/d/d_06/d_06_cr/d_06_cr_mou/d_06_cr_mou.html