Pro Index | Journal of Science in Medicine and Life
Volume: 3 Issue: 2 Year: 2025
ISSN: 2992-9202 | http://journals.proindex.uz

The Main Muscle Groups and their Functions

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Abstract: Myology (Latin myologia, from Greek: mys - muscle and lós "study, science") is a science that includes information about the muscular system, its structure, development, function, comparative anatomy and anomalies. In a narrow sense, myology describes the structure of skeletal muscles and, together with osteology and syndesmology, constitutes the study of the musculoskeletal system in anatomy [1].

Key points: main muscle groups, muscle structure, types, functions, importance.

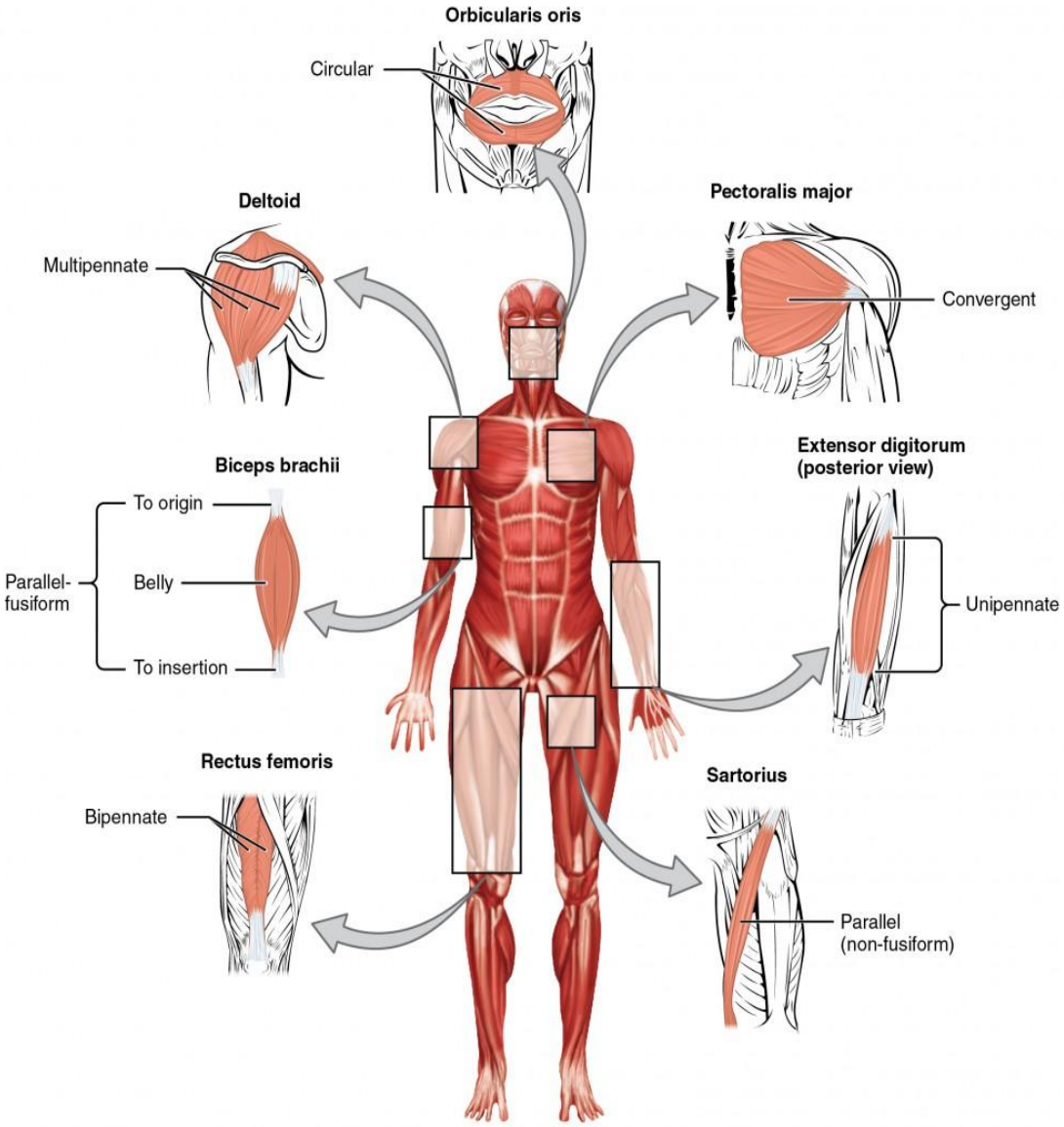
Introduction

The study of muscles and their role in the functioning of the musculoskeletal system is closely related to the development of anatomy and physiology. Information about muscles is given in the works of Hippocrates and Aristotle. The first systematic description of muscle anatomy was given by Andreas Vesalius in his work "On the Structure of the Human Body" in 1543. Leonardo da Vinci studied the structure and function of muscles in humans, and Giovanni Borelli studied muscle movements in detail [1].

The beginnings of physiological research in the field of muscles can be considered the classic works of the Weber brothers on gait (1836) and Ivan Sechenov on human labor movements (1901). Pyotr Lesgaft and his students made a significant contribution to the development of a functional approach to the study of the musculoskeletal system. Nikolai Bernstein improved the methods of recording and analyzing movements, and Mikhail Ivanitsky developed the functional anatomy of the musculoskeletal system in the context of physical education and sports [1].

Research on muscles and their role in the functioning of the musculoskeletal system is carried out in various medical research institutes (including institutes of orthopedics and traumatology), physical education institutions, and medical schools. During the research, not only the structure of muscles, but also their innervation, blood supply, morpho-functional connections between muscles and other organs and systems, the functioning of muscles in normal and pathological conditions, as well as the features of muscle biomechanics, which are important for the development of prostheses, are studied [1].

Research methods and materials: Muscles are classified according to their shape as long, short, and broad. Long muscles correspond to long levers of movement and are located mainly in the limbs. They are spindle-shaped, with the middle part called the abdomen and the ends designated as the head (beginning of the muscle) and the tail. The tendons of long muscles resemble narrow bands. There are multi-headed muscles (biceps, triceps, quadriceps) that originate from different bones, which increases their support.



In addition, there are multi-abdominal muscles with two or more bellies, as well as muscles formed by the fusion of different myomas, between which there are intermediate tendons. The lats are located on the trunk and have an expanded tendon called the aponeurosis. There are also other muscle shapes, such as the quadrate, triangular, pyramidal, teres, deltoid, serratus, soleus, etc.

Muscles can differ in the direction of the fibers: straight parallel, oblique, transverse, circular. The latter form clamps that surround the holes. According to their function, muscles are divided into flexors, extensors, adductors, abductors, rotators, internal and external. Muscles can also be single-, double- or multi-jointed, depending on the number of joints they cross [2].

Muscle structure

The structure of muscles includes various components, such as striated skeletal muscle tissue, loose and dense connective tissue, vessels, nerves, as well as nerve endings - receptors and effectors. Receptors are responsible for muscle contraction and extension, perception of speed and force of movement, and transmission of information to the central nervous system. Effectors transmit impulses from the central nervous system to the muscles, stimulating their activation [3].

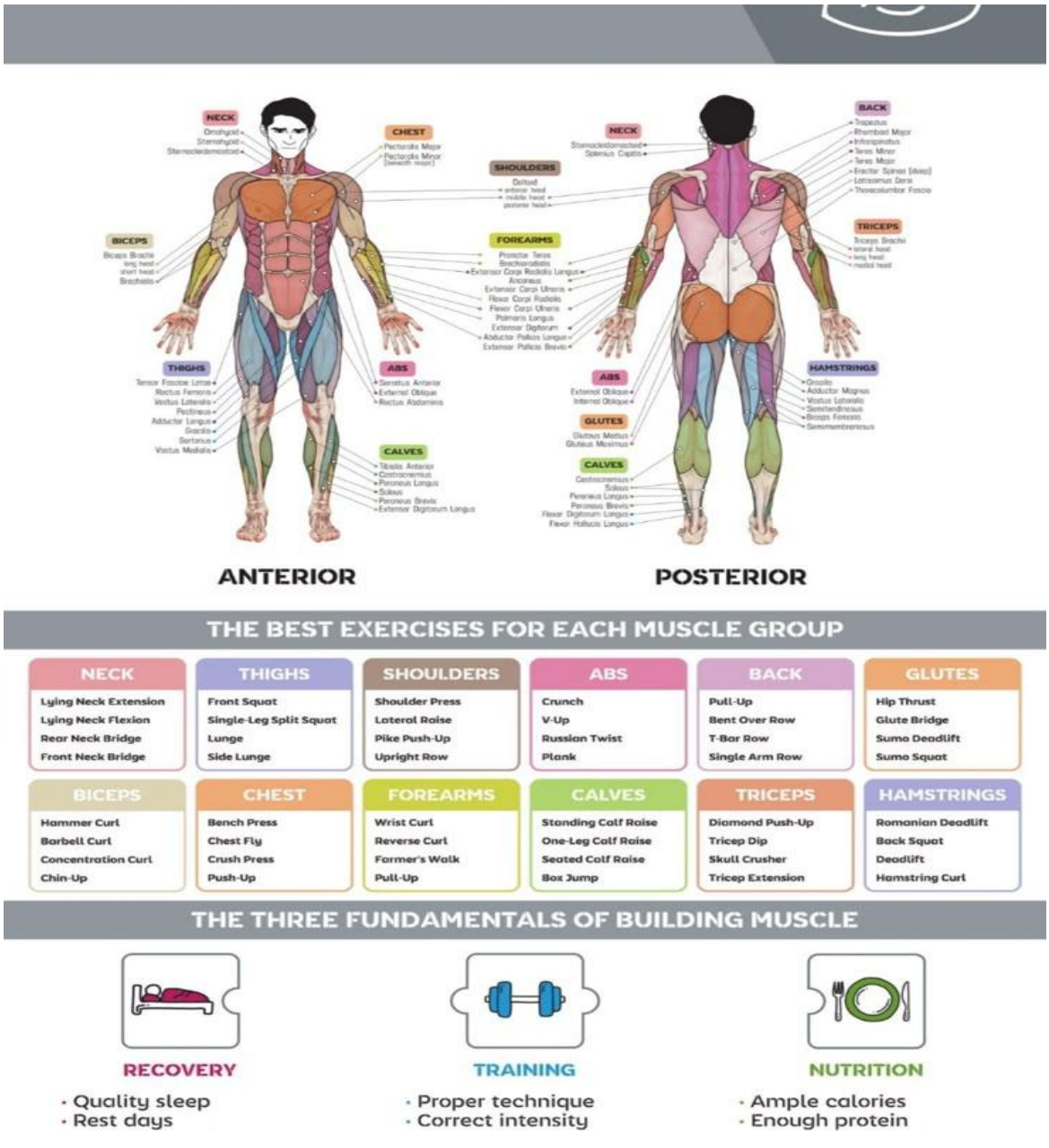
Each muscle consists of a muscle belly, a contractile middle part, and tendon ends, which are in contractile and serve as attachment points for the muscles. The muscle belly contains bundles of muscle fibers of varying thickness, each of which is surrounded by blood vessels and nerves, including the endomysium. Groups of muscle fibers form muscle bundles, which are surrounded by a denser connective tissue, the perimysium. Fascia covers the muscle belly and is divided into different types: loose, dense, superficial, and deep [3].

Tendons are formed by the force and direction of muscle movement, and as the muscle is strengthened, their size increases. Each muscle has its own tendon - it is white, shiny, while the muscles are reddish-brown. Tendons can have a variety of shapes, but the most common are cylindrical or flat. Wide, flat tendons are called aponeuroses, for example, the abdominal muscles. Tendons have high strength and resistance [3].

Auxiliary muscle apparatus

Fascia, fibrous and fibro-osseous canals, retinacula, bursae and sheaths, sesamoid bones are parts of the accessory apparatus of muscles. Fascia covers both individual muscles and muscle groups. Intermuscular septa arising from fascia separate muscle groups from each other and attach to bones, forming sheaths known as fibrous canals. If the muscles are located between the fascia and the bone, the canal is called osteofibrous. The retinacula, which is a ribbon-like thickening of the fascia, fastens the muscle tendons to the bones, lying transversely over them [3].

Synovial bursae are thin-walled sacs filled with a fluid similar to synovium. They are located under muscles, between muscles and tendons, or between bones to reduce friction. Synovial bursae form at the points where tendons attach to bones. They surround the tendon in a cylindrical shape and consist of two sheets, one covering the tendon and the other covering the wall of the fibrous canal. Between the sheets is a fluid that facilitates the sliding of the tendon [3].



Sesamoid bones are formed within tendons near the point of attachment to the bone, and they increase muscle strength. For example, the patella is one of the largest sesamoid bones. The accessory muscle attachments provide additional support to the muscles, determine their direction of movement, provide isolated contraction, prevent displacement during contraction, increase their strength, and also stimulate blood circulation and lymph flow [3].

Results: Myology is the branch of anatomy that studies the structure of muscles. Muscles perform various functions: they provide mobility, generate heat, participate in digestion and respiration, and also form the walls of cavities in our body. There are three types of muscle tissue, which differ in their structural and functional properties.

The structural and functional elements of muscle include muscle cells and their myocytes. Each muscle fiber is surrounded by a loose sheath of connective tissue called the endomysium. Many muscle fibers are grouped together into muscle bundles, which are covered by their own sheath of connective tissue called the perimysium. Ultimately, the bundle of muscle bundles forms the entire muscle fiber, which is surrounded by another layer of connective tissue called the epimysium. This anatomical structure gives muscle tissue four main physiological properties:

Without these muscles, we would need intravenous nutrition. Their well-coordinated teamwork allows us to dig into our favorite burger and eagerly enjoy a cold milkshake.

The four main paired muscles of mastication—the masseter proper, medial pterygoid, lateral pterygoid, and temporalis—attach to the skull and lower jaw. They are responsible for the movements of the temporomandibular joint.

The buccal and mylohyoid muscles play an auxiliary role in the process of consuming food and drink.

Masseter muscle: These powerful muscles lift your lower jaw so you can close your mouth and chew food.

Among the strongest facial muscles, the masseter muscles are thick, flat, rectangular in shape, and attach to the lower jaw and cheekbones on both sides of the face.

Medial pterygoid muscle: This muscle has three functions.

Also located on both sides of the head, they function as follows:

When both muscles contract simultaneously, the lower jaw moves forward.

Contraction of one medial pterygoid muscle causes the jaw to move in the opposite direction - this is how we move the jaw left and right.

We can close our mouth and bite due to the simultaneous work of the medial pterygoid, masseter, and temporal muscles.

These muscles are attached to the pterygoid processes of the sphenoid bones of the skull and to the inner surface of the corners of the lower jaw.

Lateral pterygoid muscles: the work of these muscles is no less important - they are responsible for opening the mouth, and after you, for example, bite into a piece of pie, they help you chew it.

These short, wing-shaped muscles are located above the medial pterygoid muscles on each side of the head.

Temporal muscles: The fan-shaped temporal muscles, as you might guess, are located at the temples and help close the mouth.

Cheek muscles: Why don't we bite our cheeks while chewing food? This is because the cheek muscles keep them at a safe distance from the teeth.

You can find out where the cheek muscle is located by touching your fingers to the depression on the inside of the cheek between the upper and lower jaws.

The cheek muscles perform three functions, two of which are not related to chewing:

It helps you avoid biting your cheeks while eating.

They control the movement of air flow in the oral cavity during whistling, inhalation, and exhalation, which is necessary for normalizing breathing and playing wind musical instruments.

Together with other muscles, they help us smile.

Mylohyoid muscles: Swallowing movements play an important role not only in eating but also in articulate speech. When swallowing, a pair of mylohyoid muscles help to raise the floor of the mouth, making the movement easier.

Facial muscles

Lately, we've all learned what it's like to not see our family and friends smile.

Now imagine people took off their masks and the smile on their faces never returned.

It is the facial muscles that enable us to smile (and frown), carrying out non-verbal communication. Their work largely determines our mood and the mood of the people around us.

Zygomatic muscles: one of the most important muscles of smiling.

These paired muscles attach to the cheekbones and run to the corners of the mouth.

Thanks to the work of the zygomatic muscles, a person's face acquires a friendly and joyful expression.

When these muscles contract, the corners of the mouth rise and stretch out to the sides. This is how a smile is created.

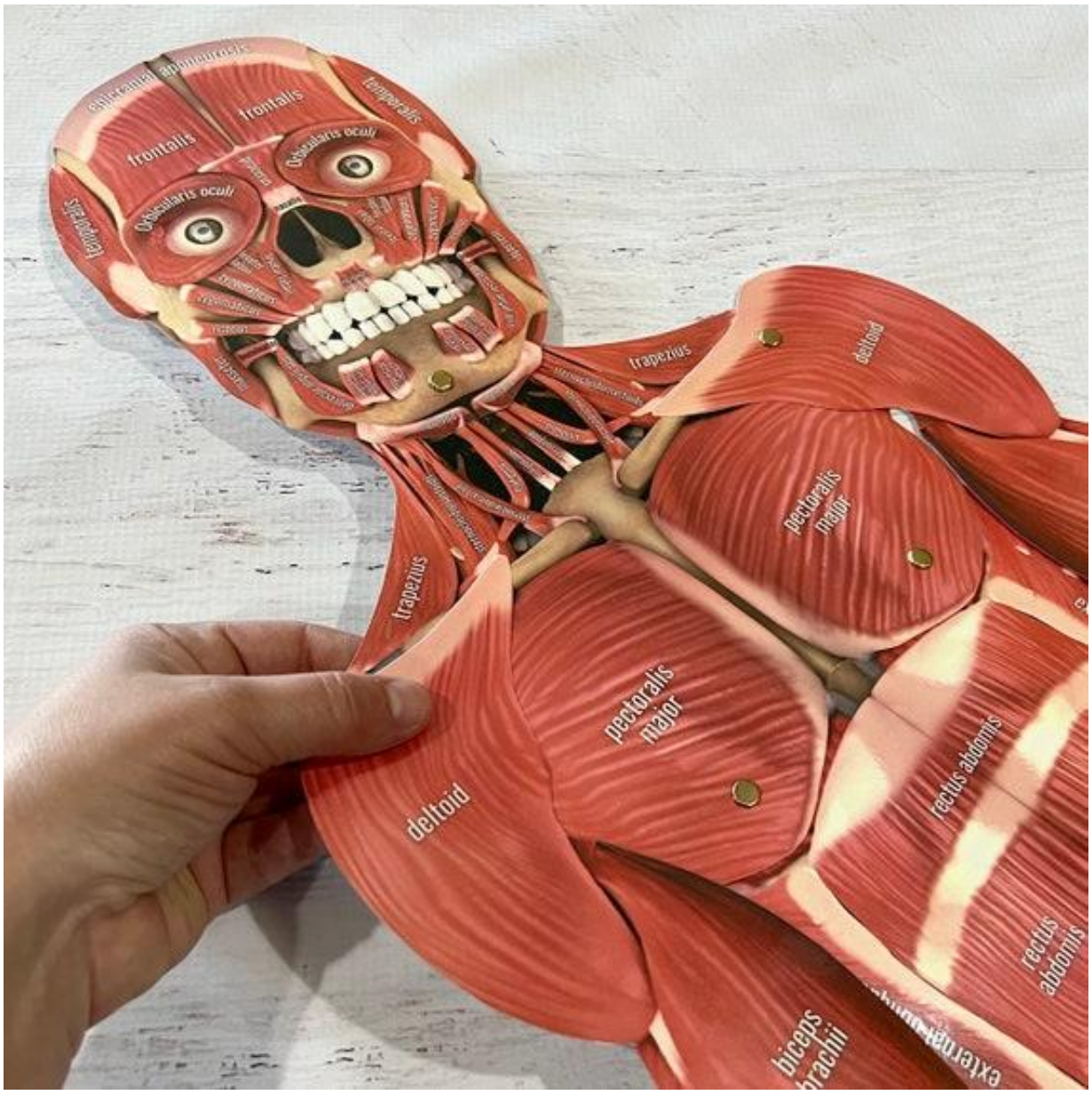
If the zygomatic major muscle is split at birth, a person will have dimples on their cheeks when they smile.

Mentalis muscle: lifts the skin of the chin, allowing you to press your lower lip against your upper lip and create various facial expressions. Thanks to this muscle, you can:

You can feel this muscle by placing your fingers on the area of the face below the lower lip.

Laughter Muscles: When you smile, laugh, or grimace, you also use these little-known muscles.

They stick to the skin at the corners of the lips and help pull them towards the ears.



The laughing muscles work "in close cooperation" with other facial muscles. If you tense only these, your mouth will stretch into a single line, and it will not be a smile, but a frown of disapproval.

Orbicularis oris muscle: kissing, blowing bubbles with gum, whistling in tune - we owe many pleasurable actions to this muscle.

The orbicularis oris muscle is located in the thickness of the lips, allowing them to close tightly and pull forward for a kiss, which is why it is sometimes called the kissing muscle.

The orbicularis oris muscle also helps force air out of the mouth. This allows us to not only whistle, blow bubbles from chewing gum, or spit out watermelon seeds, but also play wind instruments.

Muscles that raise the corners of the mouth (levators): in imitation of animals, when they open their teeth, humans use these muscles separately from the other muscles involved in forming a smile.

Summary: These muscles arise from the upper jaw, just above the canine bones, and extend to either side of the nose. They attach to other muscle fibers at the corners of the mouth and contract in response to nerve signals, helping to elevate the upper lip and pull it back slightly.

This action exposes the teeth and creates an expression of disgust or disgust on the face. However, when these muscles work together with others, they help form a smile.

Occipitofrontalis muscle: Raised eyebrows can express doubt, curiosity, surprise. The occipitofrontalis muscle is responsible for these eyebrow movements.

It runs from the eyebrows to the back of the head and is divided into two parts, which gives it its name:

The occipital lobe is located at the back of the head and provides backward movement of the skin.

The frontal lobe, which is located above the eyebrows and pushes the scalp forward, helps to make various facial expressions, including frowning. So, as long as all the facial muscles are working as they should, you can live a full life, enjoy your food, and smile at your loved ones.

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