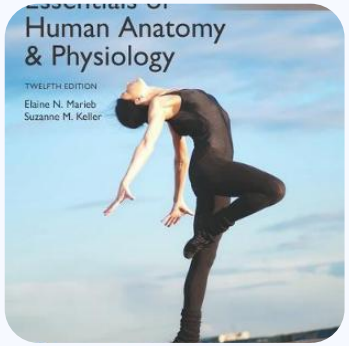
SKELETAL MUSCLES

KHALEEL ALYAHYA, PHD, MED

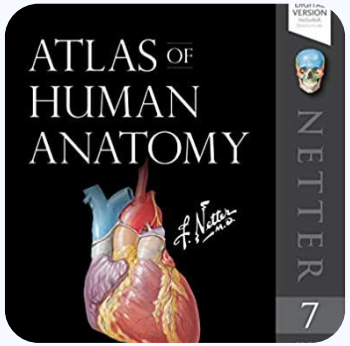
www.khaleelalyahya.net

Department of Anatomy
College of Medicine
King Saud University

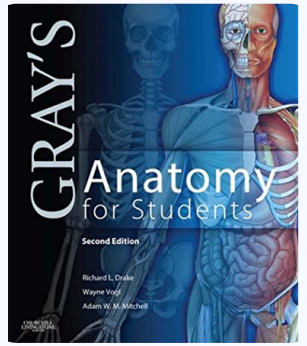
RESOURCES



By Elaine Marieb and Suzanne Keller



By Frank Netter



By Richard Drake, Wayne Vogl & Adam Mitchell

(فَكَسَوْنَا الْعِظَامَ لَحْماً)

INTRODUCTION

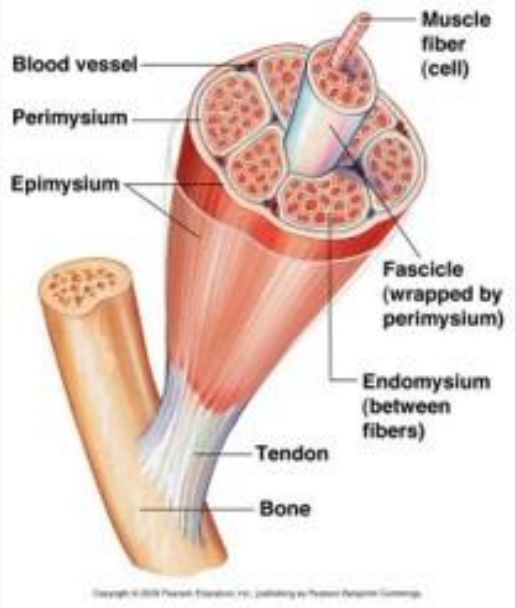
- Musculoskeletal is a general term which is defined as relating to muscles and bones of the skeleton.
- The musculoskeletal system comprises **bones**, joints, cartilage, bursae, tendons, **muscles** and ligaments.
- It is the system that moves the body and maintains its form.
- Study of this system consists of osteology (the study of bones), arthrology (the study of joints), and myology (the study of muscles).
- The musculoskeletal system does not work in isolation.
- It is closely linked with many other systems in the body, including the nervous system, genitourinary system, circulatory system, immune system, respiratory system, digestive system and endocrine system.

MUSCLES

OBJECTIVES

- Describe the main criteria of skeletal muscles.
- Describe the attachments of skeletal muscles.
- Describe the different directions of skeletal muscle fibers.
- Describe the mode of action of skeletal muscles.
- Describe briefly the naming of skeletal muscles.
- Describe briefly the nerve supply of skeletal muscles.

MUSCLES TISSUES



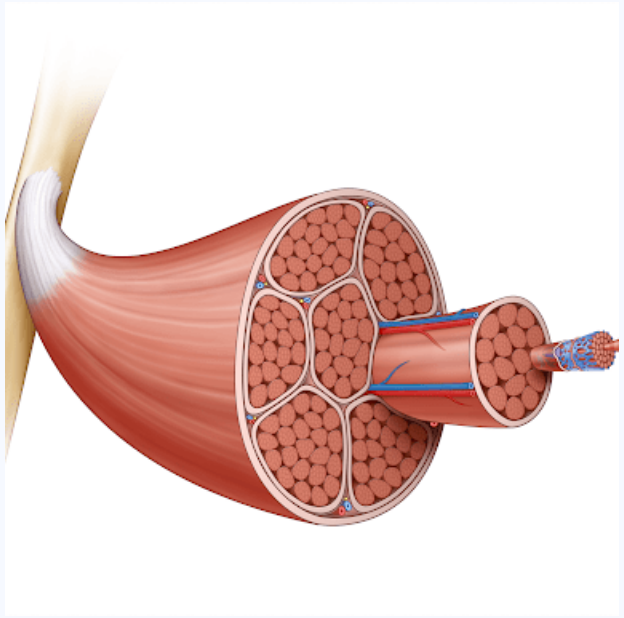
- Muscle tissue is a unique tissue which has the ability to contract.
- As a result of this ability, muscles are responsible for all the body movements.
- The structural and functional unit of muscle tissue is “muscle cell”.
- All muscle cells are elongated and are called “muscle fibers”.
- The ability of muscle to contract, or to shorten depends on two types of myofilaments (actin & myosin) in the muscle fibers

CLASSIFICATIONS

Muscles are classified based on the following:

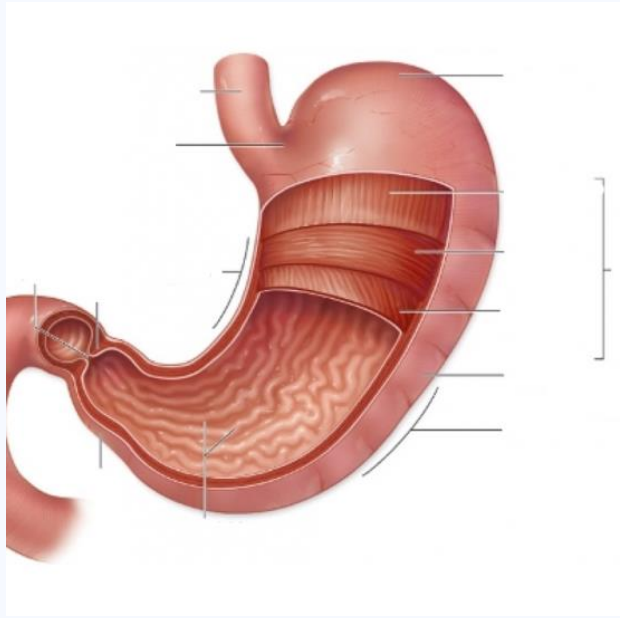
- **Location**
- **Action**
- **Microscopic structure**

BASED ON LOCATIONS



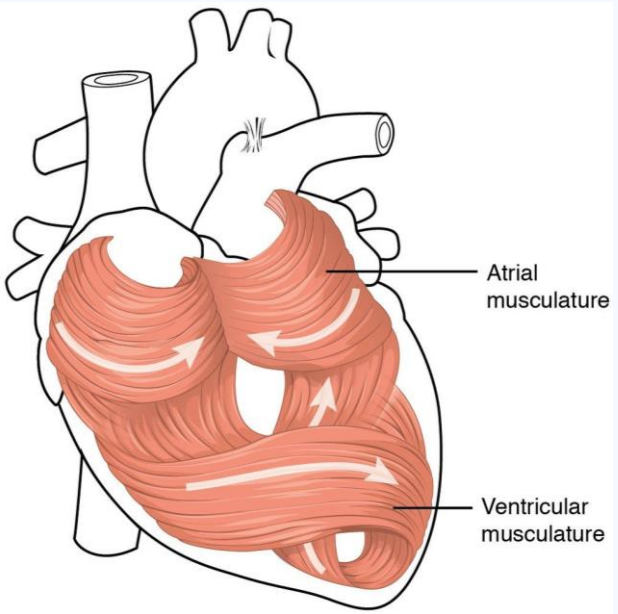
SKELETAL MUSCLES

ATTACHED TO BONES AND PRODUCE MOVEMENT



SMOOTH MUSCLES

WALLS OF VISCERAL ORGANS



CARDIAC MUSCLES

WALLS OF THE HEART

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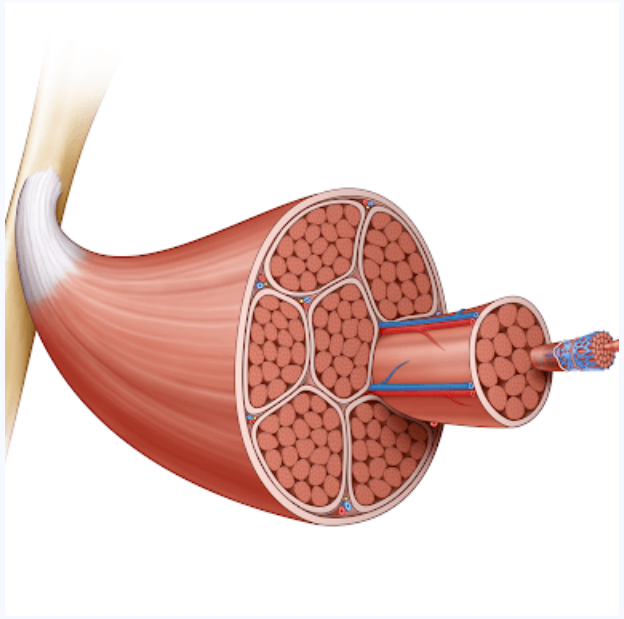
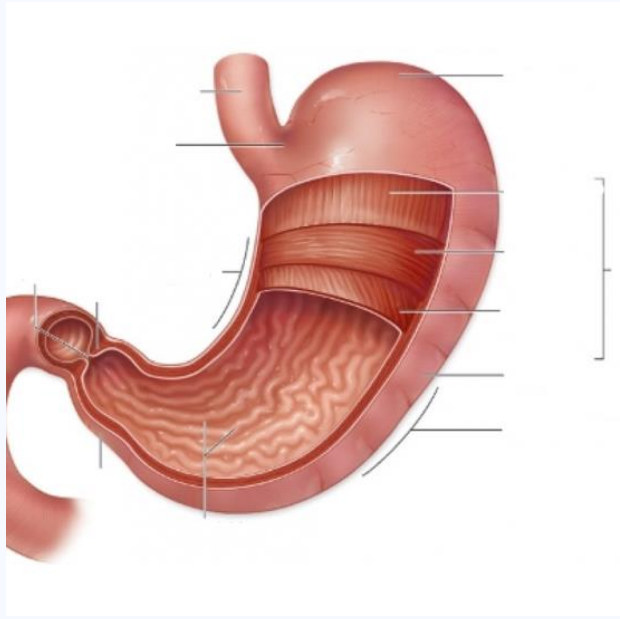
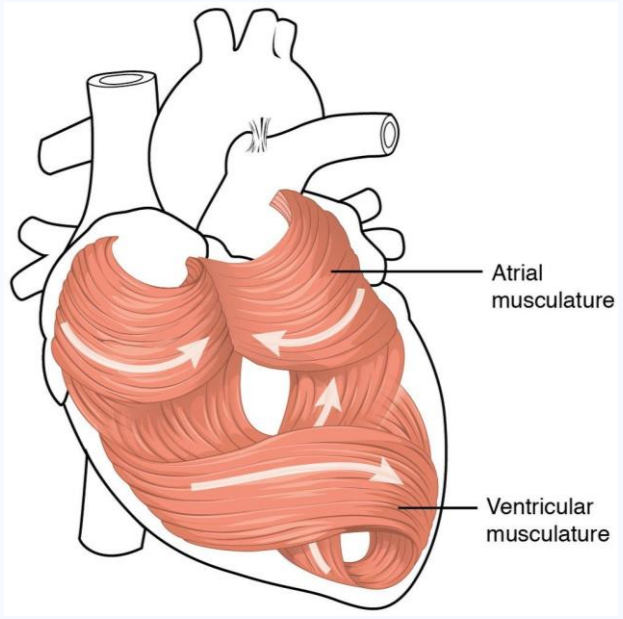
BASED ON ACTIONS



VOLUNTARY

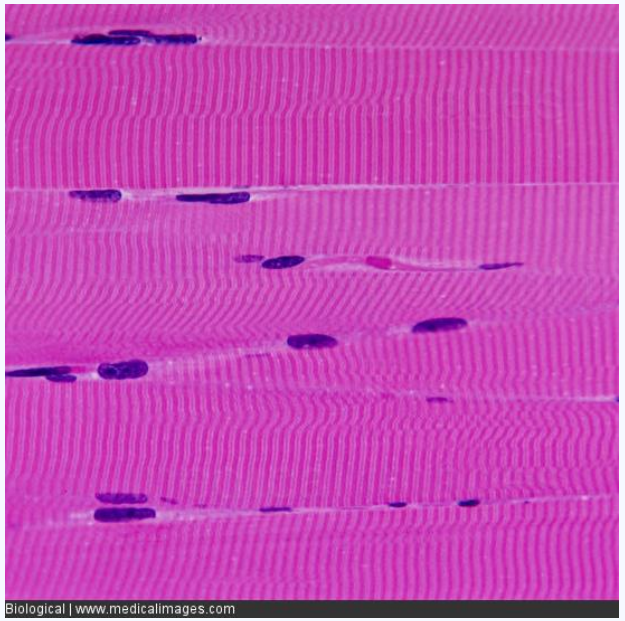


INVOLUNTARY

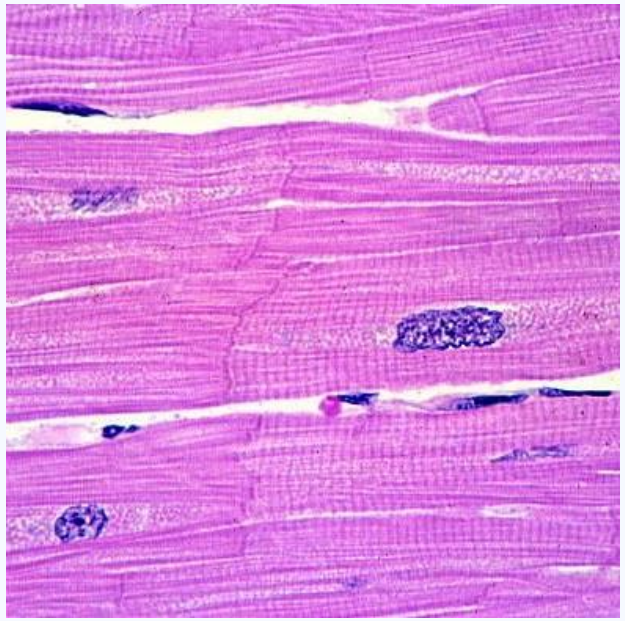


INVOLUNTARY

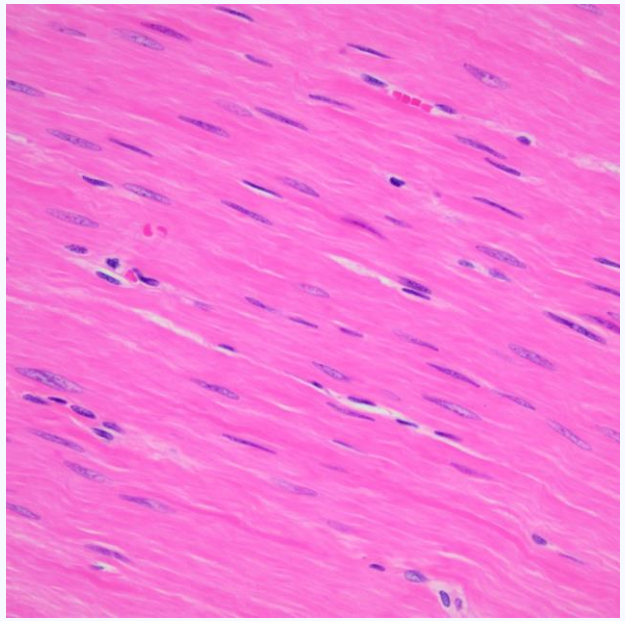
BASED ON MICROSCOPIC STRUCTURES



SKELETAL (STRIATED)



CARDIAC (STRIATED)



SMOOTH (NONSTRIATED)

CLASSIFICATION OVERVIEW

SKELETAL MUSCLE	CARDIAC MUSCLE	SMOOTH MUSCLE
Voluntary	Involuntary	Involuntary
Striated	Striated	Nonstriated

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SKELETAL MUSCLES

- The skeletal muscles are attached to bones at not less than two points:
  - **Origin**
    - Attached to less mobile or immovable bone.
    - Least movable.
    - Mostly fleshy.
    - Proximal end.
  - **Insertion**
    - Attached to the movable bones.
    - Most movable.
    - Mostly fibrous.
    - Distal end.
- When the muscle contracts, the insertion moves toward the origin.
- At insertion, the muscles are attached by means of strong cord-like tendons or by sheet-like aponeurosis.

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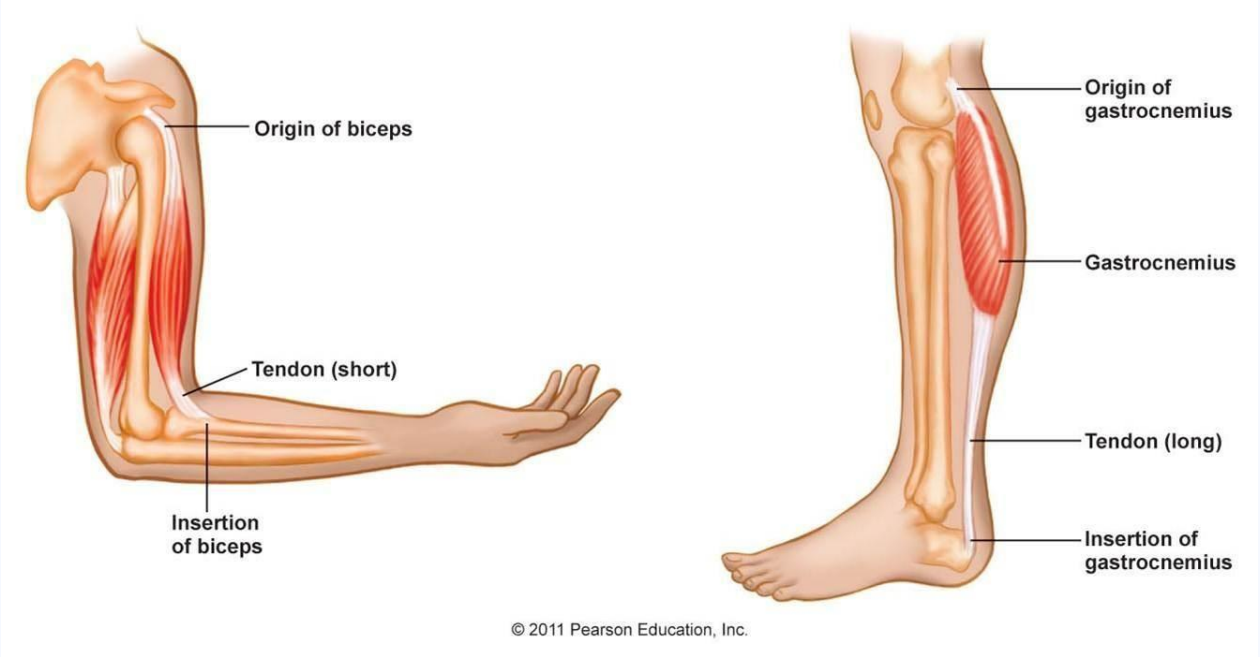
SKELETAL MUSCLES



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MAIN CRITERIA

- Striated.
- Attached to skeleton.
- Produce movement of skeleton.
- Voluntary.
- Supplied by Somatic Nerves.

FUNCTIONS

- Body Movement
- Maintain Posture
- Generate Heat
- Stabilizing Joints

ATTACHMENTS

- **Origin**
  - Least movable
  - Mostly fleshy
  - Proximal end
- **Insertion**
  - Most movable
  - Mostly fibrous
  - Distal end

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ATTACHMENTS

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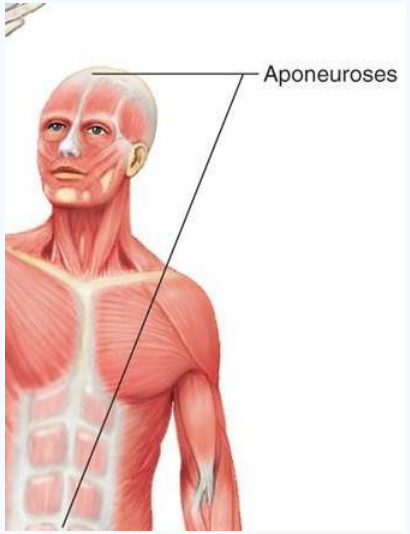
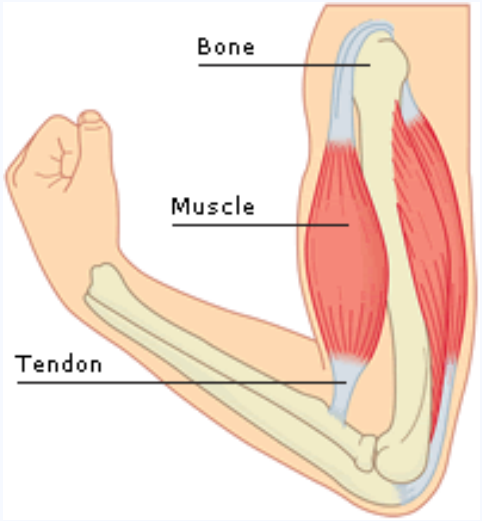
TYPES OF ATTACHMENTS

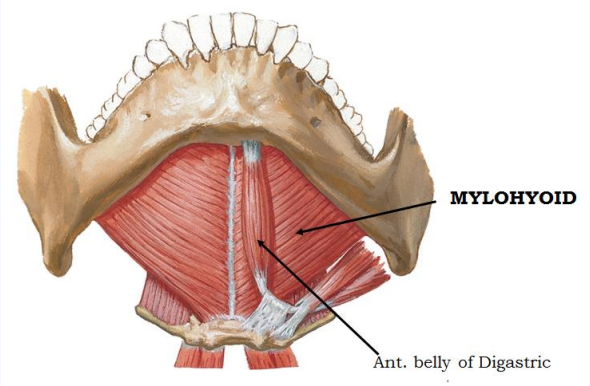
- Skeletal muscles are attached to bones, cartilage or ligaments by:
  - **Tendons**
    - A tough cord of fibrous connective tissue that usually connects muscle to bone and is capable of withstanding tension.
  - **Aponeurosis**
    - A thin broad and strong sheet of fibrous tissue.
  - **Raphe**
    - An interdigitation of the tendinous ends of the flat muscles.
    - Example: mylohyoid raphe



APONEUROSIS



TENDONS



RAPHE

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DIRECTIONS OF MUSCLES

- The range of motion and the power of a muscle depends on the arrangement of its fascicles.
- The fiber arrangement can be:
  - **Parallel**
    - More range of movement, less powerful.
  - **Pennate**
    - More powerful, less range of movement.
    - Unipennate
    - Bipennate
    - multipennate
  - **Triangular**
    - Have a broad attachment from which the fascicles converge to a single tendon.
  - **Fusiform**
    - Spindle-shaped (round, thick belly, & tapered ends).
  - **Circular**
    - Surround a body opening or orifice, constricting it when contracted.
- The long parallel arrangement give more range of motion but is not usually very powerful.
- The pennate muscles shorten very little but are very powerful.

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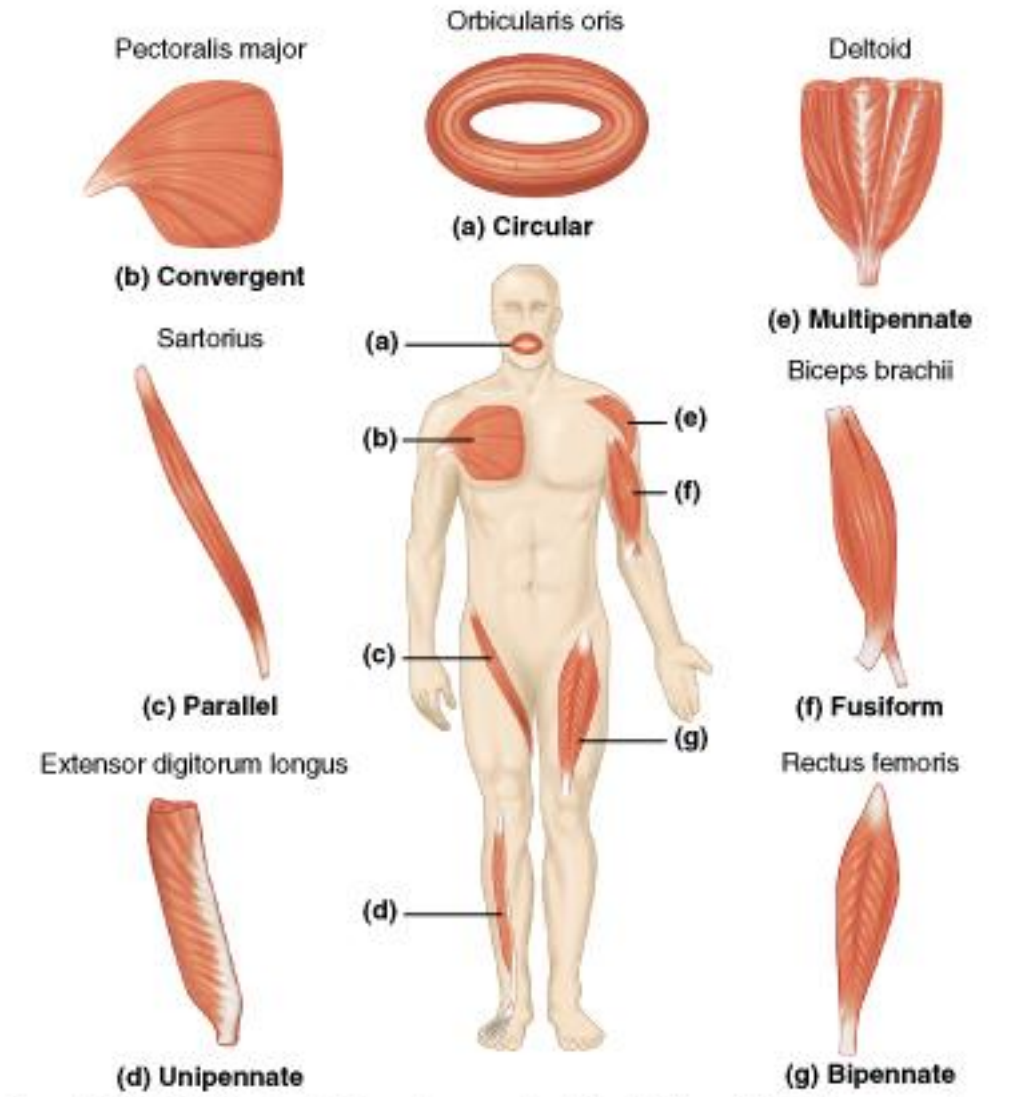
DIRECTIONS OF MUSCLES



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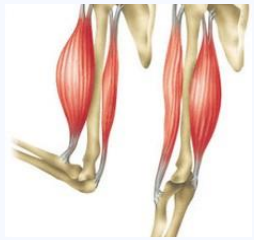
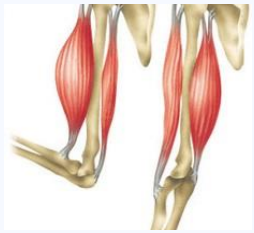
MODE OF ACTIONS

- **Prime Mover (Agonist)**
  - It is the chief muscle responsible for a particular movement.
- **Antagonist**
  - It opposes the action of the prime mover.
  - Before contraction of prime mover, antagonist must be relaxed.
- **Synergist**
  - Muscles that assist the prime mover in a particular movement.
- **Fixator**
  - Its contraction does not produce movement by itself, but it stabilizes the origin of the prime mover so that it can act efficiently.

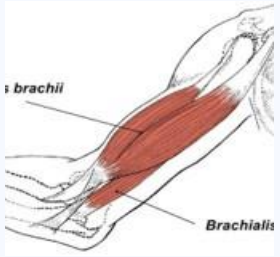
MODE OF ACTIONS



PRIME MOVER



ANTAGONIST



SYNERGIST

FIXATOR

PRIME MOVER (AGONIST)

- It is the chief muscle responsible for a particular movement.
- **Example:**
  - Biceps Brachii is the prime mover for flexion of the elbow joint and forearm.
  - Quadriceps Femoris is the prime mover for extension of the knee joint.

PRIME MOVER

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ANTAGONIST

- It opposes the action of the prime mover.
- Before contraction of prime mover, antagonist must be relaxed.
- **Example:**
  - Triceps Brachii is the antagonist for prime mover for extension of the elbow joint and forearm.
  - Biceps Femoris (Flexor of knee).
  - It opposes the action of quadriceps when the knee joint is extended.

ANTAGONIST

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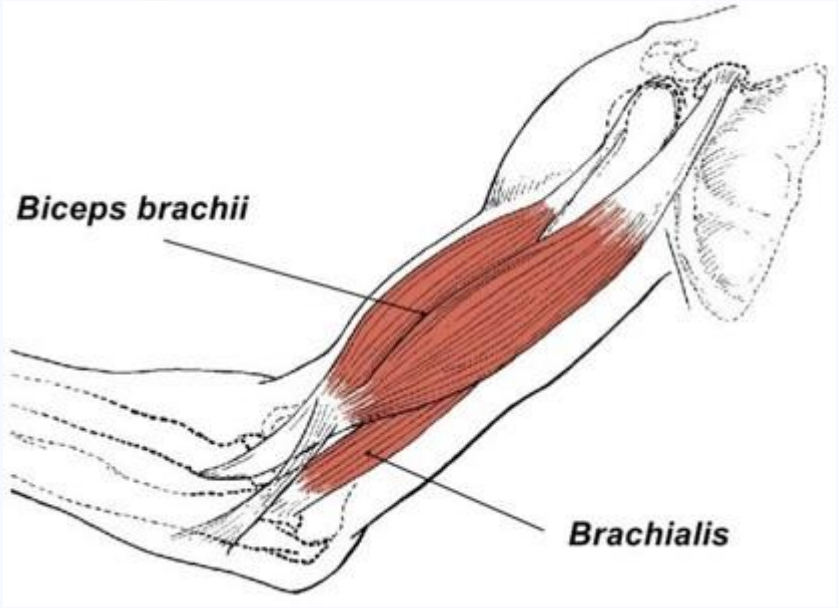
SYNERGIST

- It opposes the action of the prime mover.
- Muscles that assist the prime mover in a particular movement.
- Synergists are sometimes called neutralizers because they help cancel out, or neutralize, extra motion from the agonists to make sure that the force generated works within the desired plane of motion.
- **Example:**
  - Brachialis muscle for Biceps prime mover muscle.

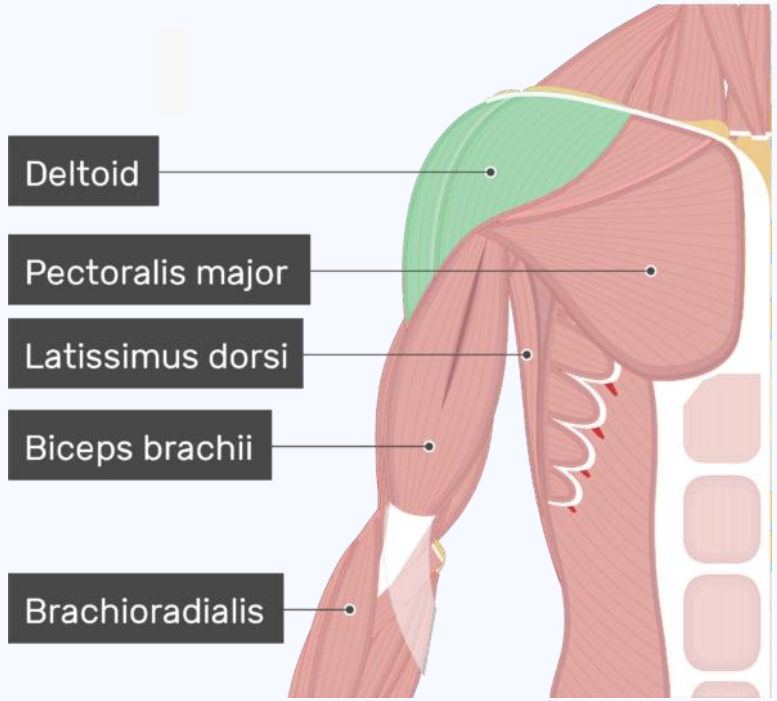
SYNERGIST



FIXATOR

- Its contraction does not produce movement by itself but it stabilizes the origin of the prime mover so that it can act efficiently.
- **Example:**
  - Deltoid muscle for Biceps prime mover muscle.
  - Muscles attaching the shoulder girdle to the trunk contract to fix shoulder girdle, allowing deltoid muscle (taking origin from shoulder girdle) to move shoulder joint (humerus).

FIXATOR



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NAMING OF MUSCLES

- **Size**
  - Major or Maximus (large)
- **Position**
  - Pectoralis (pectoral region)
- **Depth**
  - Superficialis (superficial)
- **Shape**
  - Deltoid (triangular)
- **Number of Heads**
  - Biceps (2 heads)
  - Triceps (3 heads)
- **Attachments**
  - Coracobrachialis
- **Action**
  - Flexor digitorum: flexion of digits

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TYPES OF BODY MOVEMENTS

- **Flexion**
  - Movement that brings the two bones closer to each other (decreases the angle of joint).
- **Extension**
  - Movement that increases the angle, or the distance between the two bones.
- **Adduction**
  - Movement of the limb toward the midline of the body.
- **Abduction**
  - Movement of the limb away from the midline of the body.
- **Rotation**
  - Movement of a bone around a vertical axis.
- **Circumduction**
  - Combination of all the above movements.

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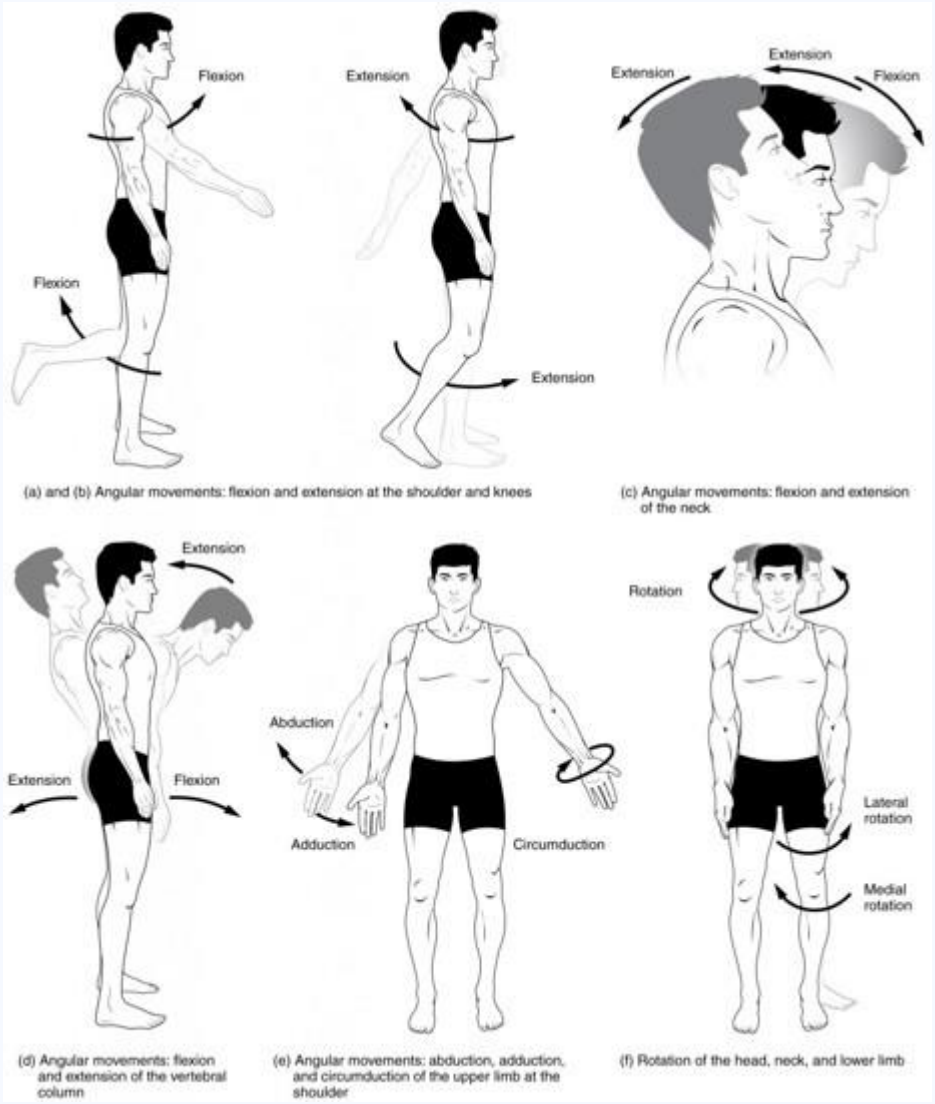
TYPES OF BODY MOVEMENTS



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MUSCLE EXERCISE

- The amount of work done by a muscle is reflected in changes in the muscle itself.
- Muscle inactivity leads to muscle weakness and wasting.
- Regular exercise increases muscle size, strength and endurance.

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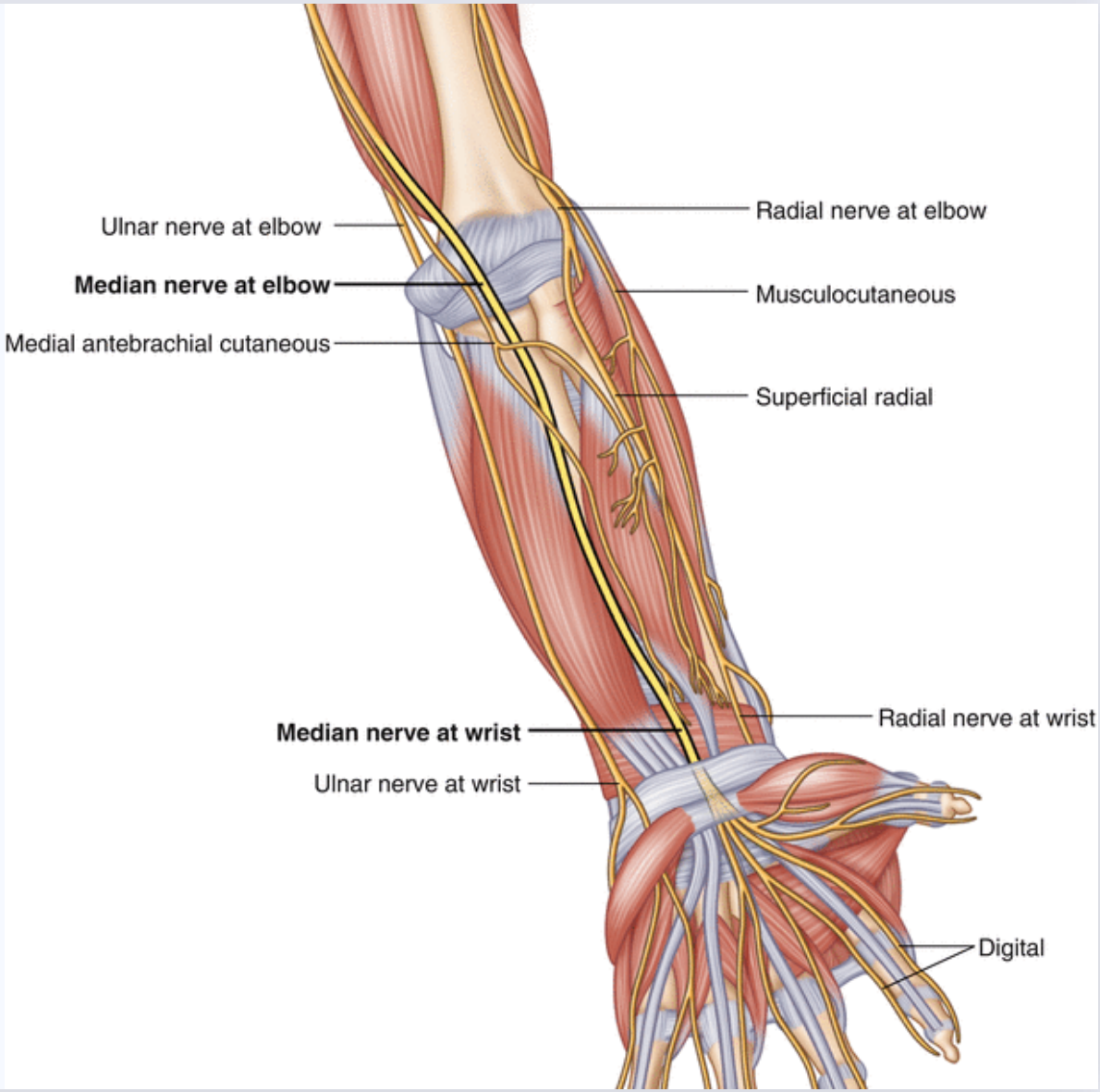
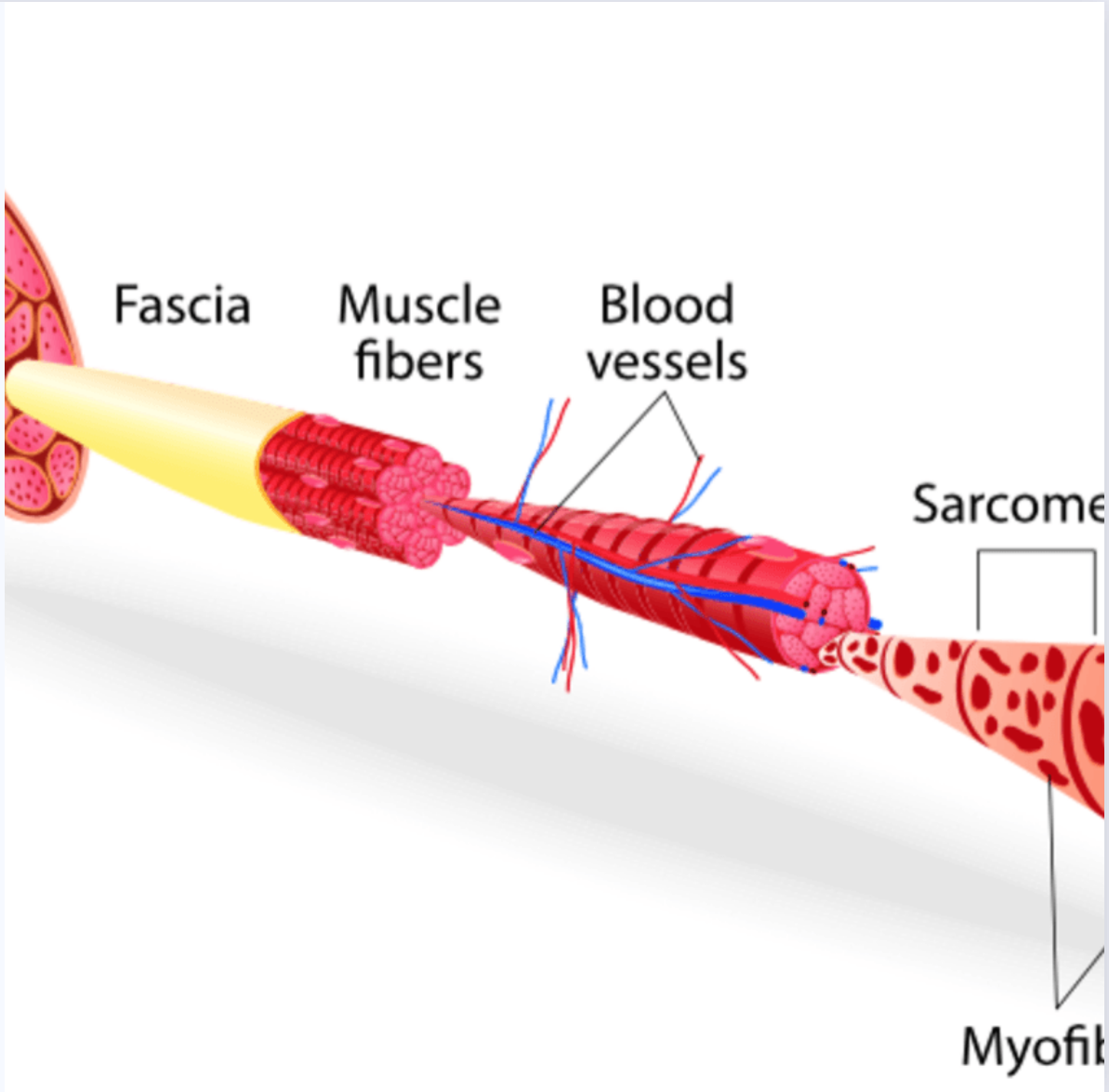
MUSCLES INNERVATION

- The **somatic nervous system** (is the part of the peripheral nervous system) associated with skeletal muscle voluntary control of body movements.
- The nerves supplying the skeletal muscles are Mixed.
  - **60% are Motor**
  - **40% are Sensory**
- It contains some Autonomic fibers
  - **Sympathetic**
- The nerve enters the muscle at about the middle point of its deep surface.



BLOOD SUPPLY

- During extreme physical exertion, more than 80% of cardiac output can be directed to contracting muscles.
- The vascular inflow to skeletal muscles is provided by primary arteries, which represent the last branches of the arterial supply that arise before entry into the tissue.
- The primary arteries are appropriately distributed along the long axis of the muscle and give rise to feed arteries that course toward the epimysium of the muscle at right or oblique angles to the primary arteries.



MUSCLE DISEASES

- Muscle diseases and injuries are common, especially in sports activities. A severe muscle injury can keep you from participating in the activities that you love and enjoy for living.
- Muscle diseases and injuries could be one of the major factors that threat someone's professional career(s).

A genetic disease that cause a damage of muscle fibers.

can occur suddenly and involuntarily in one or more muscles.

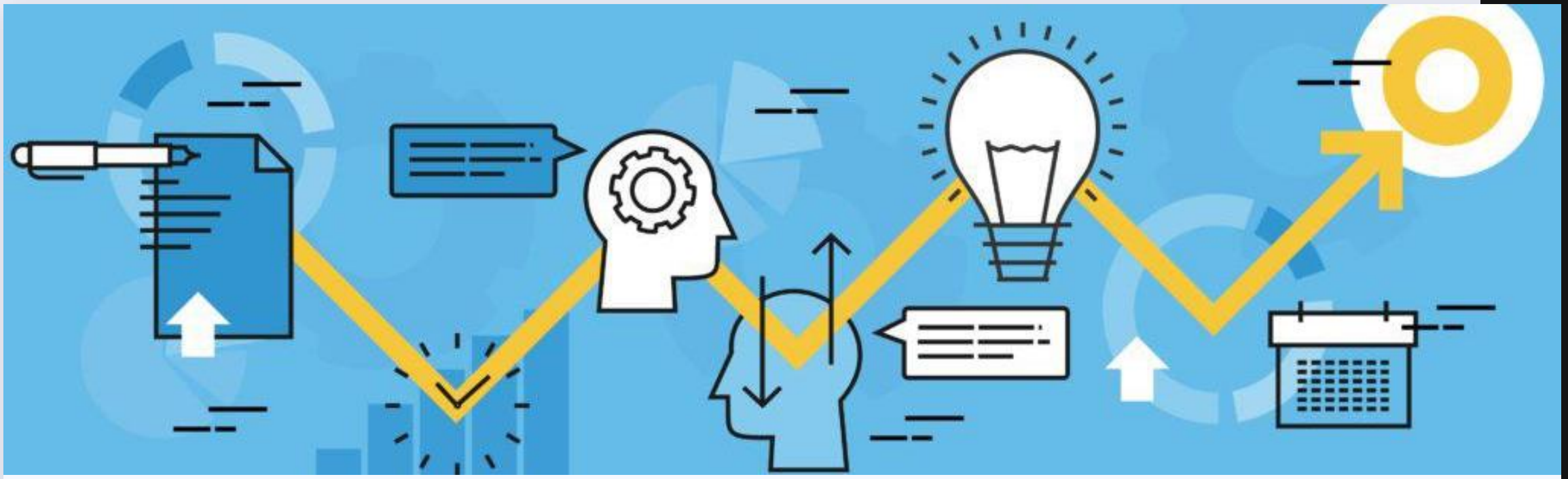
Overstretching or tearing the ligaments results in a sprain.

Overstretching or tearing muscles or tendons results in a sprain

often caused by a direct trauma or repeated blow to the muscle. In some cases, the condition can be caused by falling on a hard surface.

MUSCLE TREATMENTS

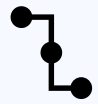
- Minor muscle injuries may be treated with simple home remedies, such as rest, applying ice, using compression bandage, and elevating your injured limb.
- Anti-inflammatory medication.
- Physiotherapy
- Severe muscle injuries need to be checked by a qualified health care provider.
- A torn muscle or tendon may need to be surgically repaired.



Questions?

alkhaleel@ksu.edu.sa

CONTACT ME



LINKEDIN
/khaleelya

TWITTER
@khaleelya

EMAIL
alkhaleel@ksu.edu.sa

PHONE
966114670811