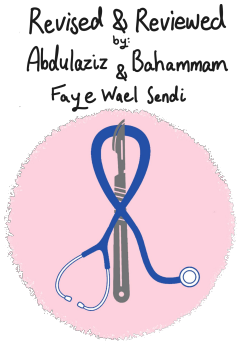
Editing File

Lecture 2:

Skeletal Muscles

- Main text
- Red : Important
- Pink : in girls slides only
- Blue : in boys slides only
- Green : Doctors Notes
- Grey : Extra info



MED441
KING SAUD UNIVERSITY

Objectives

At the end of the lecture , students should be able to:

- 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.

Note: This slide is only found in male slides.

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.

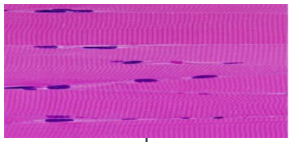
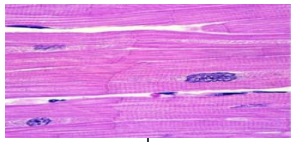
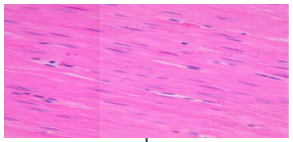
- The structural and functional unit of muscle tissue is “muscle cells”.

- All muscle cells are elongated and are called “muscle fibers”.

- The ability of muscles to contract, or to shorten depends on two types of myofilaments (actin & myosin)

  In the muscle fibers.

Classifications of Muscles:

	Skeletal	Cardiac	Smooth (Visceral)
Location	Attached to the bones or for some facial muscles, to skin (Produce movement)	Walls of the heart	Walls of visceral organs
Action	Voluntary (Subject to conscious)	Involuntary (Not under conscious)	Involuntary (Not under conscious)
Microscopic structure	Striated: Show transverse striations 	Striated: Show transverse striations 	Nonstriated(Spindle shape) 


Voluntary Control


Involuntary Control


Involuntary Control

Main criteria of skeletal muscles:

- Voluntary
- Striated
- Attached to skeleton
- Produce movement of skeleton
- Supplied by somatic nerves (أعصاب جسدية)

★ The somatic nervous system is the part of the peripheral nervous system.

Functions of skeletal muscles:

1-Movement of body and its parts (تساعد في الحركة)
2-Maintain posture (تحافظ على قوام الجسد)
3-Generate heat (تولد الحرارة)
4-Stabilize joints (تعمل على تثبيت المفاصل)

Attachments of skeletal muscles:

The skeletal muscles must be attached to bones by at least: Two points.

Origin	Insertion
❖ Attached to less mobile or Immovable bone ❖ Least movable ❖ Mostly Fleshy ❖ The Proximal end	❖ Attached to the movable bones ❖ Most movable ❖ Mostly Fibrous ❖ The Distal end

Note: 1-The origin is where muscle start and the insertion where it end.

2-Muscles can have more than one origin but they must have only one insertion.

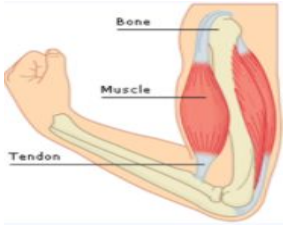
Types of attachment:

Muscles are attached to bones, cartilage or ligaments through:

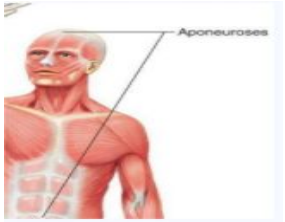
1. **Tendons:**
   A tough cord of fibrous connective tissue that usually connects muscle to bone and is capable of withstanding tension.

2. **Aponeurosis:**
   A thin broad and strong sheet of fibrous tissue ,white sheet of fibers, e.g. Scalp (فروة الرأس) anterior abdominal wall(الجدار الداخلي للبطن).

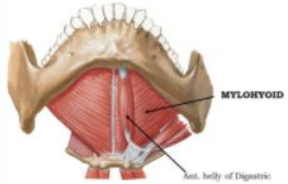
3. **Raphe:**
   An interdigitation of the tendinous ends of the flat muscles, e.g. Mylohyoid (منطقة تحت اللسان).



TENDONS



APONEUROSIS

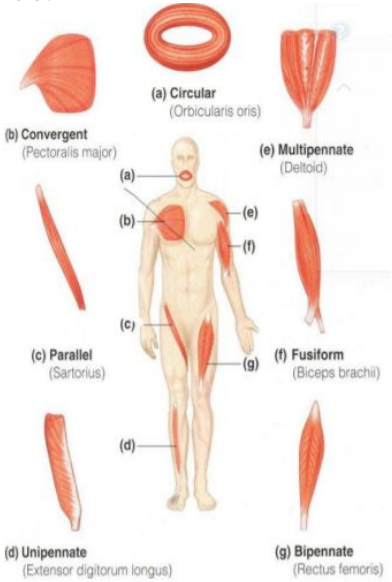


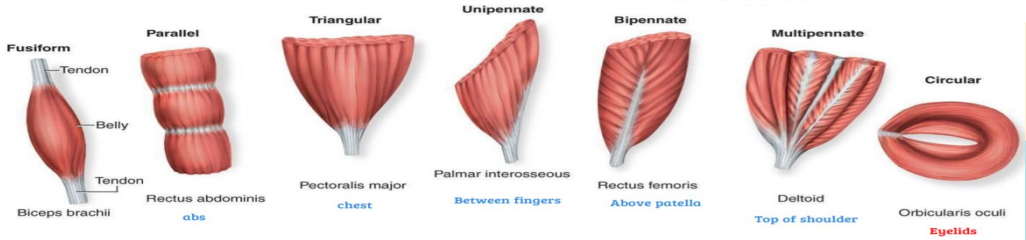
RAPHE

Directions of muscle fibers:

The range of motion and the power of a muscle depends on the arrangement of its fascicles. It can be:

- Triangular / Convergent: (تبدأ من مكان واسع "أكثر من نقطة" وتنتهي بنقطة وحدة)
  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
- **Parallel to line:**
  More range of movement, less powerful
- **pennate (oblique to line):**
  More powerful, less range of movement.
  1-Unipennate
  2-Bipennate
  3-Multipennate





Mode of Action (Mechanism) :

Helpful Video

1-Prime mover (Agonist):
It is the Chief muscle responsible for particular movement.

2-Antagonist:
It opposes the action of the prime mover. Before contraction of prime mover, antagonist must be relaxed.

E.x(1): **Biceps Brachii** is the **prime mover** for flexion of the elbow joint and forearm.
E.x(1) :**Triceps Brachii** is the **antagonist** for prime mover for the flexion of elbow joint and forearm
E.x(2): **Quadriceps Femoris** is the **prime move**r for extension of the knee joint.
E.x: **Biceps Femoris** (Flexor of knee) It opposes the action**(Antagonist)** of quadriceps when the knee joint is extended.

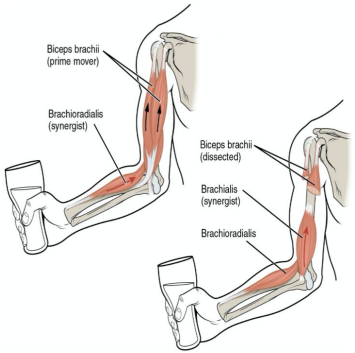
Notes
1-Biceps brachii, bi= two, ceps= head, brach= arm
2-Each muscle can be both agonist & antagonist.

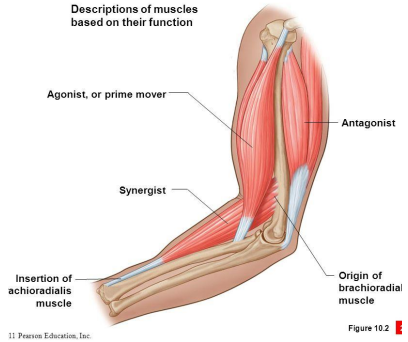
Mode of Action (Mechanism) :

3- Synergist: (2 Functions)

1-Muscles that assist the prime mover in a particular movement.
2-Prevents unwanted movement in an intermediate joint crossed by the Prime Mover.

Ex: flexors and extensors of wrist join.
(They contract to fix wrist joint in order that flexors and extensors of fingers work efficiently.)





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.
Ex: 1- Brachialis muscle for Biceps prime mover muscle.
2- Biceps and brachioradialis (The biceps is the prime mover of the elbow. Brachioradialis acts as a synergistic muscle to stabilize the joint, thus aiding in the motion).

Antagonist and synergist

Antagonist	Synergist
Opposes or reverses a particular movement.	Helps prime movers by adding a little extra force to the same movement or by reducing undesirable or unnecessary movement.

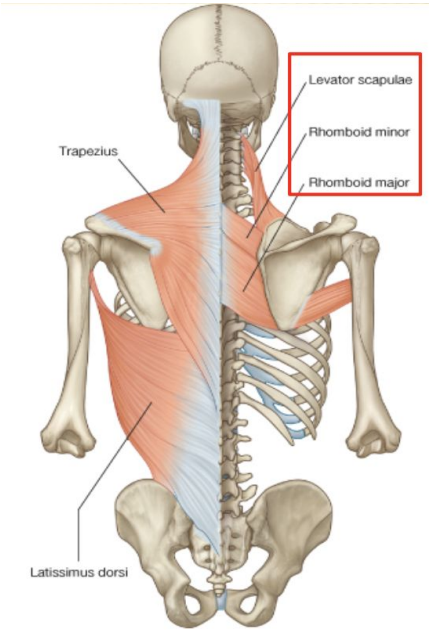
Mode of Action (Mechanism) :

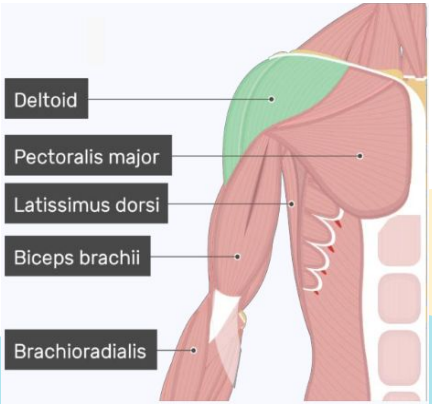
4-Fixator

Its contraction does not produce movement by itself but it **stabilizes** the origin of the prime mover so that it can act efficiently.

Ex: 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).





NAMING OF MUSCLES

1- Size:
Major or maximus (large)
Minor or minimus (small)
Latissimus (broad)
Longus (long)
Brevis (short)

2- Position:
Pectoralis (pectoral region)

3- Depth:
Superficialis (superficial)
Profundus (deep)
Externus (external)

4- Shape:
Deltoid (triangular)
Teres (rounded)
Rectus (straight)

5- Number of heads:
Biceps (2 heads)
Triceps (3 heads)
Quadriceps (4 heads)

6- Attachments:
Coracobrachialis (from coracoid process to arm).

7- Action:
Flexor digitorum: flexion of digits

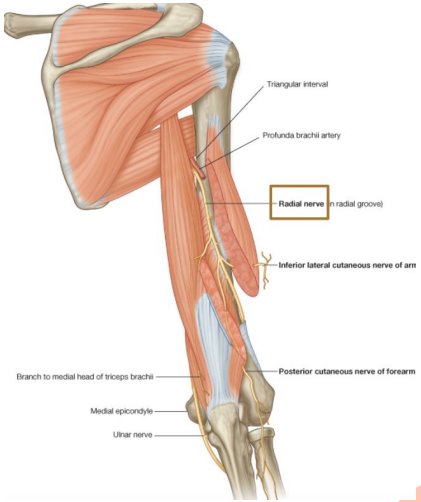
MUSCLES INNERVATION

(nerve supply of skeletal muscles)

Skeletal muscles are supplied by mixed somatic nerves

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 (carries information from brain and spinal cord to muscles ~ team 439)
40% are Sensory (carries information from nerves to central nervous system ~ team 439)



- It contains some Autonomic fibers **(Sympathetic)** for its blood vessels.
- The nerve enters the muscle at about the middle point of its deep surface.

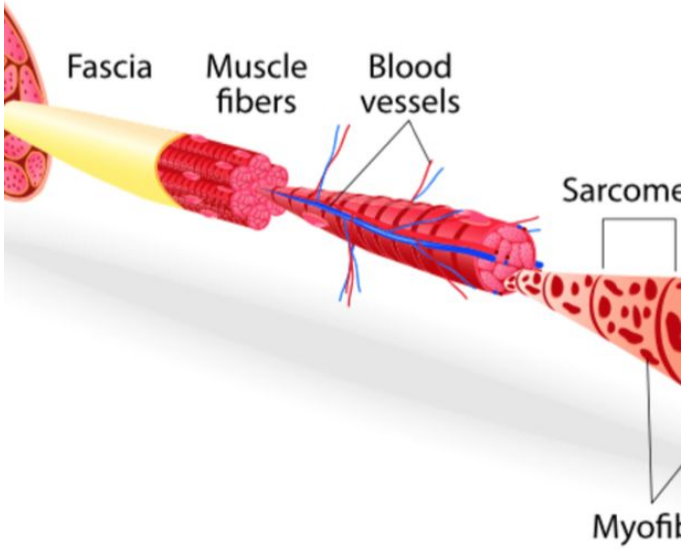
EFFECT OF EXERCISE ON MUSCLES

- 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.

Note: **This slide is only found in male slides.**

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.



Note: **This slide is only found in male slides.**

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).

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 healthcare provider.
- A torn muscle or tendon may need to be surgically repaired.

Muscle diseases and injuries

- **Muscular Dystrophy:** a genetic disease that causes a damage of muscle fibers.
- **Muscle Cramps**: can occur suddenly and involuntarily in one or more muscles.
- **Sprains**: results from overstretching or tearing the ligaments.
- **Strains:** results from overstretching or tearing muscles or tendons.
- **Contusions:** 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.

MCQs:

1-Which of the following isn't a main criteria of skeletal muscles?

A- Striated	**B-** Supplied by somatic nerves	**C-** Produce movement of skeleton	**D-** Involuntary

2-An interdigitation of the tendinous ends of the flat muscles:

A- Raphe	**B-** Aponeurosis	**C-**Tendons	**D-**Insertion

3-It opposes the action of the prime mover:

A- Agonist	**B-** Antagonist	**C-** Synergist	**D-** Fixator

4- In naming muscles, which of these names doesn't fall under size?

A- Maximus	**B-** Brevis	**C-** Profundus	**D-** Latissimus

5- Sprains result from overstretching or tearing .....

A- Muscles	**B-** Tendons	**C-** Ligaments	**D-** Both A&B

Answers	
1	D
2	A
3	B
4	C
5	C

Team members:

غادة الحربي	فاطمة البن موسى	عبدالعزيز عناب	عبدالإله آل رشود
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شيماء القعود	ندى السيف	محمد العمري	يحيى الغامدي
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