

The Muscular System

→ Muscles:

- Muscle cells are specialised contractile cells called fibres
- Muscles of 3 types:

Smooth
Muscles

cardiac
Muscles

skeletal
Muscles.

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m) Smooth Muscles:

- Involuntary or non-striated muscle is not under human control
- The cells are small, have one nucleus & spindle shape
- Smooth muscle forms sheets in wall of hollow organs & tubular structure to regulate diameter & propel substance through tracts.

m) Cardiac Muscles:

- They are found in walls of heart

m) Skeletal Muscle:

- They are voluntary muscles.

⇒ Skeletal Muscles:

- contraction of a whole skeletal muscle occurs because of coordinated contraction of its individual fibres.

→ Structures:

- skeletal muscle cells are seen to rough cylindrical in shape.

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- They lie parallel to one another, with a distinctive banded appearance consisting of alternate dark & light stripes.
- Individual fibres may be very long, upto 35cm in longest muscles
- Each cell has several nuclei, found just under cell membrane (sarcolemma)
- cytoplasm of muscle cells, sarcoplasm
- Sarcoplasm contain tiny filaments, these are contractile filament
- There are mitochondria essential for producing ATP from glucose & oxygen to power the contractile mechanism
- specialised O₂ binding substance called myoglobin & store oxygen in muscles.
- There are intra-cellular space for calcium, which is released into sarcoplasm
- there are 2 types of contractile myofilament within muscle fibres called thick & thin, arranged in repeating unit called sarcomeres.
- Thick filament which are made of protein called myosin corresponds to dark bands
- thin filament are made of protein called actin, bands are lighter in appearance
- Each sarcomere is bounded to each end by a dense strip called Z-line.

⇒ Action of skeletal Muscles:

- when individual muscle cells in muscle shortens, they pull on the connective tissue framework running through the whole muscles, & the muscle develops a degree of tension (tone)

↳ Muscle tone:

- when a muscle fibres contracts, whole fibres either contracts completely or not at all.

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- powerful contraction involve a large proportion of available to lift heavy weight
- Partial muscle contraction that allows pressure to maintained without fatiguing the muscle involved.
- Good muscles tone protects joints & gives a muscle firmness & shape even when relaxed.

ii) Muscle fatigue:

- Fatigue occurs when a muscle works at a level that exceed supply of oxygen & glucose
- Muscle response decrease with fatigue.
- fatigue resulting from inadequate oxygen supply, in stress exercise occurs when lactic acid accumulates in working muscles.

iii) Muscle recovery:

- After exercise, muscles needs a period of time of recover, to replenish its ATP, & glucose stores & to repair any damaged fibres.
- Oxygen debt remains, as the body converts excessive lactic acid to pyruvic acid & replaces the energy stores.

* Muscles of face & neck:

- i) Occipito frontalis : It raises the eye brows
- ii) Levator palpebrae : It raises upper eyelid
- iii) Orbicularis oculi : It closes eyes.
- iv) Buccinator : Muscle of cheeks, draws the cheek inward & forcible (trumpeter's muscle) expulsion of air from mouth.

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- v) Orbicularis oris :- It close the lips
- shape the muscle for whistling
- vi) Masseter :- Helps in chewing
- vii) Temporalis :- It closes the mouth
- assists chewing
- viii) pterygoid :- It closes the mouth
- pulls the lower jaw forward.

* Muscles of Neck :-

- i) Sternocleidomastoid :- It assists in turning head side to side
- ii) Trapezius :- It pulls the head backward
- squares the shoulders.
- control the movement of scapula, when shoulder joint is in use.

* Muscles of trunk :-

- These muscles stabilises the association between the appendicular & axial skeleton at pectoral girdle.
- It stabilises & allow movement of shoulder & upper arms.

* Muscles of Back :-

- There are 6 pairs of large muscles in back.
- They are :-
- a) Trapezius :- mentioned above.

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- b) Latissimus dorsi % It adducts, medially rotates & extends the arm.
- c) Teres major % - It extends, adducts & medially rotates the arm
- d) Quadratus lumborum % - fix the lower ribs during respiration
- cause extension of vertebral column (bending backwards)
 - If one muscle contract it cause lateral flexion
- e) Sacrospinalis (erector spinae) % - contraction causes extension of vertebral column.

* Muscles of abdominal wall %

- 5 pairs of muscle from abdominal wall.
- They are %

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- a) Rectus abdominis % - Most superficial muscle
- flexes vertebral column (lumbar portion)
 - compresses abdomen to aid in defecation, urination, forced exhalation & childbirth.
- b) External oblique % - acting together, compress abdomen
- flex vertebral column
 - rotate vertebral column
- c) Internal oblique % - compresses abdomen
- rotate vertebral column.
- d) Transversus abdominis % - compress the abdomen
- pulling 12th ribs during for forced exhalation

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* Muscles of pelvic floor

- This is a pair of broad flat muscles forming anterior part of pelvic floor
- They originate from inner surface of true pelvis.

- pelvic floor is divided into 2 identical half that unite along midline

- Muscles are :

- a) Levator ani : - originate from inner surface of true pelvis
- They form a sling that support pelvic organs.

- b) Coccygeus : - They complete the formation of pelvic floor
- supports the organ of pelvis

maintains continence.

* Muscles of shoulder & upper limb

- These muscles stabilise the association between the appendicular & axial skeletons.

- It stabilise & allow movement of shoulders & upper arm.

i) Deltoid :

- It forms the fleshy & rounded contour of shoulder

- Main function : - movement of arm

- cause flexion

- rotates shoulder joint.

- ii) Pectoralis major:
- Draws arms forward & toward the body i.e. flexes & adducts
- iii) Coraco brachialis: - flexes shoulder joint
- iv) Biceps: - stabilise & flex shoulder joint & ~~elbow~~ elbow joint
- It assists with flexion & supination.
- v) Brachialis: - Main flexor of elbow joint
- vi) Triceps: - Help to stabilise the shoulder joint
- assists in adduction of arm
 - extend the elbow joint.
- vii) Brachio radialis: - when it contracts, it flexes the elbow joint.
- viii) Pronator quadratus: - cause pronation of hand
- ix) Supinator: - help from biceps changing the hand from writing to anatomical position
- x) Flexor Carpi radialis: - It flexes the wrist joint
- abducts the joints
- xi) Flexor carpi ulnaris: - It flexes wrist
- adducts the joint
- xii) Extensor carpi radialis longus & brevis: - It extend & abduct the wrist.
- xiii) Extensor carpi ulnaris: - It extends & adducts the wrist
- xiv) Palmaris longus: - pull the skin & fascia of palm.
- xv) Extensor digitorum: - extend any of the joint across with its passes that is elbow, wrist or finger joint.

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* Muscles that control finger movements:

- large muscles in forearm that extends to hand gives power to the hand & fingers
- smaller muscles, which originate on carpal & meta carpal bones, control tiny & precise finger movement.

* Muscles of hip & lower limbs:

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- i) Psoas: - Together iliacus, it flexes the hip joint
- ii) Iliacus: - combined with iliacus & psoas flexes hip joint
- iii) Quadriceps femoris:
 - This is a group of 4 muscles lying on front & sides of thigh
 - They are rectus femoris & 3 vasti: - lateralis, medialis & intermedius
 - rectus femoris flexes the hip joint.
 - Together group act as very strong extensor of knee joint.
- iv) Obturator: - lateral rotation of hip joint
- v) Gluteal Muscles: - causes extension, abduction & medial rotation at hip joint.
- vi) Sartorius: - flexion at hip joint
 - Abduction at hip joint
 - flexion of knee.
- vii) Adductor group: - Adduction
 - rotate the thigh.

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viii) Hamstrings: - flexes knee joint

ix) Gastrocnemius: - crosses both knee & ankle joint causing flexion at knee.

- plantar flexion (rising on to ball of foot) at ankle.

x) Anterior tibialis: - associated with dorsiflexion of foot

xi) Soleus: - It causes plantar flexion at ankle

- helps to stabilise the joint when standing.

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