**05. The Muscular system**

Muscles are the body's movers and shakers. These tissues are attached to other parts of the body and when they relax and contract they enable movement.

The muscular system comprises the muscles of the body and their attachments - tendons and fascia. When muscle fibres contract the muscles change shape and move whichever part of the body they are attached to. This can be a voluntary (conscious) movement such as lifting an arm or an involuntary movement such as shivering.

**TOPIC 1: STRUCTURE**

**WHAT IS A MUSCLE?**

A muscle is a group of specialised, elastic tissues. More of the human body is made of muscle than any other tissue: 23% of a woman's body weight and about 40% of a man's.

**Structure:** muscle tissue is bound together in bundles and contained in a sheath (sometimes called a fascia), the end of which extends to form a tendon that attaches the muscle to other parts of the body. Muscle is 75% water, 20% proteins, 5% fats, mineral salts and glycogen.

**Function:** a muscle's function is to contract and by doing so start a movement in the surrounding structures (the tendons, ligaments and eventually bones). The muscle contracts in reaction to a nerve stimulus sent by the brain through a motor nerve. The muscle then shortens becoming fatter at the centre.

**Summary of muscular functions**

* Contract and thereby produce movement e.g. to move joints
* Stabilise joints
* Maintain postural tone
* Aid in temperature control e.g. shivering and dilation of capillaries (see Skin).

**WHAT DOES MUSCLE LOOK LIKE?**

There are three types of muscular tissue, each with a different structure.

* **Skeletal muscle (striated and voluntary)**

**Function:** these are the muscles which we consciously control e.g. our arms and legs. If we want to walk we do so.

**Structure:** skeletal muscle has cylindrical cells which make up fibres. Each fibre has several nuclei (multi-nucleated cells) and is surrounded by a sheath (sarcolemma). The muscle fibres form bundles and they all run in the same direction. Under a microscope voluntary muscle looks stripy. The stripes or striations are formed by actin and myosin protein filaments which run across the fibre in transverse bands. Where the actin and myosin cross a darker 'stripe' is created, where they do not cross the appearance is lighter. When the muscle contracts the actin filaments slide between the myosin filaments which causes a shortening and thickening of the fibres.

* **Smooth muscle ( non striated and involuntary)**

**Function:** these are the muscles we do not consciously control e.g. those that are found in the walls of blood and lymphatic vessels, in respiratory, digestive and genito-urinary systems. These muscles work automatically whether we want them to or not!

**Structure:** smooth muscles have spindle-shaped cells with no distinct membrane and only one nucleus. Bundles of the fibres form the muscle we see with the naked eye.

* **Cardiac muscle**

**Function:** to power the pump action of the heart.

**Structure:** cardiac muscle only exists in the heart; it is involuntary muscle tissue but its fibres are striated and each cell has one nucleus so, in structure, it resembles skeletal muscle. Each cell or fibre has a nucleus.

**SMALLEST AND LARGEST**

* The smallest skeletal muscle (i.e. a muscle attached to a bone) is the stapedius in the ear. It activates the stapes, the stirrup-shaped bone in the middle ear which sends vibrations from the eardrum to the inner ear.
* The muscle with the largest surface area is the lattisimus dorsi, the flat back muscle which covers the central and lower back.
* The strongest muscle in the body is the gluteus maximus which forms the main bulk of the buttock. This muscle is responsible for lifting the torso after bending down or leaning over.

**TOPIC 2: FUNCTION**

**HOW DO MUSCLES WORK?**

**By contraction:** the fibres become shorter and thicker and the parts attached to the fibres (periosteum, bone, tendons and fascia) are pulled by the contraction and move. When a muscle fibre contracts it follows the 'all or nothing' law i.e. it contracts completely or not at all. Varying forces (strengths) of contraction are produced depending upon the number of fibres recruited. The greater the number of fibres that contract, the greater the force produced. Smooth muscle and cardiac muscle contract independently of our conscious will. Skeletal muscles, however, move because we want them to. There are two types of contraction:

* **Isometric:** as the muscle contracts, its length remains the same whilst the tension increases in an attempt to overcome the opposing force, e.g pushing against an object that is too heavy to move (such as a wall) or holding a glass of water still in front of you
* **Isotonic:** as the muscle contracts, its length changes whilst the tension remains constant or develops to overcome the opposing force, pushing an object over or lifting a glass of water to your mouth and lowering it back to the table.

**HOW DOES MOVEMENT HAPPEN?**

In skeletal muscle (those attached to bones) a muscle needs to pass over a joint to create movement. Muscle contraction pulls one bone towards another and thus moves the limb. Muscles never work alone: any movement results from the actions of several muscles. In general, muscles work in pairs. Each pair contains an agonist (the contracting muscle) and an antagonist (the opposing, relaxing muscle). The agonist and the antagonist must contract and relax equally to ensure a smooth and not jerky movement.

**DID YOU KNOW?**

Human babies, unlike some other mammals, are not born knowing how to control the voluntary muscles that help us stand and move. They learn to control and coordinate muscles in the following order: first the head, then the neck, the shoulders and arms, and then the lower parts of the body. When a baby finally learns to stand and walk, it has mastered all the muscles of movement because the last ones in the learning process are the pelvis and legs.

**DID YOU KNOW?**

The adductor muscles, which take the limb towards the medial line, are also found in bivalve seashells - those with two hinged parts like clams, oysters, mussels and cockles. The muscle closes the shell.

**HOW DOES A MUSCLE KNOW WHEN TO CONTRACT?**

The stimulus to contract comes from the nervous system through the nerves. Motor nerves enter the muscles and break into many nerve endings, each one stimulating a single muscle fibre.

**WHERE DOES A MUSCLE GET ENERGY FROM?**

In order for contraction (and therefore movement) to take place, there must be an adequate blood supply to provide oxygen and nutrients and to remove carbon dioxide and waste products from energy production. Muscles receive their nutrients and oxygen from the arterial capillaries. This is converted into energy by chemical changes. The nutrients and oxygen are used up by the muscle and the waste product, lactic acid, is then excreted into the venous blood stream.

A muscle's ability to contract is affected by the following factors:

* Energy available
* Strength of the stimulus from the nerve
* Time muscle has been contracting
* Adequate blood supply bringing enough oxygen and nutrients
* Strength of inhibitory nerve supply
* Temperature of muscle (warmth increases response)
* Presence of waste products like lactic acid.

**DIFFERENT STAGES OF CONTRACTION**

* **Tone:** slight degree of contraction by some fibres as others are relaxing. In normal healthy muscles there will always be a few muscle fibres contracting at any one time, even during sleep. This action gives normal posture to the body.
* **Relaxation:** a lessening of tension, so a reduction in the number of fibres contracting at any one time. Muscle tension can be affected by conscious effort and thought and relaxation can be taught.

**PROBLEMS WITH OVER-CONTRACTION**

* **Muscle tension:** this is over-stimulation of muscle fibres. More fibres contract than are necessary to maintain postural tone.
* **Muscle fatigue:** when stimulated a muscle will need oxygen and fuel for its energy. This fuel is mainly glucose, stored in the muscle as glycogen and fats and transported by the blood. The muscle burns the glucose and fats by combining them with oxygen from the blood.

If a muscle continues to contract without enough rest (e.g. if someone does too much exercise without breaks), the muscle will run out of oxygen and a by-product of this deficiency, lactic acid, will build up. This acid causes a burning sensation in the muscle, the muscle begins to quiver and soon stops contracting. The exerciser will feel stiffness and pain in the affected muscle.

**TERMS OF DESCRIPTION FOR MUSCLES**

* **Origin:** the fixed end of a muscle. This end of the muscle barely moves during muscle action.
* **Insertion:** the moving end of a muscle, the point to which the force of the muscle is directed. A muscle always works from its insertion towards its origin.

* **Attachment:** at their origin and insertion muscles attach to bone via tendons to produce movement of joints. They sometimes take attachment from other connective tissue such as cartilage or the fascia of other muscles.
* **Belly:** thickest part or main body of muscle; usually the middle part away from insertion and origin.

**DID YOU KNOW?**

That shivering is caused by muscle contraction?

When you're cold your body starts producing body heat by making muscles contract and relax quicker than usual. This is shivering.

**TOPIC 3: HOW ARE MUSCLES ATTACHED TO THE REST OF THE BODY**

Muscles are attached by tendons and the fascia.

**TENDON**

**Structure:** white fibrous cords (an extension of the fascia) with no elasticity which are of different lengths and thickness and are very strong. They have few, if any, blood vessels or nerves.

**Function:** it connects muscle to bone.

**FASCIA**

**Structure:** white, fibrous connective tissue. It is found in all parts of the body, in different lengths and thicknesses.

**Function:**

* **Superficial fascia -** beneath the skin; found over almost the whole surface of the body; facilitates the movement of the skin; serves as a medium for the passage of nerves and blood vessels; helps retain body warmth; connects skin with deep fascia.
* **Deep fascia -** dense, inelastic, stiff membrane which forms a sheath (covering) for muscles and broad surfaces for attachment. Made of shiny tendinous fibres it is thicker in unprotected areas and assists muscle action through tension and pressure.

**DO ALL MUSCLES WORK IN THE SAME WAY?**

All muscles work by contraction but each muscle performs a specific action (type of movement) in order to move the body. There are several different actions:

* **Flexion:** bend or flex a limb inwards
* **Extension:** bend or extend a limb outwards
* **Abduction:** move a limb away from the midline
* **Adduction:** move a limb towards the midline
* **Inversion:** turning towards centre e.g. sole of foot
* **Rotation:** rotate head at neck
* **Eversion:** turning outwards away from centre e.g. sole of foot
* **Supination:** turn a limb to face upwards

* **Dorsiflexion:** flexing/bending foot up (with toe up, heel down)

* **Pronation:** turn a limb to face downwards
* **Plantarflexion:** flexing/bending foot down towards the ground (with toe down, heel up) e.g. as in walking

**DID YOU KNOW?**

The advent of more and more jobs involving the use of computers has resulted in new diseases caused by constant keyboard work. These are known as 'repetitive- strain injuries' or RSIs. The most common repetitive strain injury is 'carpal-tunnel syndrome'. It has been called the 'secretary's disease' but it can affect anyone whose job requires lots of wrist flexion (hence 'carpal' bones of the wrist) or prolonged finger extension. There are different symptoms including wrist pain, swelling and numbness or 'pins-and-needles' in the index and middle fingers.

**THE PRINCIPAL MUSCLES OF THE BODY**

There are thousands of muscles in the body. The following series of diagrams show the principal muscles of the body, detailing their position and their action.

**Muscles of the face (anterior view)**

**1. OCCIPITOFRONTALIS**

**Position:** THE OCCIPITALIS AND FRONTALIS ARE COLLECTIVELY KNOWN AS OCCIPITOFRONTALIS

**Action:** LIFTS EYEBROWS AND WRINKLES SKIN OF FOREHEAD; CREATES LOOKS OF SURPRISE AND HORROR

**2. OCCIPITALIS**

**Position:** FIBROUS SHEET OVER OCCIPITAL BONE

**Action:** MOVES SCALP BACKWARDS

**3. FRONTALIS**

**Position:** FIBROUS SHEET OVER FRONTAL AND PARIETAL BONES

**Action:** MOVES SCALP FORWARDS

**4. PROCERUS**

**Position:** CONTINUATION OF FRONTALIS DOWN MIDLINE OF NOSE BETWEEN EYEBROWS

**Action:** WRINKLES AT BRIDGE OF NOSE (DISG USTED EXPRESSION)

**5. NASALIS**

**Position:** SIDES OF THE NOSE

**Action:** COMPRESSES AND DILATES NASAL OPENING (PRODUCES ANNOYED EXPRESSION AND SNIFFING)

**6/7. LEVATOR LABII SUPERIORIS**

**Position:** THIN BAND OF MUSCLE FROM EYE TO MOUTH

**Action:** LIFTS UPPER LIP; PRODUCES CHEERFUL EXPRESSION

**8. LEVATOR ANGULI ORIS**

**Position:** THIN BAND OF MUSCLE BELOW LEVATOR LABII SUPERIORIS

**Action:** RAISES CORNER OF MOUTH; PRODUCES CHEERFUL EXPRESSION

**9. ZYGOMATICUS**

**Position:** THIN MUSCLE ANGLED ACROSS FACE SUPERFICIAL TO MASSETER

**Action:** MOVES ANGLE OF MOUTH UP, BACK AND OUT (SMILING)

**10. ORBICULARIS ORIS**

**Position:** SPHINCTER MUSCLE AROUND MOUTH

**Action:** PURSES LIPS

**11. MENTALIS**

**Position:** ABOVE MENTAL TUBEROSITY ON CHIN

**Action:** LIFTS SKIN ON CHIN AND TURNS LOWER LIP OUTWARDS

**12. DEPRESSOR LABII INFERIORIS**

**Position:** MID-LINE OF CHIN TO LOWER LIP

**Action:** PULLS LOWER LIP STRAIGHT DOWN

**13. DEPRESSOR ANGULI ORIS**

**Position:** FROM MODIOLUS TO MANDIBLE

**Action:** PULLS DOWN CORNERS OF MOUTH

**14. BUCCINATOR**

**Position:** BROAD THIN MUSCLE DEEP TO MASSETER

**Action:** COMPRESSES CHEEK AGAINST TEETH TO MAINTAIN TENSION; AIDS IN MASTICATION

**15. RISORIUS**

**Position:** BETWEEN MASSETER AND CORNER OF MOUTH

**Action:** RETRACTS ANGLE OF MOUTH AND LIFTS UPPER LIP (PRODUCES GRINNING EXPRESSION)

**16. MEDIAL PTERYGOID**

**Position:** INNER SURFACE OF MANDIBLE

**Action:** RAISES THE MANDIBLE

**17. LATERAL PTERYGOID**

**Position:** BEHIND THE ZYGOMATIC ARCH (CHEEK BONE)

**Action:** PUSHES MANDIBLE OUT AND OPENS MOUTH

**18. MASSETER**

**Position:** FROM ZYGOMATIC ARCH TO MANDIBLE

**Action:** RAISES LOWER JAW; CHIEF MUSCLE OF MASTICATION

**19. TEMPORALIS**

**Position:** FROM TEMPORAL BONE TO MANDIBLE

**Action:** RAISES AND RETRACTS LOWER JAW

**20. ORBICULARIS OCULI**

**Position:** SPHINCTER MUSCLE AROUND EYE

**Action:** CLOSES EYELID

**21. LEVATOR PALPEBRAE SUPERIORIS**

**Position:** EXTENDS FROM THE POSTERIOR PORT OF THE ORBITAL CAVITY TO THE UPPER EYE LID

**Action:** RAISES THE EYELID

**22. STERNOCLEIDOMASTOID**

**Position:** ROPE-LIKE MUSCLE RUNNING AT AN ANGLE UP SIDES OF NECK

**Action:** FLEXES HEAD AND TURNS FROM SIDE TO SIDE

**Muscles of the head and neck (side view)**

**MASSETER**

**Position:** FROM ZYGOMATIC ARCH TO MANDIBLE

**Action:** RAISES LOWER JAW

**STERNOCLEOIDOMASTOID**

**Position:** ROPE-LIKE MUSCLE RUNNING AT AN ANGLE UP SIDES OF NECK

**Action:** FLEXES HEAD AND TURNS FROM SIDE TO SIDE

**TRAPEZIUS**

**Position:** KITE SHAPED MUSCLE, UPPER BACK

**Action:** ROTATES INFERIOR ANGLE OF SCAPULA LATERALLY, RAISES SHOULDER, DRAWS SCAPULA BACKWARDs

**SPLENIUS CAPITIS**

**Position:** MUSCLE RUNNING ALONG NECK TO TRUNK

**Action:** EXTENDS AND ROTATES HEAD

**LEVATOR SCAPULAE**

**Position:** CERVICAL VERTEBRAE TO UPPER MEDIAL BORDER OF SCAPULA

**Action:** ROTATES AND ELEVATES SCAPULA; HELPS TO BEND NECK LATERALLY

**Muscles of the trunk - neck, chest and abdomen - anterior view**

**PLATYSMA**

**Position:** FRONT OF NECK

**Action:** WRINKLES SKIN OF NECK

**TRAPEZIUS**

**Position:** KITE SHAPED MUSCLE, UPPER BACK

**Action:** ROTATES INFERIOR ANGLE OF SCAPULA LATERALLY, RAISES SHOULDER, DRAWS SCAPULA BACKWARDS

**DELTOID**

**Position:** SHOULDER

**Action:** FRONT DRAWS ARM FORWARD; MIDDLE ABDUCTS; BACK DRAWS ARM BACKWARDS

**BICEPS**

**EXTERNAL OBLIQUE**

**Position:** WAIST

**Action:** FLEXES VERTEBRAL COLUMN WHEN BOTH SIDES WORK TOGETHER; ROTATES BODY AT THE WAIST WHEN THE TWO SIDES WORK ANTAGONISTICALLY

**INTERNAL OBLIQUE**

**Position:** WAIST, DEEP TO EXTERNAL OBLIQUE

**Action:** PRODUCES ROTATION AT THE WAIST WHEN WORKING ANTAGONISTICALLY; FLEXES VERTEBRAL COLUMN

**STERNOCLEIDOMASTOID**

**Position:** ROPE-LIKE MUSCLE RUNNING AT AN ANGLE UP SIDES OF NECK

**Action:** FLEXES HEAD AND TURNS FROM SIDE TO SIDE

**PECTORALIS MAJOR**

**Position:** CHEST

**Action:** DRAWS ARM FORWARDS AND MEDIALLY; ADDUCTS AND ROTATES INWARDS

**SERRATUS ANTERIOR**

**Position:** SIDE OF THORAX

**Action:** DRAWS SHOULDER FORWARD, ROTATES SCAPULA

**RECTUS ABDOMINIS**

**Position:** ABDOMINAL WALL

**Action:** SUPPORTS VISCERA (THE LARGE INTERNAL ORGANS IN THE ABDOMEN); FLEXES VERTEBRAL COLUMN

**TRANSVERSE ABDOMINIS**

**Position:** UNDERNEATH INTERNAL AND EXTERNAL OBLIQUES DEEPEST MUSCLE OF THE ABDOMEN

**Action:** SUPPORTS VISCERA; FLEXES VERTEBRAL COLUMN

**ILIO-PSOAS**

**(ALSO KNOWN SEPARATELY AS ILIACUS AND PSOAS)**

**Position:** DEEP MUSCLE OF PELVIC FLOOR WHICH CROSSES THE HIP JOINT

**Action:** ROTATES FEMUR LATERALLY AND FLEXES HIP

**Muscles of the trunk - neck, chest and abdomen - posterior view**

**SUPERFICIAL MUSCLES**

**STERNOCLEIDOMASTOID**

**TRAPEZIUS**

**Position:** KITE-SHAPED MUSCLE, UPPER BACK

**Action:** ROTATES INFERIOR ANGLE OF SCAPULA LATERALLY, RAISES SHOULDER, DRAWS SCAPULA BACKWARDS

**DELTOID**

**Position:** SHOULDER

**Action:** FRONT DRAWS ARM FORWARD; MIDDLE ABDUCTS; BACK DRAWS ARM BACKWARDS

**TRICEPS**

**LATISSIMUS DORSI**

**Position:** COVERS BACK

**Action:** DRAWS ARM BACKWARDS, ADDUCTS AND ROTATES IT MEDIALLY

**EXTERNAL OBLIQUES**

**GLUTEUS MEDIUS**

**Position:** HIGHER ON THE PELVIS CONTINUING DEEP TO GLUTEUS MAXIMUS

**Action:** ABDUCTS AND ROTATES FEMUR MEDIALLY

**GLUTEUS MAXIMUS**

**Position:** MAIN BULK OF BUTTOCK

**Action:** EXTENDS THE HIP, RAISES TRUNK AFTER STOOPING, LATERAL ROTATION OF HIP/FEMUR

**DEEP MUSCLES**

**SPLENIUS CAPITIS**

**Position:** MUSCLE RUNNING ALONG NECK TO TRUNK

**Action:** EXTENDS AND ROTATES HEAD

**LEVATOR SCAPULAE**

**Action:** ELEVATES THE SCAPULA, BENDS THE NECK LATERALLY

**RHOMBOIDS**

**Position:** BETWEEN SCAPULA AND SPINE

**Action:** ADDUCTS SCAPULA

**SUPRASPINATUS**

**Position:** TOP OF SCAPULA (ABOVE SPINE)

**Action:** ABDUCTS ARM, HOLDS HUMERUS IN SOCKET

**INFRASPINATUS**

**Position:** SCAPULA (BELOW SPINE)

**Action:** LATERAL ROTATION OF HUMERUS; STABILISES HUMERUS IN SOCKET

**TERES MINOR**

**Position:** SIDE OF SCAPULA TO HUMERUS

**Action:** LATERAL ROTATION OF HUMERUS; STABILISES HUMERUS IN SOCKET

**TERES MAJOR**

**Position:** SIDE OF SCAPULA TO HUMERUS

**Action:** ADDUCTS AND MEDIALLY ROTATES HUMERUS; EXTENDS SHOULDER JOINT

**SERRATUS ANTERIOR**

**Position:** SIDE OF THORAX

**Action:** DRAWS SHOULDER FORWARD, ROTATES SCAPULA

**ERECTOR SPINAE**

**Position:** RIBBON-SHAPED GROUP OF MUSCLES EITHER SIDE OF SPINE

**Action:** EXTENDS VERTEBRAL COLUMN

**GLUTEUS MINIMUS**

**Position:** FAN SHAPED MUSCLE UNDERNEATH GLUTEUS MEDIUS

**Action:** ABDUCTS AND ROTATES FEMUR MEDIALLY

**Muscles of the shoulder and arm - anterior view**

**DELTOID**

**Position:** SHOULDER

**Action:** FRONT DRAWS ARM FORWARD; MIDDLE ABDUCTS; BACK DRAWS ARM BACKWARDS

**CORACOBRACHIALIS**

**Position:** DEEP TO BICEPS; TOP OF HUMERUS

**Action:** FLEXES AND ADDUCTS HUMERUS

**BICEPS**

**Position:** ANTERIOR ASPECT OF UPPER ARM

**Action:** FLEXES ELBOW, SUPINATES FOREARM

**BRACHIALIS**

**Position:** BENEATH BICEPS ANTERIOR OF UPPER ARM

**Action:** FLEXES ELBOW JOINT

**BRACHIORADIALIS (SUPINATOR LONGUS)**

**Position:** LATERAL ANTERIOR FOREARM

**Action:** FLEXES ELBOW JOINT

**FLEXOR CARPI RADIALIS**

**Position:** ANTERIOR FORARM

**Action:** FLEXES WRIST JOINT

**PRONATOR TERES**

**Position:** CROSSES ANTERIOR ASPECT OF ELBOW

**Action:** PRONATES FOREARM

**FLEXOR CARPI ULNARIS**

**Position:** ANTERIOR OF FOREARM

**Action:** FLEXES WRIST, ADDUCTS ULNA

**FLEXOR CARPI DIGITORUM**

FLEXOR DIGITORUM SUPERFICIALIS

**Position:** ANTERIOR OF FOREARM

**Action:** FLEXES FINGERS

**Muscles of the shoulder and arm - posterior view**

**TRICEPS**

* LONG HEAD
* LATERAL HEAD
* MEDIAL HEAD

**Position:** POSTERIOR ASPECT OF UPPER ARM

**Action:** EXTENDS ELBOW

**ANCONEUS**

**Position:** ELBOW

**Action:** EXTENDS FOREARM ASSISTS TRICEPS

**FLEXOR CARPI ULNARIS**

**Position:** POSTERIOR OF FOREARM

**Action:** FLEXES WRIST JOINT AND ADDUCTS ULNA

**EXTENSOR CARPI ULNARIS**

**Position:** POSTERIOR OF FOREARM

**Action:** EXTENDS WRIST JOINT

**DELTOID**

**TERES MINOR**

**Position:** SIDE OF SCAPULA TO HUMERUS

**Action:** LATERAL ROTATION OF HUMERUS; STABILISES HUMERUS IN SOCKET

**TERES MAJOR**

**Position:** SIDE OF SCAPULA TO HUMERUS

**Action:** ADDUCTS AND MEDIALLY ROTATES HUMERUS; EXTENDS SHOULDER JOINT

**BRACHIORADIALIS**

(SUPINATOR LONGUS)

**Position:** LATERAL ANTERIOR FOREARM

**Action:** FLEXES ELBOW JOINT

**EXTENSOR CARPI RADIALIS**

(RADIALIS LONGUS)

**Position:** POSTERIOR OF ARM CROSSES ELBOW JOINT

**Action:** EXTENDS WRIST

**SUPINATOR RADII BREVI**

**Position:** POSTERIOR FOREARM

**Action:** SUPINATES FOREARM

**EXTENSOR CARPI DIGITORUM**

**Position:** POSTERIOR OF FOREARM

**Action:** EXTENDS FINGERS

**Muscles of the leg - anterior view**

**ILIO-PSOAS** (ALSO KNOWN SEPARATELY AS ILIACUS AND PSOAS)

**Position:** DEEP MUSCLE OF PELVIC FLOOR WHICH CROSSES THE HIP JOINT

**Action:** ROTATES FEMUR LATERALLY AND FLEXES HIP

**ILIACUS**

**PSOAS**

**QUADRICEPS**

**VASTUS LATERALIS**

**Position:** LATERAL AND FRONT OF THIGH

**Action:** EXTENDS KNEE

**RECTUS FEMORIS**

**Position:** FRONT OF THIGH

**Action:** EXTENDS KNEE AND FLEXES HIP

**VASTUS INTERMEDIUS** (UNDER RECTUS FEMORIS)

**Position:** FRONT OF THIGH

**Action:** EXTENDS KNEE

**VASTUS MEDIALIS**

**Position:** MEDIAL AND FRONT OF THIGH

**Action:** EXTENDS KNEE

**PERONEUS LONGUS**

**Position:** ANTERIOR AND LATERAL SIDE OF LEG

**Action:** EVERTS AND PLANTARFLEXES FOOT, SUPPORTS ARCHES

**TIBIALIS ANTERIOR**

**Position:** LATERAL FRONT OF LOWER LEG

**Action:** DORSIFLEXES AND INVERTS THE FOOT

**EXTENSOR DIGITORUM LONGUS**

**Position:** ANTERIOR ASPECT OF LOWER LEG

**Action:** EXTENDS TOES

**ADDUCTOR BREVIS**

**ADDUCTOR LONGUS**

**ADDUCTOR MAGNUS**

**Position:** MEDIAL SIDE OF UPPER FEMUR

**Action:** ADDUCTS FEMUR

**SARTORIUS**

**Position:** CROSSES OVER FROM THE HIP TO THE MEDIAL SIDE OF THE KNEE

**Action:** FLEXES HIP AND KNEE, ROTATES FEMUR LATERALLY

**GASTROCNEMIUS**

**SOLEUS**

**Muscles of the leg - posterior view**

**HAMSTRINGS**

**BICEPS FEMORIS**

**Position:** LATERAL SIDE BACK OF THIGH

**Action:** FLEXES KNEE JOINT AND EXTENDS HIP

**SEMITENDINOSUS**

**Position:** LIES ON TOP OF SEMIMEMBRANOSUS

**Action:** FLEXES KNEE, EXTENDS HIP

**SEMIMEMBRANOSUS**

**Position:** UNDERNEATH SEMITENDINOSUS ON MEDIAL ASPECT OF BACK OF THIGH

**Action:** FLEXES KNEE, EXTENDS HIP

**GRACILIS**

**Position:** MEDIAL ASPECT OF THIGH

**Action:** ADDUCTS AND ROTATES FEMUR MEDIALLY, FLEXES KNEE

**FLEXOR DIGITORUM LONGUS**

**Position:** DEEP TO SOLEUS

**Action:** FLEXES TOES

**GLUTEUS MINIMUS**

**Position:** FAN SHAPED MUSCLE UNDERNEATH GLUTEUS MEDIUS

**Action:** ABDUCTS AND ROTATES FEMUR MEDIALLY

**ADDUCTOR MAGNUS**

**Position:** MEDIAL AND SLIGHTLY ANTERIOR ASPECT OF THIGH

**Action:** ADDUCTS FEMUR

**VASTUS LATERALIS**

**Position:** FRONT OF THIGH LATERALLY

**Action:** EXTENDS KNEE

**GASTROCNEMIUS** (CALF MUSCLE)

**Position:** POSTERIOR ASPECT OF LOWER LEG, JOINS WITH SOLEUS TO FORM TENDON OF ACHILLES

**Action:** PLANTARFLEXES FOOT

**SOLEUS**

**Position:** DEEP TO GASTROCNEMIUS

**Action:** PLANTARFLEXES FOOT WALKING

**PERONEUS LONGUS**

**Position:** ANTERIOR AND LATERAL SIDE OF LEG

**Action:** EVERTS AND PLANTARFLEXES FOOT, SUPPORTS ARCHES

**TENDON OF ACHILLES**

**Position:** POSTERIOR ASPECT OF LOWER LEG; CONTINUATION OF SOLEUS/GASTROCNEMIUS TO HEEL OF FOOT

**Action:** PLANTARFLEXES FOOT

**TOPIC 4: DISEASES AND DISORDERS ( PATHOLOGIES )**

**FIBROMYALGIA**

**Cause:** unknown.

**Effect:** pain, stiffness and tenderness of the muscles, tendons and joints. Most common in the back, neck, shoulders and feet.

**CRAMP**

**Cause:** vigorous exercise and over-exertion; also extreme heat; sodium and/or water depletion.

**Effect:** painful localised and involuntary contraction of one or more muscles.

**ATONY**

Lack of normal tone or tension in a muscle.

**ATROPHY**

**Cause:** undernourishment; lack of use.

**Effect:** wasting away, or failure to reach normal size, of bulk of muscle.

**MYOSITIS**

Inflammation of a muscle.

**RUPTURE**

Burst or tear in the fascia or sheath surrounding muscles.

**SPASM**

A more than usual number of muscle fibres in sustained contraction, usually in response to pain. Fibres contract for much longer than is usually necessary.

**SPASTICITY**

**Cause:** inhibitory nerves have been cut.

**Effect:** spinal reflexes cause sustained contraction.

**SPRAIN**

**Cause:** sudden twist or wrench of the joint's ligaments

**Effect:** an injury or damage to a joint; painful swelling of the joint; the most commonly sprained joint is the ankle (often called a 'twisted ankle'). A sprained ankle is usually caused by the joint 'going over', thus putting all the body weight on the ankle.

**STRAIN**

**Cause:** overexertion, over-stretching, over-use; failure to warm up before strenuous activity, especially sport.

**Effect:** an injury to a muscle or its tendon; may occasionally involve rupture (tearing) of muscle fibres, muscle sheath or tendon.

**STRESS**

**Cause:** stress is any factor which affects physical or mental well-being.

**Effect:** excessive muscle tension and subsequent muscle pain, especially in the back and neck.

**ADHESIONS**

Are fibrous bands that form between tissues and organs, often as a result of injury.

**ADHESIVE CAPSULITIS ( FROZEN SHOULDER )**

Is a disorder in which the connective tissue surrounding the shoulder becomes inflamed and stiff, and grows together with abnormal bands of tissue greatly restricting motion and causing chronic pain.

**ACHILLES TENDONITIS**

Is an injury to the achilles tendon generally precipitated by overuse of the affected limb and is more common among athletes training under less than ideal conditions.

**LUMBAGO**

Is backache affecting the lumbar region or lower back; can be caused by muscle strain or arthritis.

**CRAMP**

Is an unpleasant, often painful sensation caused by contraction or over-shortening of muscles. Cramps can be caused by cold, overexertion or low calcium levels in blood.

**LATERAL EPICONDYLITIS ( TENNIS ELBOW )**

Is a painful inflammation of the tendon at the outer border of the elbow resulting from overuse of lower arm muscles.

**MEDIAL EPICONDYLITIS ( GOLFER’S ELBOW )**

Is an inflammatory condition of the elbow which in some ways is similar to tennis elbow.

**MICROTRAUMA**

Is the general term given to small injuries to the body.

**MUSCLE FATIGUE**

Is a direct term for the inability to exert force with one’s muscles to the degree that would be expected given the individual’s general physical fitness.

**REPETITIVE STRAIN INJURY/SYNDROME**

Pain with associated loss of function in a limb resulting from its repeated movement.

**RUPTURE**

Is a forcible tearing or disruption of a tissue.

**SHIN SPLINTS**

A painful inflammation of the muscles around the shins; frequent among runners.

**TENDONITIS**

Is an inflammation in or around tendons (bands of strong fibrous tissue that hold muscle to bone).

**ACHILLES BURSITIS**

Is the inflammation of one or more bursae (small sacs) of synovial fluid in and around the Achilles.

**MUSCULAR DYSTROPHY**

Any of several hereditary diseases of the muscular system characterized by weakness and wasting of skeletal muscles.

**TETANUS**

An acute and serious infection of the central nervous system caused by bacterial infection of open wounds.

**BURSITIS**

Is the inflammation of one or more bursae (small sacs) of synovial fluid in the body.

**HOUSEMAIDS KNEE**

Is when the bursa in the knee becomes inflamed, it swells up, forming a large egg like protrusion over the knee cap.

**INTERRELATIONSHIPS**

Muscular system links to:

**Nervous:** relies upon nerve impulses to produce a contraction in the muscle. Without nerve stimulus movement would not be possible.

**Skeletal:** muscles always cross a joint and thus rely on the skeletal system for leverage and movement.

**Digestive:** nutrition/energy in the form of glucose is received from the digestive system. If it is not immediately used it is converted to glycogen and stored in the muscle fibres for energy production later. Circulatory and respiratory: muscles receive oxygen from the vascular and respiratory system.

**Summary**

The muscular system:

* There are three types of muscle: voluntary, involuntary and cardiac.
* There are two types of muscle attachment: tendon and fascia.
* Voluntary muscles have a variety of actions.
* Muscles work by contraction.
* Over-contraction without enough oxygen can cause lactic acid to form, which prevents muscles from functioning correctly.

**The Muscles of the body chart**

**Muscles of the torso** - Sternocleidomastoid

**Origin**  - Sternum & clavicle

**Insertion** - Mastoid process

**Main actions** - One side only - flexes neck laterally and rotates it. Both - side flexion

**Muscles of the torso** - Scalenus

**Origin**  - Transverse processes of 2nd to 6th cervical

**Insertion** - Upper surfaces of ribs 1 and 2

**Main actions** - Raises first two ribs, flexes and rotates the neck

**Muscles of the torso** - Splenius capitis

**Origin**  - First six thoracic vertebrae

**Insertion** - Mastoid process and occipital bone

**Main actions** - Extends the neck. Slight rotation

**Muscles of the torso** - Levator scapulae

**Origin**  - Upper four cervical vertebrae

**Insertion** - Superior medial border of scapula

**Main actions** - Elevates shoulder, rotates scapula

**Muscles of the torso** - Supraspinatus

**Origin**  - Supraspinous fossa of scapula

**Insertion** - Greater tuberosity of humerus

**Main actions** - Abducts arm

**Muscles of the torso** - Infraspinatus

**Origin**  - Inferior spinous fossa of scapula

**Insertion** - Greater tuberosity of humerus

**Main actions** - Rotates arm outwards (laterally)

**Muscles of the torso** - Subscapularis

**Origin**  - Subscapular fossa of scapula

**Insertion** - Lesser tuberosity of humerus

**Main actions** - Rotates arm inwards

**Muscles of the torso** - Teres minor

**Origin**  - Axillary border of scapula

**Insertion** - Greater tuberosity of humerus

**Main actions** - Rotates arm outwards ( laterally )

**Muscles of the torso** - Teres major

**Origin**  - Inferior angle of scapula

**Insertion** - Medial lip of bicipital groove of humerus

**Main actions** - Draws arm backwards, adducts and medially rotates it

**Muscles of the torso** - Rhomboid major & minor

**Origin**  - 7th cervical and 1st to 5th thoracic vertebrae

**Insertion** - Medial border of scapula

**Main actions** - Adducts (draws towards spine) and rotates scapula downwards

**Muscles of the torso** - Trapezius

**Origin**  - Occipital bone, cervical and thoracic vertebrae

**Insertion** - Clavicle and spine of scapula

 Acromion process

**Main actions** - Elevates and braces shoulder, rotates scapula

**Muscles of the torso** - Latissimus dorsi

**Origin**  - Lower six thoracic and lumbar vertebrae, sacrum and illiac crest

**Insertion** - Bicipital groove of humerus

**Main actions** - Draws arm backwards, adducts and rotates it inwards

**Muscles of the torso** - Erector spinae

**Origin**  - Sacrum and iliac crest, ribs and lower vertebrae

**Insertion** - Ribs, vertebrae and mastoid process

**Main actions** - One side only - flexes trunk laterally. Both - extends trunk

**Muscles of the torso** - Quadratus lumborum

**Origin**  - Iliac crest

**Insertion** - 12th rib and transverse processes of upper four lumbar vertebrae

**Main actions** - One side only - flexes trunk laterally and rotates it Both - extends trunk

**Muscles of the torso** - Pectoralis major

**Origin**  - Clavicle, sternum, upper six costal cartilages

**Insertion** - Lateral lip of bicipital groove of humerus

**Main actions** - Draws arm forwards (flexes) and adducts and rotates it inwards (medial

 rotation)

**Muscles of the torso** - Pectoralis minor

**Origin**  - 3rd to 5th ribs

**Insertion** - Coracoid process of scapula

**Main actions** - Draws shoulder forwards and downwards

**Muscles of the torso** - Serratus anterior

**Origin**  - Upper nine ribs

**Insertion** - Anterior surface of vertebral border of scapula

**Main actions** - Draws shoulder forwards and rotates scapula

**Muscles of the torso** - Rectus abdominus

**Origin**  - Pubis

**Insertion** - Ribs and sternum

**Main actions** - Flexes the trunk

**Muscles of the torso** - Abdominus transversalis

**Origin**  - Inguinal ligament, iliac crest, lumbar fascia, cartilages of lower six ribs

**Insertion** - Conjoint tendon and lines alba through abdominal aponeurosis, pubis

**Main actions** - Supports the viscera, compresses abdomen

**Muscles of the torso** - Internal obliques

**Origin**  - Inguinal ligament, iliac crest and lumbar fascia

**Insertion** - Costal cartilages of ribs 9-12 and linea alba

**Main actions** - Lumbar flexion, side flexion and rotation

**Muscles of the torso** - External obliques

**Origin**  - Lower eight ribs

**Insertion** - Iliac crest and linea alba through abdominal aponeurosis

**Main actions** - Lumbar flexion, side flexion and rotation

**Muscles of the torso** - Internal Intercostals

**Origin**  - Lower borders of upper eleven pairs of ribs

**Insertion** - From the cartilages to the angles of the upper eleven ribs

**Main actions** - Draw ventral part of ribs downward, decreasing the volume of the

 thoracic cavity for expiration

**Muscles of the torso** - External Intercostals

**Origin**  - Lower margin of upper eleven ribs

**Insertion** - From the cartilages to the angles of the upper eleven ribs

**Main actions** - Draw ventral part of ribs downward, decreasing the volume of the

 thoracic cavity for expiration

**Muscles of the arm** - Deltoid

**Origin**  - Clavicle, acromion process and spine of scapula

**Insertion** - Deltoid tuberosity of humerus

**Main actions** - Front draws arm forwards, Middle abducts the arm, Back draws arm

 backwards

**Muscles of the arm** - Coracobrachialis

**Origin**  - Coracoid process of scapula

**Insertion** - Shaft of humerus

**Main actions** - Adducts and flexes the arm, horizontally adducts the shoulder

**Muscles of the arm** - Biceps brachii

**Origin**  - Long head - supra glenoid tubercle of scapula, Short head - coracoid

 process of scapula

**Insertion** - Tuberosity of radius

**Main actions** - Flexes elbow, supinates forearm

**Muscles of the arm** - Brachialis

**Origin**  - Shaft of humerus

**Insertion** - Coronoid process of ulna

**Main actions** - Flexes elbow

**Muscles of the arm** - Brachioradialis

**Origin**  - Lateral condyloid ridge of humerus

**Insertion** - Distal part of radius

**Main actions** - Flexes elbow

**Muscles of the arm** - Triceps brachii

**Origin**  - Long head – scapula

 Medial head – humerus

 Lateral head - humerus

**Insertion** - Olecranon process of ulna

**Main actions** - Extends elbow

**Muscles of the arm** - Anconeus

**Origin**  - Lateral epicondyle of humerus

**Insertion** - Olecranon process of ulna

**Main actions** - Extends elbow

**Muscles of the arm** - Pronator teres

**Origin**  - Above medial epicondyle of humerus and coronoid process of ulna

**Insertion** - Middle of shaft of radius

**Main actions** - Pronates forearm and hand

**Muscles of the arm** - Supinator

**Origin**  - Lateral epicondyle of humerus

**Insertion** - Lateral surface of radius

**Main actions** - Supinates forearm and hand

**Muscles of the arm** - Extensor digitorum

**Origin**  - Lateral epicondyle of humerus

**Insertion** - Metacarpals and phalanges

**Main actions** - Extends wrist and fingers

**Muscles of the arm** - Extensor carpi radialis brevis & longus

**Origin**  - Lateral epicondyle of humerus

**Insertion** - 2nd and 3rd metacarpals

**Main actions** - Extends and abducts wrist

**Muscles of the arm** - Extensor carpi ulnaris

**Origin**  - Lateral epicondyle of humerus

**Insertion** - 5th metacarpal

**Main actions** - Extends wrist

**Muscles of the arm** - Extensor pollicus longus

**Origin**  - Middle third of dorsal surface of ulna, interosseous membrane

**Insertion** - Base of distal phalanx of thumb

**Main actions** - Extends thumb

**Muscles of the arm** - Palmaris longus

**Origin**  - Medial epicondyle of the humerus through the common tendon

**Insertion** - Front of the flexor retinaculum and apex of the palmar aponeurosis

**Main actions** - Flexes the hand

**Muscles of the arm** - Flexor digitorum profundus

**Origin**  - Upper three-fourths of anterior and medial surfaces of shaft of ulna

 and medial side of the coronoid process, interosseous membrane

**Insertion** - Front of base of distal phalanges of fingers

**Main actions** - Flexes distal phalanges

**Muscles of the arm** - Flexor carpi radialis

**Origin**  - Medial epicondyle of humerus

**Insertion** - 2nd and 3rd metacarpals

**Main actions** - Flexes wrist

**Muscles of the arm** - Flexor carpi ulnaris

**Origin**  - Medial epicondyle of humerus and ulna

**Insertion** - 5th metatcarpal, pisiform and hamate

**Main actions** - Flexes wrist

**Muscles of the arm** - Flexor digitorum superficialis

**Origin**  - Humeroulnar head - medial epicondyle of the humerus through

 common tendon. Radial head - anterior surface of shaft of radius

**Insertion** - Four tendons divide into two slips each and these insert into the sides

 of the middle phalanges of four fingers

**Main actions** - Flexes the middle phalanges of the fingers

**Muscles of the arm** - Palmer aponeurosis ( palmaris brevis )

**Origin**  - Flexor retinaculum, palmar aponeurosis

**Insertion** - Skin of the palm

**Main actions** - Corrugates skin of palm

**Muscles of the arm** - Thenar eminence

 Abductor pollicis brevis

**Origin**  - Tubercle of scaphoid, tubercle of trapezium, flexor retinaculum

**Insertion** - Base of proximal phalanx of thumb

**Main actions** - Abducts thumb and moves it anteriorly

**Muscles of the arm** - Flexor pollicis brevis

**Origin**  - Flexor retinaculum and trapezium and first metacarpal bone

**Insertion** - Base of proximal phalanx of thumb

**Main actions** - Flexes metacarpophalangeal joint of thumb, assists in abduction and

 rotation of thumb

**Muscles of the arm** - Opponen pollicis

**Origin**  - Flexor retinaculum, tubercle of trapezium

**Insertion** - Lateral border of first metacarpal bone

**Main actions** - Rotates thumb into opposition with fingers

**Muscles of the arm** - Hypothenar eminence

 Abductor digiti minimi

**Origin**  - Pisiform bone, tendon of flexor carpi ulnaris

**Insertion** - Medial side of base of proximal phalanx of the little finger

**Main actions** - Abducts little finger

**Muscles of the arm** - Flexor digita minimi brevis

**Origin**  - Anterior surface of flexor retinaculum, hook of hamate

**Insertion** - Medial side of base of proximal phalanx of little finger

**Main actions** - Flexes little finger at metacarpophalangeal

**Muscles of the arm** - Opponens digiti minimi

**Origin**  - Anterior surface of flexor retinaculum, hook of hamate

**Insertion** - Whole length of medial border of fifth metacarpal bone

**Main actions** - Rotates fifth metacarpal bone, draws fifth metacarpal bone forward

**Muscles of the leg** - Iliopsoas Psoas Iliacus

**Origin**  - 12th thoracic and all lumbar vertebrae, iliac fossa and front of sacrum

**Insertion** - Lesser trochanter of femur

**Main actions** - Flexes the thigh and laterally rotates femur

**Muscles of the leg** - Gluteus maximus

**Origin**  - Posterior crest of ilium, posterior surface of sacrum and coccyx

**Insertion** - Gluteal tuberosity of femur

**Main actions** - Tenses fascia lata and extends hip, raises trunk after stooping

**Muscles of the leg** - Gluteus medius

**Origin**  - Posterior surface of ilium

**Insertion** - Greater trochanter of femur

**Main actions** - Abducts and medially rotates femur

**Muscles of the leg** - Gluteus minimus

**Origin**  - Lateral surface of ilium

**Insertion** - Greater trochanterof femur

**Main actions** - Abducts and medially rotates femur

**Muscles of the leg** - Piriformis

**Origin**  - Front of sacrum

**Insertion** - Greater trochanter of femur

**Main actions** - Laterally rotates femur

**Muscles of the leg** - Tensor fascia late

**Origin**  - Anterior iliac crest

**Insertion** - Fascia lata

**Main actions** - Abducts and rotates the femur

**Muscles of the leg** - Biceps femoris

**Origin**  - Long head – ischium

 Short head - linea aspera

**Insertion** - Head of fibula and lateral condyle of tibia

**Main actions** - Extends hip, flexes knee

**Muscles of the leg** - Semitendinosus

**Origin**  - Ischial tuberosity

**Insertion** - Below medial condyle of tibia

**Main actions** - Extends hip, flexes knee

**Muscles of the leg** - Rectus femoris

**Origin**  - Above acetabulum

**Insertion** - Through patella and patellar tendon on to tibial tuberosity

**Main actions** - Extends knee, flexes hip

**Muscles of the leg** - Vastus lateralis

**Origin**  - Greater trochanter and linea aspera

**Insertion** - Through patella and patellar tendon on to tibial tuberosity

**Main actions** - Extends knee

**Muscles of the leg** - Vastus intermedius

**Origin**  - Shaft of femur

**Insertion** - Through patella and patellar tendon on to tibial tuberosity

**Main actions** - Extends knee

**Muscles of the leg** - Vastus medialis

**Origin**  - Whole length of linea aspera and medial condyloid ridge

**Insertion** - Through patella and patellar tendon on to tibial tuberosity

**Main actions** - Extends knee

**Muscles of the leg** - Sartorius

**Origin**  - Anterior superior iliac spine

**Insertion** - Below medial condyle of tibia

**Main actions** - Flexes, abducts and rotates femur laterally, flexes knee

**Muscles of the leg** - Gracilis

**Origin**  - Pubis and ischium

**Insertion** - Below medial condyle of tibia

**Main actions** - Adducts and medially rotates femur, flexes knee

**Muscles of the leg** - Adductors - longue, brevis & magnus

**Origin**  - Pubis and ischium

**Insertion** - Linea aspera and supra-condylar line

**Main actions** - Adducts femur

**Muscles of the leg** - Pectineus

**Origin**  - Pubis

**Insertion** - Close to lesser trochanter of femur

**Main actions** - Adducts femur, flexes hip

**Muscles of the leg** - Popliteus

**Origin**  - Lateral condyle of femur

**Insertion** - Tibia

**Main actions** - Internally rotates and flexes the knee

**Muscles of the leg** - Gastrocnemius

**Origin**  - Medial and lateral condyles of femur

**Insertion** - Through Achilles tendon to calcaneum

**Main actions** - Plantarflexes the foot, flexes the knee

**Muscles of the leg** - Soleus

**Origin**  - Fibula and tibia

**Insertion** - Calcaneum

**Main actions** - Plantarflexes the foot

**Muscles of the leg** - Peroneus longus

**Origin**  - Fibula

**Insertion** - Medial cuneiform and 1st metatarsal

**Main actions** - Everts foot and plantarflexes ankle

**Muscles of the leg** - Peroneus brevis

**Origin**  - Fibula

**Insertion** - 5th metatarsal

**Main actions** - Everts foot and plantarflexes the ankle

**Muscles of the leg** - Tibialis anterior

**Origin**  - Shaft of tibia

**Insertion** - Medial cuneiform and 1st metatarsal

**Main actions** - Dorsiflexes and inverts the foot

**Muscles of the leg** - Tibialis posterior

**Origin**  - Tibia and fibula

**Insertion** - Navicular and 2nd to 4th metatarsals

**Main actions** - Inverts and plantarflexes the foot

**Muscles of the leg** - Extensor digitorum longus

**Origin**  - Tibia and fibula

**Insertion** - Distal phalanges of toes

**Main actions** - Extends toes, dorsiflexes the ankle and everts foot

**Muscles of the leg** - Flexor digitorum longus

**Origin**  - Posterior of tibia

**Insertion** - Distalphalanges of toes

**Main actions** - Flexes toes, plantarflexes the ankle and inverts foot

**Muscles of the leg** - Extensor hallucis longus

**Origin**  - Middle half of anterior surface of fibula and interosseous membrane

**Insertion** - Base of distal phalanx of big toe

**Main actions** - Extends big toe, dorsiflexes and inverts foot

**Muscles of the leg** - Peroneous tertius

**Origin**  - Lower third of anterior surface of fibula and interosseous membrane

**Insertion** - Dorsal surface of base of fifth metatarsal bone

**Main actions** - Dorsiflexes and everts foot

**Muscles of the leg** - Extensor digitorum brevis

**Origin**  - Anterior and lateral surfaces of calcaneus, lateral talocalcaneal

 ligament, inferior extensor retinaculum

**Insertion** - Into base of proximal phalanx of big toe, into lateral sides of tendons

 of extensor digitorum longus of second, third and fourth toes

**Main actions** - Extends the four toes

**Muscles of the leg** - Flexor digitorum brevis

**Origin**  - Tuberosity of calcaneus, plantar aponeurosis

**Insertion** - Sides of middle phalanges of second to fifth toes

**Main actions** - Flexes proximal phalanges and extends distal phalanges of second

 through fifth toes

**Muscles of the leg** - Adductor hallucis

**Origin**  - Oblique head - second, third and fourth metatarsal bones and sheath

 of peroneus longus tendon

Transverse head - plantar metatarsophalangeal ligaments of third, fourth and fifth toes and transverse metatarsal ligaments

**Insertion** - Lateral side of base of proximal phalanx of big toe

**Main actions** - Adducts big toe

**Muscles of the leg** - Flexor Hallucis longus

**Origin**  - Lower two-thirds of posterior surface of shaft of fibula, posterior

 intermuscular septum, interosseous membrane

**Insertion** - Base of distal phalanx of big toe

**Main actions** - Flexes distal phalanx of big toe, assists in plantar flexing foot, inverts

 foot

**Muscles of the head, neck and chest** - Occipitalis

**Origin**  - Lateral two-thirds of superior nuchal line of occipital bone, mastoid

 process of temporal bone

**Insertion** - Gales aponeurotica (an intermediate tendon leading to frontal belly)

**Main actions** - Moves scalp backwards

**Muscles of the head, neck and chest** - Frontalis

**Origin**  - Gales aponeurotica

**Insertion** - Fascia of facial muscles and skin above nose and eyes

**Main actions** - Moves scalp forwards

**Muscles of the head, neck and chest** - Temporalis

**Origin**  - Fascia over ear

**Insertion** - Lateral border of galea aponeurotica

**Main actions** - Raises and retracts lower jaw

**Muscles of the head, neck and chest** - Procerus

**Origin**  - Fascia over nasal bone and lateral nasal cartilage

**Insertion** - Skin between eyebrows

**Main actions** - Wrinkles at bridge of nose (disgusted expression)

**Muscles of the head, neck and chest** - Nasalis

**Origin**  - Middle of maxilla

**Insertion** - Muscle of opposite side over bridge of nose

**Main actions** - Compresses and dilates nasal opening (produces annoyed expression

 and sniffing)

**Muscles of the head, neck and chest** - Levator labii superioris

**Origin**  - Frontal process of maxilla and zygomatic bone

**Insertion** - Greater alar cartilage and skin of nose, upper lip

**Main actions** - Lifts upper lip; produces cheerful expression

**Muscles of the head, neck and chest** - Levator anguli oris

**Origin**  - Canine fossa of maxilla

**Insertion** - Angle of mouth

**Main actions** - Raises corner of mouth; produces cheerful expression

**Muscles of the head, neck and chest** - Zygomaticus

**Origin**  - Zygomatic bone

**Insertion** - Angle of mouth and upper lip lateral to levator labii superioris

**Main actions** - Moves angle of mouth up, back and out (smiling)

**Muscles of the head, neck and chest** - Orbicularis oris

**Origin**  - Lateral band - alveolar border of maxilla

 Medial band - septum of nose

 Inferior portion - lateral midline of mandible

**Insertion** - Becomes continuous with other muscles at angle of mouth

**Main actions** - Purses lips

**Muscles of the head, neck and chest** - Mentalis

**Origin**  - Incisive fossa of mandible

**Insertion** - Skin of chin

**Main actions** - Lifts skin on chin and turns lower lip outwards

**Muscles of the head, neck and chest** - Depressor anguli oris

**Origin**  - Oblique line of the mandible

**Insertion** - Angle of the mouth

**Main actions** - Pulls down corners of mouth

**Muscles of the head, neck and chest** - Depressor labii inferioris

**Origin**  - Mandible, between symphysis and mental foramen

**Insertion** - Skin of lower lip

**Main actions** - Pulls lower lip straight down

**Muscles of the head, neck and chest** - Buccinator

**Origin**  - Outer surface of maxilla and mandible over molars and along

 pterygomandibular raphe

**Insertion** - Deep part of muscles of lips

**Main actions** - Compresses cheek against teeth to maintain tension and aids in

 mastication

**Muscles of the head, neck and chest** - Risorius

**Origin**  - Fascia over masseter

**Insertion** - Skin at angle of mouth

**Main actions** - Retracts angle of mouth and lifts upper lip (produces grinning

 expression)

**Muscles of the head, neck and chest** - Medial pterygoid

**Origin**  - Medial surface of lateral pterygoid plate of sphenoid bone, palatine

 bone and tuberosity of maxilla

**Insertion** - Medial surface of ramus and angle of mandible

**Main actions** - Raises the mandible

**Muscles of the head, neck and chest** - Lateral pterygoid

**Origin**  - Superior head - lateral surface of greater wing of sphenoid

 Inferior head - lateral surface of lateral pterygoid plate

**Insertion** - Condyle of mandible, tempormandibular joint

**Main actions** - Pushes mandible out and opens mouth

**Muscles of the head, neck and chest** - Masseter

**Origin**  - Zygomatic process of maxilla, medial and inferior surfaces of zygomatic

 arch

**Insertion** - Angle and ramus of mandible, lateral surface of coronoid process of

 mandible

**Main actions** - Raises lower jaw; chief muscle of mastication

**Muscles of the head, neck and chest** - Orbicularis oculi

**Origin**  - Frontal bone, maxilla and lacrimal bone

**Insertion** - Continues around orbit and returns to origin

**Main actions** - Closes eyelid

**Muscles of the head, neck and chest** - Sternocleidomastoid

**Origin**  - Sternum and medial part of clavicle

**Insertion** - Mastoid process of temporal bone and nuchal line of occipital bone

**Main actions** - Flexes head and turns from side to side

**Muscles of the head, neck and chest** - Platysma

**Origin**  - Subcutaneous fascia of upper one-fourth of chest

**Insertion** - Subcutaneous fascia and muscles of chin, jaw and mandible

**Main actions** - Depresses and draws lower lip laterally, draws up skin of chest

**Muscles of the head, neck and chest** - Digastricus

**Origin**  - Posterior belly - mastoid notch of temporal bone

 Anterior belly - inner side of inferior border of mandible near symphysis

**Insertion** - Intermediate tendon attached to hyoid bone

**Main actions** - Raises hyoid bone, assists in opening jaws, moves hyoid forward or

 backward