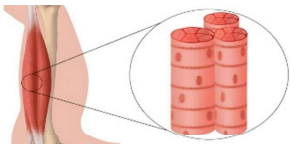


# Component 1 The Muscular System

## Classification of muscles:

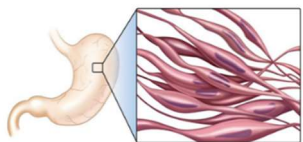
### Voluntary muscles

- Found on the skeleton e.g. biceps triceps & quadriceps
- Conscious control
- Attach to the skeleton to create movement



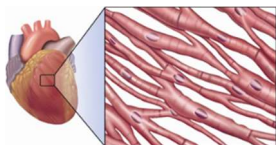
### Involuntary muscles

- Found in the stomach, intestines & blood vessels
- Unconscious control
- Contract slowly and rhythmically

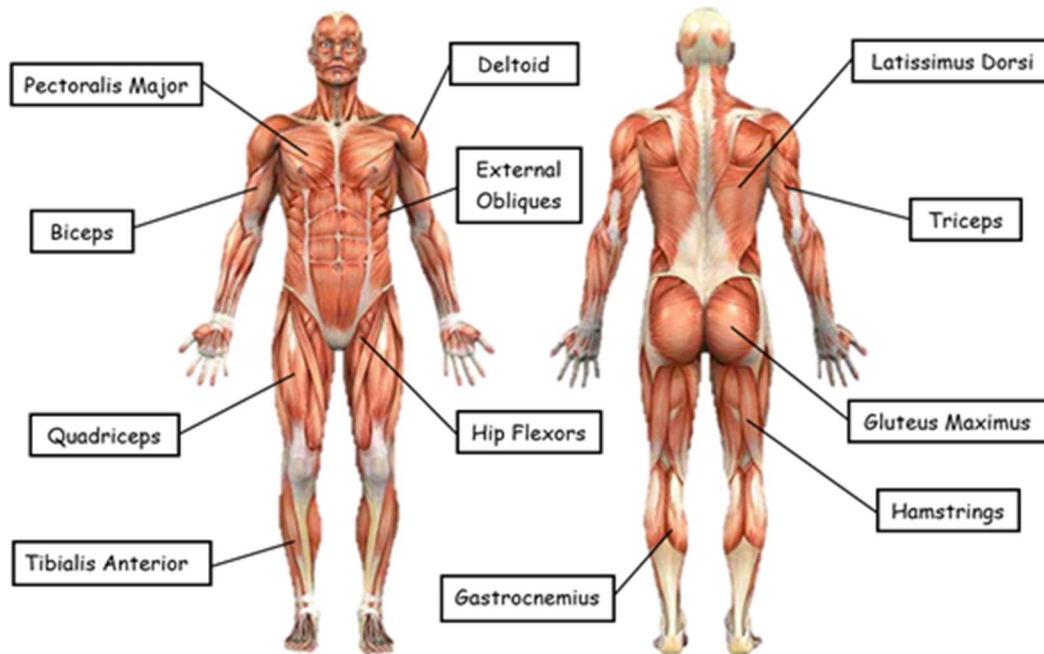


### Cardiac muscle

- Found in the wall of the heart
- Unconscious control
- Do not tire



## Voluntary muscles of the body:



## Muscle fibres:

### Type I (Slow Twitch)

- Aerobic events
- Marathon running

### Type IIa (Fast Twitch)

- 400m race

### Type IIx (Fast Twitch)

- Anaerobic events
- 100m sprint

| Characteristic        | Slow Twitch Type I | Fast Twitch Type IIa | Fast Twitch Type IIx |
|-----------------------|--------------------|----------------------|----------------------|
| Force of Contraction  | Low                | High                 | Very high            |
| Speed of Contraction  | Slow               | Medium               | Fast                 |
| Resistance to Fatigue | High               | Moderate             | Low                  |
| Aerobic or Anaerobic  | Aerobic            | Aerobic & Anaerobic  | Anaerobic            |
| Myoglobin             | High               | Medium               | Low                  |
| Mitochondria          | High               | Medium               | Low                  |
| Capillary Network     | Good               | Moderate             | Low                  |

## Muscles and their function:

| Muscle            | Location            | Function  | Sporting Example                                   |
|-------------------|---------------------|---|--|
| Deltoid           | Shoulder            | Move the upper arm in all directions from the shoulder    | Serve in tennis<br>Front Crawl                     |
| Pectoralis Major  | Chest               | Adducts the arm at the shoulder                           | Forehand drive in tennis<br>Hand off in rugby      |
| Latissimus Dorsi  | Back muscle         | Adducts and extends the arm at the shoulder               | Butterfly stroke<br>Pull ups                       |
| Biceps            | Front of Upper Arm  | Elbow flexion (bending)                                   | Boxing Uppercut<br>Preparing to Throw a javelin    |
| Triceps           | Back of Upper Arm   | Elbow extension (straightening)                           | Press-up<br>Hand off in rugby                      |
| External Obliques | Side of the abdomen | Pulls the chest downwards Flexion & rotation at vertebrae | Crunches   |
| Gluteus Maximus   | Form the buttocks   | Adducts and extends the hips pulling the leg backwards    | Pull leg back before kicking a ball                |
| Hip Flexors       | Front of the hip    | Flexes the hip, moves the hip upwards                     | Lifting knees when sprinting                       |
| Quadriceps        | Front of Upper Leg  | Knee extension (straightening)                            | Kicking a ball<br>Jumping upwards on a lay-up shot |
| Hamstrings        | Back of Upper Leg   | Knee flexion (bending)                                    | Bending knee before kicking a ball                 |
| Gastrocnemius     | Calf muscle         | Plantar flexion, points the toes                          | Running, jumping and gymnastics                    |
| Tibialis Anterior | Shin                | Dorsi flexion, pulls toes upwards                         | Ski jumping<br>Hurdling                            |

## Antagonistic muscle pairs:



When we bend the elbow (flexion) the biceps contract and the triceps relax  
Agonist = Biceps  
Antagonist = Triceps



When we straighten the elbow (extension) the triceps contract and the biceps relax  
Agonist = Triceps  
Antagonist = Biceps

### Other antagonistic pairs include:

- Quadriceps & Hamstrings
- Hip flexors & Gluteus Maximus
- Gastrocnemius & Tibialis Anterior

The skeletal system and muscular system work together. Bones provide anchors for muscles to attach. Muscles attach to bone through tendons, when muscles contract, they pull on bones to create movement.